THE EFFECT OF TESTING ACCOMMODATIONS ON NINTH GRADE SIGHTED AND BLIND STUDENTS' ACHIEVEMENT ABOUT MOTION AND SOME AFFECTIVE CHARACTERISTICS

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ABSTRACT

THE EFFECT OF TESTING ACCOMMODATIONS ON NINTH GRADE SIGHTED AND BLIND STUDENTS' ACHIEVEMENT ABOUT MOTION AND SOME AFFECTIVE CHARACTERISTICS

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The purpose of this study is revealing the problems of blind students in examinations and determining how testing accommodations affect sighted and blind students' achievement and some affective characteristics. The study was designed with the transformative mixed method. In the qualitative phase, eight blind students in Bursa were interviewed. Considering the results of qualitative phase, quantitative phase was planned and conducted in three inclusive classrooms. Two of the classrooms were in Sakarya and one was in Bursa, and each including one blind student. Before the instruction, student information form and four scales about affective characteristics were implemented to students. During the instruction, formal textbooks and enriched course materials were used. After instruction, all students took the motion achievement test in non-accommodated, verbal descriptions, and tactile graphics testing accommodations conditions and post tested about affective characteristics.

Content analysis results revealed that blind students stated problems mostly about the presentation of the exams, and setting, timing, and response styles are also problematic. They specified injustices both in instruction and exams. According to the results of the quantitative phase, the achievement of the blind and sighted students was similar when testing accommodations were used. It was determined that the exemption of blind students from the visual questions gave a score advantage to the blind students. While presenting instruction and testing in an accessible way increased the physics self-efficacy, attitude towards physics, and self-esteem of blind students, it decreased their test anxiety, and no change was detected about the affective characteristics of sighted students.

Keywords: Physics Education, Testing Accommodations, Blind Students, Physics Achievement, Affective Characteristics

ÖZ

SINAV DÜZENLEMELERİNİN GÖREN VE KÖR DOKUZUNCU SINIF ÖĞRENCİLERİN HAREKET KONUSUNDAKİ BAŞARILARINA VE BAZI DUYUŞSAL ÖZELLİKLERİNE ETKİSİ

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Bu çalışmanın amacı, kör öğrencilerin sınavlarda karşılaştıkları sorunları ortaya çıkarmak, sınav düzenlemelerinin kör ve gören öğrencilerin başarılarını ve bazı duyuşsal özelliklerini nasıl etkilediğini belirlemektir. Çalışma, karma yöntemlerden dönüştürücü desen ile tasarlanmıştır. Nitel aşamada Bursa'da yaşayan sekiz kör öğrenci ile görüşmeler yapılmıştır. Nitel aşamanın sonuçları dikkate alınarak nicel aşama planlanmış ve üç kaynaştırma sınıfında yürütülmüştür. Her birinde bir kör öğrenci bulunan sınıflardan ikisi Sakarya'da, biri Bursa'da yer almıştır. Öğretim öncesinde öğrencilere öğrenci bilgi formu ve duyuşsal özelliklerle ilgili dört ölçek uygulanmıştır. Öğretim sırasında resmi ders kitabı ve zenginleştirilmiş ders materyalleri kullanılmıştır. Öğretimden sonra, tüm öğrencilere hareket başarı testi sınav düzenlemesi yapılmamış, sözlü betimlemeler kullanılarak hazırlanmış ve dokunsal grafikler ile hazırlanmış hali ile sunulmuş ve duyuşsal özelliklere yönelik son testler yapılmıştır.

İçerik analizi sonuçları, kör öğrencilerin daha çok sınavların sunumu ile ilgili sorun yaşadıklarını, ayrıca sınav ortamı, zamanlama ve yanıtlama biçimlerinin de sorunlu olduğunu ortaya koymuştur. Kör öğrenciler hem öğretimde hem de sınavlarda

adaletsizliklerle karşılaştıklarını dile getirmişlerdir. Nicel aşamanın sonuçlarına göre, sınav düzenlemeleri kullanıldığında kör ve gören öğrencilerin başarıları benzer bulunmuştur. Kör öğrencilerin görsel sorulardan muaf tutulmasının kör öğrencilere puan avantajı sağladığı belirlenmiştir. Öğretim ve testlerin erişilebilir bir şekilde sunulması, kör öğrencilerin fizik öz-yeterliklerini, fiziğe yönelik tutumlarını ve benlik saygılarını artırırken sınav kaygılarını azaltmış, gören öğrencilerin duyuşsal özelliklerinde ise herhangi bir değişiklik tespit edilmemiştir.

Anahtar Kelimeler: Fizik Eğitimi, Sınav Düzenlemeleri, Kör Öğrenciler, Fizik Başarısı, Duyuşsal Özellikler

To my husband İsa Acar

&

My daughter Defne Bahar Acar

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LIST OF ABBREVIATIONS

ACT	: American College Testing
AYT	: Field Qualification Test
BANA	: The Braille Authority of North America
CFA	: Confirmatory Factor Analysis
CFI	: Comparative Fit Index
COMP	: Comprehension
CR	: Critical Ratio
CSAT	: College Scholastic Ability Test
CU	: Conceptual Understanding
EA	: Everyday Application
EBA	: Education and Informatics Network
ECM	: Enriched Course Materials
EGED	: Association of the Visually Impaired in Education
ELA	: English language arts
EMO	: Emotionality
GCE	: General Certificate of Education
GCSE	: General Certificate of Secondary Education
HCS	: Higher-order Cognitive Skills
IMP	: Importance
INT	: Interest
LGS	: High School Transition Examination

LYS	: Undergraduate Placement Examination
MAT	: Motion Achievement Test
MEB	: Republic of Turkey Ministry of National Education
NAMAT	: Non-Accommodated Motion Achievement Test
NCEE	: The National College Entrance Examination
ÖSYM	: Measurement, Selection and Placement Center
PATT	: Physics Attitude Scale
Post_PATT	: Post Physics Attitude
Post_PATT_COMP	: Post Physics Attitude Comprehension
Post_PATT_IMP	: Post Physics Attitude Importance
Post_PATT_INT	: Post Physics Attitude Interest
Post_PATT_REQ	: Post Physics Attitude Requirement
Post_PSEF	: Post Physics Self-Efficacy
Post_PSEF_CU	: Post Physics Self-Efficacy Conceptual Understanding
Post_PSEF_EA	: Post Physics Self-Efficacy Everyday Application
Post_PSEF_HCS	: Post Physics Self-Efficacy Higher-Order Cognitive Skills
Post_PSEF_PW	: Post Physics Self-Efficacy Practical Work
Post_PSEF_SC	: Post Physics Self-Efficacy Science Communication
Post_SEST	: Post Self Esteem
Post_TANX	: Post Test Anxiety
Post_TANX_EMO	: Post Test Anxiety Emotionality
Post_TANX_WOR	: Post Test Anxiety Worry

Pre_PATT	: Pre Physics Attitude
Pre_PATT_COMP	: Pre Physics Attitude Comprehension
Pre_PATT_IMP	: Pre Physics Attitude Importance
Pre_PATT_INT	: Pre Physics Attitude Interest
Pre_PATT_REQ	: Pre Physics Attitude Requirement
Pre_PSEF	: Pre Physics Self-Efficacy
Pre_PSEF_CU	: Pre Physics Self-Efficacy Conceptual Understanding
Pre_PSEF_EA	: Pre Physics Self-Efficacy Everyday Application
Pre_PSEF_HCS	: Pre Physics Self-Efficacy Higher-Order Cognitive Skills
Pre_PSEF_PW	: Pre Physics Self-Efficacy Practical Work
Pre_PSEF_SC	: Pre Physics Self-Efficacy Science Communication
Pre_SEST	: Pre Self Esteem
Pre_TANX	: Pre Test Anxiety
Pre_TANX_EMO	: Pre Test Anxiety Emotionality
Pre_TANX_WOR	: Pre Test Anxiety Worry
PSEF	: Physics Self-Efficacy Scale
PW	: Practical Work
QIV	: Questions Including Visual
QNIV	: Questions Not Including Visuals
REQ	: Requirement
RMSEA	: Root Mean Square Error of Approximation
R-QIV	: Revised Questions Including Visual

SAT : Scholastic Aptitude Test

SBS : The Level Determination Examination

SC : Science Communication

SEST : Self Esteem Scale

SRMR : Standardized Mean Square Residual

TAMAT : Tactile Graphics Testing Accommodations Condition of Motion Achievement Test

TANX : Test Anxiety Inventory

TAP : Test Analysis Program

TEOG : The Transition System from Elementary Education to Secondary Education

TIF : Test Instructions Form

TYT : Basic Proficiency Test

UEE : University Entrance Examination

VAMAT : Verbal Descriptions Testing Accommodations Condition of Motion Achievement Test

VESID : Vocational and Educational Services for Individuals with Disabilities

WOR : Worry

YGS : Transition to Higher Education Examination

YKS : Higher Education Institutions Examination

CHAPTER 1

INTRODUCTION

Assessment is used for multiple purposes in education. The most common assessment purposes are assigning grades in schools, placement of students to upper educational levels, diagnosing students' understanding, and improving learning. The assessment can vary from teacher-prepared classroom assessments to high-stakes, large scale national tests. High School Transition Examination (LGS) and Higher Education Institutions Examination (YKS) are the actual large-scale tests that serve to the placement of students to upper educational levels in Turkey. Since the results of these tests are used for making decisions about students' futures, the appropriate access of all test takers to testing is essential. Standardized tests that are administered to a large population under the same conditions and time limits are developed by related institutions. As it is known, students with special needs do not have an equal chance to access tests in standard conditions. Thus, it is crucial to ensure equity for all students when participating in tests.

In the Universal Declaration of Human Rights (1948), in article 26, it was stated that every child has the right to education. In Turkey, in Primary Education and Education Law (No. 222), which was enacted in 1961, it was expressed in the 1^{st} section, 12^{th} article that special education and instruction is provided for students who have mental, physical, psychological, and social disabilities. The basic principles of special education and the aim of inclusive education are explained in Decree-Law concerning Special Education (No. 573), which was declared in 1997. According to the 15^{th} article of the Turkish Disability Act (No. 5378), the right to education of disabled people cannot be prevented with any justification (2005). The people with special needs can be availed of life-long learning in inclusive environments without any discrimination by taking their special needs and differences into consideration.

Although there were instructional accommodations and acts about students with special needs, the studies about the assessment of these students were done later with Regulation of Special Education Services, which was first published in 2006 and rearranged in 2018. It regulates the principles and procedures to ensure the right to education of individuals with special educational needs in line with the general objectives and basic principles of Turkish National Education. The regulation expresses that individuals with special educational needs need to continue their education through inclusive education at all types and levels. However, special education institutions or special education classes can be opened for these individuals. As stated in the regulation, inclusive education ensures individuals with special educational needs to interact with other individuals and achieve their educational goals at the highest level at all degrees. Educational support services are also provided to these individuals with their peers, either full-time or part-time, in special education classes. In 24th and 38th articles, the evaluation of student achievement is explained in a detailed way. In all measurement and evaluation processes, necessary precautions are taken by arranging time, environment, methods, and materials in line with the student's disability type, developmental characteristics, and educational performances. In this dissertation, educationally blind students are the focal point. Although educationally blind students can see some light, they cannot read textbooks or tests. In Regulation of Special Education Services, the visually impaired individual is defined as the individual who needs special education and supports education service due to the partial or complete loss of vision. It states in the regulation that for students with visual impairments, questions containing pictures, figures, and graphics can be prepared in tactile format or with verbal descriptions. Equivalent questions can be prepared instead of these questions. Furthermore, necessary provisions can be made in the national exams for students with special educational needs in their schools. These explanations about assessment in the regulation point out testing accommodations.

Testing accommodations are the changes in the administration of standardized tests to provide the opportunity to students with special needs for showing their knowledge and understanding about constructs measured by the tests without the barriers of their disability (Lang, Elliot, Bolt, & Kratochwill, 2008). It is not expected from testing accommodations to get the edge over for students with special needs. In other words, testing accommodations are used to affect the skills needed to access a test, not the skills targeted for measurement by the test (Elliot, Braden, & White, 2001). Blind students are included in large-scale examinations in Turkey in which several testing accommodations are administered. Extended time, read-aloud, encoder, and individual administration are the testing accommodations applied in LGS and YKS. In Basic Proficiency Test (TYT) and Field Qualification Test (AYT), which are the session of YKS, blind students are not asked questions containing visual data such as figures, graphics, tables, and pictures, as well as questions containing complex expressions. Bülbül (2010) searched the last ten years' physics items of university entrance examinations and found that about 90% of the items included figures and graphs. Since physics questions contain a high proportion of visuals, blind students cannot access many of these questions like their sighted peers. Due to the visual elements in the question, the students' access to the content of the problem is restricted. Although blind students have the ability to answer the question, they cannot answer the question because they cannot access it. Excluding items that contain visuals causes the blind students not to be evaluated fairly since it changes the content of the test. Instead of exempting students from questions containing visuals, alternative testing accommodations can be used.

In this study, verbal descriptions, which means describing the items that include visuals verbally, and tactile graphics, which means presenting the items that include visuals in the tactile form, were used as testing accommodations to avoid removing visual questions from testing.

Although it is essential to evaluate blind students in fair settings, their fair access to the instruction should not be ignored. It cannot be claimed that loss of vision indicates inadequate mental capacity (Philips, 1994). Visually impaired students have the same spectrum of cognitive abilities as their sighted peers (Kumar, Ramasamy, & Stefanich, 2001). However, due to the lack of necessary instructional accommodations, blind students usually cannot access the instruction as sighted students. They cannot see what is written or drawn on the board and cannot receive additional material support that appeals to other senses. On the other hand, the accessibility of textbooks, one of the most common educational materials, for blind students is controversial. The late arrival of Braille textbooks to the blind students and limited accessibility of Braille textbooks for blind students due to the visuals in the content are other problems. Most of the teachers are not aware that their students have Braille textbooks. The probability of having a blind student in the class for a physics teacher is quite low. Therefore, teachers are unaware of how to present physics to a blind student and how to evaluate it. Teachers have to cope with the difficulties during the inclusion process and can be confused (Johnson Jones, 2017; Şahin & Yörek, 2009). This and such problems listed here can affect not only the achievement but also the affective characteristics of the blind students towards the course.

In many studies, the positive effects of testing accommodations on students with disabilities were expressed (Elliot, Kratochwill, & McKevitt, 2001; Lang et al., 2008; Tindal, Heath, Hollenbeck, Almond, & Harniss, 1998). Vanchu-Orosco (2012) conducted a meta-analysis of 34 studies. Among 34 studies, according to content, two studies were about science, and according to the level of education, two of the studies were at the secondary level. They stated that the testing accommodations have small to moderate overall effects on students with disabilities when compared to students without disabilities. For this reason, they stated that it would be more appropriate to include both blind and sighted students in order to understand the actual effect of testing accommodations.

At the end of an equitable instruction, using testing accommodations can enhance assessing blind students' achievement fairly. Providing all students equal educational opportunities might affect sighted and blind students' affective characteristics. To build an accessible learning environment for blind students and interpreting the results related with testing accommodations, it was crucial to understand their current problems. Therefore, in this mixed method study, first of all, it was aimed to determine the problems that the students experience about the testing accommodations in schools and in the central exams of science and physics courses and their suggestions to solve these problems. For a fair and accessible educational environment, instructional and testing accommodations were planned for blind students, taking into account the problems and suggestions of students. Then, attention is given to investigating how using testing accommodations affects sighted and blind ninth grade students' physics achievement about motion and the effect of instructional and testing accommodations on physics self-efficacy, physics attitude, self-esteem, and test anxiety in Bursa and Sakarya.

1.1 Research Problems

In this mixed method study, the first research problem is about the blind students' problems that they experienced about testing accommodations in their school and national examinations. In this qualitative research problem, the blind students were interviewed to determine the issues that students thought of as problems related to exams and their suggestions for them. In line with the issues identified, the testing accommodations for this study were organized. The second and third research problems are within the scope of the quantitative part. The second research problem examines the effect of testing accommodations on students' physics achievement on motion. Moreover, the third research problem is about the impact of instructional and testing accommodations on students' physics self-efficacy, attitude towards physics course, self-esteem, and test anxiety.

1. What are the experienced problems of junior and senior high school blind students about testing accommodations in school and national examinations of science and physics courses and their suggestions to the problems?

2. What is the effect of using testing accommodations on the sighted and blind ninth grade students' physics achievement in Bursa and Sakarya?

2.1. What is the mean difference between the sighted and blind ninth grade students' physics achievement scores about motion when testing accommodations are not used?

2.2. What is the effect of using verbal descriptions on the sighted and blind ninth grade students' physics achievement about motion?

2.3. What is the effect of using tactile graphics on the sighted and blind ninth grade students' physics achievement about motion?

2.4. What is the effect of using tactile graphics as compared to verbal descriptions on the sighted and blind ninth grade students' physics achievement about motion?

3. What is the effect of using instructional and testing accommodations on the sighted and blind ninth grade students' pre and post-tests of physics self-efficacy, attitude towards physics, self-esteem, and test anxiety in Bursa and Sakarya?

1.2 Definition of Important Terms

The main terms used in the study are defined as follows:

Testing Accommodations: Testing accommodations are defined as the changes in the administration of standardized tests to provide the opportunity to students with disabilities for showing their knowledge and understanding about constructs measured by the tests without the barriers of their disability (Lang et al., 2008). These changes make the tests available for students with disabilities and remove the disability barriers which prevent students with disabilities from accessing the tests. In this study, verbal descriptions and tactile graphics testing accommodations were used besides read aloud, encoder, individual administration, and extended time testing accommodations, which are currently applied in large-scale exams for blind students in Turkey.

Non-accommodated testing condition: In this study, the non-accommodated testing condition is the exam situation in which blind students are exempted from questions containing visuals, and their scores are calculated based on the questions they answered.

Verbal descriptions testing accommodation: Verbal description means describing visual materials accurately by including the critical components of the graphics without supplying additional information (Schoch, 2010). In this study, verbal descriptions testing accommodation refers to describing the items that contain visuals in a way that does not create an advantage for the blind students.

Tactile graphics testing accommodation: Tactile graphics are figures that are constructed to be investigated by touch rather than through visual exploration (Wright, 2008). They are not a simple reproduction of a visual picture in a tactile format; actually, they are intended to convey a concept or information (Steele, 2015). In this study, tactile graphics refers to transforming the items that include figures or graphs in tactile form. The tactile graphics may not be the same as the print graphics, and complex graphics have been transformed into tactile form after necessary arrangements. The TactileView software was used for creating tactile graphics. In this program, the drawings of the visuals should be made by the program, or an existing illustration should be used. The visuals in the items were drawn and printed on Index Everest DV 4 Braille embosser.

Sighted students: In this study, the sighted students do not have any visual problems during instruction and testing. They are the classmates of the blind students and do not need any testing accommodation because of their vision.

Blind students: There are several definitions for blindness in terms of medical and legal issues. While discussing the concept of blindness in educational settings, it comes to the forefront whether the student can reach the information with the sense of sight. Aylesworth (1939) defined educationally blind students as individuals, after medical corrections, whose vision are inadequate for reading ordinary school books and who could not read those books without risk of injury to their eyesight.

The definition of Özsoy, Özyürek, and Eripek (1997) for blind students in an educational context refers to the ones who are seriously visually impaired and need to use absolutely embossing alphabet (Braille) or oral presentation. To Huebner (2000), educationally blind students do not use their vision sense as the primary mode of learning.

These definitions base the independent reading ability of students so the functional effect of vision loss. In this study, the blind students cannot use their eyesight in educational environments, even if they perceive light. They need verbal and tactile accommodations during instruction and testing because of vision problems. Also, even though they see some light, the blind students cannot read textbooks or tests. Therefore, they are educationally blind.

Achievement on Motion: In this study, it is measured by the Motion Achievement Test scores. Motion Achievement Test (MAT) has three different testing accommodation conditions. One has no testing accommodation (NAMAT), one has verbal descriptions testing accommodations (VAMAT), and one has tactile graphics testing accommodations (TAMAT). All accommodation conditions were used by both the sighted and the blind students.

Students' physics self-efficacy, attitude towards physics course, self-esteem, and test anxiety: These are the affective characteristics examined with the scores of Physics Self-Efficacy Scale, Physics Attitude Scale, Rosenberg Self Esteem Scale, and Test Anxiety Inventory. The detailed information about scales is given in Chapter 3.

Instructional accommodations: Instructional accommodations are defined as the changes made in instruction without a change in standards or instructional objectives for students with disabilities (Ysseldyke et al., 2001). For the testing accommodations to be appropriately used by the students with disabilities, the course content should be presented to students with similar instructional accommodations. However, not all instructional accommodations may be suitable for presentation in the exam (Thurlow, Elliott, & Ysseldyke, 2003). In this study, Braille physics textbook, including tactile graphics and verbal descriptions and enriched course materials were instructional accommodations. With these instructional accommodations, it was aimed to make the course content accessible to the blind students as well as the sighted students, and also enabled the blind students to experience tactile graphics and verbal descriptions testing accommodations before the exam.

Enriched course materials: Enriched course materials (ECM) are the materials that are enriched with the sense of touch and hearing, which are useable with both sighted and blind students (Bülbül, 2014). In this study, enriched course materials are used during the instruction to present the instructional objectives to both the sighted and the blind students in an accessible way.

1.3 Significance of the Study

Association of the Visually Impaired in Education (EGED) conducted a project '2014-2015 Current Situation Analysis in Universities About Accessibility Intended for Students' with Special Needs with the partnership of METU without Barriers Student Club and the support of Sabancı Foundation Social Development Grant Program. In this project, it was reported that in 2014, 2086115 students applied for the university entrance examination, that 5025 of them had special needs. Among these 5025 students with special needs, visually impaired students had the most significant population of 1587 students. Although there was no accurate information about the number of blind students, it was stated that 31.5% of the students are visually impaired. In this projects' report, for large scale examinations, it was suggested to the Measurement, Selection, and Placement Center (ÖSYM) to make necessary arrangements for students with special needs and to compose alternative examination ways.

In the literature, it was expressed that using testing accommodations is an effective way of assessing students with special needs. As stated before, testing accommodations change the administration of standardized tests and remove barriers of disability to enable students to show their real knowledge and understanding. Testing accommodations that are frequently used and studied in the literature for blind students are Braille versions, test administrators who read the test items and responses aloud and codes for the students, assistive technology, and extended time (Kim, 2012; Landau, Russell, Gourgey, Erin & Cowan, 2003; Schoch, 2010; Smith & Amato, 2012; Wu, 2018). Although the test items including visuals such as graphics, figures, or tables are challenging for blind students (Bennett, Rock, & Kaplan, 1987; Bolt & Thurlow, 2004; Landau et al., 2003; Zebehazy, Hartmann, & Durando, 2006), there is a little number of research on accommodating the items including visuals (Landau et al., 2003; Schoch, 2010; Smith & Amato, 2012). In this study, the tactile graphics and verbal descriptions are used besides individual testing, reader, encoder, and extended time testing accommodations to remove barriers. Verbal descriptions of items that include visuals were written, and the tactile graphics of visuals were created. Thus, the blind students were involved in tests regardless of item types, whether or not the item includes figures, graphs, or tables. The current study investigates the effect of using testing accommodations on the sighted and blind ninth grade students' physics achievement about motion, which is a physics subject that mostly contains figures and graphs. Sözbilir, Gül, and Okçu (2015) conducted a content analysis on the published papers related to teaching science to visually impaired students. From 59 journals indexed in national and international databases between the years 1972-2014, 223 full-text papers were analyzed. Results showed that the least discussed research domain was the test and scale development. Since this study includes the adaptation of tests for blind students, it can contribute to the literature.

In many studies, it was expressed that studying with only one group of disability rather than heterogeneous groups is important to determine the appropriate testing accommodations and investigate their effects (Bolt & Thurlow, 2004; Cawthon & Leppo, 2013; Sireci, Scarpati, & Li, 2005; Vanchu-Orosco, 2012). The current study includes only one disability group, “blind students”. In this study, the effect of using testing accommodations on both the blind and the sighted student groups was determined. Since integrating student voice in the development and validation of accessible assessments is essential, the blind and the sighted students were integrated in the study during the development of tests that included verbal descriptions and tactile graphics testing accommodations.

On the other hand, it is important for students to know about testing accommodations before testing. It is not preferred for students to experience the testing accommodations for the first time on the test (Bolt & Thurlow, 2004). In this study, instructional accommodations were presented through the Braille textbook and the enriched course materials. It was aimed to present the educational objectives to the blind students like sighted students, and to prevent the blind students from using the testing accommodations for the first time in the exam. The related part of the ninth grade Braille physics textbook was arranged in terms of accessibility. Tactile graphics were created, and verbal descriptions were written for the visuals in the textbook. The blind students used verbal descriptions and tactile graphics during instruction and were familiar with testing accommodations. In this way, the blind students had the opportunity to access textbooks like their sighted peers. The same of the Braille textbook for the blind students was ink-printed for physics teachers and parents of the blind students. Thus, the difficulties experienced by the blind students while receiving support from their teachers and parents were minimized.

Although there are studies about blind students' affective characteristics, such as self-esteem and test anxiety in the literature (Bakhshi, 2017; Datta, 2013; Gürel, 2007), most of the studies about physics self-efficacy and physics attitudes of students are conducted with sighted students (Abak-Güngör, Eryılmaz, & Fakıoğlu, 2007; Gürçay & Ferah, 2018; Hung & Wu, 2018; Kapucu, 2017). The number of researches conducted on the effects of testing accommodations on students' affective characteristics is deficient (Feldman, Kim, & Elliott, 2011; Lovett & Leja, 2013). In addition, in studies examining the effect of testing accommodations on affective characteristics, it was stated that it was not appropriate to examine this effect by giving the accommodations only in the test. Therefore, it was recommended that the accommodations be used throughout the instruction and that the student should be exposed to the accommodations for a long time (Witmer, Cook, Schmitt, & Clinton, 2015). In this study, the accommodations were implemented during instruction and testing, and the effect of using instructional and testing accommodations on physics self-efficacy, attitude towards physics, self-esteem, and test anxiety for both the sighted and the blind students were determined.

The main point of this study is assessing students without their disability barriers. Appropriate testing accommodations can provide a fair assessment environment for blind students. The implementation of the testing accommodations process is expected to guide physics and science teachers in their classrooms about accommodating tests for blind students and students with other disabilities. Besides, textbook writers and school administrators can determine their roles to ensure accessibility. This study is also expected to serve decision makers on testing accommodations.

CHAPTER 2

LITERATURE REVIEW

Previous studies that are closely relevant to current research were reviewed in this chapter. In order to provide a general perspective about the present study, the chapter started with the needs of the blind students during instruction and assessment process. Secondly, the definition and categories of testing accommodations were reviewed as they are the main concepts of the current study. Furthermore, testing accommodations used by blind students in some national and international examinations were given. The literature review continued with research studies about testing accommodations and achievement. In addition, research studies about testing accommodations and affective characteristics were reviewed. Finally, studies on the concept of motion were examined. The review was completed with the summary of the literature review.

2.1 Blind Students

According to the frequently used medical definition, blind people are the individuals whose normal visual efficiency is 1/10 with all possible corrections. In other words, they have a visual acuity of 20/200 or less in the better eye or 20 degrees or less central visual field. Özyürek (1998) explains visual acuity of 20/200 as if the individuals who have normal visual acuity see the things from 200 feet (60 cm) (1 feet = 0.3048 cm) distance, where the blind individuals cannot see from 20 feet (6 cm) distance. The individuals who have normal visual acuity but see only the area of a keyhole or doorway are also determined as blind. In World Report on Vision

(World Health Organization, 2019), the severity of vision impairment based on visual acuity in the better eye is classified into five categories. Near vision impairment, mild vision impairment, moderate vision impairment, severe vision impairment, and blindness. Severe vision impairment referred to the presenting visual acuity 6/60–3/60 in the better eye. Blindness referred to the presenting visual acuity <3/60 in the better eye. The report expressed that severe visual impairment and blindness are also categorized according to the degree of visual field in the better eye to less than 20 degrees or 10 degrees, respectively. Although there are formal definitions for blindness, these definitions were found insufficient and restricted in the educational context, and educational definitions for blind and blindness were made. In this study, blindness in the educational context is related to the functional loss of vision sense.

The developmental characteristics of blind students were grouped in four categories by Demir and Şen (2009). The motor development of blind students is not different from sighted students, but the mobility and exploratory competence of blind students may be restricted. The development of expressive language is not problematic. On the contrary they speak more, but in a single and higher tone with limited gestures and facial expressions. Although the cognitive development of blind students is not different from sighed ones, they have difficulty in using cognitive skills. The social development of blind individuals usually related with the perspective of the community that they live. Since they cannot make eye contact, they may feel fear and anxiety. It is appropriate to understand the needs of blind students in instruction and assessment mediums since their learning needs are different from sighted students.

2.1.1 Needs of Blind Students in Instruction

It is known that all sensory organs are important in the process of obtaining information and the sense of sight is believed to be more dominant than other senses in this process. It has been thought that nearly more than 80 percent of the information we have obtained from the environment depends on our sense of sight (Dickerson, Smith, & Moore, 1997; Golledge, Rice, & Jacobson, 2005; James, Odo, & Nnaemekea Michael, 2017). Due to the individual differences of the students, which senses they predominantly use may vary. However, when sighted students use all senses in a learning environment, blind students use different ways to interact with information such as hearing, touching, tasting (Huebner, 2000). In many studies, it was reported that blind students have the same range of cognitive abilities as sighted students and with providing necessary instructional accommodations, they can learn higher-order science concepts as their sighted peers (Jones, Minogue, Oppewal, Cook, & Broadwell, 2006; Kouroupetroglou & Kacorri, 2010; Kumar et al., 2001; Şahin & Yörek, 2009).

Instructional accommodations are changes in classroom materials or procedures that enable students with special needs to access the curriculum like their peers without changing standards or instructional objectives (Christensen, Thurlow, & Wang, 2009; Ysseldyke et al., 2001). The use of instructional accommodations does not change the student's expected performance. With instructional accommodations, students with special needs are expected to learn the same material at the same performance level as their classmates (Ketterlin-Geller & Jamgochian, 2011). The purpose of the instructional accommodations is to make the course accessible to the student with special needs, as well as to enable them to experience the testing accommodations before the exam. On the other hand, not all instructional accommodations may be appropriate for use in examinations (Thurlow et al., 2003). For students with visual disabilities, Braille or large print copies of instructional materials, Braille and large print editions of textbooks, audio recordings or video presentations of written material, and tactile accommodations presenting the content in line with instructional objectives through touch are some instructional accommodations. Verbal descriptions are often included in addition to tactile accommodations so that students have full access to the content presented. It is also a kind of instructional accommodation that teachers emboss visual content such as graphics and tables on the worksheets they prepare for use in the lesson, using glue or various materials, and present them to blind students in the lesson (Ketterlin-Geller & Jamgochian, 2011).

There are various studies, including regulations such as the instructional accommodations, examples of which are given here, to present instruction more equitably to blind students. Fraser and Maguvhe (2008) expressed that blind and visually impaired students' teaching and learning environments have to be constructed in a multi-sensory approach. Though blind students are responsible for the same educational curriculum as their sighted peers in inclusive classrooms, blindness constitutes an obstacle for accessing the traditionally presented instructional materials and discourse. Zorluoğlu and Sözbilir (2017) conducted a study to determine the learning support needs of 5 visually impaired students in 6th grade in Erzurum Province School for the Visually Impaired. They collected data during the unit of Granular Structure of Matter / Matter and Change by interview, observation, and video recording. According to the results of content analysis, what students need most in the learning environment was to benefit from the ability of the sensory organs other than their insufficiency. In this case, individuals' learning would be provided with different sensory organs and would minimize the deficiencies in learning. They expressed the necessity of tactile instructional materials that could inform individuals by the sense of touch. Perhaps the most problematic issue for blind students during instruction is accessing and the usefulness of instructional materials.

The educational materials are presented in different visual formats like posters, charts, diagrams, videos, models, demonstrations, and print materials. Although advancing technology and increase in the diversity of teaching materials, textbooks are still among the commonly used printed materials. Blind students cannot benefit from these materials as their sighted peers (Johnson-Jones, 2017). Cox and Dykes (2001) claimed that presenting readable educational materials by touch in the classroom would create greater educational value for blind students. In his study, Kandaz (2004) designed experiments on 7th grade pressure subject and studied with three 8th grade students. He stated that physics subjects could be taught to blind students when the appropriate materials were provided. Similar with Kandaz (2004), Pehlivan and Ünlü (2008) mentioned that using tactile materials for visually impaired students contributed to students' concept development in which they conducted an experiment with four visually impaired students on Newton's 2nd law using the telemetry.

Bülbül and Eryılmaz (2012) designed and developed 40 physics course materials for visually impaired students and introduced them in their book. They classified materials in thought experiments, adaptations, used materials, marketed products, and designed products. In this book, the materials were matched with related objectives between grades 9-12, and positive and negative criticisms were given about each material. They aimed at contributing to teachers of visually impaired students.

Burke (2001) called attention to the limited number of blind students in biology and other life sciences because of the concern of accessing the print materials for blind students. Especially STEM courses might be challenging for blind students since complex STEM topics are often described on visual images (Jones & Broadwell, 2008; Rosenblum & Herzberg, 2015). Real objects, models, and tactile graphics are important in science courses for blind students. Although the verbal descriptions create the conceptual framework of objects for blind students, tactile models are especially noteworthy in elementary and middle school science courses on abstract concepts. Since the science content gets harder in higher grades, the concepts are mostly presented in textbooks as tactile graphics (Smothers, 2011).

Determining how well tactile graphics in secondary mathematics and science braille textbooks correlated with the print graphics, Smith and Smothers (2012) conducted a content analysis on 598 graphics from 10 mathematics and science textbooks. 12.5% of the print and tactile graphics were found inconsistent. Drawings of data lines and data points on the print and tactile graphics were the most common inconsistency. The researchers scored to what extent each tactile graphic presented the print graphic validly with a 5 point Likert scale. When 5 point was strongly agree, the mean score for the sample was 3.71, with a Krippendorff alpha of 0.63. 6.7% of the graphics did not have Braille transcription, and two textbooks did not include more than 85% of the tactile graphics. As a result of this study, although it was determined that most tactile graphics had good correlations to print graphics, there is a need to improve tactile graphics in secondary mathematics and science braille textbooks.

According to Beck-Winchatz and Riccobono (2008), the alternate formats of graphical information frequently used in science courses are not accessible for blind students. Rosenblum and Herzberg (2015) conducted a study with 12 students in the 6^{th} to 12^{th} grades who were tactile readers. They asked whether they accessed tactile graphics, especially in mathematics and science classes. All participants stated that they took Braille materials and used tactile graphics in math and science classes. Most of the students said that some of the Braille materials had low quality, but they got used to these errors and were able to cope with them. Although blind students stated that they had access to the graphics in math and science courses, the majority of the students stated that they could not access these graphics like their peers. Some said that they were concerned about the lack of materials.

In their study, Torres and Mendes (2017) developed materials that can tactually present the illustrations that are used to teach physics to blind students. Their material was a kit that consists of a rectangular magnetized surface table with 20 cm wide, 30 cm long, and 4 cm high and 83 metallic pieces with various shapes, including rectangles, ellipses, circles, arcs, and other different pieces. Since the metallic pieces were made from steel, they were attracted by the magnetic surface. The pieces could be arranged for illustrations by the user. They tested the functionality of the material in the physics course on topics of thermodynamics, Newton’s laws, and concepts of optics. Each topic was held on different days for 40 minutes. The materials were found versatile, portable, and durable for teachers. Also, blind students could access tactile versions of illustrations that were used for sighted students. Another study to teach physics to blind students carried out by Bülbül (2014). He developed enriched course materials on motion concept for ninth grade totally blind students in his dissertation and stated that these universally designed materials increased the achievement of the experimental group, which included both sighted and totally blind students.

Association of the Visually Impaired in Education (EGED) (2019) written a report titled “Visually Impaired Students’ Access to Education through Special Education Schools and Inclusion”. During the preparation of the report, the opinions of the teachers working in the schools for the visually impaired and providing education to the visually impaired students in the inclusion system were received. The notifications received by EGED were evaluated, and the members’ observations regarding both methods were used. The report revealed the current situation and proposed solutions regarding the aspects of the inclusion system that has been expanding with the schools of the visually impaired since 1950s in Turkey. It was stated that there was no necessary equipment in the resource rooms of inclusive schools, and these rooms could not be utilized sufficiently. In these schools, there had to be equipment such as embossed Braille textbook, tactile map, necessary tools for numerical courses, computer, and Braille printer. In the report, it was expressed that the visual contents in Braille books did not have verbal descriptions. There were also some textbooks that had not been published. However, printed textbooks could not be delivered to students at the beginning of the academic year. It was suggested that all visuals in Braille books should be verbally described and the Braille books printed for each course had to be delivered to students at the beginning of the academic year. In addition, it was noted that there were problems about the accessibility of digital resources presented by the Republic of Turkey Ministry of National Education (MEB). Among other problems, it was reported that these problems prevented visually impaired students from attending classes in the same environment as their peers and claimed that it would not be possible to achieve the targets of inclusive education without presenting learning content fairly to blind students.

The study conducted by Bayram (2014) explored visually impaired students’ academic and social challenges in learning high school mathematics in Turkey. She conducted semi-structured interviews with four visually impaired students. One of the major findings of this study was the unsuccessful status of inclusive education in addressing the academic needs of visually impaired students. This finding was associated with mathematics teachers' instructional techniques, visual materials that do not serve to visually impaired students, frequent use of the whiteboard improperly, use of uncertain directional cues such as this/that, use of assistive technology that are not accessible for visually impaired students. Chang, Richards, and Jackson (1996) stated that teachers had to say the written text on the board clearly instead of saying this plus that equals this, one should say 1 plus 2 equals 3.

The instructional accommodations used in this study are the Braille physics textbook containing tactile graphics and their verbal descriptions and enriched course materials. With these instructional accommodations, curriculum objectives were presented to blind students as well as to sighted students. With the instructional accommodations, the blind students also had the opportunity to use the verbal descriptions and tactile graphics to be used during the exam beforehand.

2.1.2 Needs of Blind Students in Assessment

In an inclusive environment, fair access to assessment materials is essential for students with special needs. If the tests are appropriate for all students, the achievement of students can be comparable. Testing accommodations play a major role for students with special needs to access tests fairly. Extended time, oral presentation and response, Braille, sign language interpreters, format changes such as large print, individual administration, and technological aids are some of the commonly used accommodations (Weston, 1999). Testing accommodations are used to reflect the test scores about the intended content, not the student's disability or access needs.

Kamış and Demir (2018) examined the in-class assessment and evaluation processes of students who study at various faculties and departments of universities in Ankara in the academic year of 2015-2016 and who have a visual impairment, according to the opinions of the instructors and students. The study group consisted of 17 visually impaired students and three instructors. The research data were collected using a semi-structured interview form. Considering the common difficulties experienced by students with visual impairment in assessment and evaluation processes, it was seen that difficulties such as the reader, the duration of the exam, not starting the exam on time, questions including visuals, optical readers (coder need) come to the fore. However, students have difficulties in issues such as the light in the environment, font size, numerical lessons, oral exam, to be asked few questions, lack of resources to study for the exam, questions in the form of long paragraphs, sometimes based on memorization and the high amount of memorization, the exam environment is not separate, lack of pre-planning and standardization for the examinations.

Lang et al. (2008) defined testing accommodations as the arrangements on the administration of standardized tests to provide the opportunity to students with disabilities for showing their knowledge and understanding about constructs measured by the tests without the barriers of their disability. Similarly, McKevitt (2001) defined testing accommodations as the changes to remove students' disability status to show students' knowledge during the testing process. McDonnell, McLaughlin, and Morison (1997) draw attention to testing accommodations as they remove disability barriers of students that cause distortional test performances. In some of the studies, it is possible to see the term of testing modifications instead of testing accommodations. Although testing accommodations and testing modifications are used as synonyms, they should not be used interchangeably due to their different meanings. Tindal and Fuchs (2000) explained testing modifications as the important changes about the way the test is given or taken, which change the measured content of the test. In many studies it is explained that testing accommodations do not change the test content as testing modifications do (Elliot, Kratochwill, McKevitt, & Malecki, 2009; McKevitt, 2001; Schulte, 2000; Tindal & Fuchs, 2000).

Measuring the achievement of students with visual impairments is challenging (Hannan, 2007). Since blind and low vision students have limited access to visual information, they have difficulty in showing what they know in standardized tests. To eliminate the limitation of their visual disability Braille, large print, and extended time have been provided for them as basic and primary accommodations in some of the high stake tests (Kim, 2012).

Kızılaslan (2020) suggested adaptations in tests and testing procedures to reveal student achievement involving changes in test setting, test time and period, presentation of test questions, and response format. Testing visually impaired students in separate classrooms, extending test time, creating short test sessions, presenting tests in Braille alphabet or audio format, using different responding formats in Braille alphabet, orally or by writing and marking with the aid of an assistant are the suggested adaptations.

Çobanoğlu Aktan, Aksu, and Eser (2018) conducted a descriptive study to investigate the legal regulations, similarities and differences in the examinations administered by Educational Testing Services in the United States and by Measurement, Selection and Placement Center (ÖSYM) in Turkey for students with disabilities. It is stated that there is a separate section for the visually impaired in the instructions of the large-scale exams administered in the United States and that the questions containing visuals are not excluded from the test. Moreover, unlike our country, regulations such as using Braille and providing verbal description support for questions containing images prepared in Braille alphabet are offered to the visually impaired. In their study, they also searched the validity of examinations specifically for blind students. According to the results of open-ended interviews conducted with the measurement and evaluation experts and academicians who study on students with special needs, exempting questions with figures and graphs for blind students was a threat to the tests' content validity. Experts also stated that the inferences obtained from these tests were not valid and caused unfair placement and classifications. Although the experts in this study were divided into two as computer environment or paper-pencil test on the way the exams have been presented, both groups did not find it suitable to be excluded figure-graphic questions from the test. They made different implementation suggestions instead of exemption. The question booklets in Braille regardless of whether the questions contain visuals or not that were read aloud by readers or computers, extended time, universal design of the test or items with the same difficulty and discrimination value instead of these questions were the expert suggestions.

It is not sufficient to convert the materials, or tests into Braille, tactile graphics or audio format directly for obtaining accessible materials or tests for blind students. Allman (2009) exemplified that converting a test item such as “write a story based on the picture” or “draw the results of the following” into Braille would be meaningless. Most maps, charts, tables, graphs, and diagrams can be converted into tactile form with required editing.

On the other hand, the students have to be familiar with the testing accommodations used in high-stakes testing (Fox, 2012; Salvia, Ysseldyke, & Bolt, 2013). Bolt and Thurlow (2004) stated that it is not preferred for students to experience the testing accommodations for the first time on the test. As well as the students being familiar with the testing accommodations, the test assistants should be familiar with the testing accommodations. Some of the testing accommodations, such as read aloud or use of a scribe, are human-related. The efficiency of these testing accommodations depends on the familiarity of the administrators about the assessment process. Even though training of test assistants would eliminate the administration differences during tests, this process could require time and money (Clapper, Morse, Lazarus, Thompson, & Thurlow, 2005; Kavanaugh, 2017).

In the literature, there are studies that express the need of qualified accommodated tests for blind and visually impaired students. Hannan (2007) conducted interviews with 10 teachers, 18 administrators, six assessment specialists, and two participants who declined to identify their positions who are working at 27 different schools for students with visual impairments. One of the results of the interview was stating the need for developing new tests, which represent the assessed construct in equal conditions. Another study conducted by Bayram (2014) determined visually impaired students' academic and social challenges in learning high school mathematics. Bayram interviewed with four high school students and one of the themes of her study was evaluating the assessment system in Turkey. As a conclusion of the interviews, the students stated that the assessment system in Turkey does not assess visually impaired students' knowledge and skills in high school appropriately since they could not reach the items on written exams as their peers and the problems on exams that uneducated readers cause.

The number and type of testing accommodations were varied in different studies. In some studies, testing accommodations are classified into four categories. The categories are presentation, response, setting, and timing/scheduling (Tindal & Fuchs, 2000; Ysseldyke, Thurlow, McGrew, & Shriner, 1994). Another classification includes five categories which are presentation, equipment and materials, response, scheduling/timing, and setting (Christensen, Lazarus, Crone, & Thurlow, 2008; Thurlow, Lazarus, Thompson, & Morse, 2005). The classification that has six categories contains the accommodation types of setting, presentation, timing, response, scheduling, and other (Elliott, Thurlow, Ysseldyke, & Erickson, 1997; Thurlow, McGrew, Tindal, Thompson, Ysseldyke, & Elliott, 2000). In this study, testing accommodations are handled in four categories. These categories are presentation, timing/scheduling, setting, and response.

2.2 Categories of Testing Accommodations

2.2.1 Presentation Testing Accommodations

Presentation testing accommodations are about the presentation style of the test. Some of the presentation testing accommodations are Braille edition of the test, sign language administration, large print edition, highlighted key words in directions, oral presentation of the test, read aloud (reader assistant), use of assistive technology equipment (audio tape, computer, visual magnification equipment), tactile graphics and verbal description of graphics (Lai & Berkeley, 2012; New York State Education Department Office of Vocational and Educational Services for Individuals with Disabilities (VESID), 2006; Schulte, 2000; Spence & Osterhaus, 2000; Thurlow et al., 2005; Wolf, 2007).

In read aloud testing accommodation, a part or whole of the test or items is clearly read to students by a technological device such as a computer/ tablet or by a reader assistant. Clapper et al. (2005) defined a reader as a person who reads the test directions, items, reading passages, or prompts orally to students who are unable to read visual text.

Graphics and visual components in the tests can be presented to blind students with testing accommodations. These presentations can be in verbal or tactile forms. In verbal form, a CD, a computer, or a cassette describes the graphs verbally, and in tactile form, the students can touch printed tactile graphs (Schoch, 2012). Technological devices such as talking tactile tablets can also create graphics (Landau et al., 2003).

2.2.1.1 Tactile Graphics and Verbal Descriptions of Graphics

Although tactile graphics are common accommodations when assessing science and mathematics, there has been little research on graphics and verbal descriptions of those graphics. Tactile graphics are used by blind individuals to get information that sighted individuals obtain from looking at visuals (Schoch, 2010). A tactile graphic is not an exact reproduction of a print graphic. It represents a print graphic in a meaningful design (The Braille Authority of North America (BANA), 2016). The information in graphics such as maps, charts, graphs, diagrams, and illustrations is usually difficult to transform in a tactile format directly. Labor-intensive and slow translation processes, inadequate human and technological resources, and variation in transformation expertise are several obstacles for transforming print graphics into tactile format (Ladner et al., 2005). However, with appropriate editing, most of the graphics can be presented in tactile form. The editing process of items with tactile graphics has some key elements. Before starting arranging tactile graphics, it should be determined whether the tactile graphic is really necessary for that question. If it is required, the elements in the original graphics for visual effect, the numbers, symbols, lines, frames, or borders that are not vital for the item have to be eliminated. Tactile graphics should contain neither less nor more information for understanding the item content. The visuals in the tactile graphics can be simplified, or Braille signs or abbreviations can be used instead of original visuals. Sheppard and Aldrich (2000) suggested using a word label instead of drawings. The description of the graphics and a key for the symbols can be added. The graphic symbols, essential features of the graphic, and abbreviations used have to be included in the key even if they are not labeled in the original version, and the key should take place above the tactile graphic. If the graphic is too complex, it can be presented in separate tactile graphics. Different textures should be used for different areas to prevent confusion and the spacing have to be enough for distinguishing different symbols and lines. The tactile graphic should be located on one page as much as possible, positioned near the left margin rather than centered. If the tactile graphic and the text of the item could not place on one page, the text of the item and tactile graphic have to be located in facing pages in the booklet. The item stimulus, item stem, and answer choices are recommended to be placed on the same page. After embossing the graphic, a braille reader has to proofread the tactile version. The students have to be familiar with reading tactile graphics (Allman, 2009; BANA, 2016; Spence, 2002).

The several methods for creating tactile graphics are swell paper, embossing, and thermoform. In swell paper (microcapsule paper) method, special microcapsules that coat paper swell up when heated. The swell paper has images with black ink on it cross into the fuser. This black ink absorbs the heat that the fuser machine provides, and the microcapsules swell up. In embossing method, a Braille embosser produces dots on a sheet of paper and creates raised dots. Creating a thermoform graphic is a process that a sheet of plastic is heated and vacuumed (Hashimato & Watanebe, 2016; Ladner et al., 2005).

Schoch (2010) expressed the limited number of researches on graphics and verbal description of those graphics. Just as the print graphics need to be edited when converted to tactile graphics, the necessary precision must be shown when preparing verbal descriptions for the print graphics. Verbal descriptions usually depend on the perspective and the knowledge of the person who is writing the description (Steele, 2015). For a blind person to understand the verbal description written by a sighted person, the concepts and terms used must be meaningful to the blind person (Aldrich & Sheppard, 2001; Steele, 2015). The verbal descriptions should include the vital elements of print graphics. Descriptions in tests should not include additional information for answering the questions (Schoch, 2010).

The addition of verbal descriptions instead of the visuals in the tests lengthens the text that blind students should read. For this reason, besides adding the verbal descriptions to the test booklet of the students, read aloud testing accommodation can also be added to the test, and the test administrators can read aloud the text for students. The decision of selecting only the verbal description or both verbal description and reading aloud testing accommodations can be left to the discretion of the students (Spence, 2002).

2.2.2 Timing/Scheduling Testing Accommodations

Timing/scheduling testing accommodations involves the changes about testing time. Timing/scheduling testing accommodations does not mean not only the extended time for completion of the test but also multiple-day testing, breaks during testing, the flexibility of time that test will be implemented and flexibility in test order (Fuchs et al., 2000; Tindal & Fuchs, 2000).

2.2.3 Setting Testing Accommodations

Setting testing accommodations address the changes in the environment where the test is administering. Individual administration, small group administration, adaptive furniture, special lighting, testing in student's home are examples of setting testing accommodations (Thurlow et al., 2000; Tindal & Fuchs, 2000).

2.2.4 Response Testing Accommodations

Response testing accommodations change the answering style of the test takers. Marking answers in booklet versus answer sheet, giving answers orally, and using a scribe are some of the response accommodations (Sireci et al., 2005; Thurlow et al., 2000; Tindal et al., 1998). Clapper et al. (2005) defined a scribe as a person who communicates with students by speech, sign language, pointing, or by using an assistive communication device and writes the student responses to the test items.

From the perspective of testing accommodations, among presentation testing accommodations read aloud, tactile graphics and verbal description of graphics were used in this study. Extended time was used as a timing/scheduling testing accommodation for blind students to provide these students sufficient time because of using one or more of read aloud, scribe, verbal descriptions, and tactile graphics testing accommodations. Since all blind students in this study preferred read-aloud testing accommodations, individual administration was used as a setting testing accommodation. The scribes in this study coded students' answers on the booklet, and this corresponded to response testing accommodation. The extended time, individual administration, and using a scribe testing accommodations were used in the same manner for all blind students. Mentioned testing accommodations were not the independent variables and were not investigated in the scope of this study. The main testing accommodations that were searched in this study was tactile graphics and verbal description of graphics.

2.3 Testing Accommodations in Large Scale Examinations for Blind Students in Turkey and Some Other Countries

First of all, in Turkey, the testing accommodations made by the Republic of Turkey Ministry of National Education (MEB) in the examinations conducted for transition from primary education to secondary education have been examined. The Level Determination Examination (SBS) was conducted between 2008-2013. In SBS, which was applied for 8th grades for the first time in 2009, testing accommodations for blind students were reader aloud, scribe, taking the exam in a single room, and additional time. There is no question exemption for blind and low vision students. However, in the exam, blind students were asked equivalent questions instead of questions containing pictures, figures, and graphics, or the descriptions of the visuals in the question were given, and the same question was asked. A question booklet in Braille was prepared for blind and low vision students, and a question booklet was prepared on CD for blind students. Testing accommodations about the presentation of the exam were determined in line with students' preferences (MEB, 2009). The question booklet in Braille was only available in 2009 and has not been included in the testing accommodations of 2010 (MEB, 2010). The question booklet on CD was presented for the last time in 2011 (MEB, 2011). The Transition System from Elementary Education to Secondary Education (TEOG) was implemented between 2013 and 2017. The testing accommodations for all special needs students were the same as SBS, which was made in 2013 (MEB, 2013a, 2013b, 2014, 2015, 2016). However, the question booklet in Braille, which was offered to students with low vision and blind, and the audio question booklet for blind students were removed (MEB, 2013b). Since 2018 in High School Transition Examination (LGS), the testing accommodations in TEOG have been maintained, and the additional time has been increased to 20 minutes for blind students. Although the additional time given seems to have increased, the ratio of the additional time to the session duration decreased due to the lengthening of the session durations.

The examination for entering university in Turkey have been administering by ÖSYM. Transition to Higher Education Examination (YGS) and Undergraduate Placement Examination (LYS), between the years 2010-2017, were the national university entrance examination conducted in Turkey. Starting from 2010, there were testing accommodations in the guidelines for students as taking the exam in separate halls according to their disability, using reader and / or scribe, and using special equipment according to the candidate's disability (ÖSYM, 2010). It was stated that in 2011, visually impaired students would not be asked questions regarding complex figures (ÖSYM, 2011). The testing accommodations to be made for students with special needs have been explained more clearly since 2014 in the OSYS guidelines (ÖSYM, 2014, 2015, 2016, 2017). The questions with visual data such as figures, graphics, tables, pictures, and complex expressions are not asked to visually impaired students who request reader assistance. Scribes, taking the exam in single halls, and extended time have been the testing accommodations for visually impaired students who request readers. Visually impaired students who are able to read the question booklet on their own are given a question booklet written in 9 or 14-point font and a scribe. Students who are able to read the question booklet themselves are not given additional time. In Higher Education Institutions Examination (YKS), which has been implemented since 2018, in addition to the previous regulations, it was decided to give additional time to students with a visual impairment rate of 25% and above and who do not request readers. Besides these testing accommodations, the blind student can request special equipment in the exam such as Braille calculation cubes, Braille slate and stylus, or Braille typewriter. If the request is deemed appropriate, the student can enter the examination with special equipment in exam centers determined by ÖSYM, in buildings without wired-wireless communication (ÖSYM, 2018, 2019, 2020). Since 2012, ÖSYM exam guides have also been presented as audio files for visually impaired candidates.

Similar to the exams for university entrance in Turkey, central exams are also held in different countries. America’s Scholastic Aptitude Test (SAT) and American College Testing (ACT) are the most well-known ones among these exams. SAT and

ACT, which are implemented by The College Board, are carried out in the United States and some other countries and are accepted for university entrance, also include testing accommodations for students with disabilities. Because the ACT also includes a science test and the regulations for the two exams are similar, testing accommodations made in ACT are presented. It is up to the student to determine the regulations in this exam, provided that he/she certifies the need for an exam arrangement (ACT, 2017). The examination center, the student, and the candidate’s school are in cooperation. There are two different exam situations for students with special needs. If the candidate can take the exam at the exam center, it is “National Testing”, and if the necessary arrangements cannot be made in the exam center, it is “Special Testing” (ACT, 2018). Some of the arrangements that can be made for visually impaired students when National Testing is preferred are 50% additional time, an 18-point question booklet, and a scribe. If Special Testing is preferred, testing accommodations such as additional time more than 50% or spreading the exam over multiple days, presenting the test in alternative formats such as Braille, pre-recorded audio in USB, or a human reader, using a scribe or computer in writing tests or using additional time only in writing tests is carried out. Question booklet in Braille also includes tactile graphs for mathematics and science tests. Students who receive oral presentation support with Braille in their school can also receive oral presentation support with Braille in the exam. Tactile graphics are included in the Braille question booklet, and additionally, they are printed as a separate booklet in mathematics and science tests. This booklet can only be offered to blind students who receive oral presentation support. The reader reads the graphic keys in the tactile graphics. The reader is not allowed to explain or describe the graphic. If the candidate’s needs are out of the specified testing accommodations, the necessary accommodations are made by examining the situation in line with students’ request (ACT, 2020).

China and South Korea are also conducting university entrance examinations. In China, students are placed in the university based on their success in the exam called The National College Entrance Examination (NCEE) or Gaokao, which is held once a year. Since 2014, Braille print question booklets for visually impaired students and large print question booklets for low vision students have been prepared for this exam (Meilian, 2014). They are also allowed to use tools such as a Braille slate and stylus, a Braille typewriter, a magnifying glass, and an appropriate amount of additional time (Fan & Cheng, 2017). On the other hand, in South Korea, College Scholastic Ability Test (CSAT) is applied for transition to university. Similar to the NCEE, the CSAT offers Braille and large print question booklet is provided for blind and low vision students, respectively, while audio booklets are also offered. Students with visual impairment are taken to the exam in a separate exam hall and given additional time. In the listening test, a special audio recording is presented to the blind students (Korea Institute of Curriculum and Evaluation, 2001; Kwon, Lee, & Shin, 2017).

Although there is no national placement examination for university entrance in the United Kingdom, some universities accept students through the General Certificate of Secondary Education (GCSE) exam, General Certificate of Education (GCE) exam, and oral interviews. In contrast, some universities conduct their examinations. GCSE, which is a summative examination, covers the qualifications of 11 years in education and carried out in England, Northern Ireland and Wales. In Scotland, Scottish Qualifications Certificates are performed. On the other hand, GCE A levels are a two-year program that allows the student to transition to university departments associated with the courses taken after two years of education. Testing accommodations for blind students in qualification examinations of UK are Braille booklet, a practical assistant who can guide students’ hands, a reader, a scribe, and 50% additional time. The test, which is presented in Braille, also includes tactile graphics. The practical assistant, reader, and scribe is the same person in these examinations (Joint Council for Qualifications, 2020; Scottish Qualifications Authority, 2019).

2.4 Research Studies on Testing Accommodations and Achievement

Most of the studies in the literature which were investigating the effect of testing accommodations on students with disabilities were conducted with students with learning disabilities (Cormier, Altman, Shyyan, & Thurlow, 2010; Thompson, Blount, & Thurlow, 2002). Not only there is not a sufficient number of studies about testing accommodations that were conducted with blind students, but there is also little research that was conducted with visually impaired students (Schoch, 2012). Because of this situation, the literature review was conducted in a broad perspective and the effect of testing accommodations was searched not only for blind students but also for different types of disabilities.

2.4.1 Research Studies on Presentation Testing Accommodations

When reviewing the effect of presentation testing accommodations on students with disabilities, read aloud, verbal description of graphics, and tactile graphics testing accommodations are stated in the foreground.

Kim (2012) conducted a study of middle school students with (n = 10) and without (n = 10) visual impairments in Korea in order to examine the effect of read aloud testing accommodation on reading comprehension. Three of the students had low vision, and seven of the students were blind who were in a special school for visually impaired students. Ten of the students who were from different Korean public schools did not have a disability. Visually impaired students took the reading comprehension test that consisted of 20 items in a classroom of their school and students without disabilities took the same test in the conference room of a church. At first, all the participants took the test without read-aloud testing accommodation. After a 10-minute break, the test with read-aloud testing accommodation was administered. Visual impaired students took the accommodations of extended time, large print, or Braille in both accommodated and non-accommodated tests because of their disability. The findings showed that for visually impaired students without read-aloud accommodation, the mean and standard deviations were 45.56 and 20.01, and with read-aloud accommodation, the mean and standard deviations were 55.56 and 20.68. For students without disability, without read-aloud accommodation, the mean and standard deviations were 81.00 and 18.23, and with read-aloud accommodation, the mean and standard deviations were 77.00 and 23.71. As a result of this study, it was seen that visually impaired students benefited from read aloud testing accommodation more than students without disability, although they score lower than students without disability. The study of Tindal et al. (1998) was not conducted with visually impaired students. They gave a large-scale statewide reading and math test in accommodated and non-accommodated conditions to 4th grade students who were with (students with individualized education programs in reading and math) and without disability. 403 of the students were from general education, 78 of the students were from special education. The students were from seven different schools, which includes 22 fourth-grade classes in total. The accommodation was about response conditions and test administration. In standard response conditions for both reading and math tests, students bubbled in answers on a separate sheet for half the test, when in accommodated response condition they marked the test booklet directly for the other half of the test. For a subgroup of students, the administration of the math test was accommodated since one of the groups read the test silently, and the other group took the test under read-aloud accommodation. A trained teacher read the test. No differences were found in the response conditions, but an interaction was found in the test administration conditions in favor of students with disabilities. Read aloud testing accommodation had a significant positive effect on students with disabilities; there was little or no effect on students without disabilities.

Since most of the studies about read aloud testing accommodations were conducted on reading and math subject areas, Li (2014) conducted a meta-analysis of 23 studies on math and reading that include only read-aloud testing accommodation to investigate the effect of read-aloud testing accommodation on students with and without disabilities. The analysis showed that students without disabilities gained

0.14 standard deviation units higher score, whereas students with disabilities gained 0.27 standard deviation units higher score with read-aloud testing accommodation. It was also reported that students who take read aloud accommodation from a human proctor scored 0.34 standard deviation units higher. On the other hand, when the computer provided the accommodation, the gain was 0.11 standard deviation units, and by video/audio player, the gain was 0.12 standard deviation units. Another result of this study was the effect of read aloud testing accommodation was greater on reading tests than math tests. Similar with Li (2004), Buzick and Stone (2014) stated that read aloud testing accommodation increases the scores of students with disabilities more than students without disabilities. Another study was conducted by Karabay (2016) with 48 visually impaired students from five different elementary schools for the visually impaired students in Ankara, İstanbul and Konya. In his study, Turkish and mathematics tests of TEOG were presented to 24 visually impaired students with a computer-assisted read-aloud and to the remaining 24 visually impaired students with a human reader. According to the results of this study, no significant difference between computerized test and human reader was found in either tests.

EGED (2015) developed an 'examination evaluation form' to determine the blind students' favorable and unfavorable experiences about the implementation of examinations in Turkey. Some of the students expressed unfavorable experiences about the reader, which would dramatically affect their exam score. They indicated that poor reading rate, unsuitable diction, poor knowledge about numeric signs, and negative reactions to re-reading the items were their unfavorable experiences. The report stated that it was important for the reader to be familiar with the content knowledge, reading techniques, symbols, and specific signs to read the text properly.

Aldrich and Sheppard (2001) conducted focus group interviews with 40 visually impaired students who were tactile graphic users. The students were from two different special schools and aged between 9 and 19. The predetermined open-ended questions were asked to participants, and the records were audio-taped. They determined that the attitude of students to tactile graphics changes by age. When young students usually enjoyed tactile graphics since the graphics were easier, the older students' attitudes were more complex. Some stated that tactile graphics meant more than text, while others stated that if verbal descriptions existed, they preferred it rather than tactile graphics. Participants were asked examples of the best and worst graphics they encountered. It was stated that the tactile graphics which were able to connect with the world they know and did not contain too much detail were the best for them. Older students clearly believed that the graphics were for sighted people only. Older students suggested alternative approaches about the content of tactile graphics, such as using a verbal description instead of tactile graphics, splitting the information into more than one tactile graphic equally, and layering the information to more than one tactile graphics from simple to complex. The student views about the production of tactile graphics were about confusion on the discrimination of lines and textures, too big or too small size of tactile graphics, the evident differences of reliefs for different areas. Some of the students complained about the difficulty of tactile graphs in public examinations such as SAT. They claimed that the tactile graphics in public exams were more and more complex than those used in classrooms.

In their study, Ferrell et al. (2017) used verbal description testing accommodation. They described images for students who were in grades three through eight and had visual (n = 117) or print (n = 178) disabilities. The students took English language arts (ELA), mathematics, and science tests under conditions with and without standardized descriptions of graphic images. In this study, 28 Braille readers tested under the conditions of "with tactile graphics, the standard accommodation; with audible descriptions of the graphic image; and with both a tactile graphic and audible descriptions of the graphic image". Braille readers' correct response proportions according to test condition and content area were determined as "with tactile graphics condition Mathematics: 28.6, Science: 50.0, ELA: 53.6; with description only condition Mathematics: 57.1, Science: 50.0, ELA: 64.3; with description and tactile graphics condition Mathematics: 35.7, Science: 39.3, ELA: 39.3". It was indicated that Braille readers performed better in verbal description only condition, and verbal description of images was suggested as an unbiased testing accommodation for Braille readers.

In the report of VESID (2006), verbal description and tactile graphics testing accommodations were expressed among the presentation testing accommodations for students with blindness or visual impairment. Similar to New York, in some states of America, verbal description and tactile graphics testing accommodations have been used since 2006 for low vision or blind students. Identifying the teacher variations of using verbal descriptions when administering graphic math test items to visually impaired students, Schoch (2010) conducted an exploratory study. This study had carried out as there were no guidelines or training on how to apply verbal description testing accommodation. In a standardized test, 12 items including graphics were asked students in tactile or large print format. The participants were 10 teachers of students with visual impairment and their 10 visually impaired students from grade 9 to 12. Among these 10 students, half of them used Braille and the other half used large print. Observed teacher behaviors were teacher initiation, teacher response after student initiation, whole picture description, detail description, pointing or other gestures, hand guidance, and reading the problem. Two teachers who were administering Braille and four teachers who were administering large print did not assist students during the test. None of the predetermined teacher behaviors were observed among these six teachers. Three of the teachers assisted students who used tactile graphics in different ways. One teacher guided the student from beginning to the end of the item, one teacher assisted the student when the student wanted help, the last teacher used a mixed approach of guidance and waiting until student's demand. It was observed that the teachers mostly used detailed descriptions and sometimes they used whole picture descriptions. It was determined that there were wide variations among teachers when administering items including graphs.

Landau et al. (2006) used Braille and talking tactile tablets in math items and investigated the preferences and experiences of blind students about them. They used three tests, each consisting 10 items. The pre-test did not include graphic items and was in Braille format. The students were divided into two groups according to pre-test results. In Test A situation, Group 1 tested with a talking tactile tablet, and Group 2 tested in Braille with a proctor and tactile graphics. In Test B situation, vice versa. Tests A and B included items with graphics. 20 participants aged between 12 and 16 were attended the study. There was no statistical significance between group scores, but the talking tactile tablet took a shorter time to complete.

Similar to Landau et al. (2006), Kamei-Hannan (2008) used assistive technology in order to investigate the use of computerized adapted tests for students who read Braille and large print. Kamei-Hannan used the Measure of Academic Progress test, which Arizona School adopted for the Deaf and Blind and aims to measure academic progress in reading, language, and mathematics. 49 students ages from 7-21 participated in the study. The test was administered to students in three different conditions. Seven students took the print version of the test, which was not adapted to the screen. 13 students used magnification software. The computerized test was administered to 29 students whose primary reading preference was Braille with using a refreshable Braille monitor and screen-reading software. The mathematics test was excluded for the Braille version because of the problematic issues of transforming the Nemeth code on a Braille monitor and accessibility to tactile graphics. As a result of the study, it was stated that the students who used 4x or higher magnification need extra time than the students who used lower magnification. In Braille version of the reading test, the items with long reading passages that required the use of scroll bars and the items that included pictures were inaccessible for most of the students. In Braille version of the language test, the items that used underlining words confused the students because of the extra dots that were used for underlining.

Bolt and Thurlow (2004) reviewed the five most frequently allowed testing accommodations in state policies. They involved 36 studies in the review. Braille was one of the most frequently allowed testing accommodations. They involved two studies that had studied item-level analyses of the Braille edition of the SAT. According to the result of these studies, math items that included tally systems, figures and graphics were hard to understand for students with visual impairment. The complexity of symbols and additional word load were the main problems of tally system items in Braille edition. Although there were problems in figure and graphic items, the items functioned equivalently for blind and sighted students (Bennett et al., 1987; Bennett, Rock, & Novatkoski, 1989).

2.4.2 Research Studies on Timing/Scheduling Testing Accommodations

In timing/scheduling testing accommodations on students with disabilities, extended time is the core accommodation. Runyan (1991) studied the effect of extended time on reading comprehension tests of university students with and without learning disability. There were 16 students with learning disability and 15 students without learning disability. The students with learning disability explained in their interviews prior to study that even they had problems about concentration when reading, they could read for approximately 15-20 minutes. Nelson-Denny Reading Comprehension Test was used for both groups, which is 20 minutes reading test. The time for testing was not explained to students. The students were told to read the test normally and answer the questions until they were stopped. After the test started, the students stopped 20 minutes later, and they were told to mark the place they came on the answer sheet. Then they were told to go on to the rest of the test and let them complete the test. The measures of mean percentile rank that were gathered after 20 minutes for two groups and the mean percentile rank that were gathered after the completion of test were compared. The study showed that there is a significant difference between scores of students with disabilities and without disabilities under timed conditions in favor of students without disabilities, while there is no significant difference between scores of students with disabilities and without disabilities under extended time condition. It was expressed that students with learning disabilities benefited from extended time more than students without disabilities.

Marquart (2000) not only examined the effect of extended time between different disability status, but also academic achievement level of students. Marquart (2000) investigated the effect of extended time on the achievement of students with disabilities, students educationally at-risk in math, and students without disabilities in his dissertation. The students were in eighth grade. There were 23 students with disabilities of mild learning disability, emotional disability, behavioral disability, mild physical disability, speech and language disability, and mild cognitive disability. 23 students were pointed as educationally at-risk in math by their teachers. These students had no diagnosed disability. The remaining 23 students were scoring at or above grade level in math. The students took two different standardized math tests under two different conditions. Condition 1 was standard time, which took 20 minutes, and the second condition was extended time, which took 40 minutes. The students with disabilities and students educationally at-risk in math were scored significantly higher under extended time condition than the scores of standard time condition, but the students without disabilities did not score significantly higher on the extended time condition.

2.4.3 Research Studies on Setting Testing Accommodations

Cormier et al. (2010) summarized the 40 studies on the effects of testing accommodations published between 2007-2008 and stated that the most prevalently used testing accommodation was presentation (n = 25), and within this category, the most prevalently used testing accommodation was read aloud (n = 9). Besides, timing/scheduling is a commonly used testing accommodation. Among 40 studies, 14 used timing/scheduling, and among these 14 studies, 10 used extended time. Setting testing accommodation was the least used with three among 40 studies. Among setting testing accommodations on students with disabilities, the focus was individual administration. Similarly, George-Ezzelle and Skaggs (2004) paid attention to the studies about setting testing accommodations. They stated that setting testing accommodation, such as individual administration included in research studies as a part of multiple accommodation packages or meta-analysis and it is not studied as a single testing accommodation. In addition, Lewandowski, Wood, and Lambert (2015) expressed the same situation. Lewandowski et al. (2015) said that even though there were many studies about the effect of testing accommodations, they could not find any about setting testing accommodations. They also stated that even the universities and test agencies around the world administer private and semi-private tests legitimately under setting accommodation; there was no evidence about the efficacy of setting testing accommodations.

2.4.4 Research Studies on Response Testing Accommodations

Bolt and Thurlow (2004) reviewed the five of the most frequently allowed testing accommodations in state policy. In the research they conducted in line with the various criteria they determined, dictated response to a scribe, large print, Braille, extended time, and interpreter for instructions were the most frequently allowed testing accommodations. In this study, the blind students said their answers to the scribe, and the scribe marked the answers. Powell (2012) examined the effect of response format on mathematics problem-solving test of third-grade students with mathematics. The researcher used multiple-choice or constructed-response formats. The 72 students who used the multiple choice format scored significantly higher from the 77 students who used constructed-response format when answering. In the study of Tindal et al. (1998), as stated in the presentation part, no differences were found in the response conditions of bubbling in answers on a separate sheet for half of the test and marking the test booklet directly for the other half of the reading and math test. Moreover, Clapper et al. (2005) searched the state guidelines for scribes, readers, and sign language interpreters. They contacted 50 states and found 22 states that had guidelines for at least one of the scribes, readers, or sign language interpreters in which 20 state guidelines for scribes, 13 state guidelines for readers, and 11 state guidelines for sign language interpreters.

2.5 Research Studies on Testing Accommodations and Affective Characteristics

The relevant literature about testing accommodations focuses on the effects of assessments on students' affective characteristics (Bayram, 2014; Crawford & Ketterlin-Geller, 2013; Feldman et al., 2011; Lang et al., 2008). Feldman et al. (2011) claimed that although the tests were thought to damage students' affective characteristics, the number of experimental studies on this subject was insufficient. Elliott, Kettler, Beddow, and Kurz (2011) stated that the tests organized in line with special needs improved students' emotional or attitudinal characteristics. The results of the accommodated tests were more meaningful and comparable, and that these tests increased students' motivation and self-efficacy.

In a study by Crawford and Ketterlin-Geller (2013), they intended to explore teachers' understanding of testing accommodations, decision-making processes, and the reasons behind these decisions. They interviewed with 20 special education teachers that had been working in nine middle schools in five different states. The teachers' experience was ranged from two to 33 years. One of the results of this study revealed that the teachers were more concerned about students' feelings towards the test and test anxiety than about the students' achievements. Most of the teachers stated that their purpose in using the testing accommodations was the emotional well-being of the students.

In the study of Rosenblum and Herzberg (2015), in which they investigated blind students' experiences in tactile graphics and the results were mentioned above earlier in Chapter 2, the 12 students who were between grades 6 and 12 explained their feeling such as anger and frustration when they did not have same materials that were used in mathematics and science classes for sighted peers.

Examining the effects of testing accommodations on students' test performances and their perceptions of testing accommodations, Lang et al. studied with 170 students that were in 4th and 8th grades. 75 of the students were with disabilities, and 95 were without disabilities. All the participants were tested in both accommodated and non-accommodated test conditions in reading and math. After the test, a questionnaire was implemented for students to determine their preference of testing accommodations. The results of the tests showed that testing accommodations raised the test scores of both students with and without disabilities, but the increase in the scores of students with disabilities was more. Although both students with and without disabilities preferred the accommodated tests, it was determined that this preference was higher for students with disabilities.

Feldman et al. (2011) conducted a study to investigate the effect of testing accommodations on test performance, test-related anxiety, test-related self-efficacy, motivation to work hard on the tests, and positive regard for large-scale achievement tests. They studied with a total of 48 eighth grade students, 24 students with disabilities, and 24 students without disabilities. The participants were randomly assigned to four groups in terms of disability status. Two of the groups consisted of students with disabilities. One of the groups tested under non-accommodated condition, and the other group was tested under accommodated condition. The other two groups included students without disabilities. Similar to students with disabilities, for students without disabilities, one group tested under non-accommodated condition and the other group was tested under accommodated condition. The students completed a pre-test questionnaire that aimed to reveal students' test-related cognitions before reading/language arts achievement test. Just after the achievement test, they completed the post-test questionnaire. Test results demonstrated that the performance of students with disabilities was worse than students without disabilities. When the groups were investigated, all the groups performed better under accommodated test conditions. The students who were tested under accommodated conditions increased self-efficacy scores from pre-test to post-test. When testing accommodations had a medium positive effect on self-efficacy (ES: 0.51) and small positive effect on motivation (ES: 0.23) of students with disabilities, they had no effect on the self-efficacy (ES: 0.07) and small negative effect on motivation (ES: -0.25) of students without disabilities. The result of this study showed that as well as their impact on test scores, testing accommodations increased the self-efficacy and motivation of students with disabilities.

Bayram (2014) associated visually impaired students' low mathematic achievement with low motivation of students. She claimed the exemption of visual-based questions as a reason for students' low motivation. Since these questions were not asked in the exam, students did not care about these subjects in the lessons and unmotivated.

2.6 Determination of Motion Concept

Motion is one of the contents of physics and is a part of the ninth and 11th grade Turkish physics curriculum. In the literature, there are many studies about the motion concept. There are some reasons for the selection of motion concept for this study. The students and teachers have problems about the conceptual understanding of motion concept (Bülbül, Garip, & Özdemir, 2015; Espinoza, 2005; Halloun & Hestenes, 1985; Narjaikaew, 2013; Thornton & Sokoloff, 1998; Trowbridge & McDermott, 1980; Trowbridge & McDermott, 1981; Turgut, Karaman, Sönmez, Dilber, Şimşek, & Altun, 2006). Some studies stated that the motion concept is hard to understand for students (Aycan & Yumuşak, 2003; Aykutlu, Bezen, & Bayrak, 2015). To Sahyun (1999), frequently used graphics were a reason of students' difficulties in understanding physics. It was known that students have serious problems about the interpretation of kinematic graphics (Goldberg & Anderson, 1989; McDermott, Rosenquist, & Zee, 1987; Tebabal & Kahssay, 2011). The graphics and figures are problematic for totally blind students as their sighted peers (Rosenblum & Herzberg, 2015; Schoch, 2010). Aycan and Yumuşak (2003) stated that 37.3% of the 151 high school graduate students indicated motion as the hardest to understand in high school physics curriculum. Aykutlu et al. (2015) determined the 38 physics teachers' opinions about the most challenging topics for students in terms of conceptual learning and revealed that, for ninth grade, 50% of teachers expressed motion, which is a part of the Motion and Force unit, as the most challenging. Moreover, students have problems about interpreting kinematic graphics that are used frequently on motion (Goldberg & Anderson, 1989; McDermott et al., 1987; Tebabal & Kahssay, 2011). Several studies include blind students about motion. Bülbül, Garip, Cansu, and Demirtaş (2012) designed a needled page material that can be used on physics and mathematics test items including graphics and geometric shapes. Bülbül, Garip, and Özdemir (2015) conducted a force concept inventory test with visually impaired and blind students and stated that blind students' conceptions about force and motion are not more different from sighted students.

In Turkey, blind students are excluded from the items that have visuals in the university exams according to the exam guidelines for ten years. Since the graphics are used prevalently in motion concept, examining the effect of verbal and tactile graphics testing accommodations on motion concept will provide the blind students to experience items with figures and graphs.

2.7 Summary of the Related Literature

The literature on the needs of blind students in instruction and assessment, categories of testing accommodations, testing accommodations in large scale examinations for blind students, research studies on testing accommodations and achievement and affective characteristics, and determination of motion concept reviewed in this chapter can be summarized as the following:

- The instructional materials and discourse have to be accessible for blind students. Multi-sensorial materials and presentations enhance a fair instruction to blind students (Bayram, 2014; Beck-Winchatz & Riccobono, 2008; Burke, 2001; Bülbül, 2014; Bülbül & Eryılmaz, 2012; Cox & Dykes, 2001; EGED, 2019; Fraser & Maguvhe, 2008; Pehlivan & Ünlü, 2008; Smothers, 2011; Torres & Mendes, 2017; Zorluoğlu & Sözbilir, 2017).

- Blind students can learn in an appropriate educational environment since they have the same range of cognitive abilities as sighted students (Jones et al., 2006; Kouroupetroglou & Kacorri, 2010; Kumar et al., 2001; Şahin & Yörek, 2009). Curriculum objectives can be presented fairly to all students through instructional accommodations (Christensen et al., 2009).
- The disability status of blind students should not hinder them form accessing tests. Exemption of test questions is a threat to content validity and the validity of inferences made through test scores (Allman, 2009; Çobanoğlu et al., 2018; Hannan, 2007; McDonnell et al., 1997).
- Testing accommodations remove the barriers of special need students that prevent them to understand the measured construct of the test and enhance them to take the test as students without disabilities do (Lang et al, 2008; McDonnell et al., 1997; McKevitt, 2001). Presentation, timing/scheduling, setting, and response are the main categories of testing accommodations (Tindal & Fuchs, 2000; Ysseldyke et al., 1994).
- Testing accommodations in transition to high school examinations and university entrance examinations in Turkey are incompatible with each other, and the diversity of testing accommodations is insufficient. While the questions containing visuals are presented to blind students with descriptions or equivalent questions in the transition to high school, blind students are exempted from these questions in university entrance examinations. Exemption from questions causes blind students to be unable to reach a question that they can answer when asked in an accessible way. Moreover, the Braille and audio booklet testing accommodations which were presented in the early years were abolished. Instead of exempting from questions, tactile graphics and verbal description testing accommodations can be an alternative way of presenting questions that include figures, graphics, and tables to blind students (Aldrich & Sheppard, 2001; Ferrell et al., 2017; Rosenblum & Herzberg, 2015; Schoch, 2010; Sheppard & Aldrich, 2000).

- Testing accommodations are effective on special need students' achievement on several subject matters (Buzick & Stone, 2014; Ferrell et al., 2017; Kim, 2012; Powell, 2012; Runyan, 1991; Tindal et al., 1998) and on special need students' affective characteristics (Bayram, 2014; Crawford & Ketterlin-Geller, 2013; Feldman et al., 2011; Lang et al., 2008). Considering the opposite, instead of asking questions in an accessible way, excluding them from questions is part of the view that students cannot do science and mathematics questions, especially with visuals, and it also undermines students' career plans that include science courses and is likely to affect their emotional characteristics.
- The motion concept includes graphics and figures frequently, and these visual elements are problematic not only for sighted students but also for blind students (Goldberg & Anderson, 1989; McDermott, Rosenquist, & Zee, 1987; Rosenblum & Herzberg, 2015; Schoch, 2010; Tebabal & Kahssay, 2011). The fact that the questions about motion also included many visuals and that blind students were exempted from these questions were effective in choosing the topic of motion.

Results of the literature review indicated that using testing accommodations makes tests accessible for special needs students and testing accommodations are usually more effective on students with disabilities than students without disabilities. When reviewing the literature about testing accommodations, it was determined that most of the studies are interested in the disability status of learning disability and the accommodation category of presentation. Most of the studies on blind students have focused on students' access to course materials. The studies about the assessment of blind students have generally focused on determining blind students' experiences, attitudes, and thoughts about testing accommodations. Although it has been stated in various studies that blind students can access the questions containing figures, graphics, and tables with tactile graphics or verbal descriptions instead of being exempted from these questions, the number of studies on these testing accommodations is very few. Most of the existing studies contain students in a wide age range, both blind and low vision students, restricted accommodation packages, and lack of the details of instruction environment. The studies do not include the blind students’ previous experiences when designing and developing tests and do not provide information on whether students have experienced the accommodation in their instruction. Therefore, it is valuable to conduct a research that takes into the considerations already mentioned above to fill the gap in the literature about how testing accommodations affect sighted and blind ninth grade students' physics achievement about motion, physics self-efficacy, physics attitude, self-esteem and test anxiety.

CHAPTER 3

METHODS

At the beginning of this chapter, the research design is summarized first, and then the qualitative and quantitative methodology followed in the dissertation are discussed separately.

3.1 Research Design

In this study, mixed methods research design was used. Creswell (2003, p. 18) defined mixed methods research as

"… in which researcher tends to base knowledge claims on pragmatic grounds (e.g., consequence-oriented, problem-centered, and pluralistic). It employs strategies of inquiry that involve collecting data either simultaneously or sequentially to understand research problems best."

From mixed methods, the transformative design was used. The transformative design is preferred when the researcher addresses the needs and injustices about underrepresented or marginalized groups (Creswell & Clark, 2011). In this design, the researcher is sensitive to the needs of the related population and gains a better understanding of the phenomenon being studied and makes suggestions for the provision of justice for the related population in line with the research results (Creswell, 2003; Creswell & Clark, 2011). In order to explore inequities about assessment process of blind students in science and physics courses from their lens, and determine the effect of using testing accommodations on sighted and blind ninth grade students' physics achievement about motion, physics self-efficacy, physics attitude, self-esteem, and test anxiety, the transformative design was chosen in this study. In transformative design, data collection for the qualitative and quantitative phases can be concurrent, sequential, or both (Creswell, 2003; Creswell & Clark, 2011). In this study, a sequential transformative approach was used. Creswell (2003) explained the purpose of the sequential transformative approach as to use the methods that would best serve the researcher's theoretical point of view. He stated that researchers who want to express different perspectives, defend participants better, or better understand a phenomenon or process that emerged as a result of the study can use this method.

In this study, focusing on the blind students, which is a special group, collecting data from people who have information about the problem at the qualitative stage such as blind students, including sighted students as suggested in previous studies, using the results of the study to express the problems of blind students and to develop suggestions for the fair evaluation of blind students make the study compatible with this method.

In the current study, the qualitative data collection is first, and the quantitative data collection is second in sequence. In the qualitative phase, gaining a deeper understanding about the issues that the junior and the senior high school blind students stated as problems about testing accommodations in school and national examinations of science and physics courses was aimed. In the methodology of the qualitative phase, qualitative research methods, participants, qualitative data collection instruments, procedure for qualitative phase, qualitative data analysis, and the researcher's role and ethical issues were presented. In the quantitative phase, the effect of using testing accommodations on the sighted and blind ninth grade students' physics achievement, and the effect of using instructional and testing accommodations on physics self-efficacy, attitude towards physics course, self-esteem, and test anxiety were investigated. The research design is summarized in Figure 3.1.

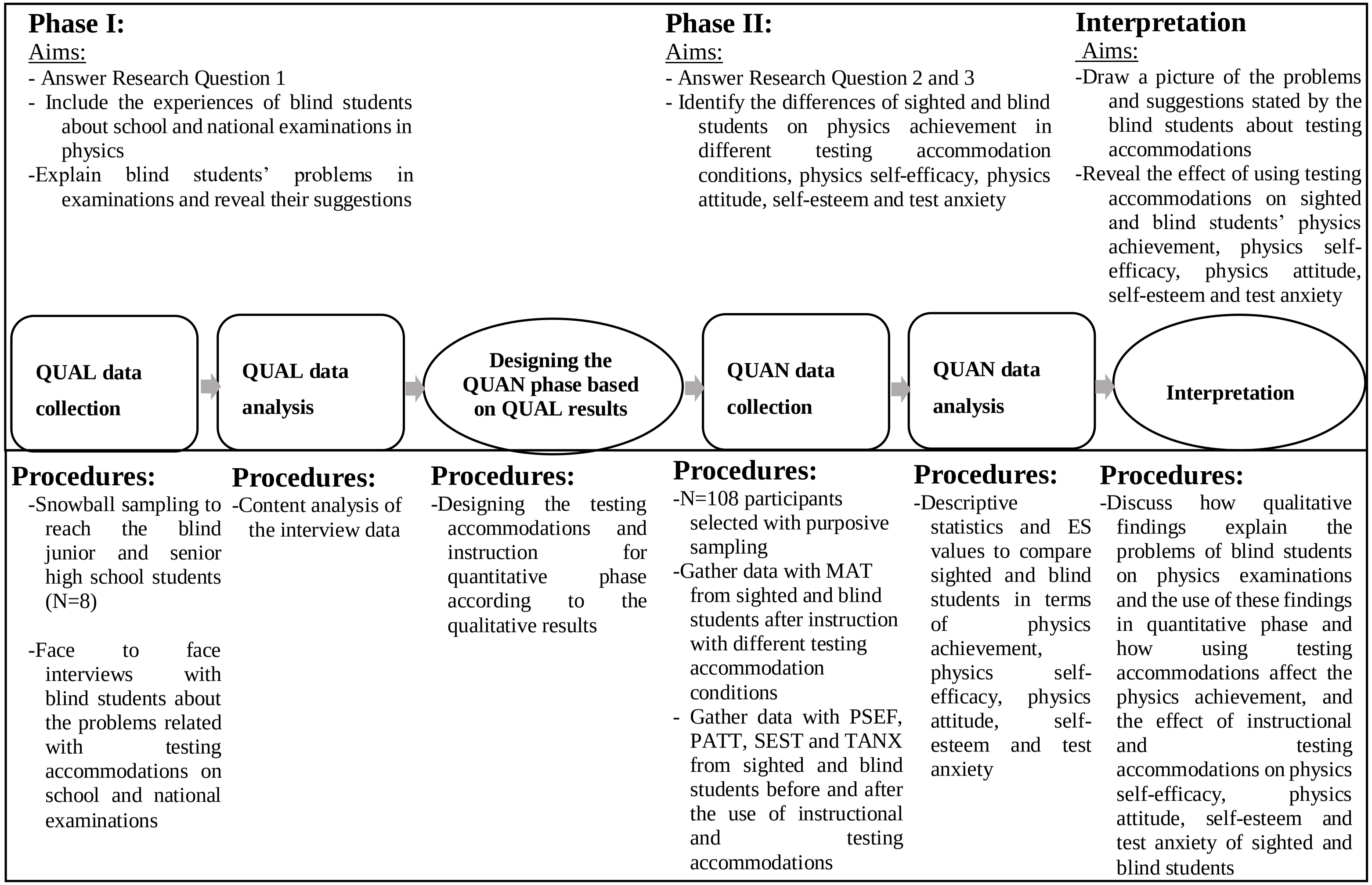

Figure 3.1 The research design

3.2 Methodology of Qualitative Phase

In the methodology of qualitative phase, qualitative research methods, participants of the research in qualitative phase, qualitative data collection instruments, procedure for qualitative phase, and qualitative data analysis were stated. Lastly, researcher's role in qualitative phase and ethical issues was explained.

3.2.1 Qualitative Research Methods

The qualitative study which was carried out with the blind students was in phenomenology design, which is one of the qualitative research designs. Phenomenology design is used in researches to reveal individuals' experiences, perceptions, and orientations towards a phenomenon (Fraenkel & Wallen, 2009).

In line with the first qualitative research problem, the situations that the junior and the senior high school blind students stated as problems about testing accommodations in school and national examinations of science and physics courses were investigated. According to Fraenkel and Wallen (2009), it is suitable to collect data mostly through in-depth interviews in phenomenological researches. Interview as a research technique is a controlled and purposeful verbal communication form between the researcher and the interviewee (Cohen & Manion, 1994; Türnüklü, 2000). Interview guide approach was used as the interviewing variation. Patton (2008) stated that the interview guide approach provided the flexibility to write the questions regarding predetermined questions and topics into a form and ask these topics and questions during the interview when the interviewer deemed appropriate and without using exactly the same words. According to Yıldırım and Şimşek (2006), it is expected that the interview guide would receive more accurate and sincere answers from the interviewee, as it both raises the questions determined beforehand, deepens the interview with additional questions in cases where they want to get more detailed information, and provides the opportunity to conduct the interview in the form of a conversation while remaining loyal to the subject of research. An interview form consisting of 17 questions was used for asking the problems of the junior and senior high school blind students about testing accommodations in school. Furthermore, national examinations of science and physics courses were investigated.

3.2.2 Participants of the Research in Qualitative Phase

The purposeful sampling method was used in the qualitative phase of the study to determine the participants. In the purposeful sampling used in qualitative research, the researcher determines the group in which she can collect the most in-depth information on the subject she has determined (Cresswell & Clark, 2011; Palinkas, Horwitz, Green, Wisdom, Duan, & Hoagwood, 2015; Patton, 2002).

In this study, for the first research problem, eight junior and senior blind high school students were reached through snowball sampling, which is one of the purposeful sampling methods. According to Fraenkel and Wallen (2009), in snowball sampling, after the interview is started with the designated people, the number of the interviewees increases throughout the research, as these people direct the researcher to those who think they can provide information on the subject being interviewed. Since it was thought that blind students would be in contact with each other through various clubs, non-governmental organizations and associations, this sampling method was deemed appropriate for the problem.

With the guidance of a special education teacher, I met with the manager of a rehabilitation center. He canalized me to another rehabilitation center to contact blind students and introduced me to a female blind student living in Bursa. In the rehabilitation I canalized, I reached only one male blind student. With the direction of the female blind student, I contacted a sports club that serves blind students in Bursa. In this sports club, I reached six more blind students who were friends of the female blind student. So in this case, there were eight blind students as participants. Two of the participants were junior, and six other students were senior high school students. Two of the senior high school students were in open high school. Numbers from 1 to 8 were assigned to the names of students as seen in Table 3.1.

Table 3.1 The blind students' high school level, grade and gender in qualitative phase

Participant	High School Level	Grade	Gender
Student 1 (S1)	Junior	7	Male
Student 2 (S2)	Junior	8	Male
Student 3 (S3)	Senior	9	Female
Student 4 (S4)	Senior (open high school)	9	Female
Student 5 (S5)	Senior (open high school)	9	Female
Student 6 (S6)	Senior	10	Female
Student 7 (S7)	Senior	11	Male
Student 8 (S8)	Senior	11	Female

3.2.3 Qualitative Data Collection Instruments

3.2.3.1 Interview Guide for Determining the Problems of Junior and Senior High School Blind Students About Testing Accommodations

An interview guide consisting of 13 questions was prepared in line with the first research question as a data collection instrument. The interview guide was examined by three faculty members, two studying in physics education and one in special education, and a physics teacher who taught blind students. The expert opinion form for the interview guide, including 13 questions, is presented in Appendix A1. After the experts' feedback, arrangements were made for the questions in the form, and a form consisting of 17 questions was created by adding four more questions. The interview form is presented in Appendix A2. In this interview guide, there were questions to obtain information about students' instruction process of science/physics courses, testing accommodations made in examinations of science/physics courses, the problems in these courses' examinations and students' suggestions on testing accommodations, and students' perceptions and expectations for fairness about instruction in science and physics courses. For high school students, there were questions to discover the problems that they faced at high school transition examination in science questions and their suggestions to the problems. Besides, there were questions related to what they think about equivalent questions instead of questions containing pictures, figures, and graphics in high school transition examinations, their ideas about the exemption of questions containing pictures, figures, and graphics in university entrance examinations, and their testing accommodation suggestions about these questions and other testing accommodations in national and school examinations, students' perceptions and expectations for fairness in science/physics courses and national examinations.

3.2.4 Procedure for Qualitative Phase of the Research

When informing about data collection, explaining the settings of the participants would be more meaningful. Marshall and Rosmann (1999) identified four characteristics that the researcher should pay attention to when choosing a field and attempting to enter the research field. The first is that it was possible to enter the field for research purposes. The second is that there was a wealth of information, processes, and documents on the research subject in the field. The third characteristic was trust-based and effective communication could be established with individuals in the research field. And lastly, there was no doubt about the quality and validity of the findings (As cited in Yıldırım & Şimşek, p. 87). Therefore, the natural environment of the interviews conducted with eight blind students is presented in this section.

3.2.4.1 Interviews with the Blind Students

As explained in participants of the research in the qualitative phase, there were eight blind students for interviews. The interviews were conducted face to face to observe the context of interviewees and take field notes.

Among eight blind junior and senior high school students, one student was going to the rehabilitation center, and the other seven students were going to sports club. The rehabilitation center and sports club were places where students were accustomed and felt comfortable. Before the interviews, I had been in these places frequently to make myself familiar to students. I explained the purpose of the study to students and informed them that being a participant is based on volunteering. I stated that I wanted to record audio during the interviews. All of the questions in the form were asked to the participants during face to face interviews and audio recorded. All interviews were conducted within a week. In none of the interviews, a situation that would adversely affect the interviewee was experienced, and the interviews took place in the expected conditions.

With Student 2, the interview was conducted in a classroom in the rehabilitation center. His special education teacher was also in the classroom. She encouraged the student to speak, and sometimes she also commented on interview questions. The interview continued for about 30 minutes.

With six of the students, the interviews were conducted in the sports club in a separate room. Students 1, 6, and 7 were interviewed individually. Interviews with Student 1 and Student 6 took approximately 18 minutes each and 14 minutes with Student 7. Student 3 attended the interview with her mother. Apart from the interviews, as I observed when I went to the sports club, this student generally attended many activities with her mother. Her mother was very sensitive to her daughter's education and gave a rights-based struggle about her daughter's disability. Interview with Student 3 lasted about 39 minutes. The other two blind siblings, Student 4 and 5, joined the interview together, and the interview continued for about 19 minutes.

Student 8 wanted to meet for the interview in a café with her mother. I knew her mother from the sports club. Her mother stated that she wanted to attend the meeting because she wanted to contribute to the study. The interview with Student 8 took approximately 21 minutes.

3.2.5 Qualitative Data Analysis

The interview data of the blind students were analyzed by the content analysis method. Content analysis is a common method used to make sense of interview and observation data (Frankel & Wallen, 2009). A mix of inductive and deductive approaches is adopted in the coding process (Kaiser & Presmeg, 2019). The literature about testing accommodations was pointing four categories of presentation, setting, timing, and response. These themes were deductively determined according to theory. The unit of analysis was chosen as the paragraphs in the student responses. Each of the paragraphs was matched with only one code and when a student repeated an answer in different parts of the interview, this paragraph was matched with the same code. The warm-up questions, such as students' grades and schools, and the questions asked by students to better understand the question posed by the researcher were not coded. Besides, the paragraphs in students' responses that did not include any element providing information about the problems and suggestions in school and national examinations were attended to "No Element" category. Since the content analysis is a dynamic process, a new category was added besides to predetermined five categories.

First of all, audio recordings were transferred into written format, and the data was prepared for analysis. Stages of content analysis in qualitative research are given in Figure 3.2.

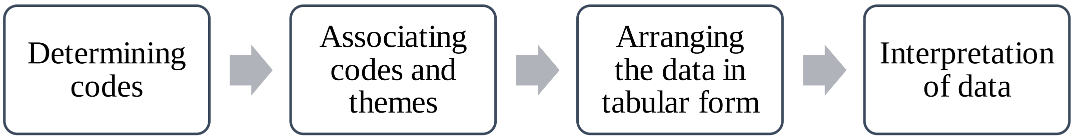

Figure 3.2 Stages of content analysis in qualitative research

In the first stage, the codes were determined by reading the records repeatedly. Following the first step, the codes and existing categories were associated, and the codes that did not belong to the predetermined five categories were renamed in a new category as “justice”. For reliability, the data were read again by the researcher after two weeks, and codes and categories were rearranged considering 80% compliance between the codes as a result of the two analyses. Afterward, the data were arranged in a tabular form according to categories and codes. Lastly, the findings were interpreted. The sample interview transcript of audio recordings with the determined categories and codes are in Appendix B.

3.2.6 Researcher’s Role in Qualitative Phase and Ethical Issues

In the qualitative phase of this study, I interviewed each of the eight blind students in the settings they felt confident, recorded, analyzed, and interpreted the data. As I was in close contact with the participants during the research process, I had to present the data without bias and subjectivity. According to Pandey and Patnaik (2014), the researcher's perspective or choices shapes not only qualitative, but also quantitative, and even laboratory research. To clear research from these doubts, Creswell (2003) stated that researchers are required to provide information about background data about the research subject, environment, participants, the communication between researcher and participants, steps for entering into the research field, and ethical issues.

There is a potential bias about the research subject since I have a daughter with coloboma. I took advantage of this bias to understand the studied phenomena deeply.

However, I knew my responsibilities as a researcher. I had to be neutral and avoid bias during the research to enhance the credibility and authenticity of the research.

I used only the participants' data, not my thoughts, when conducting the analysis. In content analysis, I gave excerpts from the interview transcripts of participants in Chapter 4.

Since conducting ethical research is a mission of the researcher, the ethics of the study is discussed in line with the principles that Frankel and Wallen (2009) stated as protecting participants from harm, ensuring the confidentiality of research data, should subjects be deceived are the main principles. The participants were not physically and psychologically harmed or were kept in a dangerous or frightening situation. They were informed about the study. For ensuring confidentiality, the actual names of the participants and places were not shared with anyone else. The names were assigned with letters. For example, Student 1 was named as S1. It was stated to the participants that if they give up the study, they can leave the study at any time and the data obtained from them will not be used. In this study, the participants were not deceived. The students were informed about the purpose of the study. I shared my contact information with the participants so that they could ask me if they had any questions about the study.

3.3 Methodology of Quantitative Phase

In the methodology of quantitative phase, quantitative research methods, population and sample, quantitative data collection instruments, instructional materials, the procedure for quantitative phase, and quantitative data analysis were stated. Lastly, the assumptions and limitations of the study were presented.

3.3.1 Quantitative Research Methods

In the quantitative phase of the study, both causal comparative research design and experimental research design are used.

When comparing the achievement or affective characteristics of the sighted and blind students, the causal comparative research design was used. In a causal comparative research, the researcher investigates the causes or consequences of differences that already exist and investigates how groups differing in terms of two or more characteristics differ in terms of other variable or variables (Frankel & Wallen, 2009). The group difference variable in a causal comparative study can be a variable that is impossible to manipulate in contrast to an experimental study. The different characteristics of the groups were not formed as a result of manipulation and already existed. One group has a feature while the other group does not. In this study, students' disability status is a group difference variable that cannot be manipulated. The blind and the sighted students were instructed with the same materials in the same environment. All testing accommodation conditions of the achievement test and scales of affective characteristics were implemented to both the blind and the sighted students. Moreover, the achievement or affective characteristics were compared based on students' disability status.

When comparing the sighted or the blind students' achievement for different testing accommodation conditions, and when comparing the pre and post-tests of affective characteristics for blind and sighted students, the experimental design was used. The basic conditions of formal experiments which are explained by Freankel and Wallen (2009) as at least two or more conditions are compared to assess the effects of particular conditions and the independent variable is directly manipulated by the researcher was meet. In this study, testing accommodation conditions on sighted and blind students were studied. The researcher was directly made the manipulations about who is getting the tests and when, where, and how they would get it. However, the study lacks randomization. The aim of random assignment is to put out of the extraneous variables and ensure internal validity. In this study although there is no randomization, the threats to internal validity were controlled by the ways explained in Chapter 5.

3.3.2 Population and Sample of the Quantitative Phase

The target population of the study is all ninth grade public high schools' inclusive classes' students which include blind students in the cities of Marmara Region. At the beginning of the study the ninth grade inclusive classes' students including blind students in the province of Bursa were considered as an accessible population, and it was intended to select at least three ninth grade inclusive classes in Bursa, including blind students for the sample. In the study year, despite the possibility of not having ninth grade inclusive classes which include blind students in Bursa, necessary permissions were obtained for the cities of Marmara Region, except Edirne, Kırklareli, and Tekirdağ. These cities are Balıkesir, Bilecik, Bursa, Çanakkale, İstanbul, Kocaeli, Sakarya, and Yalova. As predicted, in the year of the study, only one ninth grade inclusive class which includes a blind student was found in Bursa. Therefore, the researcher searched the inclusive classes with blind students in the cities close to Bursa, and three more ninth grade inclusive classes were found in Sakarya in accordance with the specified criteria. In this case, it would be more correct to define the accessible population as the ninth grade inclusive classes' students which include blind students in the provinces of Bursa and Sakarya.

In causal comparative research, it is essential to select individuals that have the characteristics to be studied as a sample (Frankel & Wallen, 2009). Since there are four inclusive classes in line with the criteria within the purpose of the quantitative study, it was deemed appropriate to work with the whole accessible population instead of choosing a sample. Before starting the study, it was stated in the interviews with the school administrators that one of the blind students in Sakarya never attended school and would be transferred to another school. Therefore, one of the classes in Sakarya was excluded from the study.

Inclusive class A which was in Sakarya includes 37 students, inclusive class C which was also in Sakarya includes 39 students, and inclusive class B which was in Bursa includes 41 students. In all inclusive classes, one of the students is blind, and the other students are sighted. There were no students with special needs in all classes except blind students. Since students who were regularly absent from all three schools were excluded from the study, a total of 108 students, 105 sighted and three blind students, participated in the study. The administrators of the School A and B stated that the blind student in the selected class was compatible, got along with their friends, socially active, and had the ability to move independently and successfully as well as the sighted students. The physics teachers of these two blind students had similar ideas with administrators about the characteristics and achievement of their blind students. According to physics teachers, these blind students were as active as the sighted students in physics courses. The administrator of School C stated that the blind student in the selected class was compatible, getting along with friends but shy and she was coming and going to school under the supervision of her sister. The physics teacher of this blind student expressed the shy characteristics of her blind student in physics courses. In selected inclusive classes, both the sighted and blind students participated in the study. The information about students was gathered by a form called student information form, which is in Appendix C.

According to the results of the student information form, 35 students from School A, 36 students from School B, and 37 students from School C attended to this study. In each selected ninth grade classroom, there was a blind student. Therefore, 105 students were sighted, and three students were blind. 50 of them were female (46.3%) and the remaining 58 were male (53.7%). Almost all students were 14 (N: 58; 53.7%) or 15 years old (N: 47; 43.5%). Only one student was 17, and two students were 16 years old. Most of the mothers and the fathers were found to be in their 40s. While nearly half of the students had two siblings (N: 52, 49.1%), it was determined that one student had 10 siblings, the other nine, and another student had six siblings. Furthermore, 33 of the mothers were working (30.6%), three of the fathers were not working (2.8%). Eight of the mothers and two of the fathers were illiterate, five mothers and 11 fathers were university graduates, one mother and two fathers had MS. Besides, the remaining mothers were mostly graduates of primary school (N: 39, 36.1%), and most of the remaining fathers were high school graduates (N: 39, 36.1%). 97.2% of the students graduated from public primary school, and similarly, 93.5% of the students were in public schools at the elementary level. The last physics exam scores of the students ranged between 26 and 92 points. Some other characteristics of students determined by student information form are given in Table 3.2.

Table 3.2 Some characteristics of the students in quantitative phase

	Yes		No	
Questions	N	%	N	%
Mother and father living together?	96	88.9	12	11.1
Living with siblings?	85	78.7	23	21.3
Non-family individuals at home?	13	12.0	95	88.0
Living with parents?	107	99.1	1	0.9
Having a study room?	101	93.5	7	6.5
Having financial problems?	15	13.9	93	86.1
Having a family member to help study at home?	64	59.3	44	40.7
Having had a serious illness before?	18	16.7	90	40.7
Having a disabled family member?	5	4.6	103	95.4
Taking support from a person or institution for the physics course?	15	13.9	93	86.1
Taking support documents or material for the physics course?	40	37.0	68	63.0
Benefiting from the textbook in the physics course?	98	90.7	10	9.3
Think that the physics course learning environment is fair for all students?	67	62.0	41	38.0
Effective participation to the physics course?	64	59.3	44	40.7
Think that the physics examinations are fair for all students?	68	63.0	40	37.0

The student in School A was a male and 16 years old. He lost his left eye at the age of 1.5 and right eye at the age of 11 because of retinoblastoma. He has one brother, and he is his classmate. Both his mother and father graduated from high school and are living together. Student A, who was living with his family, had his own room and had no financial problem. His parents and brother were supporting him when studying physics. He was receiving support from the council's course center in Sakarya for physics lessons. He was also using his Braille physics textbook while studying. His last physics exam score was 92.5. This is the highest score among 108 students.

Student B, who was also male, was 17 years old. When he was two years old, he had an eye injury and had an operation. Later, when he was seven years old, a lens was placed in his eyes due to a problem with his eyepieces. However, he lost his sight due to the problems experienced in operation. He was wearing glasses. He could perceive light, albeit a little, but this perception was insufficient for reading texts. For this reason, the student had demanded readers both at school and in national exams. He had four siblings, and both her mother and father graduated from primary school and were living together. He was living with his family, had a room for study at home and had no economic problem. His grandparents lived in the same house as Student B. His siblings were supporting him when studying physics and he was also attending the physics courses of a sports club in Bursa. At this sports club, pre-service science teachers were doing one-to-one lessons with blind students within the scope of community service practices course. He was using neither the physics textbook nor any other material when studying physics. His last physics exam score was 75. His score was the third highest score in his classroom. His teacher was asking verbal questions in his classroom exams.

Student C was a 15 years old female. She lost both eyes at the age of 7 due to Rhabdomyosarcoma. Her mother graduated from elementary school, and her father graduated from high school and were living together. While 107 of the students were living with their family, mother and/or father, only one student, Student C, was living with her sister away from her mother and father and had financial problems. Her parents were in the village with her two other siblings. She had a study room, and her sister was helping her about the physics course. He was also taking support from the same course center as Student A, but she was not using the physics textbook. She got 90 points from last physics exam. This exam score was the highest score in her classroom and second highest score among 108 students.

The fathers of the blind students were working; however, the mothers were not. There was no individual with special needs in any of the blind students' families. All the blind students graduated from public primary and elementary schools. Student C stated that while she was in primary school, she attended the Quran course for the visually impaired rather than school. None of the blind students thought that the physics course learning environment was fair for all students. Moreover, Student A and C stated that the exams of the physics course were not fair for all students. Student B thought the opposite about the fairness of physics exams to Student A and C. All students could read Braille. And lastly, none of the blind students received educational support about the motion concept in the course center and sports club during this study.

In all inclusive classrooms, the instruction was standardized by using the tactile physics textbook printed by the researcher and enriched course materials (Bülbül, 2014). All the students in inclusive classrooms took examinations without and with testing accommodations. All the students in the same school had the same teacher during instruction and examinations.

3.3.3 Quantitative Data Collection Instruments

The instruments that used in this study were Motion Achievement Test (MAT), Physics Self-Efficacy Scale (PSEF), Physics Attitude Scale (PATT), Self Esteem Scale (SEST), and Test Anxiety Inventory (TANX).

3.3.3.1 Motion Achievement Test

The purpose of the MAT is to measure students' achievement on the content of motion that belongs to the force and motion unit in ninth grade Turkish physics curriculum. The concepts and topics in this content are position, distance, displacement, speed, velocity, instantaneous velocity, average velocity, and acceleration. Although the force and motion unit in ninth grade includes 11 objectives, six of them are about motion concept. These six objectives about motion were rearranged and transformed into 16 objectives. After the feedback of my supervisor, the number of objectives was rearranged to be 14. The revised objectives, required time for them, and the related pages of the textbook for each are presented in Appendix D. Three out of 14 objectives in total were considered in MAT.

Since the quantitative part of this dissertation focuses on the assessment processes of students in large-scale exams, attention has been paid to the planning of the MAT to reflect the structure of the University Entrance Examination (UEE) physics questions in Turkey as much as possible. For this reason, the university exam physics questions between 2006-2017 were investigated according to their formats. A total of 23 exams and 350 questions were accessed from “http://osym.gov.tr”. The formats were determined according to Haladyna’s (1997) multiple-choice (MC) item formats and they were “Conventional MC” and “Complex MC”. These two categories were elaborated according to their visual content and rearranged into four main categories. The percent of items in university entrance examinations between 2006 and 2017 were determined considering four item categories. The number of items for each objective were stated according to item types in a test plan. The main point in the test plan was creating a test in a fashion similar to university entrance examination item types and percent. The comparison of each item type for UEE and MAT is presented in Figure 3.3. As a result of the analysis, 84% of the questions were designed as conventional MC, and the remaining 16% were complex MC in MAT. Similar to UEE, 67% of the questions were designed as conventional MC with visuals and 8% as complex MC with visuals.

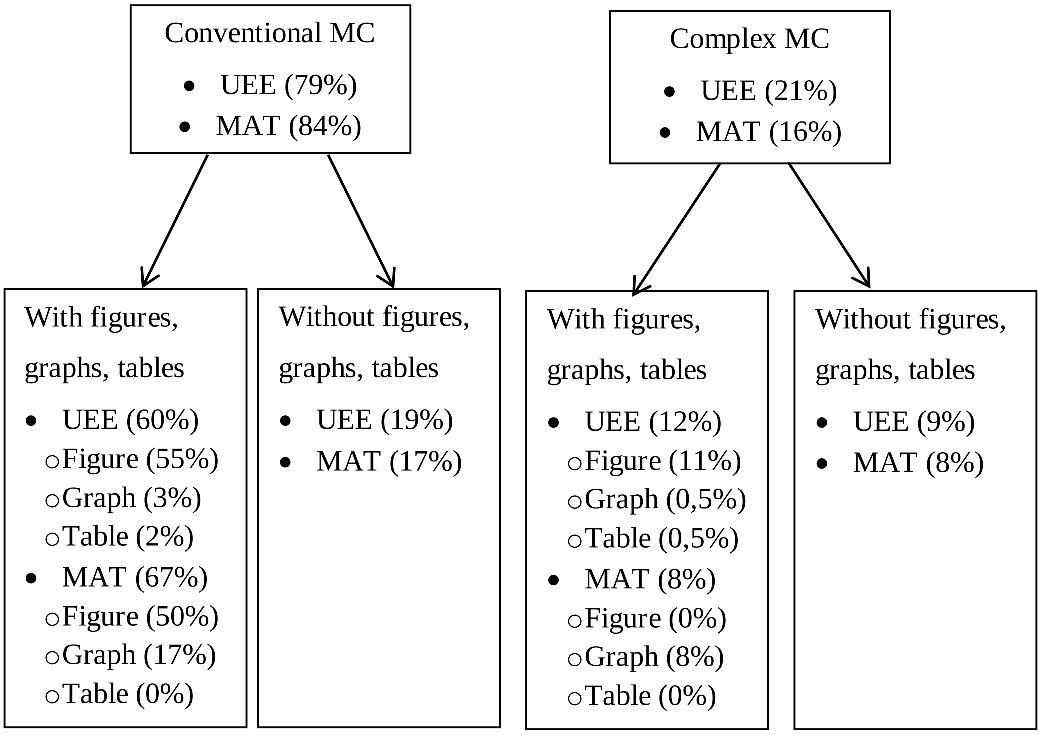

Figure 3.3 Distribution of University Entrance Examination and Motion Achievement Test items among multiple choice item types

Before starting writing multiple choice questions for MAT, preparing a test plan was appropriate. For a test plan including the number of items per objectives, question types, and matching of items and objectives, a number of studies have been done as outlined below. In the first test plan prepared, there were a total of eight questions for the three objectives selected among 14 objectives about motion (Appendix E). 10 questions for the draft version of MAT and an expert opinion form consisting of 13 questions were prepared for MAT (Appendix F1). Based on the feedback received from the thesis supervisor, the expert opinion form was revised in 14 questions, and it was decided to prepare a total of 12 questions for MAT in proportion to the acquisition time of three objectives. The members of the thesis monitoring committee suggested investigating and using the UEE questions that were asked in previous years for MAT. Seven of the questions in the first version of the MAT written by the researcher (Q1, Q2, Q3, Q8, Q10, Q11, Q12), four of the questions were raised from university entrance examination questions (Q5, Q6, Q7, Q9) and one question was taken from Education and Informatics Network (EBA) tests (Q4). The first version of MAT is in Appendix F2, and the distribution of 12 questions according to the question types is given in Table 3.3.

MAT that includes 12 questions and expert opinion form were given feedback by my supervisor and the second version of MAT was e-mailed to 11 experts with expert opinion for face and content validity (Appendix F3). Nine of the experts are academicians on physics education, one of them is an academician on special education, and two are physics teachers. The feedback was taken from seven of the 11 experts. The necessary revisions were made after taking experts' opinions, and my supervisor gave feedback to these revisions, and the third version of MAT was obtained. The edited version of the MAT, consisting of 12 questions, after receiving feedback from the experts is presented in Appendix F4.

Table 3.3 The distribution of questions in Motion Achievement Test according to the item types

Question type	Question number	
	1st version	2nd version
Conventional MC with figures	Q1, Q4, Q5, Q6, Q11	Q1, Q3, Q4, Q5, Q6, Q11
Conventional MC with graphs	Q7, Q8,	Q7, Q8,
Conventional MC with tables	-	-
Conventional MC without figures/graphs/tables	Q2	Q2, Q10
Complex MC with figures	Q3	-
Complex MC with graphs	Q9	Q9
Complex MC with tables	Q10	-
Complex MC without figures/graphs/tables	Q12	Q12

In the first testing condition of MAT, 12 items were prepared in the non-accommodated testing condition (NAMAT). NAMAT, which was structured similar to the UEE questions held nationally and presented to the students with the non-accommodation testing condition for questions containing visuals was called NAMAT. Nine of the 12 questions contained visuals, and the remaining three questions had no visuals. The questions that did not include visuals were called QNIV, and the remaining nine questions including visuals were called QIV. QNIV were same in all testing conditions of MAT. While all 12 questions in NAMAT were presented to the sighted students, the blind students were exempted from questions including visuals while applying NAMAT. With NAMAT, it was tried to reflect the testing accommodations applied by Measurement, Selection and Placement Center (ÖSYM) for blind students in UEE.

For tactile graphics testing accommodations condition of Motion Achievement Test (TAMAT), the 9QIV were revised for simplification. The figures contain details that were not required for the question. For example, the blind student's understanding of the shapes of the vehicles in Questions 5 and 6 with Braille printing requires more than what the problem is trying to measure. Considering that each blind student's past life experience was also different, the details that were not necessary for solving of the problem in the questions were simplified without creating scientific errors. In five items the visuals remained same, and four of the visuals were simplified. These revised four visual questions were called 4R-QIV, and the items that the visuals remained same were called 5QIV. For TAMAT, besides revising visuals of the questions, it was planned to prepare the descriptions for the visuals in such a way that blind students could access them, to write the abbreviations and units explicitly, and to rearrange the alternatives of some of the questions.

In this study, the texts in all testing accommodations conditions of MAT were converted to Braille with the HotDot Braille translation program, and the visuals were prepared as tactile graphics with the TactileView design software by the researcher. How visuals are viewed in the TactileView program can be seen in Appendix F6. The Braille embosser Everest-D V4 was used when printing Braille.

This printer was located only in one school in Bursa with a special education class for visually impaired students. The researcher learned how to use the printer from the special education teacher of this school. The first prints were taken in this school during the development of the test. In the following process, the sports club in the qualitative part of the study was also acquired from the same printer. A company sponsored to the sports club for the software required for tactile graphics and the Braille prints used in the treatment phase of the thesis were then taken in the sports club.

Blind students were also included in the editing process to organize TAMAT in the most accessible way for the blind students. Some questions in NAMAT and two different questions were arranged in tactile form, and four blind students' suggestions for revisions of tactile graphics were received with interviews. Questions of TAMAT were organized in line with the students' suggestions. The arrangement on TAMAT was discussed with the thesis supervisor, and TAMAT was sent to seven experts. The expert opinion form for the first version of TAMAT is in Appendix F5. Three of the experts were academicians on physics education, one was an academician on special education, one was a special education teacher and teaching Braille, one was a physics teacher who taught a blind student, and the last expert was the head of a non-governmental organization for the visually impaired who had low vision. Only one revision in the verbal description of Question 9 was done, and all questions were embossed. Since Braille print takes up more space than ink-print, the visuals in the questions were embossed on a separate page. TAMAT, which was edited after receiving expert feedback, was given in the Appendix F6 together with the appearance of the visuals in the questions on the interface in the TactileView program. All of the 12 questions in TAMAT were shared with two visually impaired students, with all the arrangements and tactile graphics. The blind students suggested that the verbal descriptions should be included in item stimulus, and a key section should be added before the visuals, and information should be given about the lines used in the visuals in this section. Thus, a legend was added to the same page before the visual in each question containing visuals. The blind students' suggestions were discussed with the thesis monitoring committee and a special education teacher experienced in teaching blind students. The third version of TAMAT is given in Appendix F7 for the sighted and the blind students. The photographs of tactile graphics are also included in Appendix F7. TAMAT was the test that reflected the testing accommodations that were created in line with the literature and the blind student suggestions. With TAMAT, both the sighted and the blind students would be able to access all 12 questions, regardless of whether the questions contain visuals or not. The visuals in questions were transferred to tactile graphics. If the blind student would not use the reader, all the tactile graphics and texts in this test would be printed in tactile form, and if a blind student would use a reader, only the tactile graphics would be embossed. TAMAT was printed on paper for the sighted students.

After the figures in TAMAT were finalized, verbal descriptions of 5QIV and 4R-QIV were prepared, and the test condition that includes verbal descriptions instead of visuals, the first version of verbal descriptions testing accommodations condition of Motion Achievement Test (VAMAT) was ready. The first version of VAMAT was presented in Appendix F8. The distribution of questions in NAMAT, VAMAT, and TAMAT for sighted and blind students are stated in Table 3.4.

Table 3.4 The distribution of questions in different testing accommodations conditions of Motion Achievement Test for sighted and blind students

	NAMAT	VAMAT	TAMAT
Sighted students	3QNIV+9QIV	3QNIV+VD(5QIV+4R-QIV)	3QNIV+5QIV+4R-QIV
Blind students	3QNIV	3QNIV+VD(5QIV+4R-QIV)	3QNIV+TG(5QIV+4R-QIV)

The verbal descriptions of visuals were presented to six sighted students. These students were selected from high schools of Bursa which have low, medium, high achievement levels. The sighted students draw the figures after reading verbal descriptions. The drawings of students are in Appendix F9. While the sighted students were drawing, the deficiencies in the verbal descriptions were noticed and the verbal description of the seventh question that caused a problem during the students' drawings was rearranged. Testing accommodations used by the MEB in examination of transition from middle school to high school were tried to be reflected with VAMAT. In VAMAT, in questions containing visuals, verbal descriptions were written instead of figures, and both the sighted and the blind students could access questions containing visuals with verbal descriptions.

After all revisions, the pilot versions of all three testing accommodations conditions were stated. These pilot versions for NAMAT, TAMAT, and VAMAT were given in Appendix F10. The pilot tests were implemented in a medium achievement level high school in Bursa with sighted students. In this school, three ninth grade classrooms that had similar physics achievement levels were selected. All the classrooms finished the motion concept in physics courses. Each classroom took one testing accommodation condition of MAT. The students took the test individually like in a testing environment. All the classrooms tested at the same day. In the first classroom in which VAMAT was implemented, there were 23 students. 20 of the students answered the VAMAT in 25 minutes. At the end of the 30 minutes, all students had handed in their exam papers. In the second classroom, 23 students took NAMAT. While seven students finished the test in 15 minutes, 14 more students finished at the end of 20 minutes, and the remaining two students delivered their exam papers at the end of 25 minutes. TAMAT was implemented in the third classroom which included 32 students. At the end of 15 minutes, eight students handed in the exam paper, and after 25 minutes, except three students, the students finished the test. The remaining three students handed over their papers after 30 minutes. According to the pilot study, it was seen that 30 minutes on average were sufficient for the tests, each consisting of 12 questions, for the sighted students. For this reason, it is thought that 45 minutes would be sufficient for 12 questions for the blind students in the actual implementation.

When scoring NAMAT, VAMAT, and TAMAT, each correct answer was given one point, whereas wrong answers and unanswered items were scored zero. Thus, all students could get a minimum score of zero and a maximum score of 12 from the tests. The items on the pilot tests of NAMAT, VAMAT, and TAMAT were analyzed by the Test Analysis Program (TAP). Item and test analysis and option analysis for each question were examined for NAMAT, TAMAT, and TAMAT. Some item analysis results are given in Table 3.5.

After the analysis of the pilot test, the problems about items were discussed with my supervisor and to understand the root of the problems the discussions with high achievers of each classroom were done. According to the pilot study results and discussions, Questions 1, 2, 6, 10, and 11 remained the same. Adjustments were made in Questions 3, 4, 5, 7, 8, 9, and 12. In Questions 4, 7, 8, and 9, revisions in item stems were done. The alternatives of Question 3, 5, 7, 8 and 9 were arranged. In Question 12, which is a complex multiple choice without visuals, the number of premises was reduced.

Table 3.5 Some item analysis results of the pilot study

	NAMAT	VAMAT	TAMAT
Number of items	12	12	12
Number of examines	23	23	32
Mean	3.35	3.48	3.84
Standard deviation	1.49	1.58	1.75
Skewness	0.02	0.43	0.38
Kurtosis	-0.98	-0.58	-0.51
Mean item difficulty (min-max)	0.28	0.29	0.32
	(0.04-0.57)	(0.00-0.61)	(0.03-0.56)
Mean discrimination index (min-max)	0.25	0.33	0.32
	(0.04-0.58)	(0.00-0.83)	(0.04-0.53)

According to the results of the main study item analysis in Table 3.6, the mean score ranges between 4.54 and 5.06 for MAT that was implemented with three different testing accommodation situations. The values of skewness and kurtosis are between -2 and +2 and are considered acceptable for a normal distribution. Mean item difficulty for multiple-choice test items is 0.40, 0.38, and 0.42 for NAMAT, VAMAT, and TAMAT, respectively, and this means that 40%, 38%, and 42% of the respondents answered test items correctly in NAMAT, VAMAT, and TAMAT, respectively. All the testing accommodations conditions of MAT are in average difficulty level. Mean discrimination index is 0.41, 0.42, and 0.45 for NAMAT, VAMAT, and TAMAT, respectively. The ability of test items to differentiate between students of higher and lower abilities is excellent for NAMAT, VAMAT, and TAMAT. KR-20 which is a measure of internal consistency is 0.47 for NAMAT and TAMAT, and 0.49 for TAMAT. Although the KR-20 values of nearly 0.5 are satisfactory for short tests (10 - 15 items) and values 0.8 or higher are satisfactory though tests with over 50 items, the KR-20 values in MAT including 12 questions can be acceptable (Kehoe, 1994).

Table 3.6 Some item analysis result of the main study

	NAMAT	VAMAT	TAMAT
Number of items	12	12	12
Number of examines	108	108	108
Mean	4.75	4.54	5.06
Standard deviation	2.19	2.15	2.24
Skewness	0.52	0.41	0.38
Kurtosis	-0.10	-0.56	-0.42
Mean item difficulty (min-max)	0.40	0.38	0.42
	(0.26-0.57)	(0.21-0.56)	(0.28-0.62)
Mean discrimination index (min-max)	0.41	0.42	0.45
	(0.23-0.56)	(0.26-0.71)	(0.28-0.62)
KR-20	0.47	0.47	0.49

The last version of NAMAT, VAMAT, and TAMAT for sighted and blind students are in Appendix F11, F12, and F13, respectively. Although the text parts of the questions to be presented to the blind students were printed in Braille, only the visuals in TAMAT were presented to the students in Braille since all blind students requested readers in the exam. The photographs of the tactile graphics in the last version of TAMAT can be seen in Appendix F13.

According to the results obtained from the qualitative part of this study, since the blind students stated that they had problems with readers, a teacher's guide was prepared to implement testing accommodations in the same way in all groups. The guide outlined the situations that a teacher should be aware of when administering testing accommodations to a blind student. It was given to the teachers before the instruction and examination process to inform them about the implementation of testing accommodations. Most of the items were written by reorganizing the items of The Examination Guide for Students Who Have Special Needs (Ministry of National Education General Directorate of Measurement, Assessment and Examination Services, 2016). The guide was checked by one special education teacher and a physics teacher who taught to blind students. Teacher Guide for Testing Accommodations is presented in Appendix G.

3.3.3.2 Physics Self-Efficacy Scale

In this study, the Physics Self-Efficacy Scale which was adopted to Turkish by Alpaslan and Işık (2016) was used with the permission of the researchers. The original form of the scale was developed by Lin and Tsai (2013). Lin and Tsai (2013) implemented the scale to 311 high school students. The scale consisted of 28 items and five dimensions: everyday application (EA) (8 items) and science communication (SC) (6 items), conceptual understanding (CU) (4 items), higher-order cognitive skills (HCS) (6 items) and practical work (PW) (4 items). The items were responded to on a five-point Likert-type scale ranging from 1 strongly disagree to 5 strongly agree, and all items were in positive form.

When examining its validity and reliability, the Turkish version of the scale was implemented on 193 students studying in the Science Education Department by Alpaslan and Işık (2016). In their study, one item was excluded from the scale and the remaining 27 items were distributed under 5 factors as in the original version. The alpha reliability coefficient for the adopted version of the PSEF was .94. The Cronbach alpha coefficients were estimated as .92 for pre and .95 for post-test results of PSEF in this dissertation. The alpha reliability coefficients of the factors are given in Table 3.7. The alpha values indicate that the internal consistency of the items is high and the scores of the scale are reliable.

To understand to what extent the factor structure of the PSEF is valid in our sample, confirmatory factor analysis (CFA) was conducted by using AMOS computer program with pre and post results of PSEF.

Table 3.7 Alpha reliability coefficients of the factors of Physics Self Efficacy Scale

Factor	Items in the factor	Alpha (Alpaslan and Işık, 2016)	Alpha (Pre_PSEF)	Alpha (Post_PSEF)
EA	3, 6, 9, 13, 20, 22, 23, 24	.81	.76	.86
SC	5, 11, 15, 17, 22, 26	.89	.79	.82
CU	2, 10, 14, 19	.74	.60	.75
HCS	4, 7, 16, 21, 25, 27	.78	.75	.82
PW	1, 8, 12, 18	.83	.76	.72

3.3.3.2.1 Verifying Assumptions of Confirmatory Factor Analysis for Physics Self-Efficacy Scale

Before starting the data analysis, it was determined during the data entry that the 14th and 23rd students marked their post PSEF responses in a pattern, so these two students were excluded from the analysis. Therefore, there were 106 students for PSEF. Although the general acceptance of sample size for conducting CFA varies in the literature, a sample size of a minimum 100 was recommended (Anderson & Gerbing, 1988; Ding, Velicer, & Harlow, 1995). All inclusive classes with at least one blind student reachable for the researcher in terms of feasibility were included in the study, and the sample size after data cleaning was 108. Thus, the assumption of sample size was met. By conducting descriptive analysis in SPSS, the normality of the observed variables and outliers were investigated. One outlier in CU of pre PSEF and one outlier in HCS of post PSEF were determined by boxplots. These two students were ignored in order not to reduce the sample size. The skewness and kurtosis values between -2 and +2 were considered an indicator of normal distribution (Tabachnick & Fidell, 2013), and the curves of histograms were drawn. By checking Mahalanobis distance, the multivariate outliers were investigated, and the multivariate normality was assessed by the critical ratio (CR) values in AMOS. Since the normalized estimates are smaller than 5 (Bentler, 2005), the data for pre and post-test was normally distributed. The univariate and multivariate normality of the distribution was provided, and descriptive statistics for pre and post results of PSEF are given in Table 3.8. To check the assumption of no multicollinearity, the correlations between factors were calculated. The correlations for pre and post-test were presented in Table 3.9 and Table 3.10. All correlation values are significant. Since there are no correlation values above 0.90, no multicollinearity assumption was met (Field, 2009).

In conclusion, the main assumptions of CFA, which are adequate sample size, normality, absence of outliers, and multicollinearity, were verified.

Table 3.8 Descriptive statistics for pre and post scores of Physics Self-Efficacy Scale

	Mean	Median	Mode	SD	Skew.	Kurt.	Min.	Max.
Pre_PSEF_EA	21.59	22.00	22.00	4.65	-0.21	-0.08	10.00	33.00
Pre_PSEF_SC	18.75	19.00	19.00	4.82	-0.28	-0.16	7.00	30.00
Pre_PSEF_CU	12.71	13.00	11.00	2.84	-0.09	0.31	4.00	20.00
Pre_PSEF_HCS	17.90	18.00	18.00	4.28	0.08	-0.08	7.00	29.00
Pre_PSEF_PW	10.20	10.00	13.00	3.49	0.06	-0.40	4.00	20.00
Post_PSEF_EA	22.97	23.00	22.00	5.70	0.03	-0.50	11.00	35.00
Post_PSEF_SC	9.58	9.00	9.00	2.62	-0.15	-0.30	3.00	15.00
Post_PSEF_CU	10.98	11.00	11.00	3.46	0.38	-0.64	5.00	20.00
Post_PSEF_HCS	20.20	20.00	21.00	5.56	0.12	-0.29	9.00	35.00
Post_PSEF_PW	18.04	18.00	15.00	4.84	0.00	-0.55	8.00	28.00

Table 3.9 Correlations among the factors of the Physics Self-Efficacy Scale pre-results

		Pre_PSEF_ SC	Pre_PSEF_ CU	Pre_PSEF_ HCS	Pre_PSEF_ PW
Pre_PSEF_EA	Pearson Cor.	.611**	.784**	.773**	.415**
Pre_PSEF_SC	Pearson Cor.		.614**	.654**	.522**
Pre_PSEF_CU	Pearson Cor.			.728**	.414**
Pre_PSEF_HCS	Pearson Cor.				.482**

** Correlation is significant at the 0.01 level (2-tailed).

Table 3.10 Correlations among the factors of the Physics Self-Efficacy Scale post-results

		Post_PSEF_ HCS	Post_PSEF_ PW	Post_PSEF_ CU	Post_PSEF_ SC
Post_PSEF_EA	Pearson Cor.	.708**	.688**	.651**	.686**
Post_PSEF_HCS	Pearson Cor.		.674**	.722**	.720**
Post_PSEF_PW	Pearson Cor.			.670**	.647**
Post_PSEF_CU	Pearson Cor.				.637**

** Correlation is significant at the 0.01 level (2-tailed).

3.3.3.2.2 Results of the Confirmatory Factor Analysis for Physics Self-Efficacy Scale

CFA was performed to understand to what extent the theory-driven factor structure of the PSEF is valid in our sample. The latent variable in this model which is physics self-efficacy has five dimensions named for pre PSEF as Pre_PSEF_EA, Pre_PSEF_SC, Pre_PSEF_CU, Pre_PSEF_HCS, and Pre_PSEF_PW, for post PSEF as Post_PSEF_EA, Post_PSEF_SC, Post_PSEF_CU, Post_PSEF_HCS, and Post_PSEF_PW and the 27 observed variables with five covariances in Figure 3.4 and Figure 3.5. Single-headed arrows in the CFA models present a direction of assumed causal influence, and double-headed arrows show covariance between dimensions. The values on the single-headed arrows show the standardized regression weights (factor loadings) and can be interpreted as the correlation between the observed variable and the related dimension (Albright & Park, 2009). For this five-factor model, it was seen that the factor loading values calculated for the items in the scale were between 0.44 and 0.80 in the pre-test and between 0.48 and 0.83 in the post-test. Therefore, it was observed that there was no factor load value lower than 0.30 (Tabachnick & Fidell, 2015). Each observed variable has an error variance given in figures from e1 to e27. By examining the modification indices, covariance was added between error terms within the same dimension with the large modification indices. As seen in Figure 3.4 and Figure 3.5, five dimensions of the scale correlate to each other.

In AMOS output Chi-square and goodness of fit statistics were examined to assess whether the data and model are compatible or not and determined that there is a good fit between the model and observational data. In a model that represents the observed data well, CMIN/DF below 3 means good fit, and the ratios up to 5 refers to adequate fit (Byrne, 2001). In pre-test results of PSEF, the CMIN/DF is 1.62, and in post-test results of PSEF, the value is 1.66. CMIN/DF in both pre and post-test results had a good fit value. Although the Comparative Fit Index (CFI) of the pre PSEF default model is 0.82 and below the criteria of CFI >0.85 (Akyüz, 2018), CFI of the post-test is 0.86 and acceptable. Root Mean Square Error of Approximation (RMSEA) value for pre-test 0.07 and 0.08 for post PSEF are satisfactory since they had to be below 0.08 (Erkorkmaz, Özdamar, Etikan, & Sanisoğlu, 2013). Standardized Mean Square Residual (SRMR) for pre PSEF was 0.08 when the SRMR of post-test was 0.07 and had an adequate fit because the values were between 0,05 and 0,09 (Hu & Bentler, 1999).

As a result, CFA was performed according to the pre-test and post-test to provide evidence of whether the physics self-efficacy scale measures five dimensions. CFA results showed that the physics self-efficacy scale evaluated five dimensions due to a good fit between the model and the observed data for both pre-test and post-test scores.

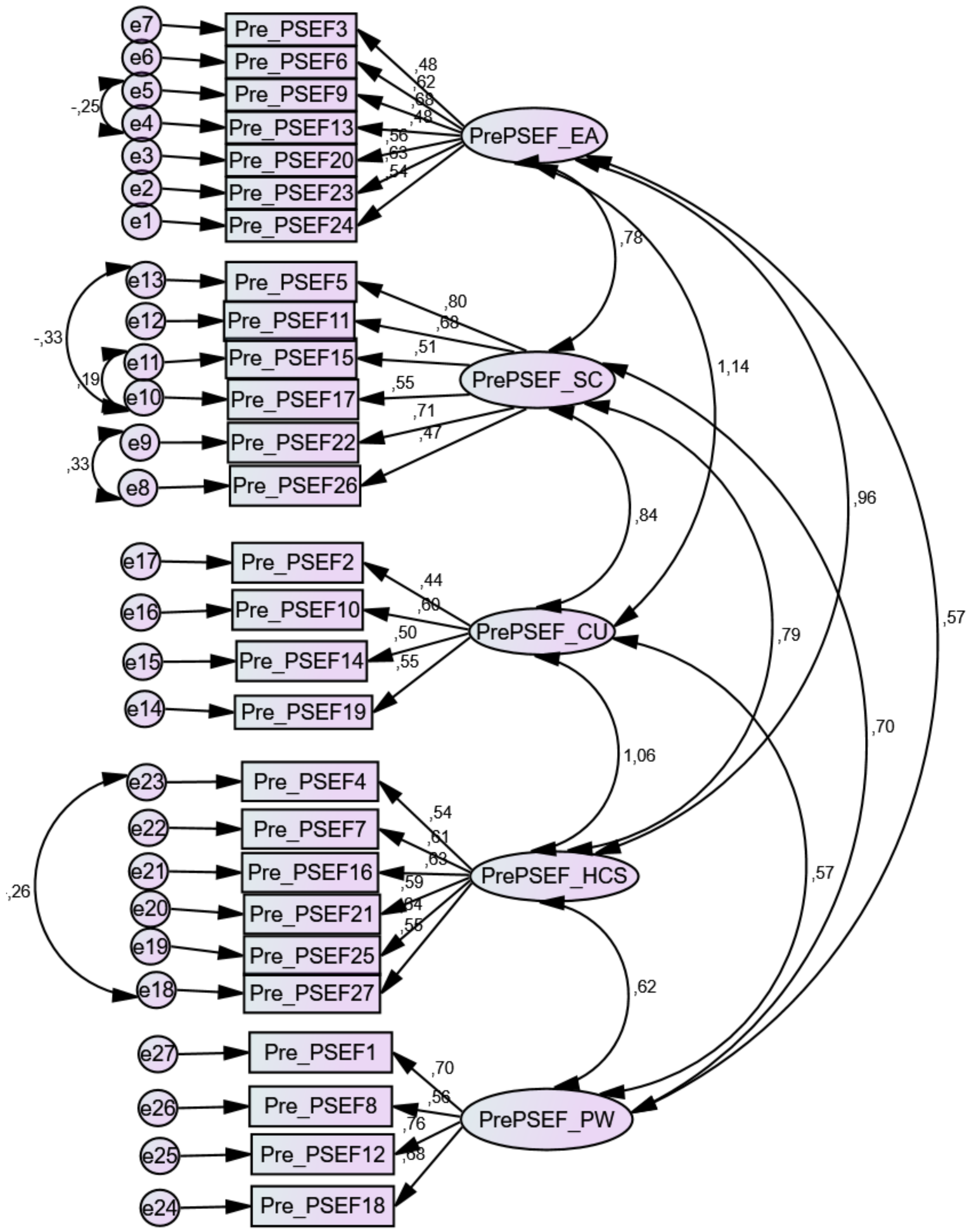

Figure 3.4 Five factor Confirmatory Factor Analysis model of the Physics Self-Efficacy Scale pre-results

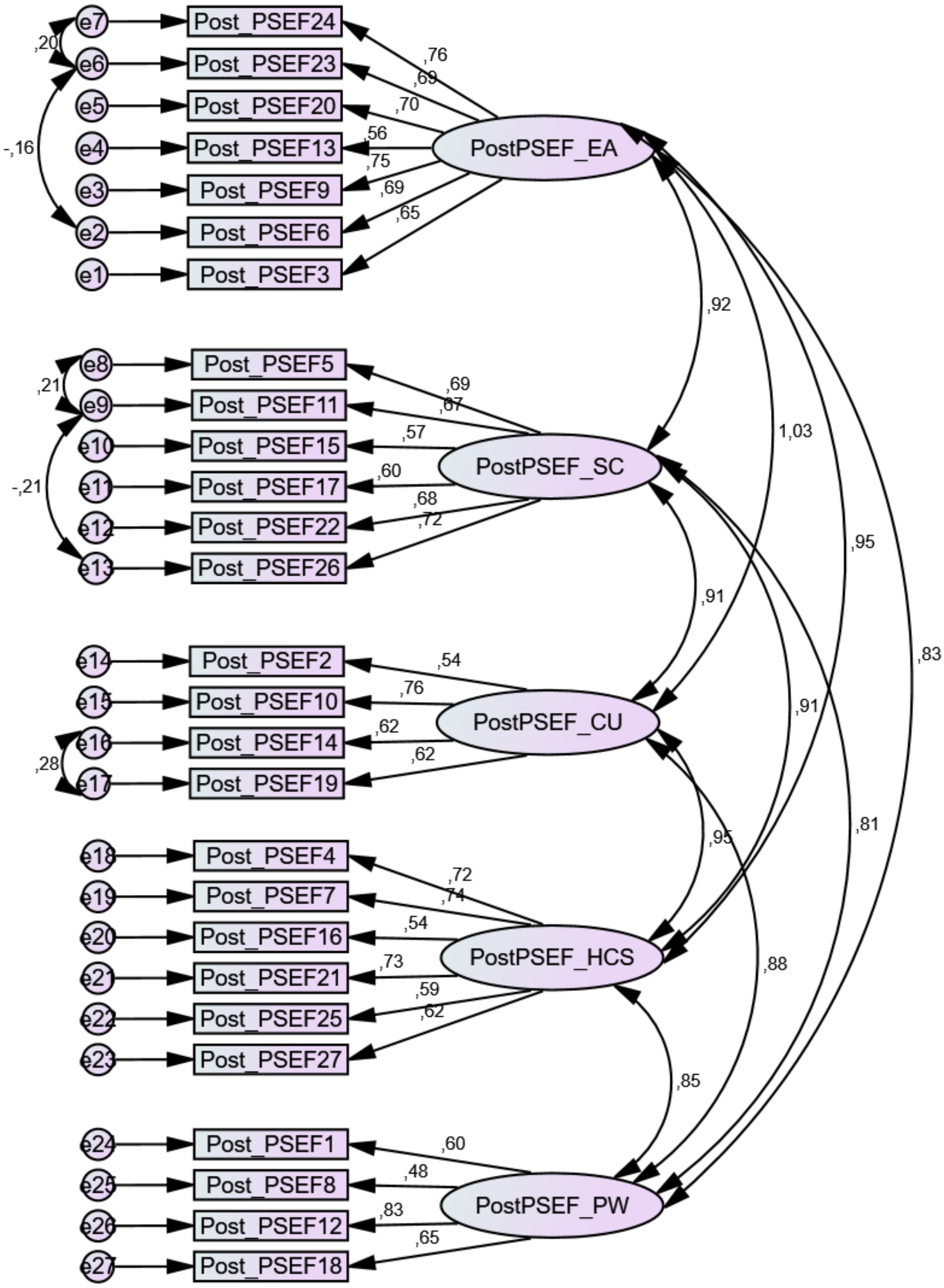

Figure 3.5 Five factor Confirmatory Factor Analysis model of the Physics Self-Efficacy Scale post-results

3.3.3.3 Physics Attitude Scale

The Physics Attitude Scale, which was developed by Tekbıyık and Akdeniz (2010), was used in this dissertation. The PATT developed for secondary school students was applied to 166 ninth grade students by Tekbıyık and Akdeniz (2010). The scale consisted of 30 items and has four factors named importance (IMP), comprehension (COMP), requirement (REQ), and interest (INT). The items were constructed with bipolar strongly agree/strongly disagree options on a five-point Likert scale ranging from 1 strongly disagree to 5 strongly agree. Item 1, 2, 3, 4, 6, 7, 9, 11, 12, 16, 20, 26 were negatively worded items. The Cronbach Alpha coefficient of the whole PATT was calculated 0.87 by Tekbıyık and Akdeniz (2010), and the Cronbach Alpha reliability of the factors ranged between 0.72 and 0.84.

In this dissertation, the Cronbach alpha coefficients were calculated as .92 for both pre and post-test results of PATT. The alpha reliability coefficients of the factors are given in Table 3.11 and indicate that the internal consistency of the items was high and the scores obtained from the scale were reliable.

Table 3.11 Alpha reliability coefficients of the factors of Physics Attitude Scale

Factor	Items in the factor	Alpha (Tekbıyık and Akdeniz (2010)	Alpha (Pre_PATT)	Alpha (Post_PATT)
IMP	9, 10, 11, 13, 23, 24, 26, 27, 28, 29	.84	.85	.87
COMP	2, 3, 5, 6, 14, 19, 20	.80	.73	.83
REQ	1, 12, 15, 17, 18, 25, 30	.75	.83	.82
INT	4, 7, 8, 16, 21, 22	.72	.79	.77

Similar to PSEF, a CFA for pre and post results of PATT was conducted with AMOS to understand to what extent the factor structure of the PATT is valid in our observed data.

3.3.3.3.1 Verifying Assumptions of Confirmatory Factor Analysis for Physics Attitude Scale

When entering the data of the students to SPSS, it was determined that the 14th student marked 3 points for all of the items in post PATT, and the data of the 14th student was excluded from the pre and post PATT analysis. A total of 107 students were included for PATT, and thereby the sample size exceeded 100. According to descriptive statistics results, in the pre-test, three students under the IMP dimension and two students under the REQ dimension were outliers, while there were no outliers in any dimension in the post-test results of PATT. A few multivariate outliers that were determined according to Mahalanobis distance values were ignored. In Table 3.12, some descriptive statistical values were presented, and the skewness and kurtosis were at expected values for normal distribution. Table 3.13 and Table 3.14 presents the correlation values for pre and post PATT and shows that all the correlations are significant. The absence of very high correlation values also provides the assumption of no multicollinearity.

As a result, the main assumptions of the CFA for the pre and post-tests of PATT are fulfilled.

Table 3.12 Descriptive statistics for pre and post scores of Physics Attitude Scale

	Mean	Median	Mode	SD	Skew.	Kurt.	Min.	Max.
Pre_PATT_IMP	37.75	38.00	36.00	7.44	-0.73	1.53	12.00	50.00
Pre_PATT_COMP	18.14	18.00	18.00	4.65	-0.02	-0.04	7.00	29.00
Pre_PATT_REQ	24.23	24.00	22.00[a]	5.58	-0.30	0.25	9.00	35.00
Pre_PATT_INT	18.76	19.00	17.00	5.18	-0.19	-0.55	6.00	29.00
Post_PATT_IMP	38.48	38.00	50.00	7.01	-0.09	-0.48	20.00	50.00
Post_PATT_COMP	18.51	19.00	22.00	5.43	-0.18	-0.18	7.00	31.00
Post_PATT_REQ	24.23	24.00	21.00	5.50	0.04	-0.74	12.00	35.00
Post_PATT_INT	18.98	19.00	19.00	4.99	0.06	-0.25	6.00	30.00

Table 3.13 Correlations among the factors of the Physics Attitude Scale pre-results

		Pre_PATT_ COMP	Pre_PATT_ REQ	Pre_PATT_ INT
Pre_PATT_IMP	Pearson Cor.	.382**	.670**	.490**
Pre_PATT_COMP	Pearson Cor.		.500**	.670**
Pre_PATT_REQ	Pearson Cor.			.656**

**.Correlation is significant at the 0.01 level (2-tailed).

Table 3.14 Correlations among the factors of the Physics Attitude Scale post-results

		Post_PATT_ COMP	Post_PATT_ REQ	Post_PATT_ INT
Post_PATT_IMP	Pearson Cor.	.214*	.750**	.539**
Post_PATT_COMP	Pearson Cor.		.335**	.702**
Post_PATT_REQ	Pearson Cor.			.647**

*.Correlation is significant at the 0.05 level (2-tailed).

**.Correlation is significant at the 0.01 level (2-tailed).

3.3.3.3.2 Results of the Confirmatory Factor Analysis for Physics Attitude Scale

As mentioned before, CFA was performed to understand to what extent the factor structure of the PATT including four factors is valid in our sample. In this model, the latent variable physics attitude was represented by four dimensions. The dimensions for pre-PATT named as Pre_PATT_IMP, Pre_PATT_COMP, Pre_PATT_REQ, Pre_PATT_INT and for post-PATT the dimensions were Post_PATT_IMP, Post_PATT_COMP, Post_PATT_REQ and Post_PATT_INT. The 30 items of the test were observed variables and had seven covariances in the model, as seen in Figure 3.6 for pre-test and Figure 3.7 for post-test. When the correlations between each observed variable and the dimension they belong to are examined, it is seen that the lowest value is 0.41 in both pre-test and post-test. That is, each observed variable represents the dimension to which it belongs. As seen in Figure 3.6 and Figure 3.7, four dimensions of the scale correlate to each other. Chi-square and goodness of fit statistics in AMOS output were investigated for examining the fit of the data with the model. In the pre-test results of PATT the CMIN/DF is 1.71, and in the post-test results of PATT the value is 1.80. In both pre and post-test results, CMIN/DF had a good fit value since the values are below 3 (Byrne, 2001). While the RMSEA value of 0.09 is slightly above the threshold value in the post-test, this value is 0.08 in the pre-test, and it is acceptable considering that the threshold value is ≤0.08 (Erkorkmaz et al., 2013). In the pre-test, the SRMR value is 0.08, and SRMR value is 0.1 in the post-test. Carvalho and Chima (2014) stated that values below 0.1 are acceptable for SRMR. Thus, SRMR values provide the condition required for an adequate-fit model.

Although some of the fit indices of the post-test of PATT did not provide the necessary values, the fit indices of the pre-test were thought to be suitable for sufficient fit, so the observed variables were not reduced. In other words, it is considered acceptable that the items forming the scale belonging to four dimensions can measure the variable of attitude towards physics.

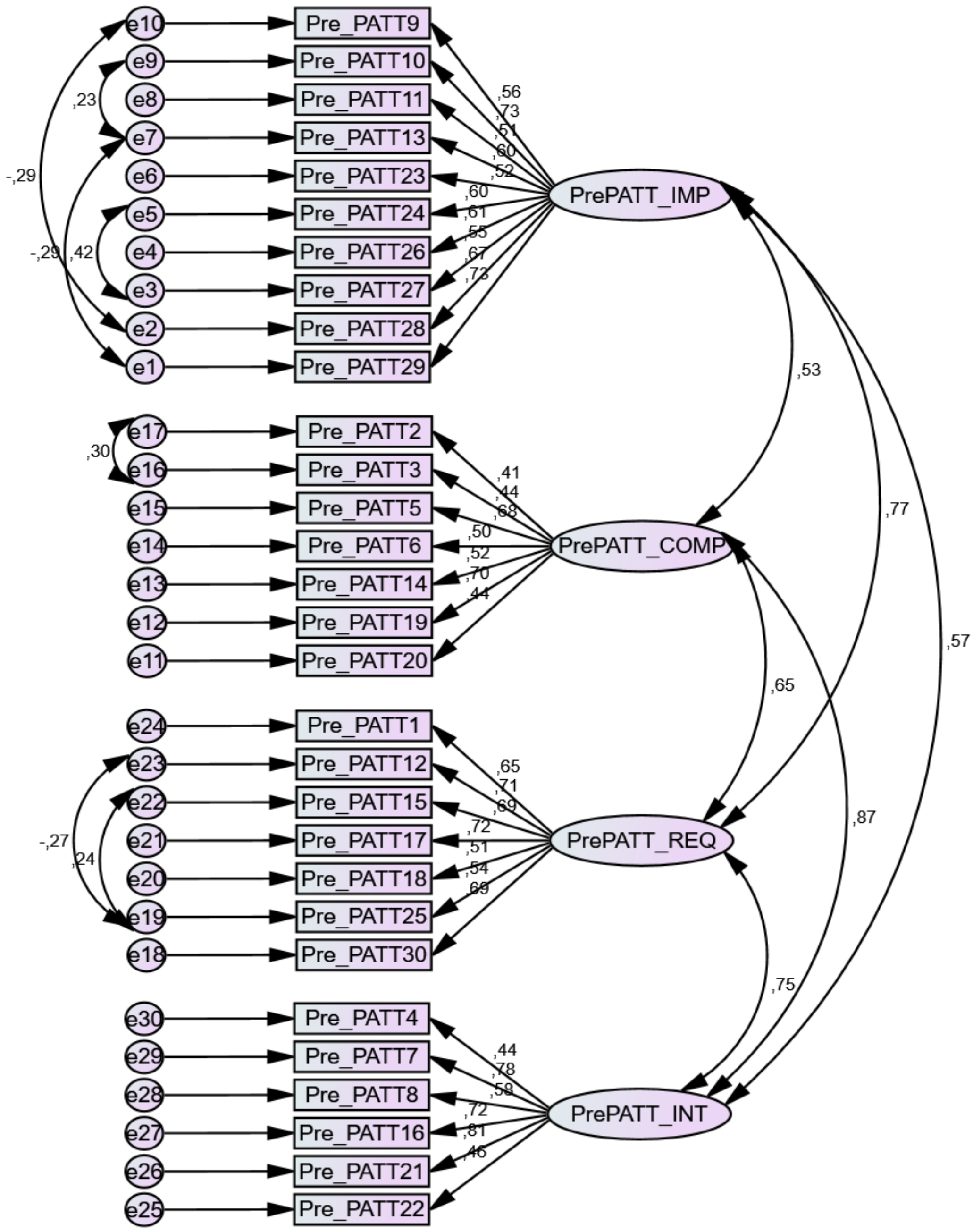

Figure 3.6 Four factor Confirmatory Factor Analysis model of the Physics Attitude Scale pre-results

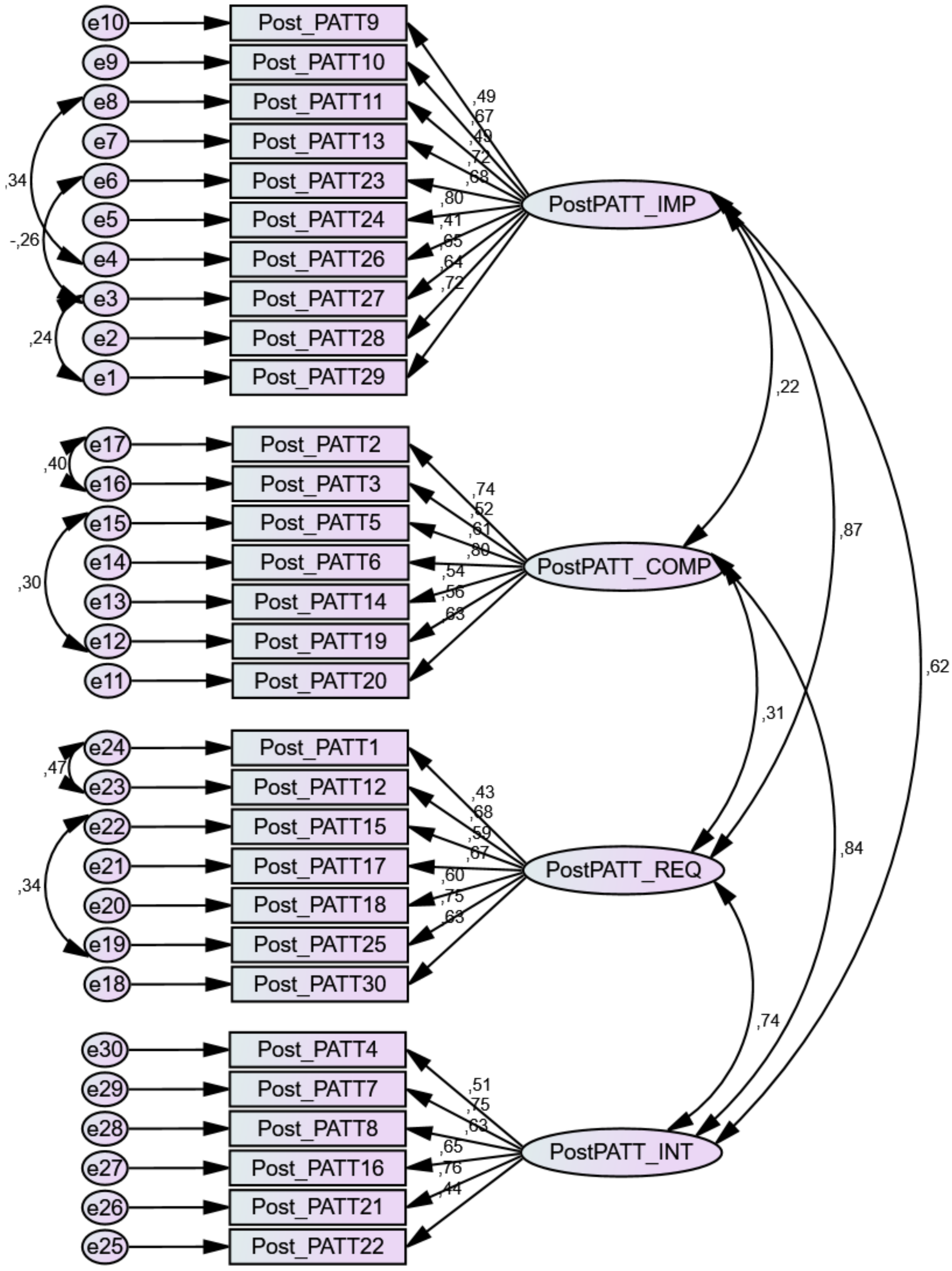

Figure 3.7 Four factor Confirmatory Factor Analysis model of the Physics Attitude Scale post-results

3.3.3.4 Self-Esteem Scale

The SEST was developed by Rosenberg (1965) as a self-esteem measurement tool for adolescents. Self-esteem was evaluated together with other characteristics in the scale. The scale consisted of 63 items and had 12 subtests. Çuhadaroğlu (1986) adopted the scale into Turkish and conducted validity and reliability studies with high school students in Turkey. In this study, only self-esteem subtest was used. The self-esteem subtest of the scale consisted of 10 items. Since the copyright of the scale was given to “Turkish Association for Child and Adolescent Psychiatry (ÇOGEPDER)”, the permission and scoring key was received from this association. Even though SEST was constructed as a Guttmann scale, the scale was often used as a Likert response format. (Dobson, Goudy, Keith, & Powers, 1979; Greenberger, Chen, Dmitrieva, & Farruggia, 2003; Mannarini, 2010). SEST includes positively and negatively worded items. Items 1, 2, 4, 6, 7 were positively, and Items 3, 5, 8, 9, 10 were negatively worded. Four-point response in items refers to strongly agree (4), agree (3), disagree (2), and strongly disagree (1). In this study, the scale scored by totaling each 4-point item after reverse-coding negatively worded items, and high scores refers to high self-esteem. When the reliability coefficient found by Çuhadaroğlu was 0.75, the Cronbach alpha values for pre and post-tests in this dissertation were .87 and .90, respectively, and both had good internal consistency. A CFA for pre and post results of SEST was conducted with AMOS to confirm the structure of the SEST.

3.3.3.4.1 Verifying the Assumptions of Confirmatory Factor Analysis for Self-Esteem Scale

108 students answered the pre and post SEST, and for a scale consisting 10 items, the sample size was quite satisfying. When there were no outliers in the pre-test results of SEST, two scores were outliers in the post-test. None of the CR values were above 5 and the multivariate normality assumption was met. It is seen that

kurtosis and skewness values presented in Table 3.15, together with some descriptive statistics values, are at a level to meet the normal distribution assumption.

That is, all the main assumptions required for conducting CFA were verified.

Table 3.15 Descriptive statistics for pre and post scores of Self-Esteem Scale

	Mean	Median	Mode	SD	Skew.	Kurt.	Min.	Max.
Pre_SEST	29.16	29.50	33.00	5.54	-0.23	-0.39	15.00	40.00
Post_SEST	29.43	29.00	29.00	5.94	-0.26	-0.12	13.00	40.00

3.3.3.4.2 Results of the Confirmatory Factor Analysis for Self-Esteem Scale

To confirm the structure of the SEST, CFA for pre and post results of SEST was conducted. The latent variable of the model was self-esteem, and there were 10 observed variables. The model had one covariance in both pre and post results of SEST. When the one-factor CFA model of the pre SEST data is given in Figure 3.8, the one-factor CFA model of the post SEST data is presented in Figure 3.9. When minimum and maximum values for factor loadings are 0.08 and 0.81 in the pre-test, the values are 0.49 and 0.80 in the post-test, respectively. The minimum values in both pre and post-test belong to the 8th item. When the 8th item, which has the lowest factor load in the pre-test, is examined in the post-test, it is seen that the factor load is 0.48. It is seen that the factor load of the 8th item, which is 0.08 in the pre-test, is 0.48 in the post-test, which is satisfactory.

The model fit values obtained in AMOS for pre and post-test results and presented in Table 3.16 were considered in terms of CMIN/DF (<3), Goodness-of-fit Index (GFI) (>.90), CFI (>.85), RMSEA (≤.08), SRMR (≤.09) critical values, it can be stated that the one-factor model fit well for both pre and post-test data. Considering all the values related to the model-data fit, it was seen that the goodness of fit values of the established model met the criterion values, and the model is valid for assessing self-esteem.

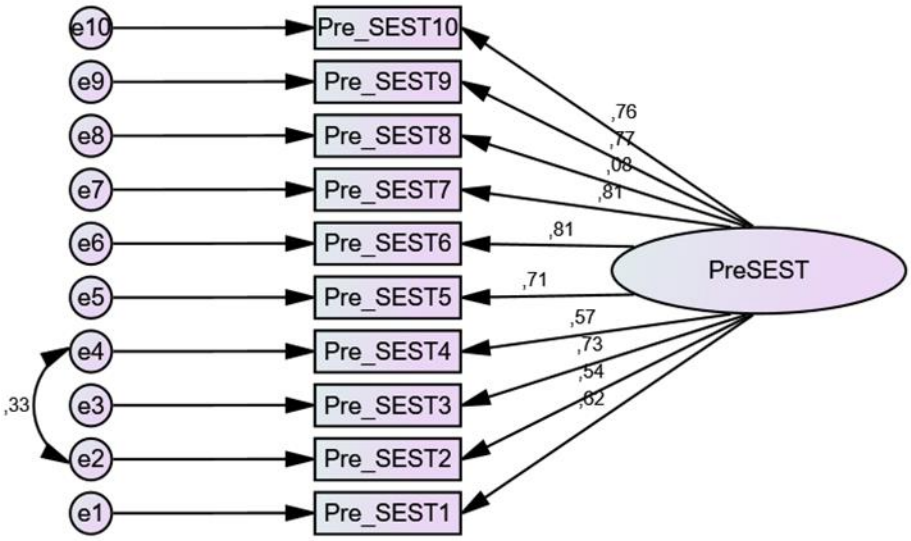

Figure 3.8 One factor Confirmatory Factor Analysis model of the Self-Esteem Scale pre-results

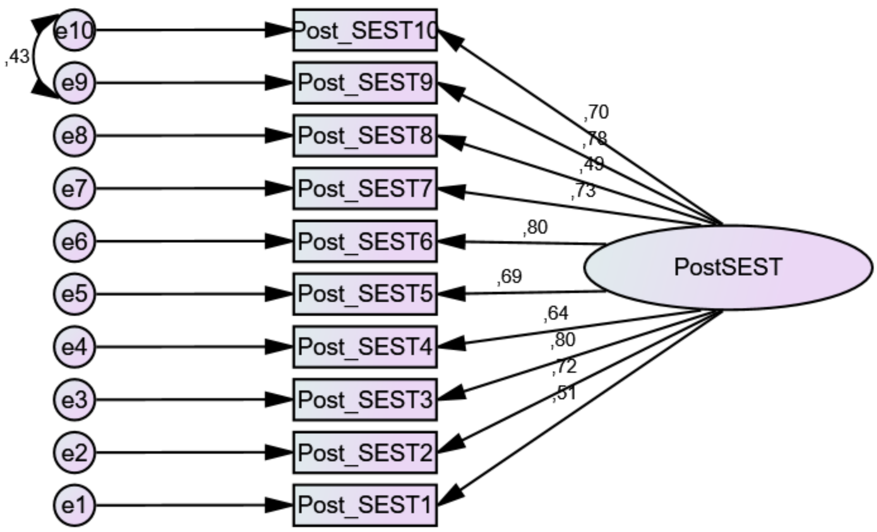

Figure 3.9 One factor Confirmatory Factor Analysis model of the Self-Esteem Scale post-results

Table 3.16 Model fit values for pre and post results of Self-Esteem Scale

Fit Indices	Pre-test (1 covariance)	Post-test (1 covariance)
CMIN/DF	1.73	1.42
GFI	0.91	0.92
CFI	0.95	0.97
RMSEA	0.08	0.06
SRMR	0.05	0.05

3.3.3.5 Test Anxiety Inventory

The TANX was the product of a 5-year study conducted by Spielberger and a group of doctoral students at the University of South Florida between 1974-1979. It was first published with the manual in 1980. It was adapted into Turkish by Öner and Albayrak Kaymak in 1986 (Öner, 1990). The inventory consisted of 20 items, and there was a four-point Likert-type response for items. These are (1) almost never, (2) sometimes, (3) often, (4) almost always. Of the 20 inventory items, eight were worry (WOR) (2, 3, 4, 5, 8, 12, 17, and 20), twelve (1, 6, 7, 9, 10, 11, 13, 14, 15, 16, 17, 18 and 19) constitute emotionality (EMO) subtests. The lowest possible total test score is 20, and the highest possible total test score is 80. If the number of blank or invalid answers is more than two for the whole scale and more than one for each subtest, the form cannot be scored. Since the copyright of the scale was given to YÖRET Foundation, permission, the booklet, and the scoring key was received from this foundation.

Öner and Albayrak Kaymak carried out the validity and reliability of the scale with 434 female and 597 male students aged between 13 and 22. Cronbach alpha values of the scale were found .93 and .94 for WOR and EMO. In this dissertation, the Cronbach alpha values of WOR both for pre and post-test results of TANX are .86. The Cronbach alpha values of EMO are .87 and .85 for pre and post TANX scores, respectively. The Cronbach alpha reliability coefficients of WOR and EMO mentioned that the internal consistency of the items was high, and the scores obtained from the scale were reliable. As in previous scales, a CFA for pre and post results of

TANX was conducted with AMOS to provide evidence as to whether the results of the TANX are compatible with the theoretical model.

3.3.3.5.1 Verifying Assumptions of Confirmatory Factor Analysis for Test Anxiety Inventory

Before conducting analysis on TANX, the number of unanswered or invalid answers for subtests and the whole scale was examined. There were not more than two blank or invalid answers for the whole, and for each subtest, there was not more than one blank or invalid answer. In this case, the sample for the pre and post TANX consisted of 108 students. The univariate outliers were controlled with box plots in SPSS, and Mahalanobis distances were checked in AMOS for multivariate outliers. There were no outliers in either the pre or post-test. In Table 3.17, some descriptive statistical values were presented. The central tendency and dispersion values are at expected values, and skewness and kurtosis values were pointing out normal distribution. A few CR values above 5 in AMOS output were ignored. The Pearson correlation between WOR and EMO is significant in pre and post-TANX (.84 and .85, respectively), and there is no shortage of assumptions that are important for CFA.

Table 3.17 Descriptive statistics for pre and post scores of Test Anxiety Inventory

	Mean	Median	Mode	SD	Skew.	Kurt.	Min.	Max.
Pre_TANX_WOR	18.68	18.00	17.00	5.75	0.54	-0.30	9.00	32.00
Pre_TANX_EMO	28.88	28.00	25.00	7.88	0.27	-0.64	14.00	46.00
Post_TANX_WOR	17.57	17.00	16.00	5.46	0.60	0.12	8.00	32.00
Post_TANX_EMO	27.45	28.00	28.00	7.04	0.42	0.20	14.00	48.00

3.3.3.5.2 Results of the Confirmatory Factor Analysis for Test Anxiety Inventory

As explained previously, to provide evidence as to whether the results of the TANX are compatible with the theoretical model, CFA for pre and post results of TANX was conducted. In this model, the latent variable test anxiety was represented by two dimensions. The dimensions for the pre-test were called Pre_TANX_WOR, Pre_TANX_EMO, and for post-test they were Post_TANX_WOR, Post_TANX_EMO. The 20 items of the test were observed variables and had three covariances in the pre-test and four covariances in the post-test in the model, as represented in Figure 3.10 and Figure 3.11. When the factor loadings of the items were examined for the pre-test, it was seen that the factor loading of the 19th item in the EMO dimension was 0.09, but the other item loadings were sufficiently large. A similar examination was also made for the post-test, and it was seen that item 19 had the lowest factor load. But this time, the value was 0.39 and sufficient.

The CMIN/DF values were below 3 in both pre and post-tests (1.44 and 1.61, respectively). When the CFI value in post-test was 0.89 and satisfactory for good fit, the same fit index was 0.83 in the pre-test. Considering that the appropriate values for RMSEA should be 0.08, it can be said that the pre-test value of .06 and the post-test value of 0.08 are sufficient for the fit of the model with the data. Both of the SRMR values, which are 0.06 in the pre-test and 0.07 in the post-test, meet the threshold value of ≤ 0.09.

According to the results of the CFA, the data obtained from TANX are compatible with the theoretical model, and the scores of the scale can be accepted as valid.

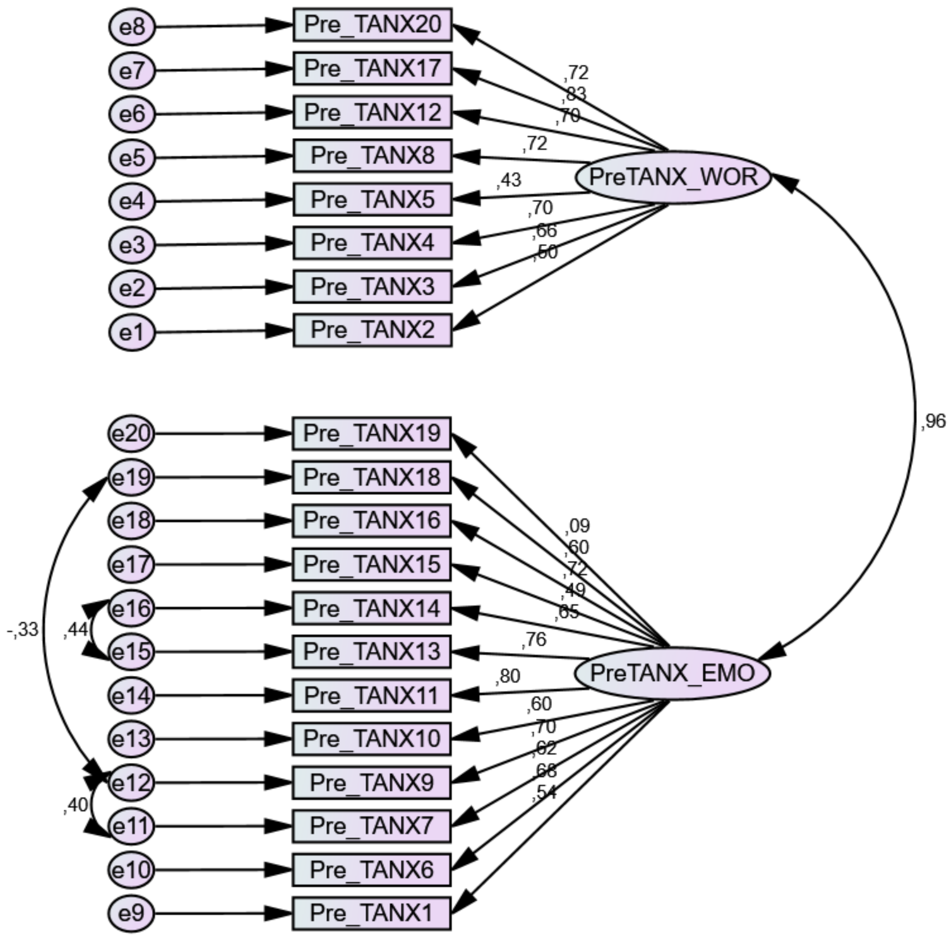

Figure 3.10 Two factor Confirmatory Factor Analysis model of the Test Anxiety Inventory pre-results

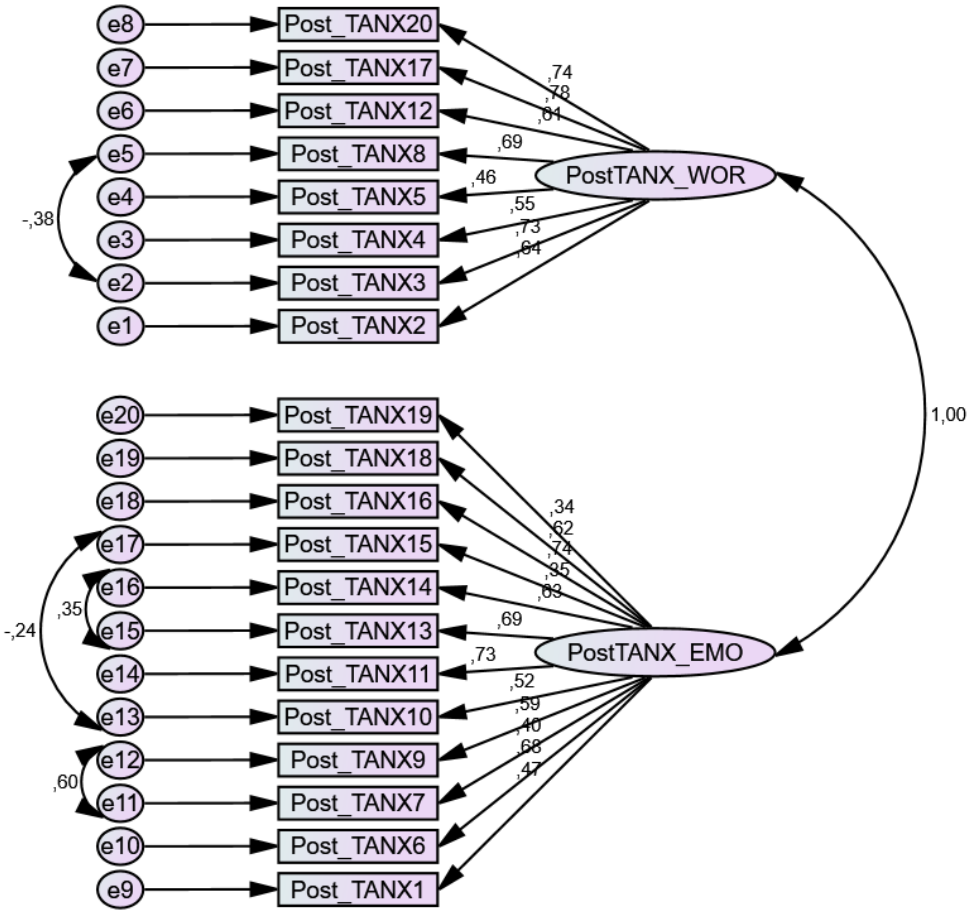

Figure 3.11 Two factor Confirmatory Factor Analysis model of the Test Anxiety Inventory post-results

3.3.4 Instructional Materials

In this study, ninth grade Braille and ink-print physics textbook and Enriched Course Materials (ECM) were used for standardizing the education of sighted and blind students.

3.3.4.1 The Ninth Grade Braille Physics Textbook

Throughout this study, physics teachers in all classes were deemed appropriate to follow the relevant section of the ninth grade physics book given by the Republic of Turkey Ministry of National Education (MEB). MEB sends the Braille version of this book for blind students to the school where the blind student is but in the qualitative part of the research, the blind students stated that Braille printed books reached them long after the beginning of the academic year and that their books arrived almost at the end of the fall semester. The blind students also stated that some of the visuals in the textbooks of the sighted students were not in the Braille books, even if the figures were extracted, the texts related to the visuals were included in the Braille books, and the visuals were not understood due to the lack of descriptions for the visuals in Braille books. Since the subject of this study is related to the assessment and evaluation processes of sighted and blind students, fair access of the sighted and blind students to course materials is a very important issue. Braille books are sent to schools with blind students according to the number of blind students by the Course Equipment Production Center. For this reason, communication was established with the Course Equipment Production Center to be used within the scope of the research, and a ninth grade Braille physics book was requested with a petition. It was predicted that the Braille textbook would be sent late, and there would not be enough time to review and edit the visuals of the Braille book. Therefore, it was necessary to organize the visuals of the Braille textbook for the blind students.

At the beginning of the 2018-2019 academic year, the ninth grade physics book sent to schools by the MEB for sighted students was provided, and the part of the textbook related to the study was examined. It was determined that there were 15 figures in the book, six of the figures belonged to the questions, and two figures belonged to the solution of the questions. It was seen that six of the 12 graphs in the book belonged to the sample question, and two of them belong to the question solution. Two of the three tables were given within the scope of the questions. There were also five pictures in the book. One of the pictures was related to a question. For 15 figures, 12 graphics and three tables, the tactile graphics and descriptions were prepared. For five pictures, only descriptions were written. Tactile graphics were drawn, and descriptions were written for the visuals in the textbook, taking into account the feedback received previously from the blind students regarding the arrangement of the figures and descriptions in the MAT. Similar to TAMAT, a legend for each visual was stated. In this way, it was aimed to enable blind students to experience the testing accommodations before the exam. Tactile graphics and verbal descriptions were re-examined by my supervisor, a lecturer in special education, and a special education teacher teaching visually impaired students. For each blind student, one Braille print and two ink prints which are exactly the same as the Braille print content were prepared. Sample pages for the ink print and Braille print of the textbook are given in Appendix J. In each school, Braille print textbook was used by the blind student, one of the ink prints was given to the blind student to guide friends or family while studying, and the other ink print was given to the physics teacher and used when studying with the blind student during educational support courses.

The blind students and physics teachers experienced verbal descriptions and tactile graphics with the use of Braille print physics textbooks for blind students and ink print textbooks with the same content for their teachers. This process served not only treatment fidelity but also aimed to decrease the novelty effect.

3.3.4.2 Enriched Course Materials

In this study, enriched course material term referred to the materials which were used during instruction by both sighted and blind students. The ECM, which were developed by Bülbül (2014), were used during the instruction to standardize the instruction for all sighted and blind students in all classes. Four of the 11 materials previously developed were used in this study. The names of the used materials were “tack board, safety pin, velcro board, and playground”. The required permission and the originals of materials were taken from the researcher. The ECM guide prepared by Bülbül (2014) indicates the time needed to use each ECM, in which page of the textbook ECM should be used and how it would be used. Bülbül developed the ECM for the 2010 version of motion concept objectives and matched them with the 2011 version of the formal textbook of the MEB in the guide of the ECM. For this study, the ECM were matched to the 2018 version of motion concept objectives in the Turkish curriculum for the ninth grade physics course, and the implementation pages of each ECM were adapted to the 2018 version of the formal textbook of the MEB.

3.3.5 Procedure for Quantitative Phase of the Research

To get permission, Human Subjects' Research Ethics Committee was consulted with application forms, course materials, and instruments to be used in the research. Although the study was planned to be carried out in Bursa, it was not known whether there was a blind student in inclusive education who went to the ninth grade in Bursa at the time of application to the ethics committee. For this reason, while applying to the Human Subjects' Research Ethics Committee, an application was made for implementation at public high schools with blind students in their ninth grade in Balıkesir, Bilecik, Bursa, Çanakkale, Istanbul, Kocaeli, Sakarya, and Yalova. The Human Subjects' Research Ethics Committee directed my application to the Ministry of National Education Innovation and Educational Technologies General Directorate. After bringing application forms to the Innovation and Educational Technologies General Directorate, I was allowed to conduct my study in the relevant provinces. The permission documents were given in Appendix K.

I contacted with Bursa Provincial Directorate of National Education Special Education and Counseling Services Unit and asked if there were any blind students in the ninth grade of high schools in Bursa. They stated that low vision students and blind students could not be distinguished in the database and that all of them were included in the system as "visually impaired". The institution made phone calls with schools of visually impaired students in Bursa city center and its districts and stated that there was an educationally blind student continuing to the ninth grade in Bursa. In my research, I had to study with at least three blind students. For this reason, I contacted the Sakarya Provincial Directorate of National Education and investigated whether there were any educationally blind students in Sakarya. It was stated that there were three blind students attending ninth grade in Sakarya. In this case, I had four blind students to take part in the study, so I had four inclusive classes. As a researcher, it was not possible for me to go to more than two cities, so the cities included in the study were Bursa and Sakarya.

After determining four blind students, I contacted their school administrators and physics teachers. One blind student in Sakarya was not continuing to school and would transfer to a different school. Therefore, three blind students and their sighted classmates were included in the study. All schools within the scope of the study were Anatolian High Schools. When I first went to School A, I talked to both the school administrator and the physics teacher. When I first went to Schools B and C, I only met with the school administrators. On my second visit, I met the physics teachers. The content of the study, the activities to be carried out in the lessons, the scales to be implemented, and the information that the test would be done at the end of the subject were shared with all school administrators and physics teachers. Additionally, I informed teachers about testing accommodations in terms of their purpose and the implementation process. I shared the ECM guide and Teacher Guide for Testing Accommodations with physics teachers. I gave them an ink print version of the physics textbook and showed them the Braille version of the textbook. I explained to them how to guide the Braille print physics textbook with the ink print textbook during courses and educational support. These meetings with teachers lasted about an hour.

Teacher A, who is the male physics teacher of inclusive classroom A in Sakarya, was about 45 years old. Another male teacher, Teacher B, was the physics teacher of inclusive classroom B in Bursa and was about 50 years old. Teacher C is about 30 years old and the female physics teacher of inclusive classroom C in Sakarya. All teachers had a Bachelor of Science (BSc) degree. Teachers A and B did not have training on special education and had no experience teaching a special needs student before the blind student in their classrooms, while Teacher C had training on special education less than 40 hours and had a physically impaired student in her classroom before.

All of the administrators were male. The administrators of Schools A and B consider inclusive education to be the most appropriate form of education for blind students, and they approached the education of blind students based on aid rather than rights-based. The administrator of School C thought that blind students should be educated in separate schools. The administrator of School B wanted the permission letter of the study and copied it. The timetable and student list of the classes within the scope of the study were requested from the school administrations. Both the administrators of the schools and physics teachers were eager to have the study done in their schools.

Data were collected in the December and January months of the 2018-2019 academic year for five weeks. One week before the study started, I attended the classrooms with the physics teacher, introduced myself, and explained to the students that I would be in physics courses for a while for research purposes. I presented the informed consent forms to the students and gave one copy to all students. While starting the study, informed consent forms were taken from most sighted and blind students. The forms were received in the following weeks from the students who forgot to bring the form when the study started. The school administrators in all schools asked me to call the parents of the blind students by phone and also to get permission orally. The mothers of the students in School A and C and the sister (she was the guardian of her sister) of the student in School B were informed about the study, and their verbal consent was obtained. During the four weeks of instruction, teachers in all classes did not change their usual teaching style, taught the course in company with the same physics book, solved the examples in the textbook, and used the ECM on time as expected. In addition, students attended classroom activities, answered NAMAT, VAMAT, TAMAT, and the scales about affective characteristics. I had been in all of the lessons at all schools during the instruction and testing. Each student in the study took NAMAT, VAMAT, and TAMAT on the same day. It was stated to the blind students that they could read the entire tests in

Braille, they could receive reader support for questions with only tactile graphics in the test or for all questions in the tests, and their preferences were asked among these three choices. All the blind students preferred the read-aloud testing accommodation for all questions in the tests. Thus, the blind students were tested individually in the physics laboratory, on the same day with sighted students and sighted students were tested in the classroom.

The test instructions were read to both the sighted and the blind students just before the tests were administered. A Test Instructions Form (TIF) was prepared and given in Appendix H. In TIF, it was stated that they would take three tests in a row, that there would be short time intervals between the tests, and general information was given about the tests. There were also informative items for blind students about what they can and cannot request from the readers during the tests.

The students were given numbers according to their sitting order in the classroom. In all scales and tests, the students wrote the same number on their papers. While implementing the tests consecutively, 3QNIV and 5QIV, which are identical in the tests, were asked in the first test environment and were not asked repeatedly in the following tests. The testing sequence of NAMAT, VAMAT and TAMAT were different in schools, as stated in Table 3.18. An observation checklist was used to determine to what extent the testing accommodations were implemented during MAT for both sighted and blind students. The observation checklist for testing accommodations that included items about setting, presentation, response, and timing testing accommodations was given in Appendix I.

Table 3.18 Testing conditions of the schools

School	1st Testing Condition	2nd Testing Condition	3rd Testing Condition
A	NAMAT	VAMAT	TAMAT
B	TAMAT	NAMAT	VAMAT
C	VAMAT	TAMAT	NAMAT

The scales about students' physics self-efficacy, physics attitude, self-esteem, and test anxiety were given first time to all students before starting the instruction. After implementing all versions of MAT, the students answered to the same scales for the post-test.

3.3.6 Quantitative Data Analysis

The data collected with the SIF, MAT, PSEF, PATT, SEST, and TANX were entered into the Microsoft Excel file with the numbers assigned to each student. The data in Microsoft Excel was imported to an SPSS file. Frequency analysis was performed to determine missing data in the data set. The unexpected values for each variable were reviewed to free from errors. The negatively worded items in the scales were reverse coded. The distribution of missing values among students and percentage values of missing data in each question and in each dimension were detected in a new Excel file. Although there are different opinions about how much of the missing data is problematic, there are studies in the literature indicating that 20 percent or less is acceptable (Little & Rubin, 2002; Meeyai, 2016). Missing responses were analyzed considering this threshold value, and unanswered questions were replaced with the median of the dimension in which the respondent's missing response was in the scales. For MAT, the unanswered questions were predicted according to the student's performance on the other questions since the reason why the question remained unanswered is unknown. The missing data analysis and data cleaning process will be explained in Chapter 4 in more detail.

3.4 Assumptions and Limitations of the Study

In this study, it was assumed that students responded to the questions and items on the instruments seriously, consciously, and truthfully.

The results of the qualitative part of the study are limited to the problems of junior and senior high school blind students about testing accommodations in the examinations of science and physics courses. These students might face other problems about the physical properties of their school or attending socio-cultural activities in their school and might have different problems in different courses' examinations.

The results of the quantitative part of the study are limited to ninth grade students in inclusive classes that contain a blind student in Bursa and Sakarya, and the results are also limited to the subject of motion. Since there was only one blind student going to the ninth grade in Bursa, the province where the study was planned to be conducted, the study was conducted in two provinces. Due to time and financial reasons, inclusive classes that include a blind student in the two provinces were kept within the scope of the study, and inclusive classes in other provinces could not be reached.

CHAPTER 4

RESULTS

This chapter includes the results of the qualitative and quantitative phases of the current study. The results of qualitative data are given first, and then the results of quantitative data are presented.

4.1 Results of Qualitative Data

In the qualitative phase of the study, the junior and senior blind students evaluated the science and physics courses in terms of school and national examinations. The stated problems and suggestions for solving problems were determined with the Interview Guide for Determining the Problems of Junior and Senior High School Blind Students About Testing Accommodations. The interview form was presented in Appendix A2. Two junior and six senior high school students were interviewed face to face. The content analysis method was used for analyzing the interview. The results of the content analysis are presented in Table 4.1 with related categories and codes. Then, the codes that were defined for each category were explained separately with interview excerpts of the students.

4.1.1 Results Related to the First Research Problem

The results related to the first research problem are presented in Table 4.1. In the table, the frequency of the categories and codes and the number of unit of analysis for each interview are given.

Table 4.1 The frequency of the codes for the blind students' problems and suggestions about examinations

Categories (f)	Codes	S1 (34)		S2 (31)		S3 (26)		S4 (38)		S5		S6 (30)		S7 (25)		S8 (37)		Total	
		Problem	Suggestion	Problem	Suggestion	Problem	Suggestion	Problem	Suggestion	Problem	Suggestion	Problem	Suggestion	Problem	Suggestion	Problem	Suggestion	Problem	Suggestion
Presentation (76)	Reader	2	0	2	0	3	2	0	1	0	0	3	0	2	1	0	2	12	6
	Exemption	1	2	1	0	0	1	0	1	0	0	1	1	2	1	1	0	6	6
	Verbal description of visuals	2	0	0	0	2	0	0	1	0	0	3	0	1	4	0	4	8	9
	Equivalent questions instead of questions containing visuals	0	2	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	5
	Braille print of questions/visuals	3	1	0	0	0	2	0	1	0	0	0	4	0	2	0	2	3	12
	Facilitation of questions	0	0	0	0	0	0	0	0	0	0	0	2	3	0	3	0	6	2
	School administration	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0
Justice (49)	Note taking	0	0	2	0	0	0	1	0	3	0	0	0	0	0	3	0	9	0
	Subjects including visuals	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	3	2	4
	Educational support	0	0	2	0	1	0	3	1	2	1	0	1	0	1	0	1	8	5
	Facilitation of instruction	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
	Assessment	1	0	1	0	1	1	1	2	1	2	1	3	1	1	3	1	10	10
Setting (4)	Crowded testing environment	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0
	Guiding counselor	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Timing (4)	Additional time	2	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	4	0
Response (3)	Answering audibly	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
	Answering with Braille	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
NE (85)	Others	16		20		9		15				7		5		13		74 / 85	62

Note: "Student # (Number of unit of analysis)" spans S1–S8; "Frequency of codes" spans all count columns. S4 and S5 share the count (38).

As seen in Table 4.1, there are six categories and 18 codes. While the most frequent category is No element (85), presentation (76), justice (49), setting (4), timing (4), and response (3) are the categories in which problems were stated, and suggestions were made about the examinations of physics courses.

The codes are given below, with related excerpts from the transcripts of audio recordings of the interview. While giving the excerpts about the codes, abbreviations in brackets were used to indicate which student stated the problem or suggestion about this code when asked which interview question. As an example, S1P-5 refers to a problem stated by S1 in Question 5. S7S-9 refers to a suggestion stated by S7 in Question 9.

4.1.1.1 Results of Presentation Category

The presentation category was about the problems and suggestions regarding the presentation of the school and national examinations of science and physics courses. The seven codes about the problems and suggestions on the presentation of examinations were determined according to the interview with the blind students. These codes are "reader, exemption, verbal description of visuals, equivalent questions instead of questions containing visuals, Braille print of questions/visuals, school administration and facilitation of questions".

The most frequently cited issue as a problem by the blind students was about "reader" in exams. In school examinations, the accent and reading speed of readers (S1-9), students or other subject teachers reading the exam questions (S2P-9, S3P-9, S6P-9, S7P-9) were the problems. S3 suggested that the teacher who teaches the course should read the questions in the school exams (S3S-9), and S8 suggested training the teachers about instruction and how to test visually impaired students (S8S-9). The excerpts about readers from the transcripts of audio recordings of the interview are given below.

S1P-9: "Sometimes you cannot understand the questions when some teachers have different accents. Or someone is reading slowly, someone is reading too fast."

S2P-9: "Either the teacher reads the exam questions or the student."

S3P-9: "The teacher does not usually read exam questions, a friend of mine does."

S6P-9: "Any available teacher reads the questions."

S7P-9: "That is, from time to time, different teachers can read [exam questions] when verbal questions are predominant. Like the guidance counselor."

S3S-9: "Why does the teacher not read the exam in school? Why does the student [usually a classmate] read?"

S8S-9: "It would be better if the teachers were given some information about the exams for the visually impaired, about how to teach the lesson. Most of the teachers try to help, but they don't understand you much because they don't have the knowledge about blind students. That's why the teachers should be trained."

The blind students stated that the readers in the national examinations had problems about the accent and reading speed (S1P-10), sarcastic attitude (S2P-10), question-reading techniques (S3P-10), and negative attitudes towards students (S3P-10, S6P-10). According to the responses of S4 and S7, it is understood that the readers try to explain visuals in addition to reading the verbal descriptions written for the visual in the questions of The Transition System from Elementary Education to Secondary Education (TEOG) (S4P-10, S7P-10). S3 recommended that readers should be trained about question reading techniques and behaviors towards the blind students (S3S-11). S7 and S8 made suggestions about the readers, and they offered the readers with content knowledge should read the questions (S7S-11, S8S-11).

S1P-10: “For example, as I said, the reader has a different pronunciation, reads fast, reads slowly, or skips some words.”

S2P-10: “One of the readers mocked me in the scholarship exam. I guess he did it as a joke.”

S3P-10: “Who will read, how will he [the reader] read, will he read properly, will he be bored while reading, will he read with emphasis or will he read in skip. If the reader reads the underlined statement when it is said to read the question stem, this reader has a problem.”

S6P-10: “Some of my friends had problems at TEOG since the readers were very angry.”

S4P-10: “Some readers [rather than reading the verbal descriptions] try to explain the figure.”

S7P-10: “At TEOG, I had trouble not about answering the questions, but about the readers to understand the question and transferring it to me. They did not have much knowledge of the field of science, so from time to time, they could have problems while explaining.”

S3S-11: “In a province, Bursa, a maximum of four or five blind students can take the exam per year. No more than five, the number of students entering the TEOG in the same year. I wish the 20 teachers were given seminars, and these teachers would be the readers. If the readers were psychologically sufficient, positive, and had good reading knowledge, who would lose what?”

S7S-11: “I had a lot of trouble about readers. There are many teachers, after all, there are teachers from all majors. While assigning the readers to the exam, the distribution of readers can be done more carefully, especially when assigning it to a blind student. There are not many blind students entering the exam, but there are a lot of teachers. This should be considered when assigning the readers to the exam.”

> S8S-11: “The reader-encoder was the same person in TEOG. For example, there are science, history, and English exams on the same day. It’s always the same teacher who reads and doesn’t know anything about the subject. In these situations, it can be a problem for us that the readers do not read the question carefully.”

The exemption of blind students from visual questions is another code considered under the category of presentation. There were students who suggested continuing the exemption from the questions that contain visuals (S3S-15, S4S-15). Whereas, there were students who see exemption from visual questions as a problem in school (S7P-9) and national examinations (S1P-14, S2P-14, S6P-14, S7P-14, S8P-14) and requested the description of questions containing figures (S1S-13, S6S-13, S7S-14, S8S-13) and asking equivalent questions instead of these questions (S1S-13, S6S-14, S8S-13, S1S-14, S6S-14). The excerpts from the transcripts of audio recordings of the interview about the exemption of students from the questions including visuals are presented below.

> S3S-15: “It is better not to be asked questions [containing visuals] rather than answering the questions incorrectly.”

> S4S-15: “It is good to take out questions containing visuals in the university entrance exam.”

> S7P-9, “For example, instead of avoiding visual questions, explaining them with additional materials as possible and then asking them in the same way in the exam. If there is a circuit there, for example, drawing the circuit in an embossed way.”

> S7P-14: “Questions are already verbalized in TEOG. Especially I think that YGS [Transition to Higher Education Examination] physics is not very challenging for a blind. Therefore, a blind student can do physics questions on their own or with little support from someone.” S7S-14: “Therefore, I think that a verbalization can be made there like as TEOG or if someone in

the field of physics is asking and reading, it can be expressed in a comfortable way. I believe the question can be expressed if a few helpful statements are added there."

S1P-14, , S1S-13, S1-S14: "Of course, I wanted to see the questions [the physics questions including visual in the university entrance exam]." … "Questions can be changed and asked." … "Instead of being exempted, there may be verbal, written, paragraph questions, rather than questions containing visuals."

S2P-14: "I would like those questions to be asked as well. I wish I could get my points from those questions."

S6P-14, S6S-13: "If there were simple questions we could do instead of being exempt. Let them verbalize those questions again, but instead of describing the figure, asking another question."

S8P-14: "You know, more than 90 percent of the physics questions in the exam contain visuals. If we say 90% of 40 questions, there are 5-6 questions left. Then, other students will say that when we answer 40 questions, the blind students answer 5 and 6 questions. How convenient could it be?"

The stated problems and suggestions of the blind students about the verbal description of visuals in school and national examinations create the code of "verbal description of visuals". In school exams, the teachers trying to explain the visuals as much as they see (S6P-9) and the length of these explanations (S1P-9), and also the length of the descriptions in high school entrance exams (S3P-10, S6P-10) were seen as problems by the blind students. The students' opinions about verbal descriptions of visuals are presented with related interview excerpts.

S6P-9: "The teacher explains the images in the questions as much as he/she sees and as much as he/she can."

S1P-9: "If only there were no visual and long questions in the physics exams at school."

> S3P-10: “In the first TEOG, some of the questions that included images were long, and the longer the questions were, the more confused I was. I had such a problem. The questions were too long, as they were trying to describe the figures.”

> S6P-10: “In TEOG, the paragraphs were a bit long, hard to remember [paragraphs describing images]. I didn’t have too many problems in the first TEOG. In the second TEOG exam, there were purely visual questions. Almost all of them were including visuals. My second science exam was messed up on the TEOG.”

Including only descriptions without any tactile graphics in the questions in high school entrance exams (S3P-12, S6P-12), asking questions with descriptions in this exam about the subjects that were not presented to the blind student in the course since they contained visuals (S7P-12) were other problems stated by the blind students.

> S3P-12: “In some questions, you wish there were visuals [in TEOG].”

> S6P-12: “There was a question about triangles in the TEOG, but there was no visual. They completely verbalized the question. It was a question that I could do if there was a visual, but they verbalized it and made it worse, it could never be solved.”

> S7P-12: “Although I do not remember clearly at the moment, I remember that there were some questions in TEOG that were not covered in the course.”

While some students see the verbal descriptions for questions including visuals in national examinations as the most appropriate testing accommodation (S4S-12, S8S-15), using a clear and understandable verbal description of visuals was a suggestion of the blind students instead of explaining or exempting visual questions in school and national exams (S7S-11, S7S-15).

> S4S-12: “It is the best [description of questions with figures in TEOG]. There is nothing else to do anyway.”

S8S-15: "It is good to ask equivalent questions [instead of questions including visuals], but maybe it would be better if they write verbal descriptions [in national examinations]."

S7S-11: "If the teacher expresses the visual to the student with similar sentences during the lesson, the student will be able to animate the visual from the lesson as he/she remembered. I think science questions can be solved more easily if they can be expressed in neat and understandable sentences."

S7S-15: "Visual content can be expressed in more neat sentences [in TEOG]"

The blind students also suggested using equivalent verbal questions instead of questions containing figures or descriptions in both classroom, high school, and university entrance examinations (S6S-11, S1S-15, S6S-15). "Equivalent items instead of questions containing visuals" is the new code of presentation category, and related excerpts are given.

S1S-15: "Questions [with images] may be changed and replaced by other kinds of questions. For example, a question with a rectangle. Ask another question instead. Because when you explain the image in writing, nothing will change."

S6S-11: "I think it would be better to ask equivalent verbal questions instead of visual science questions [in TEOG], but I do not know if it will be the same with the sighted students. It would make more sense if it had the same difficulty but was verbal."

S6S-15: "Asking other questions instead of describing the images [in TEOG]. Easier questions to ask, but not so easy because it will be unfair to the others this time."

When the blind students were asked about testing accommodation suggestions for school exams, high schools, and university entrance exams, the answers were mostly exemptions, descriptions of figures, and asking equivalent verbal questions instead of visual questions, as explained above. Unlike these, S3 suggested that the questions in the school exam would be written in Braille (S3S-9), while S7 suggested that the visual questions in the school exams would be printed in Braille booklet (S7S-9). When students were asked to evaluate whether the students should be given both tactile graphics and verbal descriptions of the visual, S1 stated that reading Braille is difficult, and he did not think that such an arrangement would be made (S1P-15). On the other hand, some students stated that this accommodation would be possible if they learned the course content in this way in lessons and books (S3S-15, S6S-15, S7S-15, S8S-15). These suggestions were handled under “Braille print of question/visuals” code and presented below with related excerpts.

> S1P-15: “Honestly, I do not think they will ever do something like this [presenting visuals in questions with tactile graphics and verbal descriptions].”

> S3S-9: “The questions can be written in Braille [in school exams].”

> S7S-9: “If there is a question with a visual, I would probably wish it in tactile form, or I would like a question booklet in Braille [in school exams].”

> S4S-15: “This is [presenting visuals in questions with tactile graphics and verbal descriptions] a very good accommodation for blind students.”

> S3S-15: “It can also be difficult to understand the visual in the questions when you can’t solve questions from books including Braille images while studying on subjects.”

> S6S-15: “It actually makes sense, but first of all, how can we understand the logic of the problem? You somehow understand the logic of the question, but they [the teachers] have to explain how that question is done in physics class. They can do this by giving additional courses to visually impaired students. As long as I do not understand the question, I think nothing will happen even if I understand the tactile graphic.”

> S7S-15: “If the student has already learned this [using tactile graphics] in high school, he can do it with someone’s expression, but the main problem starts with not being able to learn it in high school. Therefore, if I don’t know anything about electric current, even if the tactile graphics are presented in the exam, I did not learn it in high school anyway. But if I could learn it with materials in the school, presenting tactile graphics in the exam would be a perfect situation for me. Then there will be no obstacle for the visually impaired students to study physics, but it is more important to provide this material support first in the courses and then in the exams.”

> S8S-11, S8S-15: “Questions with images can be asked tactilely [in national exams]. But sometimes, the visuals are not well understood in tactile form. For example, if they show me the reflection and refraction of light [by tactile graphics], I do not understand anything. I don’t know because I don’t know how. Beforehand, I need to study this subject with a tactile book or by embossing it with a person.” … “In our textbooks [in Braille], there are not many tactile graphics. For example, in the activities of the book, it is written in parentheses -you can get help from your parents or teacher-. The tactile graphics are not given much in these books.”

Asking easier questions for the blind students in the exams at school and in the high school entrance examination is a problem (S7P-9, S8P-9) and also a suggestion (S6S-13) for the presentation style of the exams stated by the blind students. The stated problems and suggestions are analyzed under the “facilitation of questions” code.

> S7P-9: “I do not have any problems in the physics exam, but since I did not receive the same instruction during the lesson, he [the teacher] does not ask me the same questions as sighted. It’s actually a problem that he asks me easier questions.”

> S8P-9: “If a normal student sees the exam questions my teacher asks, how can I say… He asks very simple questions... Since the questions are very simple, I cannot answer a numerical question in the book because I don’t

know much about that subject. The teacher only asks me about the information verbally."

S6S-13: "The questions could be simpler, not complicated. At least there may be simpler questions [in YGS-LYS]."

On the other hand, one blind student stated that as a result of the school administration's failure to inform the Directorate of National Education in time that there is a blind student in their school, she could not access the testing accommodations in the first step of the TEOG exam and that she was taken to the exam with booklets prepared for the sighted students (S6P-10). This is analyzed under the "school administration" code.

S6P-10: "In the first TEOG exam, the school did not apply to the Directorate of National Education. That is why normal questions were asked."

4.1.1.2 Results of Justice Category

The justice category, which is about the stated problems and suggestions of the blind students on the fairness of instruction and assessment, consists of the codes named as "note taking, subjects including visuals, educational support, facilitation of instruction, assessment". None of the blind students think that they receive fair instruction in science or physics classes with the sighted students (S1P-2, S2P-2, S3P-2, S4P-2, S5P-2, S6P-2, S7P-2, S8P-2). The stated problems about the fairness of instruction are presented with related interview excerpts.

The blind students stated that they had trouble taking notes in physics courses (S2P-5, S3P-5, S4P-5, S5P-5, S6P-5). The teachers not depicting what is written on the board, drawn or presented on the slides, and the teachers who are disturbed by the sound of slate and stylus were obstacles for note taking.

S2P-5: "The teacher was occasionally warning for being uncomfortable with the clicking of the Braille slate and stylus."

S3P-5: “My chance of taking notes varied according to the slides, according to the subjects. For example, I have very little chance of taking notes on subjects that involve a lot of visuals, such as buoyancy force. But I was taking notes on more verbal subjects.”

S4P-5, S5P-5: “[the teacher did not say that she wrote on the board] was a problem not only in science but also in other courses.”

S6P-5: “I was just taking notes of what the teacher was saying verbally. If the teacher was writing something on the board, I was asking my friend, so I could write the question in my notebook.” … “He actually says what he wrote on the board, but since it’s a bit complicated, he says it fast, and it is a little difficult to write at the same time while saying it fast.”

Especially in subjects involving visuals, students think that teaching is not fair (S1P-5, S3P-5). The stated problem by blind students and the excerpts about note taking are stated below.

S1P-5: “Some issues are based on visuals. ... Some of the teachers write on the board and pass.”

S3P-5: “Education is fair in some subjects. We were almost the same in verbal subjects, but not in subjects including visuals.”

Lack of educational support (S2P-5, S3P-5, S4P-5, S5P-5) and facilitation of instruction for the blind students (S7P-5) were also seen as a cause for unfair instruction. One student stated that educational support is provided only in verbal courses, and it is not provided in science and mathematics courses (S2P-5).

S2P-5: “There is no educational support in science class.”

S3P-5: “We asked the science and math teacher for educational support because science and mathematics are the most difficult courses for visually impaired students. They somehow understand English by listening, but science and mathematics are not like that. The math teacher said ok for 1 hour a week. When we told the science teacher, he said he would organize, but although the 1st TEOG passed, he did not arrange the course and we got support for science from another teacher."

S4P-5, S5P-5: "He was lecturing and finishing the lesson. He wasn't doing it [educational support] even if there was time. I don't know why he didn't. We never asked why he did not do it. We were taking the same instruction as the sighted students, but it was not enough for us."

S7P-5: "I do not think I have received the same level of education as the sighted, as the training is simplified as much as possible by the teacher and the school administration."

The suggestions made by the blind students regarding the problems they experience about being fair in instruction are presented below with excerpts from the relevant interview recordings. For fair instruction, the students stated that instruction using tactile materials (S2S-6) and verbal description of subjects including visuals is necessary for justice (S3S-6, S8S-6).

S2S-6: "In class, I would like my teacher to touch my hand to an object" … "I would like my teacher to tell me verbally."

S3S-6: "He could have explained it [the visual] more clearly. It's not just for the sighted students. He could have verbalized the subject a little bit more."

S8S-6: "For example, he draws something, for example, about the reflection of light, I expect him to at least describe that visual a little bit. But nothing, he's just saying and passing by. He doesn't think, "There is a visually impaired friend in our class. I have to tell her about it too."

Taking educational support (S4S-6, S5S-6, S6S-6, S7S-6, S8S-6) and having education at the same level as the sighted students (S7S-6) are the blind students' recommendations for fairness of instruction.

S4S-6, S5S-6: "It was enough for our science teacher to come to us [after the course] and explain the subject, even for 10 minutes. Yes, that was a very useful thing."

S6S-6: "Physics or science classes are terrible for us, so I won't be studying numerical courses" … "Physics, chemistry, and biology may have additional lessons for 10th grades, even if it is 1-2 hours a week, but I don't want my teacher to tell me "didn't you understand in class.""

S7S-6: "The same education is given in the classroom [as the sighted students], that is, the education level, can be given either in the classroom or with an individualized education program [to the blind students]."

S8S-6: "For example, I would expect the teacher to come after the lesson and ask if you understood something about the subject. I expect my teacher to say, "If there is anything you do not understand, come to me and I will explain it to you, maybe it will be better for you", but the teachers never do such a thing."

None of the students think that fair assessment is made for science and physics lessons at school and in national exams. There are also students who think they are ignored in exams (S4P-16, S5P-16). Preparing verbal questions equivalent to visual questions (S6S-17, S8S-17), writing verbal descriptions for visuals (S4S-17, S5S-17, S8S-17), training the readers (S3S-17, S6S-17), revocation of exemption, and presenting visual questions to the student in different ways (S7S-17, S8S-17) were suggestions offered by the blind students to ensure fair assessment in school and national examinations.

S3S-17: "Readers need to be educated."

S6S-17: "Questions with images should be removed. Again, with the same difficulty, questions without visuals should be asked to the visually impaired." … "I think it makes more sense for teachers to be trained in how to teach physics or science to visually impaired people."

S4S-17, S5S-17: “Some readers are unable to explain visual questions. It would be better to have an explanation of the image next to it.”

S7S-17: “I think it is a fairer solution to present the questions including visuals with a different solution rather than exemption.”

S8S-17: “In TEOG, they were taking out questions with visuals and trying to ask similar questions instead. It is good to ask similar questions, but maybe it is better if they describe and ask them verbally, textually. ... they describe the visual one-to-one.” … “They can explain the questions verbally or textually. If a visual is in the question given to the sighted students, it would be appropriate to give an explanation of this visual to us. We need to answer questions as normal students answer. While the sighted students otherwise answer more questions, we answer a few questions. This is not fair actually.”

4.1.1.3 Results of Setting Category

The setting category, which is about the specified problems and suggestions by the blind students related to the setting of the testing environment, includes the codes of “crowded testing environment and guiding counselor”. S1 and S2 stated that they were taken to the exam in a crowded environment (S1P-9, S2P-9) and that they were disturbed by the noise in the exam environment (S3P-9). For national examinations, it was suggested to have a guidance counselor in the exam hall in addition to the reader and coder to manage the anxiety and stress that the blind student would experience in the exam environment (S3S-11). The interview excerpts of the “crowded testing environment” and “guiding counselor” codes are stated below.

S1P-9: “The teacher gives me the exam in the teachers’ room in the lesson after my friends take the exam or when he has a free lesson.”

S2P-9: “I’m taking an exam in a quiet environment. My teacher tells my classmates to be quiet [a blind student is being tested in the same class while other students are in the classroom].”

S3P-9: “The exam is held in a noisy environment, such as a library. It is not clear who went in and out.”

S3S-11: “I wish they [decision makers for testing accommodations] gave a guidance counselor with positive energy along with the reader in the exam. The biggest concern is stress.”

4.1.1.4 Results of the Timing Category

Timing category is about the stated problems and suggestions of the blind students regarding the timing of the exam. About the timing of the exam, lack of additional time in school exams (S4P-9, S5P-9) and insufficient additional time in national examinations (S1P-10) was the problem of blind students.

S4P-9, S5P-9: “We were not given additional time.”

S1P-10: “There was no timing problem in school exams, but it is in national examinations.”

4.1.1.5 Results of the Response Category

Response category is about the specified problems and suggestions by blind students regarding the way the exam is answered, and the related codes are “answering audibly and answering with Braille”. A student stated it was very difficult to explain the answer audibly instead of writing the answer in physics exams at school (S8P-9). One of the blind students suggested answering the questions in the exams held at the school by writing answers with Braille (S2S-9).

S8P-9: “The teachers mostly ask open-ended questions. We answer by explaining, but actually, it is easier to write something than to explain it. We cannot express some things while we are talking. Also, we don’t always have a physics teacher with us, and it gets harder to explain to someone else because he can’t understand you. For example, a student or a teacher of another course writes as I explained, but the physics teacher, for example, uses mostly physics terms, uses numerical terms, and because he understands me, I can get better scores. But when it's another person, a student or a teacher of another subject, they don't understand me much."

S2S-9: "It would be nice if they read me the questions and I wrote the answer in Braille."

4.1.1.6 Results of the No Element Category

The "no element" category was including the student responses that were not including any element about the problems and suggestions of blind students' in school and national examinations of science and physics courses. The sample interview excerpts related to no element category are stated below.

S1, Question 8: "The teacher reads the questions and alternatives. Then, I answer. The teacher writes the answers. After that, he gives my score."

S7, Question 7: "Paper-pencil exam, but it's like an oral exam. My own teacher is reading the exam."

S8, Question 10: "Not much. How can I say? There were some challenging questions, but I was still able to answer them. I only had a problem in terms of English in the TEOG exam. I did not have any problems in terms of science."

4.2 Results of Quantitative Data

In this section, firstly, the quantitative data cleaning and missing data analysis process were explained. After presenting the descriptive statistics, the results about the second research problem were given. The data for the second research problem were obtained by the non-accommodated (NAMAT), verbal descriptions (VAMAT), and tactile graphics testing accommodations conditions (TAMAT) of Motion

Achievement Test which were developed to determine how using testing accommodations affect the sighted and the blind ninth grade students' physics achievement. Lastly, the data about the third research problem were obtained with Physics Self-Efficacy Scale (PSEF), Physics Attitude Scale (PATT), Self Esteem Scale (SEST), and Test Anxiety Inventory (TANX) to understand the effect of using instructional and testing accommodations on the sighted and blind ninth grade students' physics self-efficacy, attitude towards physics course, self-esteem, and test anxiety. The data collection instruments of the second and third research problem were implemented to 108 students in ninth grade, in which three students were blind.

In Chapter 3, in the section of population and sample, it was explained that there were four inclusive classes with at least one blind student in the accessible population. All of these classes were intended to be included in the study, but this study was conducted with three of the classes because the blind student in one of the inclusive classes had never attended the school. In this case, since almost all of the population was studied, the inferential statistic is not performed, and after descriptive statistics, effect size (ES) values are calculated for research problems related to the quantitative part.

The ESs were calculated with Cohen's d formula (Cohen, 1988). The pooled standard deviation values were used in the ES formula. The mean scores and standard deviation values that were presented in the descriptive statistics section in related tables were used when calculating ESs. Cohen suggested that when $d \leq 0.2$, the ES can be considered small or negligible, while 0.5 represents a 'medium' and 0.8 and greater values mean a 'large' effect. In this study, the ES values between 0.2 and 0.49 are considered small (*). ES between 0.5 and 0.79 are accepted as medium (**), and ES values greater than 0.8 are assumed large (***). The ES values smaller than 0.2 are negligible. The same intervals are used for negative ES values, too.

4.2.1 Data Cleaning and Missing Data Analysis

The data cleaning process, missing data analysis, and how to replace unanswered questions for NAMAT, VAMAT, TAMAT, PSEF, PATT, SEST, and TANX were explained in this part.

Although there was a total of 117 students in the three schools where the study was conducted, in School A and B, two students, in School C, five students were permanently absent and no longer attended school. All of the tests and scales were administered to 108 students, and permanently absent students were excluded from the study. When entering the data into an Excel file, it was noticed that 14th and 23rd students marked the responses of post PSEF in a pattern, and also 14th student marked 3 points for all of the items in post PATT. Accordingly, the data of 14th student for PSEF and PATT, also the data of 23rd students for PSEF was excluded. Therefore, there were 106 students for pre and post-PSEF and 107 students for pre and post-PATT.

Then, the frequency analysis was conducted for identifying incorrect data entries and detecting missing data. All alternatives and the distribution of answers by alternatives were as expected except the 4th student's response in post-PATT for the 10th item. This student's response was "n". This was an unexpected alternative, and the student's paper was controlled. The response value was changed to 4. Since the questions including visuals were not presented to the blind students in NAMAT, these questions were not considered as unanswered.

The missing data for NAMAT, VAMAT, and TAMAT were presented in Table 4.2. There was no unanswered question in School B in any testing accommodation conditions of MAT and in School C in NAMAT and TAMAT. As shown in the table, there was one unanswered question for each of NAMAT and TAMAT, and three unanswered questions for VAMAT. The percent of unanswered questions to answered questions were 0.08 for NAMAT and TAMAT and 0.31 for VAMAT. There was no need to clean data. In this case, all 108 students are acceptable in the data set for NAMAT, VAMAT, and TAMAT. The unanswered questions were predicted according to student' performance on the other questions since the reason why the question remained unanswered is unknown. To explain the way of prediction, it is appropriate to give an example of the 32nd student in NAMAT. The 32nd student has a missing value and scored 4 out of 11 questions. The total score of this student is 4.36 when calculated with the direct proportion of how many points he will receive if he answers 12 questions. In this case, 0.36 points are given to the unanswered question.

Among the answers given by the blind students to the different testing accommodation conditions of MAT and the scales, only Student C's (the blind student in School C) 4th question of VAMAT was unanswered. The ID number of Student C is 108 and can be seen in Table 4.2 below. This student explicitly said that she could not answer the question and did not know the answer. Thus, the student's score was corrected according to chance factor. Since there were five alternatives in the question, the score written in place of this question was 0.20.

Table 4.2 The distribution of unanswered questions in non-accommodated, verbal descriptions and tactile graphics testing accommodation conditions of Motion Achievement Test

School Name Testing accommodation condition	# of Questions			
	Q4	Q5	Q9	
	Number of unanswered questions (Student ID)			Total
School A				
NAMAT	1 (32)	0	0	1
VAMAT	1 (32)	1 (31)	1 (32)	3
TAMAT	1 (32)	0	0	1
School C				
VAMAT	1 (108)	0	0	1

The distribution of unanswered items in pre and post-tests of PSEF, PATT, SEST, and TANX were examined according to the sub-dimensions of each scale and school. For the dimensions of all scales, the percent of unanswered items were calculated, and it was found that the percentage of missing data did not exceed 1% in any of the dimensions. The unanswered items were replaced with the median value of the respondent in the related dimension for all of the scales.

In Table 4.3, the distribution of unanswered items is given according to schools and Everyday application (EA), Science communication (SC), Conceptual understanding (CU), Higher-order cognitive skills (HCS), Practical work (PW) sub-dimensions for pre and post-PSEF. Items 3 and 9 in EA, Items 5 and 26 in SC, Items 4 and 27 in HCS, Items 8 and 18 in PW dimensions did not have any missing data neither for the pre-test nor the post-test of PSEF. The student IDs who had missing data in the related items are given in brackets. The student's missing data were replaced by the student's median value for that dimension in which the missing data was found.

Table 4.3 The distribution of unanswered items for pre and post-results of Physics Self Efficacy Scale

	Number of unanswered items (Student ID)							
	School A		School B		School C		Total	
Dimension Item #	Pre_ PSEF	Post_ PSEF	Pre_ PSEF	Post_ PSEF	Pre_ PSEF	Post_ PSEF	Pre_ PSEF Total	Post_ PSEF Total
EA								
6	0	1 (34)	0	0	0	0	0	1
13	1 (28)	0	0	0	0	0	1	0
20	0	1 (17)	1 (60)	0	0	0	1	1
23	1 (32)	0	1 (44)	0	0	0	2	0
24	1 (32)	1 (29)	0	1 (52)	0	0	1	2
SC								
11	0	1 (31)	2 (40, 55)	1 (53)	1 (101)	0	3	2
15	0	0	0	1 (38)	0	0	0	1
17	0	0	0	1 (38)	0	1 (102)	0	2
22	1 (32)	1 (13)	1 (39)	0	0	0	2	1
CU								
2	0	0	0	0	1 (87)	1 (104)	1	1
10	0	0	2 (40, 52)	0	0	0	2	0
14	0	0	0	1 (47)	0	0	0	1
19	1 (18)	0	0	0	1 (104)	0	2	0
HCS								
7	0	1 (34)	0	0	0	0	0	1
16	0	1 (24)	0	0	1 (105)	1 (98)	1	2
21	1 (29)	0	0	0	0	0	1	0
25	1 (9)	0	0	0	0	0	1	0
PW								
1	1 (31)	0	0	0	0	0	1	0
12	0	0	2 (44, 45)	1 (55)	0	1 (104)	2	2
Total	8	7	9	6	4	4	21	17

In Table 4.4, the distribution of unanswered items is given for Importance (IMP), Comprehension (COMP), Requirement (REQ), and Interest (INT) sub-dimensions for pre and post-PATT. The numbers in brackets are the student IDs who had missing data in related items. Student's missing data was replaced with the student's median value in the related dimension. Item 29 in IMP, Items 2, 5, 6, 14, and 19 in COMP, Items 12 and 30 in REQ, Items 7, 16, and 22 in INT dimensions did not have any missing data neither for the pre nor the post-PATT.

Table 4.4 The distribution of unanswered items for pre and post-results of Physics Attitude Scale

	Number of unanswered items (Student ID)							
	School A		School B		School C		Total	
Dimension Item #	Pre_ PATT	Post_ PATT	Pre_ PATT	Post_ PATT	Pre_ PATT	Post_ PATT	Pre_ PATT Total	Post_ PATT Total
IMP								
9	0	0	0	1 (52)	0	0	0	1
10	1 (28)	0	0	0	0	0	1	0
11	0	0	1 (45)	0	0	0	1	0
13	1 (29)	0	0	0	0	0	1	0
23	0	0	3 (36, 49, 52)	0	0	0	3	0
24	0	1 (22)	0	0	1 (104)	0	1	1
26	0	0	0	0	1 (81)	0	1	0
27	2 (18, 22)	0	0	1 (53)	0	0	2	1
28	0	1 (27)	0	0	0	0	0	1
COMP								
3	0	0	0	0	0	1 (83)	0	1
20	1 (34)	0	0	0	0	0	1	0
REQ								
1	1 (2)	0	0	0	0	0	1	0
15	0	0	1 (36)	0	0	0	1	0
17	1 (17)	0	0	0	0	0	1	0
18	0	0	0	0	0	1 (102)	0	1
25	0	0	0	0	1 (77)	0	1	0
INT								
4	0	0	0	0	0	1 (91)	0	1
8	0	1 (13)	0	0	0	0	0	1
21	0	0	0	0	1 (90)	1 (79)	1	1
Total	7	3	5	2	4	4	16	9

The unanswered items in pre and post-test of SEST are given in Table 4.5. The SEST that consisted of 10 items did not have any missing values for pre and post-test in Items 1, 2, 5, 7, 8, and 9. The unanswered values of three students that were presented in brackets in Table 4.5 for Item 3, 4, 6, and 10 were replaced with the student's median value.

Table 4.5 The distribution of unanswered items for pre and post-results of Self Esteem Scale

	Number of unanswered items (Student ID)							
	School A		School B		School C		Total	
Item #	Pre_ SEST	Post_ SEST	Pre_ SEST	Post_ SEST	Pre_ SEST	Post_ SEST	Pre_ SEST Total	Post_ SEST Total
3	0	0	1 (63)	0	0	0	1	0
4	0	0	1 (38)	0	0	0	1	0
6	0	0	1 (63)	0	0	0	1	0
10	0	0	0	0	0	1 (78)	0	1
Total	0	0	3	0	0	1	3	1

The distribution of unanswered items is given according to schools and dimensions of Worry (WOR) and Emotionality (EMO) for pre and post-TANX in Table 4.6. Items 3, 12, 17, and 20 in WOR and Items 6, 9, 11, 13, 16, 18, and 19 in EMO dimensions did not have any missing data in none of the pre and post-TANX. The unanswered items were replaced with the median of the students for the related dimension as in PSEF, PATT and SEST.

Table 4.6 The distribution of unanswered items for pre and post-results of Test Anxiety Inventory

	Number of unanswered items in TANX (Student ID)							
	School A		School B		School C		Total	
Dimension Item #	Pre_ TANX	Post_ TANX	Pre_ TANX	Post_ TANX	Pre_ TANX	Post_ TANX	Pre_ TANX Total	Post_ TANX Total
WOR								
2	0	0	0	0	0	1 (83)	0	1
4	0	0	0	1 (45)	0	0	0	1
5	0	0	0	0	1 (80)	0	1	0
8	0	0	0	1 (56)	0	0	0	1
EMO								
1	1 (25)	0	0	0	0	0	1	0
7	0	0	0	0	1 (72)	0	1	0
10	0	0	2 (38, 44)	0	0	0	2	0
14	0	0	0	0	0	1 (83)	0	1
15	0	0	0	0	1 (101)	0	1	0
Total	1	0	2	0	2	1	5	1

For PSEF, PATT, SEST, and TANX, to what extent the missing data of the students clustered was determined, and the number of questions answered in each dimension was higher than the number of unanswered questions for the students. For all scales, it was seen that the number of unanswered items was decreased in post-test when compared to the pre-test. When the number of unanswered items in all dimensions of PSEF, PATT, SEST, and TANX was compared for the pre-test and post-test, the number either remained the same or decreased, except school C in SEST. Therefore, the number of missing items in the scales is quite few.

4.2.2 Descriptive Statistics

4.2.2.1 Descriptive Statistics Related to the Second Research Problem

After unanswered questions were predicted as explained in the data cleaning and missing data analysis section above, the descriptive statistics for NAMAT, VAMAT, and TAMAT for the sighted (S) and the blind students (B), and the total of the group were calculated. In Table 4.7, number of participants (N), mean, standard deviation (SD), minimum, maximum, skewness and kurtosis values are presented.

Among 108 students in three schools, there were 105 sighted and three blind students. When average scores for the total of the groups were investigated, it was seen that the highest mean score is in TAMAT, and the lowest mean score is in VAMAT (5.06 and 4.57, respectively). Both the blind and the sighted students got the lowest mean score on VAMAT (4.60 and 4.56, respectively). Additionally, the mean score of the blind and the sighted students in VAMAT (4.60 and 4.56, respectively) and TAMAT (5.00 and 5.06, respectively) are approximately equal. While the mean score of the blind students is 6.67 in NAMAT, the mean score of the sighted students is 4.83. In NAMAT, the sighted students were asked 12 questions without any testing accommodations, while the blind students were exempted from questions containing figures and answered only three questions that did not contain visuals. With this implementation, it was tried to reflect the testing accommodation made in the university entrance exams in recent years in Turkey. When calculating the scores of the blind students in NAMAT, a similar method to the calculation of the scores of the blind students at the entrance to the university exam was used. The NAMAT scores of the blind students were calculated according to the student's performance on the three questions, which were not including visuals and were presented to the blind students. The higher value in the mean scores of the blind students in NAMAT compared to the sighted students might be due to the overestimation of the method used in calculating the scores.

The possible minimum score that can be obtained from NAMAT, VAMAT, and TAMAT is 0, and the maximum possible score is 12. While the minimum values of the blind students are greater than the sighted students, the maximum values of them are lower than the sighted students in all test conditions. Thus, the range of the blind students' scores is narrower. The effect of these values is seen on skewness. When the distribution of the blind students' scores on NAMAT and VAMAT are negatively skewed, the sighted students' scores were positively skewed. The skewness values ranging between -1.73 and 0.53 and the kurtosis values between -0.53 and 0.0 are evidence for the normality of the MAT scores distribution.

Table 4.7 Descriptive statistics of non-accommodated, verbal descriptions and tactile graphics testing accommodations conditions of Motion Achievement Test for sighted, blind and all students

	N	Mean	Minimum	Maximum	SD	Skewness	Kurtosis
NAMAT_B	3	6.67	4.00	8.00	2.31	-1.73	.
NAMAT_S	105	4.83	1.00	12.00	2.17	0.53	-0.02
NAMAT	108	4.88	1.00	12.00	2.19	0.49	-0.14
VAMAT_B	3	4.60	3.80	5.00	0.69	-1.73	.
VAMAT_S	105	4.56	1.00	10.00	2.23	0.45	-0.53
VAMAT	108	4.57	1.00	10.00	2.20	0.45	-0.47
TAMAT_B	3	5.00	5.00	5.00	0.00	.	.
TAMAT_S	105	5.06	1.00	12.00	2.29	0.38	-0.46
TAMAT	108	5.06	1.00	12.00	2.25	0.39	-0.38

4.2.2.2 Descriptive Statistics Related to the Third Research Problem

After unanswered items were predicted for pre and post-tests of PSEF, PATT, SEST, and TANX as explained in the data cleaning and missing data analysis section, the descriptive statistics were calculated. For all the scales about student's affective characteristics, the results of the descriptive statistics for the total score of the scales and dimensions were shown in tables separately for each scale. For each dimension, the results are presented for the blind, sighted, and all participants.

The descriptive statistics for PSEF are presented in Table 4.8. The dimensions of the five-point Likert scale were everyday application (EA) (8 items) and science communication (SC) (6 items), conceptual understanding (CU) (4 items), higher-order cognitive skills (HCS) (6 items), and practical work (PW) (4 items).

Table 4.8 Descriptive statistics of Physics Self Efficacy Scale for sighted, blind, and all participants

	N	Mean	Min.	Max.	SD	Skew.	Kurt.
Pre_PSEF_TOTAL_B	3	88.67	77	109	17.67	1.68	
Post_PSEF_TOTAL_B	3	117.33	111	128	9.29	1.64	
Pre_PSEF_TOTAL_S	103	80.92	39	126	16.67	0.02	0.38
Post_PSEF_TOTAL_S	103	80.73	41	123	18.48	0.29	-0.22
Pre_PSEF_TOTAL	106	81.14	39	126	16.66	0.02	0.37
Post_PSEF_TOTAL	106	81.77	41	128	19.25	0.31	-0.31
Pre_PSEF_EA_B	3	25.67	24	29	2.89	1.73	
Post_PSEF_EA_B	3	33.33	32	35	1.53	0.94	
Pre_PSEF_EA_S	103	21.47	10	33	4.65	-0.19	-0.08
Post_PSEF_EA_S	103	22.67	11	34	5.49	-0.01	-0.44
Pre_PSEF_EA	106	21.59	10	33	4.65	-0.21	-0.08
Post_PSEF_EA	106	22.97	11	35	5.70	0.03	-0.50
Pre_PSEF_SC_B	3	19.67	15	25	5.03	0.59	
Post_PSEF_SC_B	3	14.33	14	15	0.58	1.73	
Pre_PSEF_SC_S	103	18.72	7	30	4.84	-0.29	-0.15
Post_PSEF_SC_S	103	9.44	3	15	2.52	-0.21	-0.24
Pre_PSEF_SC	106	18.75	7	30	4.82	-0.28	-0.16
Post_PSEF_SC	106	9.58	3	15	2.62	-0.15	-0.30
Pre_PSEF_CU_B	3	15.33	14	17	1.53	0.94	
Post_PSEF_CU_B	3	16.67	16	18	1.15	1.73	
Pre_PSEF_CU_S	103	12.63	4	20	2.83	-0.05	0.36
Post_PSEF_CU_S	103	10.82	5	20	3.36	0.42	-0.49
Pre_PSEF_CU	106	12.71	4	20	2.84	-0.09	0.31
Post_PSEF_CU	106	10.98	5	20	3.46	0.38	-0.63
Pre_PSEF_HCS_B	3	20.00	17	24	3.61	1.15	
Post_PSEF_HCS_B	3	29.67	26	35	4.73	1.39	
Pre_PSEF_HCS_S	103	17.83	7	29	4.30	0.10	-0.07
Post_PSEF_HCS_S	103	19.93	9	32	5.36	0.04	-0.41

Table 4.8 (cont.)

	N	Mean	Min.	Max.	SD	Skew.	Kurt.
Pre_PSEF_HCS	106	17.90	7	29	4.28	0.08	-0.08
Post_PSEF_HCS	106	20.20	9	35	5.56	0.12	-0.29
Pre_PSEF_PW_B	3	8.00	4	14	5.29	1.46	
Post_PSEF_PW_B	3	23.33	22	25	1.53	0.94	
Pre_PSEF_PW_S	103	10.26	4	20	3.44	0.07	-0.32
Post_PSEF_PW_S	103	17.88	8	28	4.82	0.05	-0.49
Pre_PSEF_PW	106	10.20	4	20	3.49	0.06	-0.40
Post_PSEF_PW	106	18.04	8	28	4.84	0.00	-0.55

For the total score of PSEF, the average score for pre and post-test is nearly the same for the total of the group, 106 participants. However, when the mean scores for pre and post-tests are compared by disability status among dimensions of the scale, some results are remarkable. For the TOTAL, EA and HCS, the mean scores are increasing for the blind students from pre to post-test, while they are nearly the same for the sighted students. For SC, the mean score is reducing from pre to post-test for both the blind and the sighted students. The decrease in average is greater for the sighted students than for the blind students. The CU mean scores are increasing for blind and decreasing for the sighted students slightly. The average score for both the sighted and the blind students are increasing for PW from pre to post-test. All minimum values of PSEF are lower in pre-test when compared to post-test minimum values for both blind and sighted students, except the minimum values of SC. The similar situation is also observed in the maximum values. This might be due to using testing accommodations. All the values of skewness and kurtosis are between -2 and +2. Thus, the scores are normally distributed. After PSEF, the results of the descriptive statistics for the Physics Attitude Scale (PATT) are shown in Table 4.9. The dimensions of the five-point Likert scale were importance (IMP) (10 items), comprehension (COMP) (7 items), requirement (REQ) (7 items), and interest (INT) (6 items).

Table 4.9 Descriptive statistics of Physics Attitude Scale for sighted, blind, and all participants

	N	Mean	Min.	Max.	SD	Skew.	Kurt.
Pre_PATT_TOTAL_B	3	129.67	123	135	6.11	-0.94	
Post_PATT_TOTAL_B	3	143.33	142	144	1.15	-1.73	
Pre_PATT_TOTAL_S	104	97.99	37	137	18.22	-0.42	0.88
Post_PATT_TOTAL_S	104	98.96	54	138	17.13	0.31	-0.14
Pre_PATT_TOTAL	107	98.88	37	137	18.73	-0.37	0.70
Post_PATT_TOTAL	107	100.21	54	144	18.42	0.44	-0.09
Pre_PATT_IMP_B	3	48.33	48	49	0.58	1.73	
Post_PATT_IMP_B	3	50.00	50	50	0.00		
Pre_PATT_IMP_S	104	37.44	12	50	7.32	-0.75	1.71
Post_PATT_IMP_S	104	38.14	20	50	6.82	-0.09	-0.38
Pre_PATT_IMP	107	37.75	12	50	7.44	-0.73	1.53
Post_PATT_IMP	107	38.48	20	50	7.01	-0.09	-0.48
Pre_PATT_COMP_B	3	25.33	24	27	1.53	0.94	
Post_PATT_COMP_B	3	30.33	30	31	0.58	1.73	
Pre_PATT_COMP_S	104	17.93	7	29	4.54	-0.01	0.10
Post_PATT_COMP_S	104	18.17	7	30	5.11	-0.38	-0.30
Pre_PATT_COMP	107	18.14	7	29	4.65	-0.02	-0.04
Post_PATT_COMP	107	18.51	7	31	5.43	-0.18	-0.18
Pre_PATT_REQ_B	3	29.67	24	34	5.13	-1.09	
Post_PATT_REQ_B	3	33.67	32	35	1.53	-0.94	
Pre_PATT_REQ_S	104	24.08	9	35	5.53	-0.30	0.30
Post_PATT_REQ_S	104	23.96	12	35	5.33	0.02	-0.70
Pre_PATT_REQ	107	24.23	9	35	5.58	-0.30	0.25
Post_PATT_REQ	107	24.23	12	35	5.50	0.04	-0.74
Pre_PATT_INT_B	3	26.33	24	28	2.08	-1.29	
Post_PATT_INT_B	3	29.33	29	30	0.58	1.73	
Pre_PATT_INT_S	104	18.54	6	29	5.08	-0.19	-0.51
Post_PATT_INT_S	104	18.68	6	29	4.74	-0.05	-0.23
Pre_PATT_INT	107	18.76	6	29	5.18	-0.19	-0.55
Post_PATT_INT	107	18.98	6	30	4.99	0.06	-0.25

The pre-test mean scores of the blind students are higher than the mean scores of the sighted students for the total of the PATT and also for each dimension. This situation is an indication that the blind students have higher attitudes towards physics compared to the sighted students. When all mean values of the sighted students in PATT are raised for the blind students from pre to post-test, the mean values for the sighted students are nearly the same. For the total score of PATT, the highest mean value belongs to the post-test of the blind students (143.33), and the lowest value belongs to the pre-test of the sighted students (97.99). Furthermore, the skewness and kurtosis values are compatible with the normal distribution. Then, the descriptive statistics results about the Self-Esteem Scale (SEST) were calculated and presented in Table 4.10.

Table 4.10 Descriptive statistics of Self Esteem Scale for sighted, blind, and all participants

	N	Mean	Min.	Max.	SD	Skew.	Kurt.
Pre_SEST_TOTAL_B	3	33.67	33	34	0.58	-1.73	
Post_SEST_TOTAL_B	3	38.00	36	40	2.00	0.00	
Pre_SEST_TOTAL_S	105	29.03	15	40	5.57	-0.18	-0.40
Post_SEST_TOTAL_S	105	29.18	13	40	5.84	-0.26	-0.04
Pre_SEST_TOTAL	108	29.16	15	40	5.55	-0.23	-0.40
Post_SEST_TOTAL	108	29.43	13	40	5.94	-0.27	-0.12

For pre and post-test of SEST, the mean scores of the sighted students and overall group are nearly the same. However, there is a difference in the mean score of the blind students between the pre and post-test. Moreover, the self-esteem of the blind students at the beginning is higher (33.67) than the post-test mean score of the sighted students (29.18).

Despite that, the lowest maximum value belongs to the blind students on the pre-test. This situation can be explained by the fact that the change in the minimum and

maximum score range of the blind students is less than the sighted students. In addition, the values of skewness and kurtosis indicate the normal distribution.
Lastly, the descriptive statistics results for the Test Anxiety Inventory (TANX), which includes the dimensions of worry (WOR) (8 items) and emotionality (EMO) (12 items), and had four-points Likert response format is presented in Table 4.11.

When the mean scores of the blind, sighted, and all participants are investigated for pre and post-test of TANX, it is seen that the mean scores are decreasing. The test anxiety of groups reduced regardless of disability status in post-test. On the other hand, the decrease is greater for the blind students, while it does not seem practically significant for the sighted students. The use of testing accommodations may have led to lowering test anxiety of the blind students more than the sighted students. Similar to previously presented scales, the skewness and kurtosis values are in an acceptable range for normal distribution in TANX.

Table 4.11 Descriptive statistics of Test Anxiety Inventory for sighted, blind, and all participants

	N	Mean	Min.	Max.	SD	Skew.	Kurt.
Pre_TANX_TOTAL_B	3	43.33	36	49	6.66	-1.06	
Post_TANX_TOTAL_B	3	29.00	26	31	2.65	-1.46	
Pre_TANX_TOTAL_S	105	47.68	23	78	13.22	0.39	-0.49
Post_TANX_TOTAL_S	105	45.49	22	80	11.87	0.52	0.34
Pre_TANX_TOTAL	108	47.56	23	78	13.08	0.41	-0.44
Post_TANX_TOTAL	108	45.03	22	80	12.02	0.53	0.27
Pre_TANX_WOR_B	3	16.00	13	19	3.00	0.00	
Post_TANX_WOR_B	3	10.00	9	12	1.73	1.73	
Pre_TANX_WOR_S	105	18.75	9	32	5.80	0.51	-0.35
Post_TANX_WOR_S	105	17.79	8	32	5.38	0.61	0.17
Pre_TANX_WOR	108	18.68	9	32	5.75	0.54	-0.30
Post_TANX_WOR	108	17.57	8	32	5.46	0.60	0.12
Pre_TANX_EMO_B	3	27.33	23	33	5.13	1.09	

Table 4.11 (cont.)

	N	Mean	Min.	Max.	SD	Skew.	Kurt.
Post_TANX_EMO_B	3	19.00	17	21	2.00	0.00	
Pre_TANX_EMO_S	105	28.92	14	46	7.96	0.25	-0.67
Post_TANX_EMO_S	105	27.70	14	48	6.99	0.40	0.26
Pre_TANX_EMO	108	28.88	14	46	7.88	0.27	-0.64
Post_TANX_EMO	108	27.45	14	48	7.04	0.42	0.20

4.2.3 The Results Related to the Second Research Problem

The second research problem was "What is the effect of using testing accommodations on the sighted and blind ninth grade students' physics achievement in Bursa and Sakarya?". This problem also has four sub-questions. The results of the sub problems are presented respectively. In the results related to the second research problem, the magnitude of the effect that testing accommodations have on test scores was determined by effect sizes.

4.2.3.1 The Results Related to the First Sub Problem of the Second Research Problem

The first sub-question that belongs to the second research problem was "What is the mean difference between the sighted and blind ninth grade students' physics achievement scores about motion when testing accommodations are not used?" (2.1). In this situation, the effect size (ES) between the cases where both blind and sighted students took the test about motion in which no testing accommodation was used was examined. Thus, the mean scores of NAMAT that were presented in Table 4.7 for blind and sighted students were subtracted and divided to pooled standard deviation (SD_{pooled} = 2.17). The blind students had a mean score of 6.67, and the sighted students had a mean score of 4.83, resulting an ES of 0.84. This ES can be considered as large and might be interpreted as the blind students' achievement is practically greater than the sighted students in NAMAT.

However, it should be noted that since the blind students are exempted from questions containing visuals, their scores are calculated with the direct proportion as if all questions were asked to them. The mean score of the sighted students on NAMAT is 5.04 when it is calculated using the direct proportion over these three questions asked to the blind in NAMAT (SD_{pooled} = 1.45, ES = 1.12).

To understand the effect of using testing accommodations, the second and third sub-questions that belong to the second research problem were investigated.

4.2.3.2 The Results Related to the Second Sub Problem of the Second Research Problem

The second sub-problem of the second research problem was "What is the effect of using verbal descriptions on the sighted and blind ninth grade students' physics achievement about motion?" (2.2). The achievement of the sighted and the blind students in non-accommodated situation and verbal description testing accommodation condition is presented in Figure 4.1.

In Figure 4.1, when the testing accommodations were not used, the achievement of the blind students seemed greater than the sighted students, and when verbal description testing accommodation was used, the achievement of the groups seemed similar. When the verbal description testing accommodation was used, the scores of the blind students tended to decrease, and there was a slight reduce in the sighted students.

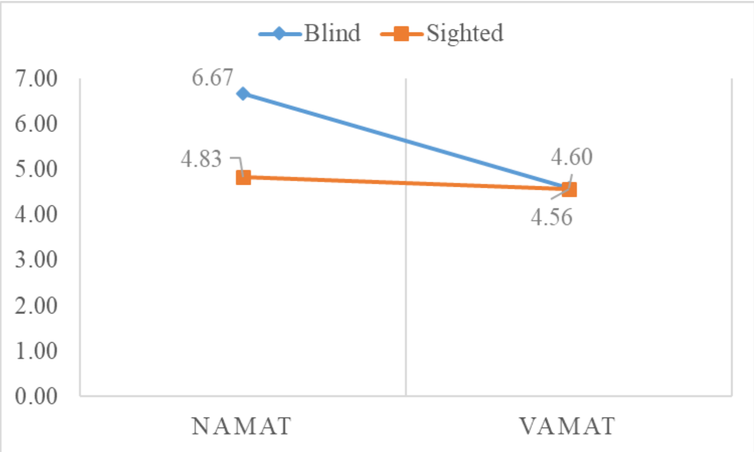

Figure 4.1 The mean scores for blind and sighted students in non-accommodated and verbal descriptions testing accommodations conditions of Motion Achievement Test

According to Table 4.12, using the testing accommodations have a negative large effect on blind students' physics achievement about motion. The blind students had a mean score of 6.67 without accommodations and a mean score of 4.60 with verbal descriptions testing accommodations, resulting in an ES of -1,21. Using verbal descriptions caused a decrease of 2.07 points in the test scores of the blind students. On the other hand, the sighted students had a mean score of 4.83 without accommodations and a mean score of 4.56 with verbal descriptions testing accommodations, which resulted in an effect size of -0.12 that is negligible. The mean scores of the sighted and blind students on VAMAT were nearly the same and resulted an effect size of 0.02, suggesting the sighted and blinds performed similarly with verbal descriptions testing accommodation (Blind students: $M_{VAMAT} = 4.60$, $SD_{VAMAT} = 0.69$; Sighted students: $M_{VAMAT} = 4.56$, $SD_{VAMAT} = 2.23$; $SD_{pooled} = 2.21$).

Table 4.12 The results about the effect of using verbal descriptions testing accommodations on sighted and blind students' achievement

Compared test scores	Effect size
VAMAT_B vs NAMAT_B	-1.21***
VAMAT_S vs NAMAT_S	-0.12
VAMAT_B vs VAMAT_S	0.02

4.2.3.3 The Results Related to the Third Sub Problem of the Second Research Problem

The third sub-problem of the second research problem was about using tactile graphics, and the problem sentence was "What is the effect of using tactile graphics on sighted and blind ninth grade students' physics achievement about motion?" exactly (2.3). When answering this question, the achievement of the blind and the sighted students in test situations with and without tactile graphics was compared, and also in cases where tactile graphics were used, the achievement of blind and sighted students was compared.

As seen in Figure 4.2, the achievement of the sighted and the blind students is almost the same when using tactile graphics, unlike NAMAT, in which the testing accommodations were not used.

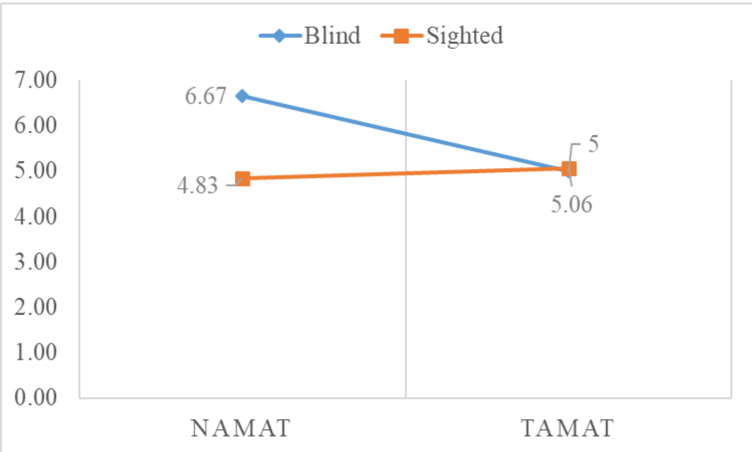

Figure 4.2 The mean scores for blind and sighted students in non-accommodated and tactile graphics testing accommodations conditions of Motion Achievement Test

While using tactile graphics slightly increase the scores of sighted students, decrease the scores of the blind students. To investigate the magnitude of the difference due to the tactile graphics, ES values were calculated. The results about the 3rd sub-problem of the 2nd research problem (2.3) are given in Table 4.13. When calculating effect sizes, the related values in Table 4.7 were used.

Table 4.13 The results about the effect of using tactile graphics testing accommodations on sighted and blind students' achievement

Compared test scores	Effect size
TAMAT_B vs NAMAT_B	-1.02***
TAMAT_S vs NAMAT_S	0.10
TAMAT_B vs TAMAT_S	-0.03

Based on these results in Table 4.13, tactile graphics testing accommodation has a negative large effect on the scores of the blind students (ES= -1.02). The mean score of the blind students was 6.67 when the testing accommodations were not used, and 5.00 while using tactile graphics. Using tactile graphics resulted with a score decrease of 1.67 points. Thus, the blind students seemed as performed better when the testing accommodations were not used. Although, using tactile graphs had no effect on the sighted students. The sighted students with a mean score of 4.83 in NAMAT and a mean score of 5.06 in TAMAT had an ES of 0.10. Lastly, the mean scores of the sighted and the blind students on TAMAT are almost the same, and the ES is -0.03, which is negligible. Since the mean score of sighted students on TAMAT are slightly greater than the mean scores of the blind students on TAMAT, the ES is negative (Blind students: $M_{TAMAT} = 5.00$, $SD_{TAMAT} = 0.00$; Sighted students: $M_{TAMAT} = 5.06$, $SD_{TAMAT} = 2.29$; $SD_{pooled} = 2.27$). When using tactile graphics, the sighted and blinds have nearly the same physics achievement about motion.

4.2.3.4 The Results Related to the Fourth Sub Problem of the Second Research Problem

In research problem 2.4, the question was “What is the effect of using tactile graphics as compared to verbal descriptions on sighted and blind ninth grade students’ physics achievement about motion?”. The sighted and the blind students’ physics achievement about motion was compared based on the scores of TAMAT and VAMAT. As presented in Figure 4.3, for both blind and sighted students, the scores are higher in tactile graphics testing accommodation conditions rather than verbal description testing accommodation situations.

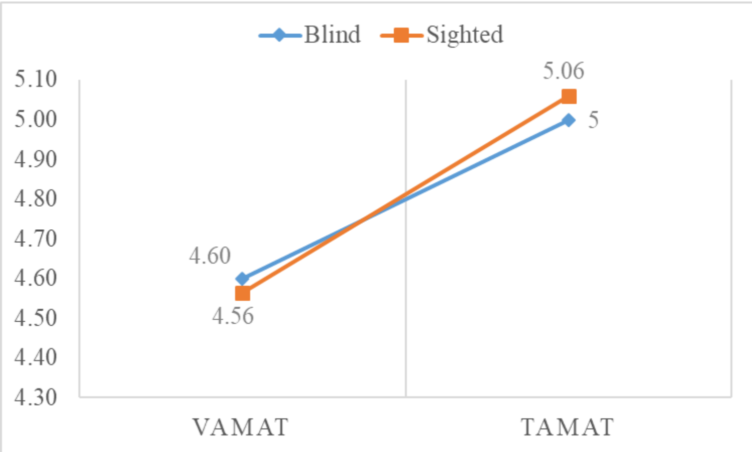

Figure 4.3 The mean scores for blind and sighted students in verbal description and tactile graphics testing accommodations conditions of Motion Achievement Test

In order to understand the magnitude of the increase, the effect sizes were examined. The ES values for two different testing accommodation conditions are presented in Table 4.14.

Table 4.14 The results about the effect of using tactile graphics as compared to verbal descriptions on sighted and blind students' achievement

Compared test scores	Effect size
TAMAT_B vs VAMAT_B	0.82***
TAMAT_S vs VAMAT_S	0.22*

The ES values in Table 4.14 show that using tactile graphics as compared to verbal descriptions have a large effect on the blind students (M_{TAMAT} = 5.00, M_{VAMAT} = 4.60, SD_{pooled} = 0.49, ES = 0.82) and have a small effect on the sighted students

(M_{TAMAT}= 5.06, M_{VAMAT} = 4.56, SD_{pooled} = 2.26, ES = 0.22). When compared with the ES values of the sighted students, a large ES of the blind students indicated a better performance gain for the blind students in the tactile graphics testing condition, rather than the verbal descriptions testing condition.

In Figure 4.4, the MAT test scores of the sighted and the blind students in three different testing conditions, which were investigated in research problems 2.1, 2.2, 2.3, and 2.4 are presented. According to Figure 4.4, the scores are differentiating in non-accommodated condition and came closer when verbal description and tactile graphics testing accommodations were used.

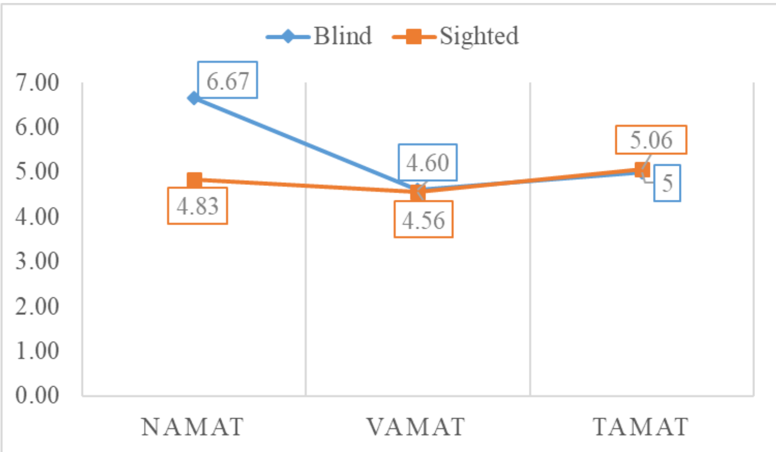

Figure 4.4 Mean scores of sighted and the blind students physics achievement on non-accommodated, verbal descriptions and tactile graphics testing accommodations conditions of Motion Achievement Test

The practically significant ES values about the results of problems 2.1, 2.2, 2.3, and 2.4 are summarized in Table 4.15. Based on the results in Table 4.15, when the testing accommodations were not used, there was a large effect between the blind and the sighted students' physics achievement in favor of the blind students. NAMAT scores of the blind students were higher than the VAMAT and NAMAT. Thus, the ES values between NAMAT and VAMAT or TAMAT have negative values for the blind students. Moreover, both the sighted and the blind students performed better on TAMAT than VAMAT with small and large ESs, respectively.

Table 4.15 The practically significant effect size values about the effect of using testing accommodations on the sighted and blind students' achievement

Compared test scores	Effect size
NAMAT_B vs NAMAT_S	0.84***
VAMAT_B vs NAMAT_B	-1,21***
TAMAT_B vs NAMAT_B	-1.02***
TAMAT_B vs VAMAT_B	0.82***
TAMAT_S vs VAMAT_S	0.22*

4.2.4 The Results Related to the Third Research Problem

The third research problem is related to the effect of instructional and testing accommodations on students' various affective characteristics, and the research question is "What is the effect of using instructional and testing accommodations on sighted and blind ninth grade students' pre and post-tests of physics self-efficacy, attitude towards physics course, self-esteem, and test anxiety in Bursa and Sakarya?". The results for this research question is given for physics self-efficacy, attitude towards physics course, self-esteem, and test anxiety, respectively in Table 4.16, Table 4.17, Table 4.18, and Table 4.19.

For each affective characteristic, relevant scales were analyzed considering their dimensions. For PSEF, PATT, SEST, and TANX and their sub-dimensions, the effect sizes were calculated by using the pre-tests of blind and sighted students to determine the initial status of blind and sighted students. Effect sizes in the last situation, after using testing accommodations, were calculated with the post-tests to determine the effect of using instructional and testing accommodations on the sighted and the blind students' post-tests of PSEF, PATT, SEST, and TANX. To examine the effect of using instructional and testing accommodations on the blind students' PSEF, PATT, SEST, and TANX, post and pre-tests of the blind students were used. Similarly, when investigating the effect of using instructional and testing accommodations on the sighted students' PSEF, PATT, SEST, and TANX, post and pre-tests of the sighted students were used.

As presented in Figure 4.5, the physics self-efficacy of the blind students is higher than the sighted students both in pre and post-test, and the mean difference between the scores of sighted and blind students is greater in post-test.

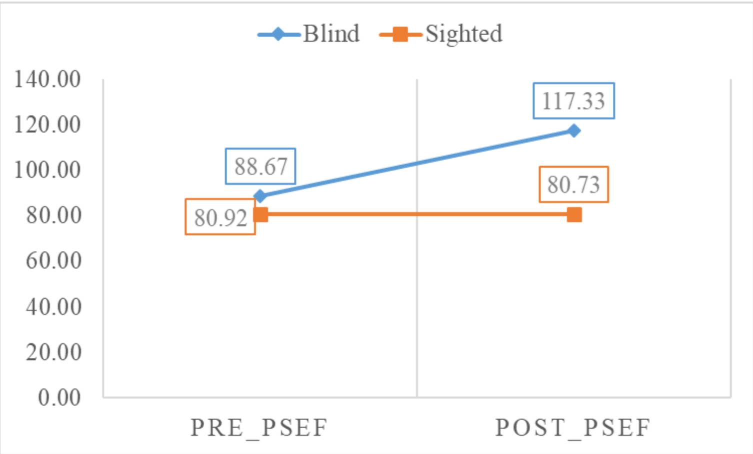

Figure 4.5 The mean scores of sighted and blind students on pre and post physics self-efficacy

In Table 4.16, the results about the effect of using instructional and testing accommodations on the sighted and the blind students' physics self-efficacy are given with the ES values for PSEF and sub-dimensions of EA, SC, CU, HCS, and PW. The ES value that was calculated with the total scores of pre-tests for blind and sighted students has a small value ($M_{Pre\_PSEF\_TOTAL\_B}$ = 88.67, $M_{Pre\_PSEF\_TOTAL\_S}$ = 80.82, SD_{pooled} = 16.69, ES = 0.46). Only the SC dimension has a small positive ES value for pre-tests of blind and sighted students. Even though the blind students mostly have a higher physics self-efficacy than the sighted students at the beginning of the study, there is a negative medium value on PW. When ES values that were calculated with post-tests of blind and sighted students were investigated, it is seen that all ES values are large and increased when compared to ES in the pre-tests. The greatest increase is in SC dimension (Pre_PSEF, blind vs sighted: ES_{SC} = 0.20; Post_PSEF, blind vs sighted: ES_{SC} = 2.19), while the following increase is seen in PW which has a negative value at the beginning (Pre_PSEF, blind vs sighted: ES_{PW} = -0.65; Post_PSEF, blind vs sighted: ES_{PW} = 1.14).

While comparing pre and post-test total scores for the blind students and also for the sighted students, ES of the blind students has a large positive value ($M_{Post\_PSEF\_TOTAL\_B}$ = 117.33, $M_{Pre\_PSEF\_TOTAL\_B}$ = 88.67, SD_{pooled} = 14.12, ES = 2.03) and ES of the sighted students has a value near 0 and negligible ($M_{Post\_PSEF\_TOTAL\_S}$ = 80.73, $M_{Pre\_PSEF\_TOTAL\_S}$ = 80.92, SD_{pooled} = 17.60, ES = -0.01). According to the results, it can be said that the effect of using instructional and testing accommodations has a greater effect on the blind students' PSEF. The ESs of the blind students are all greater when compared to the sighted students between pre and post-tests except the SC dimension. The ES values of SC have a negative large value for both the blind and the sighted students. This can be due to the decrease of mean score from pre to post-PSEF for both of blind and sighted student and the greater amount of decrease in average of the sighted students (Blind students: $M_{Post\_PSEF\_SC\_B}$ = 14.33, $M_{Pre\_PSEF\_SC\_B}$ =19.67, SD_{pooled} = 3.58, ES_{SC} = -1.49; Sighted students: $M_{Post\_PSEF\_SC\_S}$ = 9.44, $M_{Pre\_PSEF\_SC\_S}$ = 18.72, SD_{pooled} = 3.77, ES_{SC} = -2.46).

Table 4.16 The results about the effect of using instructional and testing accommodations on sighted and blind students' physics self-efficacy

Compared scores			ES
Pre_PSEF_TOTAL_B	vs	Pre_PSEF_TOTAL_S	0.46*
Pre_PSEF_EA_B	vs	Pre_PSEF_EA_S	0.91***
Pre_PSEF_SC_B	vs	Pre_PSEF_SC_S	0.20*
Pre_PSEF_CU_B	vs	Pre_PSEF_CU_S	0.96***
Pre_PSEF_HCS_B	vs	Pre_PSEF_HCS_S	0.51**
Pre_PSEF_PW_B	vs	Pre_PSEF_PW_S	-0.65**
Post_PSEF_TOTAL_B	vs	Post_PSEF_TOTAL_S	1.99***
Post_PSEF_EA_B	vs	Post_PSEF_EA_S	1.96***
Post_PSEF_SC_B	vs	Post_PSEF_SC_S	2.19***
Post_PSEF_CU_B	vs	Post_PSEF_CU_S	1.76***
Post_PSEF_HCS_B	vs	Post_PSEF_HCS_S	1.82***
Post_PSEF_PW_B	vs	Post_PSEF_PW_S	1.14***
Post_PSEF_TOTAL_B	vs	Pre_PSEF_TOTAL_B	2.03***
Post_PSEF_EA_B	vs	Pre_PSEF_EA_B	3.31***
Post_PSEF_SC_B	vs	Pre_PSEF_SC_B	-1.49***
Post_PSEF_CU_B	vs	Pre_PSEF_CU_B	0.99***
Post_PSEF_HCS_B	vs	Pre_PSEF_HCS_B	2.30***
Post_PSEF_PW_B	vs	Pre_PSEF_PW_B	3.94***
Post_PSEF_TOTAL_S	vs	Pre_PSEF_TOTAL_S	-0.01
Post_PSEF_EA_S	vs	Pre_PSEF_EA_S	0.24*
Post_PSEF_SC_S	vs	Pre_PSEF_SC_S	-2.46***
Post_PSEF_CU_S	vs	Pre_PSEF_CU_S	-0.58 **
Post_PSEF_HCS_S	vs	Pre_PSEF_HCS_S	0.43*
Post_PSEF_PW_S	vs	Pre_PSEF_PW_S	1.82***

The sighted and blind students' attitudes towards physics are presented in Figure 4.6 with their mean scores on pre and post-test of PATT. In Figure 4.6, it is seen that the blind students' attitudes towards physics is higher than the sighted students in both pre and post-test and had a greater increase from pre to post-test than sighted students.

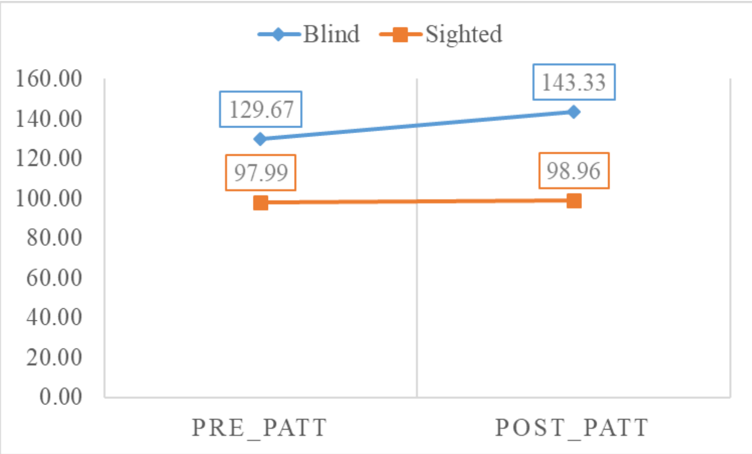

Figure 4.6 The mean scores of sighted and blind students on pre and post physics attitude

The ESs related to the effect of using instructional and testing accommodations on the sighted and the blind students' attitude towards physics course is presented in Table 4.17. The ES values for PATT and sub-dimensions IMP, COMP, REQ, and INT are calculated between pre-test scores of the sighted and the blind students, between post-test scores of the sighted and the blind students, and additionally for the blind students between pre and post-test and for the sighted students between pre and post-test.

In pre-PATT, the blind students had a mean score of 129.67, and the sighted students had a mean score of 97.99, with a pool SD of 18.07, resulting in an ES of 0.60. Moreover, in the post-test, the blind students had a mean score of 143.33, and the sighted students had a mean score of 98.96, with a pool SD of 16.97, resulting in an ES of 2.62. Thus, at the beginning of the study, there was a medium effect size for the total of PATT and large effect size values in sub-dimensions in favor of the blind students. In post-test scores of PATT, it is seen that the already existing effect increased for the blind students.

While the lowest ES of the blind students between their pre and post-test scores in PATT is 1.06 and shows a large effect, the ES values of the sighted students range between -0,02 and 0.10, which means negligible. These results indicate that using the instructional and testing accommodations behaves in favor of the blind students' physics attitude.

Table 4.17 The results about the effect of using instructional and testing accommodations on sighted and blind students' physics attitude

Compared scores			ES
Pre_PATT_TOTAL_B	vs	Pre_PATT_TOTAL_S	0.60**
Pre_PATT_IMP_B	vs	Pre_PATT_IMP_S	1.50***
Pre_PATT_COMP_B	vs	Pre_PATT_COMP_S	1.64***
Pre_PATT_REQ_B	vs	Pre_PATT_REQ_S	1.01***
Pre_PATT_INT_B	vs	Pre_PATT_INT_S	1.55***
Post_PATT_TOTAL_B	vs	Post_PATT_TOTAL_S	2.62***
Post_PATT_IMP_B	vs	Post_PATT_IMP_S	1.76***
Post_PATT_COMP_B	vs	Post_PATT_COMP_S	2.40***
Post_PATT_REQ_B	vs	Post_PATT_REQ_S	1.84***
Post_PATT_INT_B	vs	Post_PATT_INT_S	2.27***
Post_PATT_TOTAL_B	vs	Pre_PATT_TOTAL_B	3.11***
Post_PATT_IMP_B	vs	Pre_PATT_IMP_B	4.07***
Post_PATT_COMP_B	vs	Pre_PATT_COMP_B	4.32***
Post_PATT_REQ_B	vs	Pre_PATT_REQ_B	1.06***
Post_PATT_INT_B	vs	Pre_PATT_INT_B	1.96***
Post_PATT_TOTAL_S	vs	Pre_PATT_TOTAL_S	0.05
Post_PATT_IMP_S	vs	Pre_PATT_IMP_S	0.10
Post_PATT_COMP_S	vs	Pre_PATT_COMP_S	0.05
Post_PATT_REQ_S	vs	Pre_PATT_REQ_S	-0.02
Post_PATT_INT_S	vs	Pre_PATT_INT_S	0.03

The self-esteem of the sighted and blind students' is given in Figure 4.7. The mean scores of blind students on pre and post-test of SEST are higher than the sighted students as in PSEF and PATT.

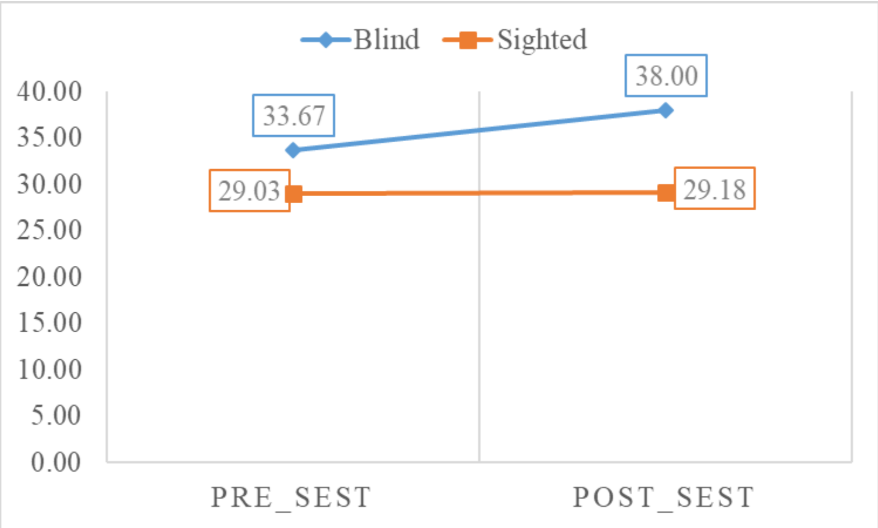

Figure 4.7 The mean scores of sighted and blind students on pre and post self-esteem

In Table 4.18, the results about the effect of using testing accommodations on the sighted and the blind students' self-esteem are shown. Looking at the initial ES value of 0.84, it is seen that the self-esteem of the blind and the sighted students are different from each other at the beginning of the study ($M_{Pre\_SEST\_TOTAL\_B}$ = 33.67, $M_{Pre\_SEST\_TOTAL\_S}$ = 29.03, SD_{pooled} = 5.52, ES = 0.84). The fact that the effect size increased to 1.52 after the instructional and testing accommodations were used indicates that the difference between the self-esteem of the groups increased ($M_{Post\_SEST\_TOTAL\_B}$ = 38.00, $M_{Pre\_SEST\_TOTAL\_S}$ = 29.18, SD_{pooled} = 5.79, ES = 1.52). According to the pre and post-tests of sighted students, the effect size is almost zero, while the effect size value is large for the blind students. While the use of instructional and testing accommodations did not have an effect on the self-esteem of sighted students ($M_{Post\_SEST\_TOTAL\_S}$ = 29.18, $M_{Pre\_SEST\_TOTAL\_S}$ = 29.03, SD_{pooled} = 5.71, ES = 0.03), they worked in favor of the blind students' self-esteem ($M_{Post\_SEST\_TOTAL\_B}$ = 38.00, $M_{Pre\_SEST\_TOTAL\_B}$ = 33.67, SD_{pooled} = 1.47, ES = 2.94).

Table 4.18 The results about the effect of using instructional and testing accommodations on sighted and blind students' self esteem

Compared scores			ES
Pre_SEST_TOTAL_B	vs	Pre_SEST_TOTAL_S	0.84***
Post_SEST_TOTAL_B	vs	Post_SEST_TOTAL_S	1.52***
Post_SEST_TOTAL_B	vs	Pre_SEST_TOTAL_B	2.94***
Post_SEST_TOTAL_S	vs	Pre_SEST_TOTAL_S	0.03

The mean scores on the test anxiety of the sighted and blind students' are given in Figure 4.8. The mean scores of blind students on pre and post-test of TANX are lower than the sighted students, and the decrease in the test anxiety of blind students is greater than sighted students.

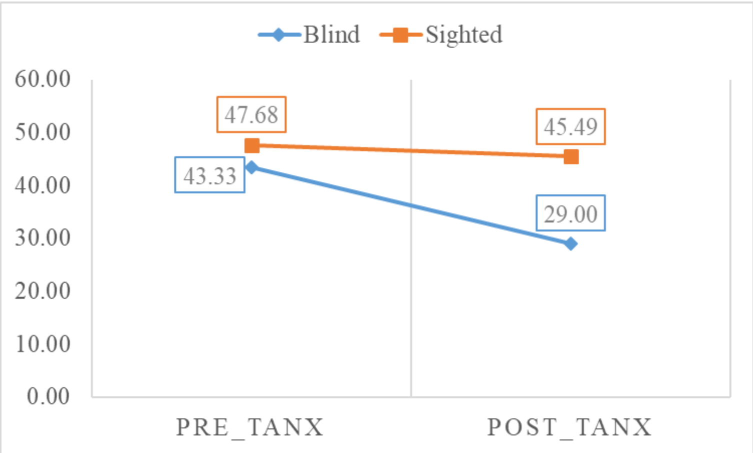

Figure 4.8 The mean scores of sighted and blind students on pre and post test anxiety

The results related to the effect of using testing accommodations on the sighted and the blind students' test anxiety is presented in Table 4.19. The ES values for TANX and sub-dimensions of WOR and EMO were found.

Table 4.19 The results about the effect of using instructional and testing accommodations on sighted and blind students' test anxiety

Compared scores			ES
Pre_TANX_TOTAL_B	vs	Pre_TANX_TOTAL_S	-0,33*
Pre_TANX_WOR_B	vs	Pre_TANX_WOR_S	-0,48*
Pre_TANX_EMO_B	vs	Pre_TANX_EMO_S	-0,20*
Post_TANX_TOTAL_B	vs	Post_TANX_TOTAL_S	-1,40***
Post_TANX_WOR_B	vs	Post_TANX_WOR_S	-1,46***
Post_TANX_EMO_B	vs	Post_TANX_EMO_S	-1,26***
Post_TANX_TOTAL_B	vs	Pre_TANX_TOTAL_B	-2,83***
Post_TANX_WOR_B	vs	Pre_TANX_WOR_B	-2,45***
Post_TANX_EMO_B	vs	Pre_TANX_EMO_B	-2.14***
Post_TANX_TOTAL_S	vs	Pre_TANX_TOTAL_S	-0,17
Post_TANX_WOR_S	vs	Pre_TANX_WOR_S	-0,17
Post_TANX_EMO_S	vs	Pre_TANX_EMO_S	-0,16

In Table 4.19, all ES values for TANX are negative. There is a negative small ES value when starting the study ($M_{Pre\_TANX\_TOTAL\_B}$ = 43.33, $M_{Pre\_TANX\_TOTAL\_S}$ = 47.68, SD_{pooled} = 13.33, ES = -0.33). At the end, between the post-tests of blind and sighted students, there is a large effect size which is also negative ($M_{Post\_TANX\_TOTAL\_B}$ =29.00, $M_{Post\_TANX\_TOTAL\_S}$ = 45.49, SD_{pooled} = 11.76, ES = -1.40). When any of the ES values between post and pre-tests that belong to the sighted students' are not practically significant, all ES values between post and pre-tests that belong to the blind students' are large. Although the use of instructional and testing accommodations also reduced test anxiety of the sighted students, this decrease is practically significant only for the blind students.

4.3 Summary of the Results

In the qualitative phase of the study, the problems of junior and senior high school blind students in science and physics courses about school and national examinations were determined by the interview. The results of the qualitative part of the study were used when planning the quantitative part of the study. The problems and suggestions about these problems were taken into consideration, and the qualitative part of the study was planned in such a way that the blind students could access instruction and examinations fairly as the sighted students by clearing their previous negative experiences. S7 and S8 were included in the development process of MAT since they used a more descriptive language in interviews. When writing verbal descriptions for VAMAT and creating tactile graphics for TAMAT, these two students read verbal descriptions and tested tactile graphics as explained in Chapter 3. The main findings and results of the qualitative phase of this study and the way they were used while planning the quantitative part of this study are summarized as follows:

1. The most expressed problem about presentation testing accommodations was about readers. In science and physics course examinations in schools, the classmates of the blind students or other subject teachers were frequently reading the exam questions. Lack of content knowledge, accent, and reading speed of readers were problematic issues. Besides lack of content knowledge and reading speed of readers, in national examinations sarcastic attitude, inappropriate question-reading techniques, and irritability towards the desire to read again were the problems that the blind students faced. The blind students suggested having readers content knowledge and training readers about question reading techniques and about how to behave to the blind students while reading the exam. In line with these problems and suggestions, a Teacher Guide for Testing Accommodations (Appendix G) was prepared and presented to the physics teachers of the blind students. Also, all blind students were asked whether they preferred the question booklet in Braille for all test items or not. All students preferred using a reader and Braille print for only tactile graphics. Physics teachers read the MAT questions in the quantitative part of this study according to the recommendations in this guide.

2. The exemption of blind students from questions that including visuals was also a problem about presentation testing accommodations. Using verbal description of questions containing figures or asking equivalent questions instead of these questions were suggestions of students. Asking equivalent questions was about testing modifications, where testing accommodations were about presenting the same questions in an accessible way to students with special needs. In this study, the blind students were asked questions containing visuals in MAT with verbal descriptions and tactile graphics testing accommodations. The blind students stated that they could have tactile graphics testing accommodations if they experience tactile graphics in courses and books before the examination. Thus, the blind students used the enriched course materials (ECM) and tactile physics textbook in the course. The tactile textbook also had two ink prints, one for the blind student's physics teacher and one for family or friends that accompanying the blind student's study. In the tactile physics textbook, the verbal descriptions and tactile graphics were prepared similarly as used in VAMAT and TAMAT.
3. Fairness of instruction and assessment is one of the main problems of the blind students. The science and physics teachers who do not say what they write on the blackboard, do not describe what they draw, do not allow the blind students to record voice and the materials used in the courses, inability of the blind students about taking notes due to the sound of the slate and stylus, not providing educational support for the blind students in physics lessons, facilitating courses and exams for the blind students are situations that create injustice in exams for the blind students. In the current study, in order for the instruction and the exams to be fair, the precautions regarding the presentation of the course and the exams were taken. For an accessible instruction, a Braille physics textbook with tactile graphics and verbal descriptions, and ECM were used. The questions including visuals in MAT were presented to blind students with verbal descriptions and tactile graphics.

4. The blind students stated that they were uncomfortable and anxious about taking the exam in a crowded and noisy setting. Each of the blind students took the exam individually in a noise-free environment in this study.
5. Not being given additional time in school examinations and inadequate additional time in national exams are the problems of the blind students regarding the timing of the exams. Therefore, as generally accepted in the literature, 50% additional time is given to the blind students in the current study.
6. About the response type of the exams, the blind students suggested answering audibly and answering with Braille options when answering, especially in school exams. In this study, MAT was a multiple choice test. All blind students preferred their teachers as encoders.

In the quantitative phase of the study, the effect of using testing accommodations on the sighted and blind ninth grade students' physics achievement was determined by administering non-accommodated, verbal descriptions, and tactile graphics testing accommodations conditions of the Motion Achievement Test to the sighted and the blind students. To understand the effect of using instructional and testing accommodations on the sighted and blind ninth grade students' physics self-efficacy, attitude towards physics course, self-esteem, and test anxiety, PSEF, PATT, SEST, and TANX were implemented to both the sighted and the blind students. The main findings and results of the quantitative phase of this study are as follows:

1. When the testing accommodations were not used in NAMAT, the blind students were exempted from questions containing visuals, while the sighted students answered all the questions. The blind students were more successful than the sighted students on NAMAT with a large ES value.
2. When the verbal description testing accommodation was used in VAMAT, the achievement of the blind students reduced when compared to NAMAT with a large ES, and the achievement of the sighted students decreased with a negligible ES. Using verbal descriptions testing accommodations affected the blind students' scores negatively more than the sighted students.

3. The scores of the blind and the sighted students were almost the same on VAMAT with a negligible ES. Using verbal descriptions testing accommodations revealed that the blind and sighted students have similar achievement levels.
4. When using tactile graphics testing accommodations in TAMAT was compared with NAMAT, the score of sighted students increased with a negligible ES, and the score of the blind students decreased with a large ES. While using tactile graphics testing accommodations affected the blind students' achievement negatively, they affected the sighted students positively.
5. The achievement level of blind and sighted students on TAMAT were nearly the same, with a negligible ES. Using tactile graphics testing accommodations resulted in similar achievement levels for blind and sighted students.
6. The achievement of both the blind and the sighted students were higher in TAMAT than VAMAT and resulted a large effect and small effect on the blind and the sighted students, respectively. Thus, both blind and sighted students performed better when tactile graphics testing accommodations were used when compared to verbal descriptions testing accommodations.

To sum up the effect of testing accommodations on the achievement of the blind and sighted students, when the testing accommodations were not used, and the blind students were exempted from questions containing figures, the achievement of the blind students was significantly higher than the sighted students. The achievement levels of blind and sighted students were similar when both verbal descriptions and tactile graphics testing accommodations were used.

7. The physics self-efficacy of the blind students was higher than the sighted students according to both pre-test and post-test results of PSEF, with small and large ES values, respectively. Using instructional and testing accommodations affected the physics self-efficacy of the blind students positively and did not affect the physics self-efficacy of the sighted students.

8. The blind students' attitudes towards physics are higher than the sighted students both in the pre-test and post-test, and the difference is greater in the post-test. When using instructional and testing accommodations affected the blind students' attitudes towards physics positively with a large ES, the attitude of sighted students' towards physics did not change.
9. The self-esteem of the blind students was higher than the sighted students according to both pre-test and post-test results of SEST with both large ESs. While the use of instructional and testing accommodations did not have an effect on the self-esteem of the sighted students, they worked in favor of the blind students' self-esteem with a large ES.
10. At the beginning of the study, according to the pre-test results of TANX, the test anxiety of the blind students was lower than the sighted students with a small ES. Similar to pre-test results, due to the post-test results of TANX, the test anxiety of the blind students was lower than the sighted students, but with a large ES. The use of instructional and testing accommodations decreased both blind and sighted students' test anxiety. The decrease in test anxiety was practically significant for the blind students with a large ES.

In summary, using the instructional and testing accommodations resulted a large increase for the blind students', and no difference for the sighted students' physics self-efficacy, physics attitude, self-esteem. When the use of instructional and testing accommodations created a large decrease on the test anxiety of blind students, the decrease on the test anxiety of sighted students was negligible. Using the instructional and testing accommodations had a greater effect on the blind students' affective characteristics that were examined in this study.

CHAPTER 5

DISCUSSION AND CONCLUSION

This study aimed to investigate how using testing accommodations affect sighted and blind ninth grade students' physics achievement about motion and various affective characteristics such as physics self-efficacy, physics attitude, self-esteem, and test anxiety. The use of testing accommodations would remove the barriers blind students face due to their disability situation.

Before examining the effect of testing accommodations, the blind students' current situation in school and national examinations was revealed with the content analysis results of the "interview form" data. The results of the content analysis were used to provide both a fair course and a fair testing condition. The blind students were given fair instruction accompanied by the enriched course materials (ECM) and the Braille physics textbook. With the prepared textbook, the blind students experienced verbal descriptions and tactile graphics. In order to examine the effect of using testing accommodations on the achievement of sighted and blind students about motion, the MAT was applied to the sighted and the blind students without the testing accommodations, with verbal description testing accommodation and tactile graphics testing accommodation. Physics Self-Efficacy Scale (PSEF), Physics Attitude Scale (PATT), Self Esteem Scale (SEST), and Test Anxiety Inventory (TANX) were applied to investigate the effect of using instructional and testing accommodations on physics self-efficacy, physics attitude, self-esteem, and test anxiety of sighted and blind students, respectively.

5.1 Validity of the Results of the Study

Although the terms used for validity in the qualitative and quantitative paradigms differ, showing the accuracy and credibility of inferences drawn from the results of the study is essential for both cases. Since qualitative and quantitative paradigms were used in this study, the validity is discussed for two paradigms.

5.1.1 Validity of the Results of the Qualitative Phase

In the qualitative paradigm, ensuring trustworthiness is the researcher's indication of the worth and credibility of the study. For ensuring trustworthiness, the issues that Lincoln and Guba (1985) called attention to are credibility, transferability, dependability, and confirmability.

Credibility is related to rely on the authenticity of the findings and the "congruence" between the participants' views and the researcher's representation of them (Nowell, Norris, White, & Moules, 2017). In the qualitative part, a number of precautions were taken to ensure credibility. In the qualitative part, the participants were blind students. In interviews with the blind students, it was important that the students answered the interview questions sincerely, without showing any shyness, and that I could ask questions which I could gain in-depth knowledge by understanding the problems related to the situation. For this reason, long before the interviews with the blind students, I met with the managers of the rehabilitation centers and the sports club and gave information about the study. These were places where students regularly went and where I conducted my interviews. Two months before the interviews, I started going to these places once or twice a week. Many of the students knew me and were chatting with me. Thus, I established a prolonged engagement with participants. The teachers and administrators at the centers trusted me and made the students accept me as a member of the community. These strategies also provided referential adequacy for me. According to Frankel and Wallen (2009), understanding the group's values and traditions allows the researcher to obtain valid and reliable information in interviews. The interviews started after this relationship was established. Thus, I was sure that the answers given by my participants were sincere.

Transferability shows the applicability of findings in other contexts. The thick descriptions that were given about the research environment, events and people, how the data was analyzed, how codes and themes were established in Chapter 3 were the evidence for establishing transferability.

While dependability is about the consistency and reproducibility of the findings, conformability is related to the neutrality of the findings obtained without the bias of the researcher. For enhancing dependability and conformability, audit trial is a suggested technique (Lincoln & Guba, 1985; Merriam, 1995). To provide audit trail evidence, codes, categories, and related excerpts from transcripts of audio recordings are presented in Chapter 4, and sample raw interview data is provided in Appendix B.

5.1.2 Validity of the Results of the Quantitative Phase

Fraenkel and Wallen (2009) defined internal validity as the observed differences on the dependent variables are due only to the independent variables and not to other variables. There are various threats to internal validity for a study such as subject characteristics, mortality, location, instrumentation (instrument decay, data collector characteristics, and data collector bias), testing, history, maturation, attitude of subjects (Hawthorn effect, John Henry effect), regression, and implementer threats. When Fraenkel and Wallen (2009) stated subject characteristics as the main threat to internal validity in causal comparative research, loss of subjects (mortality), location, instrumentation, history, and maturation were also other threats to internal validity.

In this study, the subject characteristics of blind and sighted students were determined by the Student Information Form. In Chapter 3, the information about subjects was given in detail. The percent of male students was higher for both the sighted and the blind students. The age, gender distribution, and mean of the last physics course grades of the students were nearly equal in three inclusive classrooms.

These can be evidence that the threat of subject characteristics was controlled in this study.

For controlling the mortality threat, the date of implementing tests and scales was planned against extreme events to converse the sample size. At the beginning of the study, the students were informed that it is very important for the study to attend the physics classes, and they were asked not to be absent on the days of physics classes and tests throughout the study. Although there were no absent students on the test days, two students were removed from the data of PSEF and PATT due to problems in marking the post-test as stated in Chapter 4. However, these losses are acceptable.

To control the location threat, the following precautions were taken. The class sizes and physical characteristics of classes were similar in all three schools. The physics teachers were allowed to use only textbooks and enriched course materials in the lesson. While the sighted students took tests in their classes with similar physical characteristics without talking to each other, all three of the blind students took the tests at their school in a quiet and undisturbed environment where they had previously taken their physics exams.

Since the MAT had multiple choice questions and the scales about students' affective characteristics had Likert-type items, the instrument decay threat was controlled. In order to control data collector characteristics, the researcher had been in all of the three inclusive classrooms during instruction and implementing MAT and affective scales. Moreover, to lower down the data collector bias, the researcher informed all physics teachers about the layout of the testing environment for sighted and blind students beforehand.

Although the achievement test did not have a pre-test in this study, three tests including different testing accommodation conditions had to be administered to each student. To minimize the testing threat, the testing sequence of non-accommodated (NAMAT), verbal descriptions (VAMAT), and tactile graphics testing accommodations condition of Motion Achievement Test (TAMAT) were differed in three inclusive classrooms. In School A, tests were implemented in the order of

NAMAT, VAMAT, and TAMAT. In School B, the sequence of testing was TAMAT, NAMAT, and VAMAT. Lastly, in School C, the order of the tests was VAMAT, TAMAT, and NAMAT. In addition, the five-week time interval between the pre-tests and post-tests of the scales measuring affective characteristics minimized the testing threat.

It was avoided to administer tests on the days with extreme events, and also the instruction and testing process in three inclusive classrooms were observed by the researcher, and no unplanned event or situation was observed by the researcher that might affect the responses of the students. As a result, the history threat is not a problem of this study.

Since the students attending this study were ninth graders and at similar age, the five-week time period did not create a maturation threat for these students.

The attitude of subjects threat was controlled by using the same instruments and tests for the sighted and the blind students. During the instructions, both the sighted and the blind students used ECM and physics textbooks. By using the tactile textbook in the courses, the novelty effect of using tactile graphics was minimized for the blind students. While testing, the items were the same for the sighted and the blind students, and the students knew that the questions in the exam were the same for all students. These can be evidence that the attitude of subjects threat was controlled in the current study.

The students were in intact groups and did not have extremely low or high performances at the beginning of the study. Thus, the regression threat is assumed to be controlled.

To control the implementation threat, before starting testing, the testing instructions prepared for both the sighted and the blind students were read aloud by the teacher. The physics teachers were given the guide for implementing testing accommodations. The researcher checked whether the teachers used ECM, followed the textbook during the instruction, and used the testing accommodations during MAT properly. Thus, implementation threat is assumed to be minimized.

The extent to which the results of a study are generalizable is related to the external validity of the study (Fraenkel & Wallen, 2009). The external validity can be examined with the concepts of population generalizability and ecological generalizability. While population generalizability is related to the extent to which the sample represents the population, ecological generalizability is related to the extent to which the results obtained in the study can be generalized to different environments and conditions.

The accessible population is ninth grade inclusive classrooms' students which include at least one blind student in the provinces of Bursa and Sakarya. There were four inclusive classrooms meeting these criteria in Bursa and Sakarya. Although it is intended to work with the whole accessible population instead of selecting a sample, since one of the blind students in Sakarya did not attend school, the students in three of the inclusive classrooms are included in the study. In this case, almost all of the accessible population has been studied. In spite of there is no concern for population generalizability since almost the entire accessible population is studied, it is important to define the environment in which the study was conducted for the ecological generalizability of the study. All three of the inclusive classes were in Anatolian High Schools, and there was a blind student in each class. There were not any other students in the class with different disability groups, and the blind students had no disabilities other than vision. All blind students could read Braille. All three schools were in the city center, and the physics achievement level of the inclusive classes was at a moderate level. The physics lesson in School A and B is before noon, while in School C the lesson is in the afternoon. In all three inclusive classrooms, ECM and textbooks were used as course materials. In all three inclusive classrooms, the sighted students took the tests in the classroom environment, while the blind students took the tests individually in quiet environments where they had been tested in physics courses before. Therefore, the results of the study can be generalized to the similar ecological conditions described above.

5.2 Discussion of the Results

In this section, the results of the current study are compared with the results of the previous related studies. Although there are various studies to determine the problems faced by blind people in examinations, the number of studies that determine the problems of blind students in science and physics courses is restricted. Besides, the number of studies investigating the effects of testing accommodations on physics achievement and various affective variables is quite limited. For this reason, in the discussion section, the studies searching the problems of blind students about examinations in different subject areas and investigating the effects of testing accommodations on not only physics achievement but also in other subject areas were also examined.

In this mixed method study, in the qualitative part, the blind students stated problems and made suggestions mostly about the presentation, justice, setting, timing, and response, respectively, in school and national examinations of science and physics courses.

In the qualitative part of the current study, the blind students thought that the most problematic issue about presentation testing accommodations was readers. This result is similar to various studies in the literature (Bayram, 2014; Kamış & Demir, 2018). In the study of Kamış and Demir (2018), the difficulties in classroom assessment processes experienced by undergraduate students with visual impairment in various faculties and departments of universities in Ankara were searched by interviews conducted with 17 visually impaired students and three lecturers, and the reader was the code that had the highest frequency about the implementation of examinations. Bayram (2014) interviewed four visually impaired students to explore the academic and social challenges of visually impaired students in learning high school mathematics in Turkey, and students claimed that they could not reach the questions on written exams and examinations as their peers due to uneducated readers. In this study, the blind students suggested their teachers to be educated about instruction and how to test visually impaired students as Tindal and Fuchs (2000) stated the importance of teachers being trained in the determination and implementation of testing accommodations. The blind students recommended that readers in national examinations should be trained about question reading techniques and behaviors towards blind students. In addition to these, the blind students stated that the questions should be read by the readers with content knowledge because the readers tried to explain the visuals in The Transition System from Elementary Education to Secondary Education (TEOG) and could not explain them due to their insufficient knowledge. This situation revealed that the readers who should only read the verbal descriptions in the exams also try to explain the figures to the students with their own sentences. In addition to these results, in our study, it was determined that the classmates of blind students were also assigned to read the questions in the school exams. It has been understood that the read-aloud testing accommodation in school exams and in national exams are quite inconsistent. Clapper, Morse, Thompson, and Thurlow (2005) reported that readers should have information about the student group and emphasized that readers should be given written or online guides for consistency and standardization and that readers should receive training on how to use the guidelines. Thus, the teacher guide prepared in line with the qualitative research results to be used while implementing the testing accommodations is also consistent with the studies in the literature.

The exemption of blind students from questions that including visuals was also a problem stated by the blind students about presentation testing accommodations. Using verbal description of questions containing figures, asking equivalent questions instead of these questions of Braille print were suggestions of the blind students in the qualitative part of this study. This result was in line with what Çobanoğlu et al. (2018) found. In the descriptive study they carried out by taking expert opinions, what kind of accommodations can be made for questions containing figures, the experts stated that they did not find it appropriate to remove the questions in terms of content validity and that these questions could be asked with Braille booklets by reading aloud or by using equivalent questions.

The blind students stated that they could use tactile graphics in exams only if they learn them in lessons are in line with the implications for practice of the study conducted by Bolt and Thurlow (2004) about the most frequently allowed testing accommodations. Bolt and Thurlow (2004) stated that the student's first encounter with the testing accommodations in the exam would limit their benefit from the testing accommodation. For this reason, they recommended that the arrangements to be used in the exam should also be used during the lesson and stated that this would ensure that the student became familiar with the testing accommodations.

The issues about the fairness of instruction and assessment were also the results of the qualitative part of the current study. The blind students in the qualitative part of this study stated that taking notes like sighted peers in physics courses and especially the presentation of visual subjects are not fair at all. Beck-Winchatz and Riccobono (2008) expressed the same problem about graphical representations in science courses. Unlike these findings in the study of Rosenblum and Herzberg (2015), 12 students in 6^{th} to 12^{th} grades stated that, albeit of low quality, they took Braille materials and used tactile graphics in math and science classes. The blind participants of our study stated that facilitating instruction is not a solution but rather a problem and made suggestions to give the necessary importance to educational support in physics lessons for fairness. Similarly, the Association of the Visually Impaired in Education (EGED) (2019) reported that instead of presenting the curriculum to visually impaired students in an accessible way, methods such as simplification, facilitation, and exemption are not appropriate.

According to the results of the current study, the blind students stated problems about justice not only in the educational environment but also in the assessment process, and they made suggestions about them. None of the eight students think that assessment is fair in the science and physics courses and in the national exams. The suggestions of the students to ensure fairness about assessment were educating readers, removal of the exemption from questions containing visuals, and presenting visual questions to the student in different ways. Similar problems and suggestions were made about the national examinations in Turkey in the study of Şenel (2015), in which interviews were conducted with six visually impaired university students who took the university exam at most two years ago. According to her study, some blind students stated that insufficient information on the determination and evaluation of exempted questions was unfair to them.

In this study, the problem revealed about the setting of the testing was crowded and noisy testing environment. This problem is especially seen in school exams. In the study of Kamış and Demir (2018), it was also stated by university students that taking the exam in a classroom where other students are present is disturbing.

Lack of additional time in school exams and insufficient additional time in national examinations was the problem of the blind students about the timing of the exam. These results are consistent with the fact that there is no regulation for the additional time to be given in school exams, and additional time given to blind students in both high school transition and university entrance exams is less than 50% which is commonly recommended in the literature (Wetzel & Knowlton, 2000).

According to the results about the response type of the exam, answering audibly is a problem and answering with Braille is a suggestion of the blind students, especially in school exams. This result is supported by the result of the study conducted by Bell and Silverman (2019). Bell and Silverman (2019), online surveyed blind and visually impaired 49 youth, at the average age of 14.98, about their experiences of accessing math and science-related content in schools. They reported in the results that the most frequently used methods for taking tests were Braille and responding with Braille on paper (37.50%).

In the quantitative part, it was determined that when the blind students were exempted from the questions containing visuals, the achievement of the blind students was practically significantly higher than the sighted students. For the sighted students, using neither tactile graphics nor verbal descriptions testing accommodations did not have an effect when compared to non-accommodated testing condition. On the other hand, using testing accommodations decreased the achievement of the blind students when compared to non-accommodated testing condition. In the study of Lang et al. (2008), 102 fourth-grade students in which 43 students with disabilities and 68 eighth-grade participants in which 32 students with disabilities from nine schools were taken a widely used math and reading test with and without testing accommodations. Since the disability type of the students was heterogeneous, the accommodations were determined according to students' needs. According to the results of this study, testing accommodations had a small effect for students with disabilities and did not have an effect for students without disabilities on reading and math scores (ES: 0.41 and ES: 0.13 on reading and ES: 0.32 and ES: 0.15 on math, for students with disabilities and students without disabilities, respectively). In another study by Dembitzer (2016), testing the effectiveness of testing accommodations, 83 students without functional impairment in reading fluency, and 44 students with functional impairment in reading fluency on twelfth grade from three high schools took a reading comprehension test under non-accommodated and audio presentation plus extended time testing accommodations conditions. According to the results of this study, neither of the groups had a significant increase on the accommodated condition. While the results in the current study for the sighted students are consistent with previous studies, the results for blind students differ from the literature. The decrease in the scores of blind students while using testing accommodations can be explained by the change in the content validity of the test with the use of the testing accommodations. As Dembitzer (2016) stated, the purpose of the testing accommodations is not to ensure the students with special needs get high scores but to ensure the students with special needs can access the content of the test regardless of their disabilities like other students. In this study, MAT under non-accommodated testing condition measured two objectives with three questions in total, while it measured all three of the three objectives that were the focus of the study when the tactile graphics and verbal descriptions testing accommodations were used, and blind students were able to reach all 12 questions in MAT. In non-accommodated testing condition, the blind students were not asked questions about the second objective related to graphics, and their performance on this objective could not be assessed as sighted students. In this case, it can be said that the inferences made with the scores obtained from the non-accommodated MAT are not valid. Moreover, this is explained by Kavanaugh (2017) by the fact that students cannot access the tests because of their special needs, and due to this construct irrelevant variance, the tests cannot measure what students know. When the scores of the sighted students were re-calculated as they were exempted from the questions including visuals like their blind peers, the mean score of the sighted students increased. Excluding questions containing visuals from the exam increased the achievement of both student groups. In previous studies, it was stated that the subjects containing visuals were difficult to understand for both sighted and blind students. Sahyun (1999) pointed out the graphics, which are frequently used in physics lessons, as a reason why students have difficulty in understanding physics. It has been revealed by various studies that students have serious problems with kinematic graphics (Goldberg & Anderson, 1989; McDermott, et al., 1987; Tebabal & Kahssay, 2011). In addition, it was determined that blind students had problems with graphics as well as sighted students (Bülbül et al., 2015; Rosenblum & Herzberg, 2015; Schoch, 2010). While the achievement of the blind students is calculated by removing visual questions from the test, determining the achievement of the sighted students by considering all questions does not only affect the content validity of the test but also causes questions of different difficulty to be taken into account for the two groups.

When verbal descriptions and tactile graphics testing accommodations were used, it was seen that the physics achievement of the blind and sighted students on motion were similar. The fact that blind students using tactile graphics in this study achieved similar results with their peers who received the same graphics in printed form is consistent with the result in Schoch's (2010) study that the group of students who took the mathematical questions containing graphics with tactile graphics and the students with low vision who received them in large font received similar scores. A math test consisting of 12 questions with graphics was applied to 10 visually impaired students in the study of Schoch (2010). Five blind students took the test with tactile graphics, and five low vision students took the test with large print. The mean difference between the groups were not significant (tactile graphics: M = 0.45 and SD = 0.21, large print: M = 0.55 and SD = 0.27). When MAT was implemented with verbal descriptions or tactile graphics testing accommodations, all students reached the test under the same conditions, and as Schulte (2010) reported, the standardization of the achievement tests with testing accommodations allows the comparability across students since they cover all objectives regardless of disability status.

As in this study, the groups with different disability status were tested with a testing accommodation condition by Elliott and Marquart (2004) and resulted in similar scores for groups with and without disabilities. In their study, Elliott and Marquart (2004) used extended time testing accommodation for 97 eighth grade students. The 23 students who had disabilities were selected in this study only if extra time was listed in their individualized education programs as an appropriate accommodation. Although the remaining 74 students did not have any special needs, 23 of these students were rated as an educationally at-risk group in mathematics by their teachers. The last 51 students were at or above the expected level in math. Both students with and without disabilities had similar performances under extended time testing condition as in our study the blind and sighted had similar scores in both the verbal description and tactile graphics conditions.

Both the blind and the sighted students performed significantly higher while using tactile graphics testing accommodations compared to verbal description testing accommodations in this study. When using tactile graphics resulted a large effect on the scores of the blind students, a small effect on the scores of the sighted students also occurred. Prescher, Bornschein, and Weber (2014) surveyed 78 blind, 24 low vision individuals about the exploration of tactile graphics and construction of tactile graphics on their own. 78 of the participants have experience about exploring tactile graphics, and 58 of the participants have created tactile graphics on their own before. The participants who have explored tactile graphics before were asked about how they would like to have access to images. More than half of the 78 participants preferred tactile graphics with a supplemental description (N = 41). Only four of the respondents preferred a verbal description rather than a tactile graphic. In our study, the fact that blind students obtained higher scores when using tactile graphics than when using description testing accommodation is consistent with the results of Prescher et al. (2014). The blind students benefited from tactile graphics testing condition more than the sighted students when compared to the testing situation including verbal descriptions instead of visuals.

While instructional and testing accommodations were used, the blind students' physics self-efficacy, attitude towards physics, self-esteem increased, and test anxiety reduced with large effect sizes. Unlike that, physics self-efficacy, attitude towards physics, self-esteem, and test anxiety of the sighted students did not change when instructional and testing accommodations were used. In the current study, the accommodations were used during instruction and also during testing, similar to Witmer et al. (2015). Witmer and his colleagues examined the effects of using the read-aloud accommodation in instruction on students' growth in math and reading achievement, locus of control (LOC), and self-concept, unlike studies using accommodations only during testing and exploring their effect on affective variables (Witmer et al., 2015). They studied with 378 students that were diagnosed with learning disability, cognitive impairment, emotional disability, or other health impairment. 70 of the students who had reader/interpreter accommodation during instruction according to their individualized education program were given read-aloud accommodation during instruction with a human assistant. According to the results of the study, a relationship between read-aloud accommodation and LOC was found, but no effects on academic growth were detected. The results of the study conducted by Feldman et al. (2011) support the results of the current study about self-efficacy. In the mentioned study, using testing accommodations increased the self-efficacy scores of the students with special needs from pre to post-test with a medium effect size of 0.51 and had no effect on the self-efficacy of the students without special needs. Self-efficacy is a construct that is related to the academic performance of students (Bandura & Adams, 1977; Hung & Wu, 2018; Lindsay, 2016). It was determined that the three blind students who participated in our study got very high scores in the exam of physics course at school. When Student A had the highest physics exam score, Student C had the second highest score among 108 students. The physics exam score of Student B was the third highest score in his classroom. Since self-efficacy beliefs of students have shown to be related to students' academic performance, higher physics self-efficacy scores of the blind students than the sighted students in the pre-test can be explained by the higher performance of the blind students in the physics course exam (Multon, Brown, & Lent, 1991). Thus, blind students feel more confident than sighted students about their abilities in physics courses.

In the study of Bülbül (2014), the motivation and attitude towards physics course for both sighted and totally blind students increased with a large effect size when enriched course materials were used from pre to post-test (ESs are 3.52 and 1.00 for the sighted and the blind students, respectively). While the results of our study on attitude towards physics are compatible with the results of Bülbül (2014) for the blind students, they differ for the sighted students. In our study, it should be taken into account that the accommodations were made both in instruction and in testing, and this combined effect created a large ES of 3.11 for the blind students on physics attitude.

Self-esteem is defined as the positive and/or negative evaluations that a person makes and traditionally maintains of himself/herself in relation to her ability, competence, achievement, and worth by Beaty (1991). Bano, Anjum, and Pasha (2015) expressed the dynamic nature of self-esteem since it can be changed by lived experiences, and Beaty (1991) expressed the variability about the results of studies on self-esteem conducted with visually impaired individuals. While some studies have stated that visually impaired people have higher self-esteem than sighted people, some studies have found that self-esteem is the same. Gürel (2007) found that there is a significant difference between 24 sighted and 24 visually impaired adolescents aged between 13 and 19 in favor of sighted students. Bano et al. (2015) assessed the self-esteem level of university students with a self-esteem scale. Among 93 participants, 42 students had disabilities, and 15 of them had visual disabilities. They determined that there was no significant difference in self-esteem of students with and without disabilities. In the study of Beaty (1994), the self-esteem of visually impaired college students and students without disabilities were compared. Although there was no significant difference between the self-esteem scores of the groups, visually impaired students had slightly higher scores. Tuttle and Tuttle (2004) stated that the level of blind individuals' self-esteem is affected by the extent to which there is a lack or lose of independence in everyday activities such as home management, travel, reading, or writing. On the other hand, social competence is associated with high self-esteem in individuals with visual impairment (Doğuş & Şafak, 2019; Wagner, 2004). The fact that the blind students participating in our study have independent mobility skills and that they are supported by their families for both educational and social activities may explain the high self-esteem of the blind students at the beginning of the study. Rickey (2005) conducted a qualitative study to reveal the decision-making process of testing accommodations by interviewing stakeholders who are in the decision-making process and by observing the individualized education plan meetings for nine students in three middle schools. According to the results of the study, parents and educators indicated increasing self-esteem and reducing anxiety of students as a reason for using testing accommodations. In addition, while the only reason for using testing accommodations in one of the schools was to improve the affective status of the students, in the other two schools, the improvement of the students' affective status was shown as the main reason for using the testing accommodations. Thus, the accommodations made during both instruction and testing might increase the self-esteem of blind students.

In recent studies, students with disabilities reported high levels of stress and frustration when taking tests (Peleg, 2009; Salend, 2011). Inadequate teaching and learning opportunities, lack of supervision, society attitudes might be the cause of test anxiety for students with visual disabilities. Although there are many reasons why students have high test anxiety, low grades in the past are also one of them. The low grades students have received in a course in the past can cause high anxiety about tests (Cizek & Burg, 2006). In the current study, the test anxiety of the blind students before the instruction was lower than the sighted students, and they had higher physics exam scores than the sighted students. Besides higher grades, the blind students had higher self-esteem than the sighted students. Previous studies express the inverse relationship between test anxiety and self-esteem (Peleg, 2009). Peleg (2009) conducted a study with 52 students with learning disabilities in special education high school and 50 students without learning disabilities in regular high school and found that students with learning disability had higher levels of test anxiety and lower levels of self-esteem when compared to their peers without disabilities. The blind students feel more comfortable and relaxed in our study with their higher test scores, and the higher self-esteem is consistent with previous studies.

After an instruction and testing with accommodations, the test anxiety of the blind students decreased with a large effect size when the test anxiety of the sighted students did not change. This result is congruent with the results of Datta and Talukdar (2017). They interviewed 14 visually impaired students and nine students with intellectual disabilities aged between 15 and 25, their parents, and teachers. They searched the influence of educational support services on the test anxiety of students. According to the results, the majority of students with visual disabilities, their parents, and all teachers stated that the accommodations that support services made during instruction and testing reduce the test anxiety of the students.

5.3 Conclusion of the Study

The use of mixed design in this study provided exploring the situations that the blind students thought they had problems in instruction and assessment who have similar characteristics to the group to be studied in the quantitative phase, and revealing the effect of testing accommodations on their physics achievement and various affective characteristics.

- On the basis of qualitative results, the blind students specified problems about equal access to instruction and assessment processes. The late arrival of the textbooks and the accessibility of their content, the inaccessible instruction methods of teachers, the easier questions to be asked in the school exams than the peers, the inconvenience of the readers both in the school exams and the national exams, the description of the visual questions in the high school transition exams without presenting the visual, being exempt from visual questions in the university entrance exam are the main problems stated by the junior and the senior high school blind students. The students welcomed the suggestion of presenting the questions containing visuals as tactile graphics in the exams, provided that they learned these contents in the course. In order to reveal the impact of testing accommodations, it was extremely important to understand the specific needs of the group to be studied and to plan the study in line with these needs.

- It has been determined that the blind students have the highest achievement scores in testing accommodation condition where they are exempted from the questions containing images, that is when testing accommodations are not used. It was seen that there was an increase in the scores of the sighted students in the scoring made by removing the questions containing visuals. Removing the questions containing images increased the scores for both groups. Exemption of the blind students from the visual questions is an advantage for the blind students. Although the purpose of the testing accommodations is to ensure fairness in the tests and to interpret the test scores more accurately, it is seen that non-accommodated testing condition that covers the exemption of questions containing images in this study, and which is used in some national examinations as a testing accommodation, gives results contrary to the purpose of the testing accommodations.
- In testing conditions where verbal descriptions and tactile graphics testing accommodations were used, the achievement scores of the blind and the sighted students are almost the same. This means that the blind students can perform as well as the sighted students when appropriate testing accommodations are used, even if exam questions contain images. In

addition, both the blind and the sighted students scored significantly higher while using tactile graphics testing accommodation rather than using verbal descriptions.

- The accommodations made during the instruction and testing increased the physics self-efficacy, attitudes towards physics, and self-esteem of the blind students while reducing their test anxiety. There was no change in the related affective status of the sighted students. Considering this result, it can be said that the accommodations made in the instruction and in the testing process are in favor of the affective characteristics of the blind students.

5.4 Implications of the Study

The following implications can be offered to the teachers, school administrators, blind students, textbook writers, Republic of Turkey Ministry of National Education (MEB), and Measurement, Selection and Placement Center (ÖSYM) based on the results of this study.

For teachers:

- The results of the qualitative phase of the study indicated that the blind students have problems about accessing course content due to the inaccessible presentation style of their teachers. This fairness is dominant especially in subjects including visuals. Instead of using "this, that" statements, the teachers should say what they wrote on the board and explain the visuals they draw.
- Since blind students perceive it as a problem to be asked very easy questions instead of questions including visuals in the school exams, it is recommended that the teachers assess blind students at the same level as sighted students after providing accessible course content to blind students. Students can be introduced to verbal descriptions and tactile graphics testing accommodations in the instruction process, and they can be assessed to be

responsible for the same content as sighted students with these testing accommodations.

- The fact that the questions are not read by the teacher to the blind students in the school exams is a situation that disturbs the blind students. Examinations held in crowded environments, lack of additional time, and students are not offered response options other than read-aloud answering are among the problems stated by the blind students in school exams. For this reason, the teachers should read the questions in the exams themselves, organize their exams in a quiet environment, with sufficient additional time, give the blind students the option of writing their answers in Braille, and allow blind students to read their Braille responses immediately after the exam.
- The purpose and types of testing accommodations are explained within the scope of this study. The teachers with special needs students can benefit from these testing accommodations in line with the needs of their students.

For school administrators:

- It is a problem for blind students to have their Braille textbooks available long after school has started. For this reason, school administrators should request the Braille textbook on time for the blind students enrolled in their school.
- For the educational support given at schools, offering verbal courses to blind students and not providing educational support for science lessons are among the problems faced by the blind students. As suggested by the blind students, school administrations should plan educational support for science courses.

For blind students:

- According to the results of this study, the blind students perform similarly in physics course when fair instruction and assessment conditions are provided. Thus, blind students can continue their careers in fields involving physics. The blind students should continue their demands for equal and accessible education and assessment.

For textbook writers:

- It has been determined that some of the images in the ninth grade ink-print physics textbook are not included in the Braille textbooks, even if the images are omitted, these images are cited in the text, some images needed to solve the problem are not given, and there is a lack of descriptions for the images. While preparing Braille textbooks, textbook writers should include the descriptions of the visuals, put the visuals in the Braille book after simplifying, and arrange the text in cases where the visual is removed.

For MEB and ÖSYM:

- It has been determined that blind students have problems about readers in the national exams. Institutions that organize national examinations are required to consider the readers' correct use of language, reading speed, emphasis and intonation, and attitudes towards students. In addition, necessary precautions should be taken to ensure that the visuals given in the questions are not explained to the students who request readers, and the readers should be allowed to read only the questions without explanations. Therefore, institutions that organize national examinations should organize training and prepare instructions for readers.
- The exemption of blind students from questions containing visuals overestimates the achievement of blind students and creates an advantage for blind students. When verbal descriptions and tactile graphics testing accommodations were made, the achievements of blind and sighted students were similar. Both blind and sighted students performed lower than tactile graphics in the case of verbal descriptions testing. ÖSYM should ask questions in an accessible way with verbal descriptions and tactile graphics options instead of exempting blind students from questions containing visuals in national exams. MEB, on the other hand,

should present the tactile graphics testing accommodations to the students as well as the verbal descriptions testing accommodations.

- In this study, blind students were given the option of presenting all of the exam booklets in Braille, but students preferred only tactile graphics in Braille. The MEB and ÖSYM should also offer the exam booklets in Braille. MEB and ÖSYM should be consistent and diversified as much as possible about presentation testing accommodations. Diversifying the presentation testing accommodations can increase accessibility and enhance fairness. In this way, the inferences made from the results of the exams that affect the decisions about the future of the students can be more meaningful.
- In addition, it is a prerequisite that the testing accommodations are experienced by the student during the education process. For this reason, the MEB should organize the necessary in-service training for the teachers to use the testing accommodations, and provide the necessary support to the schools including students with special needs.

5.5 Recommendations for Further Research

The following recommendations can be offered based on the results of this study for future studies.

- In this study, because of feasibility, the inclusive classes including at least one blind student were reached in two different provinces. More inclusive classrooms with at least one blind student might provide more information about the effect of using testing accommodations on students' achievement and affective characteristics.
- In this study, to determine the effect of instructional and testing accommodations, the scales about affective characteristics were implemented before the instruction and after the achievement tests that were implemented after instruction. It is desirable for future research to interview

blind students after the achievement tests were presented with testing accommodations. In this case, it will be possible to obtain in-depth knowledge on the source of blind students' affective characteristics change.

- In the current study, the blind students were asked for the preferences of taking the tests. They were given the alternatives of taking the question booklets in Braille for all testing conditions, read-aloud, or taking only the tactile graphics in Braille. To control the attitudes of the subjects more precisely in the future researches, the sighted students can be asked for their preferences of font type or size in their exam papers.

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APPENDICES

A1. Expert Opinion Form for "Interview Guide for Determining the Problems of Junior and Senior High School Blind Students About Testing Accommodations"

Okul Sınavları ve Merkezi Sınavların Fen ve Fizik Dersleri Açısından Kör Öğrenciler Tarafından Değerlendirilmesine Yönelik Görüşme Formu Hakkında Uzman Görüşü Formu

Aşağıdaki görüşme formunda okul sınavları ve merkezi sınavların fen ve fizik dersleri açısından kör öğrenciler tarafından değerlendirilmesine yönelik sorular, amaçları ile birlikte verilmiştir. Formu inceleyerek, her soru için "Uygun, Düzeltilmeli ya da Uygun Değil" seçeneklerinden birini işaretlemenizi, Düzeltilmeli seçeneğini işaretlemeniz durumunda soru için düzeltme önerinizi yazmanızı beklemekteyiz.

Değerli zamanınızı ayırıp katkı sunduğunuz için teşekkür ederiz.

Okul Sınavları ve Merkezi Sınavların Fen ve Fizik Dersleri Açısından Kör Öğrenciler Tarafından Değerlendirilmesine Yönelik Görüşme Formu

Bu formdaki sınıf düzeyiniz, yaşınız, geçmiş eğitim-öğretim yaşantınız, Fen/Fizik derslerinin okulda ve merkezi sınavlarda değerlendirilmesi ile ilgili sorular, okulda ve merkezi sınavlardaki mevcut sınav koşullarında sorunlarınızı belirlemek ve sınav koşullarınızda yapılacak olan düzenlemeler için önerilerinizi almak amacıyla hazırlanmıştır.

Formda verdiğiniz bilgiler bilimsel çalışma dışında kullanılmayacaktır. Formdaki sorulara doğru, eksiksiz ve gerektiğini düşündüğünüz kadar açıklama yaparak cevap vermeniz beklenmektedir.

Çalışmaya verdiğiniz katkıdan dolayı teşekkür ederim.

Sınıf Düzeyin :

Doğum Tarihin :

Görüşme Soruları	Amaç	Uygun	Düzeltilmeli (Öneri)	Uygun değil
1. İlköğretim 1. Kademede ne tür bir okuldaydın? Devlet □ Özel □ Özel eğitim □ -İlköğretim 2. Kademede ne tür bir okuldasın/okuldaydın? Devlet □ Özel □ Özel eğitim □	Öğrencilerin değerlendirme sürecine bakış açılarını, bu süreçte yaşadıkları sorunları etkileyebileceğinden, geçmiş eğitim/öğretim yaşantıları hakkında bilgi sahibi olmak			
2. Okulda Fen ve Teknoloji/Fizik dersi işlenirken herhangi bir doküman ya da materyal desteği alıyor musun?	Öğrencilerin değerlendirme sürecine bakış açılarını, bu süreçte yaşadıkları sorunları etkileyebileceğinden, geçmiş eğitim/öğretim yaşantıları hakkında bilgi sahibi olmak			
3. Fen ve Teknoloji/Fizik dersi için okul dışında herhangi bir destek alıyor musun? (Herhangi bir kişi, kurum…)	Öğrencilerin değerlendirme sürecine bakış açılarını, bu süreçte yaşadıkları sorunları etkileyebileceğinden, geçmiş eğitim/öğretim yaşantıları hakkında bilgi sahibi olmak			
4. En son aldığın Fen ve Teknoloji/Fizik dersi dönem sonu ders notun nedir?	Öğrencilerin değerlendirme sürecine bakış açılarını, bu süreçte yaşadıkları sorunları etkileyebileceğinden, geçmiş eğitim/öğretim yaşantıları hakkında bilgi sahibi olmak			
5. Okulda Fen ve Teknoloji/Fizik dersi	Öğrencilerin okullarda mevcut koşullarda nasıl			

başarın nasıl değerlendiriliyor? (sözlü sınav, yazılı sınav, performans ödevi…)	değerlendirildiklerini belirlemek			
6. Okulda Fen ve Teknoloji/Fizik dersi sınavlarında sana yönelik düzenlemeler yapılıyor mu? Eğer yapılıyorsa ne gibi düzenlemeler yapılıyor? (sınavın sunuluş şekli, zaman ayarı/programlama, sınav ortamı, sınavı cevaplama şekli)	Öğrencilerin okullarda mevcut koşullarda nasıl değerlendirildiklerini belirlemek			
7. Okuldaki Fen ve Teknoloji/Fizik dersi sınavlarında sorun yaşıyorsun musun? Eğer sorun yaşıyorsan, bu sorunlara yönelik sınavlarda ne gibi düzenlemeler yapılmasını istersin? (sınavın sunuluş şekli, zaman ayarı/programlama, sınav ortamı, sınavı cevaplama şekli)	Öğrencilerin okullarda mevcut koşullarda değerlendirilirken yaşadıkları sorunları ve bu sorunlara yönelik çözüm önerilerini belirlemek			
8. TEOG sınavında Fen ve Teknoloji sorularını cevaplarken sorun yaşadın mı? Eğer sorun yaşadıysan, bunları açıklar mısın?	Öğrencilerin merkezi sınavlarda mevcut koşullarda değerlendirilirken yaşadıkları sorunları belirlemek			
9. TEOG sınavındaki Fen ve Teknoloji sorularında ne gibi düzenlemeler yapılmasını isterdin? (sınavın sunuluş şekli, zaman ayarı/programlama,	Öğrencilerin merkezi sınavlarda mevcut koşullarda değerlendirilirken yaşadıkları sorunlara			

sınav ortamı, sınavı cevaplama şekli)	yönelik çözüm önerilerini belirlemek			
10. TEOG sınavında resim, şekil ya da grafik içeren Fen ve Teknoloji soruları yerine, bu sorulara eşdeğer sözel sorular sorulmasını nasıl değerlendiriyorsun?	Resim, şekil ya da grafik içeren sorulara yönelik düzenlemeler TEOG ve YGS' de farklı olduğundan, bu düzenlemelere yönelik öğrencilerin görüşlerini belirlemek			
11. YGS/LYS fizik sorularında ne gibi düzenlemeler yapılmasını isterdin? (sınavın sunuluş şekli, zaman ayarı/programlama, sınav ortamı, sınavı cevaplama şekli)	Öğrencilerin gelecekte girecekleri merkezi sınavlara yönelik düzenleme önerilerini belirlemek			
12. YGS/LYS' de resim, şekil ya da grafik içeren fizik sorularından muaf olmanı nasıl değerlendiriyorsun?	Resim, şekil ya da grafik içeren sorulara yönelik düzenlemeler TEOG ve YGS' de farklı olduğundan, bu düzenlemelere yönelik öğrencilerin görüşlerini belirlemek			
13. Okulda ya da merkezi sınavlarda sorulan resim, şekil ya da grafik içeren Fen ve Teknoloji/Fizik sorularının ne şekilde düzenlenmesini önerirsin?	Öğrencilerin sınavlardaki resim, şekil ya da grafik içeren sorulara yönelik düzenleme önerilerini belirlemek			

A2. Interview Guide for Determining the Problems of Junior and Senior High School Blind Students About Testing Accommodations

Okul Sınavları ve Merkezi Sınavların Fen ve Fizik Dersleri Açısından Görme Engelli Öğrenciler Tarafından Değerlendirilmesine Yönelik Görüşme Formu

Bu formdaki sınıf düzeyiniz, yaşınız, geçmiş eğitim-öğretim yaşantınız, Fen/Fizik derslerinin okulda ve merkezi sınavlarda değerlendirilmesi, bu derslerdeki öğretim ve ölçme-değerlendirmenin adilliği ile ilgili sorular, okulda ve merkezi sınavlardaki mevcut sınav koşullarında sorunlarınızı belirlemek ve sınav koşullarınızda yapılacak olan düzenlemeler için önerilerinizi almak amacıyla hazırlanmıştır.

Verdiğiniz bilgiler bilimsel çalışma dışında kullanılmayacaktır. Size sorulan sorulara doğru, eksiksiz ve gerektiğini düşündüğünüz kadar açıklama yaparak cevap vermeniz beklenmektedir.

Çalışmaya verdiğiniz katkıdan dolayı teşekkür ederim.

Sınıf Düzeyin :

Doğum Tarihin :

1. Ortaokulda ne tür bir okuldaydın?

Devlet □ Özel □ Özel eğitim □

Lisede ne tür bir okuldasın/okuldaydın?

Devlet □ Özel □ Özel eğitim □

2. Okulda Fen/Fizik dersi işlenirken herhangi bir doküman ya da materyal desteği alıyor musun?

3. Fen/Fizik dersi için okul dışında herhangi bir destek alıyor musun?

(Herhangi bir kişi, kurum…)

4. En son aldığın Fen/Fizik dersi dönem sonu ders notun nedir?

5. Fen/Fizik derslerinde diğer öğrencilerle eşdeğer, adil öğretim aldığını düşünüyor musun?

6. Fen/Fizik derslerinde adil öğretim nasıl olmalı?

7. Okulda Fen/Fizik dersi başarın nasıl değerlendiriliyor?

(sözlü sınav, yazılı sınav, performans ödevi…)

8. Okulda Fen/Fizik dersi sınavlarında sana yönelik düzenlemeler yapılıyor mu? Eğer yapılıyorsa ne gibi düzenlemeler yapılıyor?

(sınavın sunuluş şekli, zaman ayarı/programlama, sınav ortamı, sınavı cevaplama şekli)

9. Okuldaki Fen/Fizik dersi sınavlarında sorun yaşıyorsun musun? Eğer sorun yaşıyorsan, bu sorunlara yönelik sınavlarda ne gibi düzenlemeler yapılmasını istersin? (sınavın sunuluş şekli, zaman ayarı/programlama, sınav ortamı, sınavı cevaplama şekli)

10. TEOG sınavında Fen sorularını cevaplarken sorun yaşadın mı? Eğer sorun yaşadıysan, bunları açıklar mısın?

11. TEOG sınavındaki Fen sorularında ne gibi düzenlemeler yapılmasını isterdin? (sınavın sunuluş şekli, zaman ayarı/programlama, sınav ortamı, sınavı cevaplama şekli)

12. TEOG sınavında resim, şekil ya da grafik içeren Fen soruları yerine, bu sorulara eşdeğer sözel sorular sorulmasını nasıl değerlendiriyorsun?

13. YGS/LYS fizik sorularında ne gibi düzenlemeler yapılmasını isterdin? (sınavın sunuluş şekli, zaman ayarı/programlama, sınav ortamı, sınavı cevaplama şekli)

14. YGS/LYS'de resim, şekil ya da grafik içeren fizik sorularından muaf olmanı nasıl değerlendiriyorsun?

15. Okulda ya da merkezi sınavlarda sorulan resim, şekil ya da grafik içeren Fen/Fizik sorularının ne şekilde düzenlenmesini önerirsin?

16. Okulda ve TEOG/YGS/LYS gibi merkezi sınavlarda Fen/Fizik derslerine yönelik adil ölçme-değerlendirme yapıldığını düşünüyor musun?

17. Okulda ve TEOG/YGS/LYS gibi merkezi sınavlarda Fen/Fizik derslerine yönelik adil ölçme-değerlendirme nasıl olmalı?

B. Sample Interview Transcripts of Blind Students in Qualitative Phase

INTERVIEW TRANSCRIPT OF S7

Presentation
Justice
Setting
Timing/scheduling
Response
No element
Warm-up questions and responses

Researcher (R): 00:00:01 Kaçıncı sınıftasın S7?

S7: 00:00:32 Şu an lise 3 öğrencisi olacağım bu sene.

R: 00:00:37 Lise 2 den lise 3'e geçtin. Kaç doğumluydun?

S7: 00:00:40 2000.

R: 00:00:44 Ortaokulda nasıl bir okuldaydın?

S7: 00:00:48 7. sınıfın ilk dönemine kadar özel alt sınıfı olan, yani ilk 3 sene görme engelliler sınıfında okuduktan sonra kaynaştırmaya geçtiğim bir okuldaydım. Görme engelliler sınıfı vardı. İhtiyaç duyduğumda oradaki öğretmenden materyal ve benzeri desteği alıyordum. 7. sınıfın sonunda tamamen kaynaştırılmış bir okula geçtim ve özel eğitime dair hiçbir şey yoktu. 8. sınıfa kadar orada okudum sonrasında liseye geçtim.

R: 00:01:13 Bunların ikisi de özel okul muydu?

S7: 00:01:16 Hayır. İkisi de devlet okuluydu.

R: 00:01:27 Hangi lisedesin?

S7: 00:01:29 (Deleted for ensuring confidentiality).

R: 00:01:38 Sen ortaokulda fen dersini tecrübe ettin, lisede de fizik dersini tecrübe ettin. Peki, alan olarak eşit ağırlık mı seçtin?

S7: 00:01:45 Evet eşit ağırlık seçtim.

R: 00:01:49 Bu derslerde herhangi bir doküman materyal desteği aldın mı fen ya da fizik derslerinde?

S7: 00:01:56 Dokümandan kastımız klasik olarak kullanılan ders materyalleri dışında, ek olarak bir şey mi?

R: 00:02:00 Evet.

S7: 00:02:01 Hayır.

R: 00:02:10 Okul dışından bir destek aldın mı bir kişiden bir kurumdan bu derslere yönelik?

S7: 00:02:14 Hayır, fen derslerine yönelik bir destek almadım.

R: 00:02:19 Bu derslerde sen dersi ne şekilde dinliyordun, ne şekilde öğreniyordun?

S7: 00:02:24 Genel olarak hocanın anlattıklarını dinliyordum. Tabii birçok kez birçok şey eksik kalıyordu. Tahtada anlattıklarını ona soruyordum, zaman zaman bana anlatıyordu ya da not çıkartıyordu, ya da hiçbir şey anlatmadan direkt eksik kalıyor konular.

R: 00:02:36 Not tutuyor musun?

S7: 00:02:37 Tutuyordum.

R: 00:02:40 Ya da ses kaydı?

S7: 00:02:41 Ses kaydı tutmuyordum ama not tutuyordum.

R: 00:02:46 En son dönem aldığın fizik notunu hatırlıyor musun?

S7: 00:02:41 Genel ortalamamı hatırlıyorum ama diğer notlarımı hatırlamıyorum.

R: 00:03:03 Sen fizik dersinde diğer öğrencilerle eşdeğer, adil eğitim aldığını düşünüyor musun?

S7: 00:03:11 Hayır. Eğitim olabildiğince öğretmen ve idare tarafından basitleştirildiği için aynı seviyede eğitim aldığımı düşünmüyorum (Justice/ facilitation of instruction: S7P-5).

R: 00:03:19 Sence adil bir eğitim nasıl olmalı?

S7: 00:03:25 Sınıfa verdiği aynı eğitimin, yani eğitim seviyesinin, ya sınıf içerisinde ya da bireysel eğitim programı ile belki verilebilir (Justice/ educational support: S7S-6).

R: 00:03:35 Senin okuldaki fizik dersi başarın nasıl değerlendiriliyor? Sözlü sınav mı oluyorsun, mı, ödev mi veriyor öğretmenin?

S7: 00:03:44 Yazılı sınav ama sözlü sınav gibi oluyor. Kendi öğretmenim okuyor sınavı.

R: 00:03:50 Nasıl yapılıyor, bana bir fizik sınavını anlatır mısın? Nasıl bir ortamda, nasıl koşullarda oluyor?

S7: 00:04:00 Öncesinde biz zaten hocamla aşağı yukarı nerelerden soru çıkacağını konuşmuş oluyoruz. Sınıf sınav olduktan sonra, genel okul fizik sınavı olduktan sonra laboratuvarda, rehber öğretmenin odasında, ya da boş bir sınıfta hazırladığı soruları okuyor. Ben de cevaplıyorum. Zaman zaman bilgisayar üzerinde de verdiği oluyor soruları. O ikimizin tercihine kalıyor aslında birazcık.

R: 00:04:32 Bilgisayar üzerinden verdiğinde sen o sınavı nerede yapıyorsun, evde mi?

S7: 00:04:36 Yok, hayır. Ben okula kendi bilgisayarımı götürmüş oluyorum ya da okuldaki bilgisayarlardan bir tanesini kullanıyorum. Soruları bana USB ile veriyor, ben de cevaplayıp teslim ediyorum. Tabii başında bir gözetmen oluyor.

R: 00:04:47 Soruları her zaman öğretmenin mi okuyor?

S7: 00:04:51 Yani zaman zaman sözel soruların ağırlıklı olduğu dönemlerde farklı öğretmenler de okuyabiliyor. Rehber öğretmen gibi (Presentation/ reader: S7P-9).

R: 00:04:58 Sınava da yönelik düzenleme yapılıyor mu? Yani zamanla ilgili sorun yaşıyor musun mesela?

S7: 00:05:05 Zamandan çok soruların kalitesi ile ilgili düzenlemeler yapıyor genelde (Presentation/ facilitation of questions: S7-P9).

R: 00:05:08 Daha kolaylaştırıyor mu?

S7: 00:05:10 Evet olabildiğince basite indirgiyor (Presentation/ facilitation of questions: S7-P9).

R: 00:05:14 Sen bu sınavlarda sorun yaşadığını düşünüyor musun?

S7: 00:05:19 Nasıl yani?

R: 00:05:21 Fizik sınavında sorun yaşadığını düşünüyor musun?

S7: 00:05:25 Fizik sınavında sorun yaşamıyorum ama ders esnasında aynı eğitim almadığım için, dolayısıyla bana aynı soruları da sormuyor. Daha kolay soru sorması bir sorun aslında (Presentation/ facilitation of questions: S7-P9).

R: 00:05:34 Peki, soruların sana farklı şekilde sunulmasını ister miydin?

S7: 00:05:39 Nasıl yani?

R: 00:05:40 Sesli değil de kabartmalı diyelim ki.

S7: 00:05:43 Görsel bir soru varsa onun kabartmasına isterdim muhtemelen, ya da Braille bir soru kitapçığı isterdim mesela (Presentation/ Braille print of questions/visuals: S7S-9).

R: 00:05:50 Sesliyi mi tercih ederdin, Braille mi tercih ederdin? Bunları şunun için soruyorum, sizin tercih ettiğiniz şeyler neler? Şöyle olsa daha iyi olurdu diyebileceğin şeyler varsa onları söyleyebilirsin.

S7: 00:06:08 Görsel sorulardan kaçmak yerine onları olabildiğince ek materyallerle anlatıp sonra sınavda da aynı şekilde uygulaması, sorulması mesela. Orada bir devre varsa örneğin devreyi kabartılmış bir şekilde çizmesi (Presentation/ exemption: S7P-9).

R: 00:06:23 Sen TEOG'a da girdin. TEOG'da fen sorularını çözdün. Soruları cevaplarken herhangi bir sorun yaşadın mı fen sorularında?

S7: 00:06:33 Soruları anlamakta zaman zaman sıkıntı yaşadığımı hatırlıyorum. Sadece fen üzerinden mi konuşuyoruz yoksa sayısal dersler üzerine mi konuşuyoruz?

R: 00:06:40 TEOG olunca fen üzerinden konuşuyoruz. Ne gibi sıkıntılar yaşadın soruları cevaplarken?

S7: 00:06:55 Aslında soruları cevaplarken değil, soruları okuyan kişilerin anlaması ve bana aktarmaları yönünde sorun yaşadım. Fen alanına çok fazla hakim değillerdi, dolayısıyla zaman zaman anlatırken sorun yaşayabiliyorlardı (Presentation/ reader: S7P-10).

R: 00:07:09 Genel okuyucu sorunu.

S7: 00:07:10 Aynen.

R: 00:07:20 Bu sınava yönelik ne gibi düzenlemeler önerirsin, TEOG? Okuyucu ile ilgili sorun yaşadım dedin. Buna yönelik bir önerin var mı?

S7: 00:07:30 Sınav sorularının yöntemi ile alakalı mı, okuyucu ile alakalı mı?

R: 00:07:33 Her türlü öneri. TEOG sınavını düşün. Sen bu sınava girdin. Sınavda sorun yaşadın belirli konularda. Soruyla ilgili sıkıntı yaşadıysan buna yönelik önerilerin, okuyucu ile ilgili sorun yaşadıysan buna yönelik önerilerin.

S7: 00:07:50 Genel okuyucu anlamında çok fazla sıkıntı yaşadım. Bir sürü öğretmen var sonuçta, her branştan öğretmen var. Sınav görevlendirmesi yapılırken onun dağılımı daha dikkatli yapılabilir özellikle görme engelli bir öğrenciye verirken. Zaten çok fazla görme engelli öğrenci yok sınava girerken, bir sürü öğretmen var. Sınava atama yapılırken buna dikkat edilerek yapılabilir (Presentation/ reader: S7S-11).

Sorularda da olabildiğince şekilden kaçmak gerekiyor sanırım. Ya da daha düzgün cümlelerle ifade edilebilir görsel bir şey varsa (Presentation/ verbal description of visuals: S7S-15).

Öğrenciye öğretmen onu ders esnasında benzer cümlelerle ifade etmişse, öğrenci canlandırabilecektir dersten aklında kaldığı gibi. Düzgün ve anlaşılabilir cümlelerle ifade edilebilirse fen soruları daha rahat çözülebilir sanırım (Presentation/ verbal description of visuals: S7S-11).

R: 00:08:40 TEOG'da kitapçıklarda şekilli soru varsa eşdeğer sorularla soruluyor, betimlemelerle. Bu yöntemi nasıl buluyorsun?

S7: 00:08:58 Bu güzel aslında, benim açımdan gayet güzel bir durum. Ama bazı sorularda şu an net olarak hatırlamasam da o dönemde derste işlenmeyen sorular olduğunu hatırlıyorum (Presentation/ verbal description of visuals: S7P-12). Yeterli olmadığını düşündüğüm sorular vardı.

Ama böyle bir şeyin olması sorulardan direkt muaf tutulmasından çok daha iyi (Presentation/ verbal description of visuals: S7S-15).

R: 00:09:17 YGS-LGS ye yönelik fikrin var mı, fizik sorularına yönelik?

S7: 00:09:19 Hangi açıdan?

R: 00:09:20 Mesela şekilli sorular TEOG'daki gibi değil. Şekilli sorulardan muaf oluyorsun.

S7: 00:09:29 Birkaç soruyu çözdüm YGS fiziğinde. Sözel olan sorular anlamında, genel soru kalitesi sözel olduğu için rahattı. Ama şekilli sorulara hiç bakmadım. Zaten dediğiniz gibi muaf olunuyor bildiğim kadarıyla.

R: 00:09:40… Şekilli sorular tamamen kitapçıktan çıkartıldı.

S7: 00:10:02 Muaf olan sorunun puanı nasıl, neye göre, nasıl eşit dağıtılıyor? Benim bu konuda soru işaretlerim var.

R: 00:10:07 O soruları yapmadığın için sen bir eksi puan almış olmuyorsun muaf olman sebebiyle. Yani sana bir kaybı da yok, kazancı da yok, o soru yokmuş gibi değerlendiriliyorsun.

S7: 00:10:19 O soruların puanları ama aynı şekilde diğer sorulara yüklenmiyor mu?

R: 00:10:26 Oran orantı gibi düşün. Diğer kişi diyelim ki 15 sorunun 15'ini de çözdü ve tam puan aldıysa, bu 15 sorudan 13'ü şekilli, sana kaldı 2 soru. Sen o 2 soruyu çözdüğünde tam puan almış oluyorsun. Bu şekilde oranlanarak, buna benzer yöntemle yapılıyor puan hesaplaması da.

S7: 00:10:51 Anladım.

R: 00:11:04 Sen bu sorulardan muaf olmanı nasıl değerlendiriyorsun?

S7: 00:11:08 Bana kalırsa TEOG'da böyle bir şey yapılabiliyor, fizikte de en azından, özellikle YGS fiziğinin çok zorlayıcı olmadığını düşünüyorum bir görme engelli için de. Dolayısıyla kendi çalışması ya da birinden çok az bir destekle fizik sorularını yapabilir (Presentation/ exemption: S7P-14).

Dolayısıyla orada ya bir sözelleştirmeye gidilebilir ya da fizik alanında biri soruyor okuyorsa rahat bir şekilde ifade edilebilecektir diye düşünüyorum. Oraya yardımcı birkaç ifade de eklenirse, ifade edilebileceğine inanıyorum sorunun (Presentation/ exemption: S7S-14).

Dolayısıyla muaf olmasına gerek yok (Justice/ assessment: S7P-16).

Daha farklı bir çözümle o soruları sunmak bence daha adil bir çözüm (Justice/ assessment: S7S-17).

R: 00:11:45 Fizik sorularının %90'dan fazlası şekilli. Şekilli soruların oranı çok fazla olduğu için, sen fizik çözmek istesen bile çoğu kitapçığında olmadığı için fizik sorularının çoğunun görme engelli öğrencilere sunulamaması gibi bir durum var YGS-LYS sınavlarında. Buna yönelik senin önerin ya soruları sözelleştirme ya da soruları farklı şekilde.

S7: 00:12:29 Sonuçta bu TEOG'da uygulanabiliyor, Milli Eğitim'in bunu uyguladığını biliyoruz. Pek başarılı olmasalar da böyle bir şey olacağını gördük. ÖSYM de yapabilir, sonuçta yıllardır sınav hazırlıyor (Presentation/ verbal description of visuals: S7S-15).

R: 00:12:43 Şekilli soruların şekillerini de kabartmalı olarak verseler

S7: 00:12:51 Orada da şöyle bir şey doğuyor, eğer öğrenci bunu lisede de zaten öğrenmişse birinin ifade etmesi ile de yapabilir ama temel sorun zaten lisede bunu öğrenememekle başlıyor. Dolayısıyla ben elektrik akımı ile ilgili bir şey bilmiyorsam benim sınavda benim sınavda o düzenek kabartılmış bir şekilde de gelse ben zaten onu lisede öğrenmemiş oluyorum. Ama eğer ben onu öğrenebilmişsem materyaller ile benim için 10 numara bir durum sınavda. O zaman görme engellilerin fizik okumasının önü de açılacaktır ama bu materyal desteğini önce derslerde sağlayıp sonra sınavlarda sağlamak daha önemli (Presentation/ Braille print of questions: S7S-15).

R: 00:13:35 Tüm öğrenciler için durum böyle. Derste öğrenemediyse, en kaliteli soru da sorulsa çözmesi çok mümkün değil. Sizin için de aynı şey geçerli. Senin de söylediğin gibi derste sana bu konu etkin bir şekilde anlatılmadıysa eğer sınavda çok kaliteli bir soruyla sözel olarak bile sorulsa bunu cevaplamak çok da mümkün olmaz. Öncelikle tabii ki bunun derste verilmesi gerekiyor. Yani öncelikle öğrenme.

C. Student Information Form

Öğrenci Bilgi Formu

29 sorudan oluşan bu form sınıf düzeyiniz, cinsiyetiniz gibi demografik bilgilerinizi, ailenizin sosyo-ekonomik özelliklerini, fizik dersi ve sınavlarına yönelik deneyimlerinizi belirlemek ve fizik dersi başarınızı doğru yorumlayabilmek için hazırlanmıştır. Formda verdiğiniz bilgiler bilimsel çalışma dışında kullanılmayacaktır. Formdaki soruları doğru, eksiksiz ve gerek duyduğunuz yerlerde açıklama yaparak cevaplamanız beklenmektedir.

Çalışmaya verdiğiniz katkıdan dolayı teşekkür ederim.

1. Okulun? ……………..
2. Sınıfın? ……………..
3. Cinsiyetin? ( ) Kadın ( ) Erkek
4. Kaç yaşındasın? ……………..
5. Annenin yaşı nedir? ……………..
6. Babanın yaşı nedir? ……………..
7. Kaç kardeşsiniz? ……………..
8. Annen çalışıyor mu? ( ) Çalışıyor ( ) Çalışmıyor ( ) Emekli ( )Diğer
9. Baban çalışıyor mu? ( ) Çalışıyor ( ) Çalışmıyor ( ) Emekli ( ) Diğer

10. Anne eğitim durumu?	11. Baba eğitim durumu?
( ) okur-yazar değil	( ) okur-yazar değil
( ) ilkokul mezunu	( ) ilkokul mezunu
( ) ortaokul mezunu	( ) ortaokul mezunu
( ) lise mezunu	( ) lise mezunu
( ) üniversite mezunu (önlisans, lisans)	( ) üniversite mezunu (önlisans, lisans)
( ) yüksek lisans	( ) yüksek lisans
( ) doktora	( ) doktora

12. İlköğretim 1. Kademede nasıl bir okuldaydın?

( ) Devlet ( ) Özel ( ) Özel eğitim ( ) Diğer

13. İlköğretim 2. Kademede nasıl bir okuldaydın?

( ) Devlet ( ) Özel ( ) Özel eğitim ( ) Diğer

14. En son yapılan fizik sınavından aldığın not nedir? …………

	Evet	**Hayır**	**Açıklama**
15. Annen ve baban aynı evde mi yaşıyor?			
16. Kardeşlerinin hepsi annen ve babanla mı yaşıyor?			
17. Evde aile dışında birileri yaşıyor mu?			
18. Ailenle mi yaşıyorsun?			
19. Evde çalışabileceğin bir odan var mı?			
20. Maddi olarak sıkıntı yaşadığını düşünüyor musun?			
21. Evde çalışmana yardımcı olacak kimse var mı?			
22. Geçirdiğin önemli bir hastalık var mı?			
23. Ailende engelli birey var mı?			
24. Fizik dersine çalışmak için herhangi bir kurum ya da kişiden destek alıyor musun?			
25. Okuldaki fizik derslerine çalışmak için doküman ve materyal desteği alıyor musun?			
26. Fizik dersine çalışırken ders kitabından faydalanıyor musun?			
27. Fizik dersi öğrenme ortamının tüm öğrenciler için adil olduğunu düşünüyor musun?			
28. Fizik derslerine etkin katılım sağlıyor musun?			
29. Fizik dersi sınavının tüm öğrenciler için adil olduğunu düşünüyor musun?			

D. Instructional Objectives of Motion Concept

	Kazanım	Süre (ders saati)	Ders kitabı ilgili sayfaları
1	Deneylerden veya simülasyonlardan yararlanarak öteleme, dönme ve titreşim hareketlerine örnekler verir.	0.5	109
2	Konum, alınan yol, yer değiştirme, sürat ve hız kavramlarını birbirleri ile ilişkilendirir **(Seçilen Kazanım 1)**.	2	110-117
3	Deney yaparak topladığı veriler ile konum-zaman ve hız-zaman grafiklerini çizer.	2	117-122
4	Konum-zaman ve hız-zaman grafiklerindeki hareketi açıklar **(Seçilen Kazanım 2).**	1	
5	Konum-zaman ve hız-zaman grafikleri arasında dönüşümler yapar.	0.5	
6	Grafiklerden yararlanarak hareket ile ilgili matematiksel modelleri çıkarır.	0.5	
7	Ortalama hız kavramını açıklar.	0.5	123
8	Trafikte yeşil dalga sisteminin çalışma ilkesini açıklar.	0.5	
9	İvme kavramını hızlanma ve yavaşlama olayları ile ilişkilendirir **(Seçilen Kazanım 3)**.	1	124-128
10	İvmenin matematiksel modelini çıkarır.	0.5	
11	Sabit ivmeli hareket için hız-zaman ve ivme-zaman grafiklerini çizer.	0.5	
12	Sabit ivmeli hareket için hız-zaman ve ivme-zaman grafiklerindeki hareketi açıklar	0.5	
13	Anlık hız kavramını açıklar.	0.5	
14	Gözlemlerle hareketin göreceli olduğu çıkarımını yapar.	0.5	129
	Toplam	11 Saat	

E. Draft Test Plan

	Question type	Objective	Number of questions planned	Number of questions written	Question number
1	**Conventional MC with graphs/ figures/ tables**				
	• Conventional MC with figures	1	2	4	Q1, Q4, Q5, Q6
	• Conventional MC with graphs	2	2	2	Q7, Q8
	• Conventional MC with tables	3	1	1	Q10
2	**Conventional MC without graphs/figures/tables**	1	1	1	Q2
3	**Complex MC with graphs/ figures/ tables**				
	• Complex MC with figures	1	1	1	Q3
	• Complex MC with graphs	-	0	0	
	• Complex MC with tables	-	0	0	
4	**Complex MC without graphs/figures/tables**	3	1	1	Q9

Objective 1. Relates the concepts of position, distance, displacement, speed and velocity with each other.

Objective 2. Explain the motion in position-time and velocity-time graphs.

Objective 3. Relates the concept of acceleration with acceleration and deceleration events.

F1. Draft Version of Motion Achievement Test Expert Opinion Form and Motion Achievement Test

HAREKET BAŞARI TESTİ UZMAN GÖRÜŞÜ FORMU

Bu test dokuzuncu sınıf hareket konusundan seçilen ve revize edilen aşağıdaki üç kazanıma yönelik hazırlanmıştır. Sizden alınan dönütler sonucunda testte düzenlemeler yapılacaktır. Testi verilen değerlendirme ölçütleri doğrultusunda incelemeniz, bu maddelerin kapsamadığı ve belirtmek istediğiniz bir görüşünüz varsa "Diğer görüşler" kısmına yazmanız testin geliştirilmesi için önemlidir. Verdiğiniz katkı için teşekkür ederiz.

Kazanım 1. Konum, alınan yol, yer değiştirme, sürat ve hız kavramlarını birbirleri ile ilişkilendirir.

Kazanım 2. Konum-zaman ve hız-zaman grafiklerindeki hareketi açıklar.

Kazanım 3. İvme kavramını hızlanma ve yavaşlama olayları ile ilişkilendirir.

Değerlendirme ölçütleri		Evet	Hayır	Açıklama
1.	Sorular ile kazanımlar birbiri ile uyumlu mu?			
2.	Soruların bilişsel süreç boyutu uygun mu?			
3.	Sorular 9. Sınıf Hareket konusu kazanımları içinden seçilen üç kazanımı kapsıyor mu?			
4.	Sorular 9. Sınıf Hareket konusu kazanımları içinden seçilen üç kazanımdaki bütün alt konuları ve kavramları yansıtıyor mu?			
5.	Soruların içeriği bilimsel olarak uygun mu?			
6.	Test dil ve anlam bilgisi olarak 9. sınıf öğrencileri için uygun mu?			
7.	Sorulardaki açıklama, soru cümlesi, seçenek ve şekil, grafik ya da tablo sıralaması uygun mu?			
8.	Yazı puntosunun ve şekil, grafik ya da tabloların büyüklüğü uygun mu?			
9.	Şekil, grafik ya da tablolarda verilen bilgiler yeterli ve gerekli mi?			

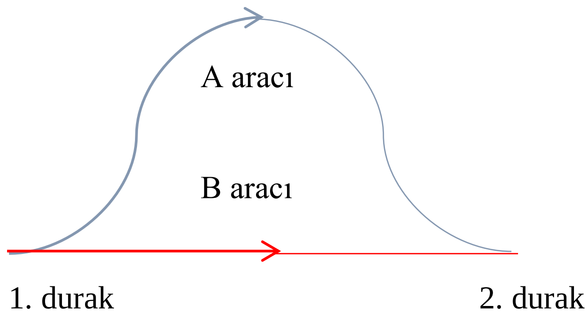
10.	Şekil, grafik ya da tablo içeren sorularda yapılan açıklamalar yeterli ve gerekli mi?	
11.	Puanlama kısmında verilen cevaplar uygun mu?	
12.	Testin cevaplanması için … dakika süre verilmesi uygun mu? (Süre pilot çalışmada belirlenecek)	
13.	Diğer görüşler:	

SORU 1:

Kazanım 1 : Konum, alınan yol, yer değiştirme, sürat ve hız kavramlarını birbirleri ile ilişkilendirir.

Bilişsel Süreç Boyutu: Anlama

1. Durakları aynı olan A ve B toplu taşıma araçları farklı güzergâhlar kullanarak birinci duraktan ikinci durağa ulaşmaktadır. Araçların izlediği güzergâhlar aşağıdaki şekilde verilmiştir.



Buna göre iki durak arasında araçların hangi nicelikleri kesinlikle aynıdır?

A) Alınan yol
B) Yer değiştirme
C) Sürat
D) Hız
E) Herhangi bir t süre sonraki konumları

PUANLAMA

Tam puan (1):

- B) Yer değiştirme

Puan yok (0):

- Diğer cevaplar

SORU 2:

Kazanım 1 : Konum, alınan yol, yer değiştirme, sürat ve hız kavramlarını birbirleri ile ilişkilendirir.

Bilişsel Süreç Boyutu: Anlama

2. Ayşe öğretmen otobüs durağında beklerken cep telefonunu evde unuttuğunu fark ediyor ve durağın 30 m doğusundaki evine gidip telefonunu alarak durağa aynı yol üzerinden geri dönüyor. Ayşe öğretmenin gidip dönmek için geçirdiği toplam süre 12 s'dir.

Ayşe öğretmenin hareketi ile ilgili aşağıdaki yargılardan hangisi doğrudur?

A) Aldığı yol 60 m'dir.
B) Yer değiştirmesi 30 m'dir.
C) Yer değiştirmesi 60 m'dir.
D) Sürati sıfırdır.
E) Hızının büyüklüğü 5 m/s'dir.

PUANLAMA

Tam puan (1):

- A) Aldığı yol 60 m'dir.

Puan yok (0):

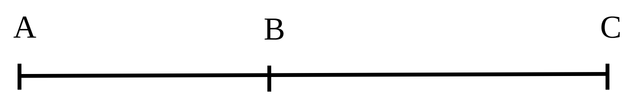
- Diğer cevaplar

SORU 3:

Kazanım 1 : Konum, alınan yol, yer değiştirme, sürat ve hız kavramlarını birbirleri ile ilişkilendirir.

Bilişsel Süreç Boyutu: Anlama

3. Bahar aşağıda gösterilen düz bir yürüyüş yolunda A noktasından C noktasına, sonra da C noktasından B noktasına yürüyor.



A ve B noktaları arasındaki mesafe ile Bahar'ın toplam yürüyüş süresi bilindiğine göre;

I. Alınan yol
II. Yer değiştirme
III. Sürat
IV. Hız

niceliklerinden hangileri hesaplanabilir?

A) Yalnız I

B) I ve III

C) I ve IV

D) II ve III

E) II ve IV

PUANLAMA

Tam puan (1):

- E) II ve IV

Puan yok (0):

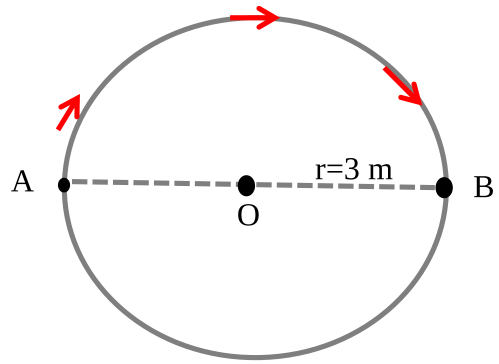
- Diğer cevaplar

SORU 4: EBA Kuvvet ve Hareket Kazanım Testi 2-soru 8'in düzenlenmiş halidir.

Kazanım 1 : Konum, alınan yol, yer değiştirme, sürat ve hız kavramlarını birbirleri ile ilişkilendirir. Bilişsel Süreç Boyutu: Anlama

---

4. Bir hareketli yarıçapı 3 m olan yanda gösterilen çembersel yolda A noktasından B noktasına okla belirtilen yörünge ile 3 s' de gidiyor.



Buna göre hareketlinin sürati ve hızı kaç m/s' dir? ($\pi = 3$)

	Sürat	Hız
A)	3	1
B)	6	1
C)	3	2
D)	6	2
E)	3	6

PUANLAMA

Tam puan (1):

		Sürat	Hız
-	C)	3	2

Puan yok (0):

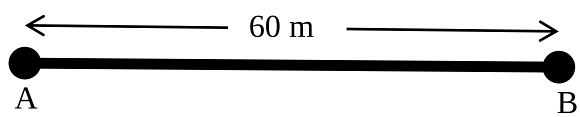
- Diğer cevaplar

SORU 5: EBA Kuvvet ve Hareket kazanım testi 2-Soru 11'in düzenlenmiş halidir.

Kazanım 1 : Konum, alınan yol, yer değiştirme, sürat ve hız kavramlarını birbirleri ile ilişkilendirir.

Bilişsel Süreç Boyutu: Anlama

5. Şekildeki A noktasından B noktasına 5 s' de giden bir çocuk hiç durmadan geri dönüp B noktasından A noktasına 7 s' de varıyor.



A ile B noktaları arası 60 m olduğuna göre; çocuğun hareketi ile ilgili aşağıdakilerden hangisi doğrudur?

A) Aldığı yol 60 m'dir.

B) Yer değiştirmesi sıfırdır.

C) Sürati 12 m/s'dir.

D) Hızının büyüklüğü 10 m/s'dir.

E) Sürati ve hızının büyüklüğü birbirine eşittir.

PUANLAMA

Tam puan (1):

- B) Yer değiştirmesi sıfırdır.

Puan yok (0):

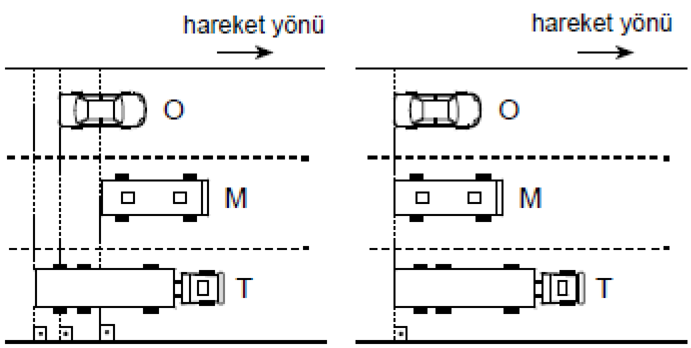
- Diğer cevaplar

SORU 6: 2007 ÖSS, fen 1, soru 11

Kazanım 1 : Konum, alınan yol, yer değiştirme, sürat ve hız kavramlarını birbirleri ile ilişkilendirir.

Bilişsel Süreç Boyutu: Anlama

6. O otomobili, M minibüsü ve T tırı doğrusal bir yolda sabit hızlarla ilerliyor. Bu araçların birbirlerine göre konumları, $t_0=0$ anında Şekil I, t anında da Şekil II' deki gibi aşağıda verilmiştir.



Şekil I Şekil II

O, M, T'nin hızlarının büyüklüğü sırasıyla V_O, V_M, V_T olduğuna göre, bunlar arasındaki ilişki nedir?

A) $V_O < V_T < V_M$
B) $V_O < V_M < V_T$
C) $V_T < V_M < V_O$
D) $V_M < V_T < V_O$
E) $V_M < V_O < V_T$

PUANLAMA

Tam puan (1):

- E) $V_M < V_O < V_T$

Puan yok (0):

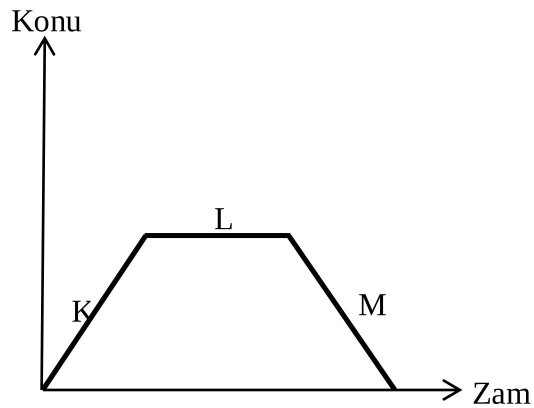
- Diğer cevaplar

SORU 7:

Kazanım 2 : Konum-zaman ve hız-zaman grafiklerindeki hareketi açıklar.

Bilişsel Süreç Boyutu: Anlama

7. Bir aracın hareketi K, L ve M olmak üzere üç aralıktan oluşmaktadır. Bu aracın hareketine ait yanda verilen konum – zaman grafiği ile ilgili aşağıdaki yargılardan hangisi doğrudur?



A) K aralığında hızlanmaktadır.

B) L aralığında sabit hızla hareket etmektedir.

C) M aralığında yavaşlamaktadır.

D) M aralığında aracın yönü değişmiştir.

E) Aracın hareketi harekete başladığı noktadan farklı bir konumda sonlanmıştır.

PUANLAMA

Tam puan (1):

- D) M aralığında aracın yönü değişmiştir.

Puan yok (0):

- Diğer cevaplar

SORU 8:

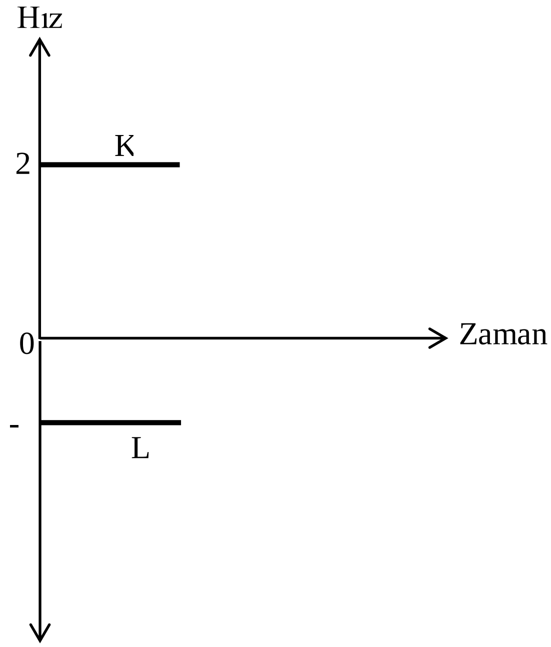
Kazanım 2 : Konum-zaman ve hız-zaman grafiklerindeki hareketi açıklar.

Bilişsel Süreç Boyutu: Anlama

8. Yanda t=0 anında yan yana olan K ve L araçlarına ait hız-zaman grafiği verilmiştir.

İki araç 10 saniye boyunca hareket ettiğine göre araçların hareketi ile ilgili aşağıdaki yargılardan hangisi doğrudur?

A) Araçlar zıt yönde hareket etmektedir.
B) K aracı hızlanmaktadır.
C) L aracı yavaşlamaktadır.
D) L aracı zıt yönde hızlanmaktadır.
E) 10 s sonunda aralarındaki mesafe 100 m'dir.



PUANLAMA

Tam puan (1):

- A) Araçlar zıt yönde hareket etmektedir.

Puan yok (0):

- Diğer cevaplar

SORU 9:

3. Kazanım : İvme kavramını hızlanma ve yavaşlama olayları ile ilişkilendirir.
Bilişsel Süreç Boyutu: Anlama

9. Aşağıda ivme ile ilgili yargılar verilmiştir.

I. Cisim düzgün hızlanıyorsa ivmesi düzgün artmaktadır.
II. Cisim düzgün yavaşlıyorsa ivmesi düzgün azalmaktadır.
III. Cisim duruyorsa ivmesi sıfırdır.
IV. Cisim sabit hızla gidiyorsa ivmesi sıfırdır.

Verilen yargılardan hangileri doğrudur?

A) Yalnız III
B) I ve II
C) III ve IV
D) I, II ve III
E) I, II, III ve IV

PUANLAMA

Tam puan (1):

- C) III ve IV

Puan yok (0):

- Diğer cevaplar

SORU 10:

3. Kazanım : İvme kavramını hızlanma ve yavaşlama olayları ile ilişkilendirir.
Bilişsel Süreç Boyutu: Anlama

10. **A**şağıdaki tabloda doğrusal yolda hareket eden araca ait hız-zaman değerleri verilmiştir.

Hız (m/s)	5	10	15	15	15	10	5
Zaman (s)	1	2	3	4	5	6	7

Bu aracın ivmesi için aşağıdakilerden hangisi doğrudur?

A) 1-3 s aralığında cismin ivmesi pozitif değerde, sabit bir büyüklüktedir.
B) 1-5 s aralığında cismin ivmesi düzgün artmaktadır.
C) 3-5 s aralığında cismin ivmesi pozitif değerde, sabit bir büyüklüktedir.
D) 5-7 s aralığında cismin ivmesi düzgün azalmaktadır.
E) Hareket boyunca ivme sıfırdır.

PUANLAMA

Tam puan (1):

- A) 1-3 s aralığında cismin ivmesi pozitif değerde, sabit bir büyüklüktedir.

Puan yok (0):

- Diğer cevaplar

F2. First Version of Motion Achievement Test Expert Opinion Form and Motion Achievement Test

HAREKET BAŞARI TESTİ UZMAN GÖRÜŞÜ FORMU

Bu test 9. Sınıf fizik dersi, hareket ve kuvvet ünitesinden seçilen ve yeniden düzenlenen hareket konusundaki üç kazanıma yönelik hazırlanmıştır. Bu kazanımlar aşağıda verilmiştir. Sizden alınan dönütler sonucunda testte düzenlemeler yapılacaktır. Testi verilen değerlendirme ölçütleri doğrultusunda incelemeniz, bu maddelerin kapsamadığı ve belirtmek istediğiniz bir görüşünüz varsa "Diğer görüşler" kısmına yazmanız testin geliştirilmesi için önemlidir. Verdiğiniz katkı için teşekkür ederiz.

Kazanım 1. Konum, alınan yol, yer değiştirme, sürat ve hız kavramlarını birbirleri ile ilişkilendirir.

Kazanım 2. Konum-zaman ve hız-zaman grafiklerindeki hareketi açıklar.

Kazanım 3. İvme kavramını hızlanma ve yavaşlama olayları ile ilişkilendirir.

Değerlendirme ölçütleri		**Evet**	**Hayır**	**Açıklama**
1.	Sorular ile kazanımlar birbiri ile uyumlu mu?			
2.	Soruların bilişsel süreç boyutu uygun mu?			
3.	Sorular 9. Sınıf Hareket konusu kazanımları içinden seçilen üç kazanımı kapsıyor mu?			
4.	Sorular 9. Sınıf Hareket konusu kazanımları içinden seçilen üç kazanımdaki bütün alt konuları ve kavramları yansıtıyor mu?			
5.	Soruların içeriği bilimsel olarak uygun mu?			
6.	Test dil ve anlam bilgisi olarak 9. sınıf öğrencileri için uygun mu?			
7.	Sorular çoktan seçmeli formatına uygun yazılmış mı?			

8.	Sorulardaki açıklama, soru cümlesi, seçenek ve şekil, grafik ya da tablo sıralaması uygun mu?			
9.	Yazı puntosunun ve şekil, grafik ya da tabloların büyüklüğü uygun mu?			
10.	Şekil, grafik ya da tablolarda verilen bilgiler yeterli ve gerekli mi?			
11.	Şekil, grafik ya da tablo içeren sorularda yapılan açıklamalar yeterli ve gerekli mi?			
12.	Puanlama kısmında verilen cevaplar uygun mu?			
13.	Testin cevaplanması için 40 dakika süre verilmesi uygun mu? (Süre pilot çalışmada belirlenecek)			
14.	Diğer görüşler:			

9. Sınıf Fizik Dersi Hareket Başarı Testi

12 sorudan oluşan bu test 9. Sınıf fizik dersi, hareket ve kuvvet ünitesinden seçilen ve yeniden düzenlenen hareket konusundaki üç kazanımın ölçülmesine yönelik hazırlanmıştır. Testi cevaplamaya dilediğiniz sorudan başlayabilirsiniz. Yanlış cevaplarınız doğru cevaplarınızı götürmeyecektir. Tüm sorular eşit puanlıdır. Testi cevaplama süreniz bir ders saatidir.

Öğrenci No:

Şube:

SORU 1:

Kazanım 1 : Konum, alınan yol, yer değiştirme, sürat ve hız kavramlarını birbirleri ile ilişkilendirir.

Bilişsel Süreç Boyutu: Anlama

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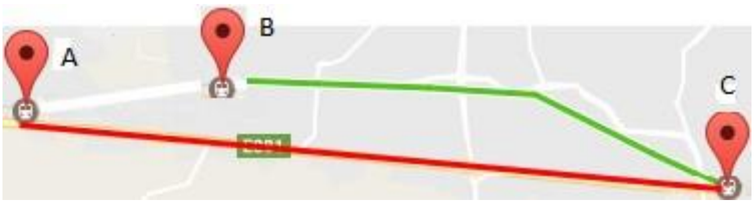
1. A ve B toplu taşıma araçları seferlerini t sürede C durağında tamamlamaktadır. Araçların izlediği güzergâhlar aşağıdaki haritada verilmiştir.



Buna göre araçların hareketine ait niceliklerden hangisi kesinlikle aynıdır?

A) Alınan yol
B) Harekete başladıktan t süre sonraki konum
C) Yer değiştirme
D) Sürat
E) Hız

PUANLAMA

Tam puan (1):

- B) Harekete başladıktan t süre sonraki konum

Puan yok (0):

- Diğer cevaplar

SORU 2:

Kazanım 1 : Konum, alınan yol, yer değiştirme, sürat ve hız kavramlarını birbirleri ile ilişkilendirir.

Bilişsel Süreç Boyutu: Anlama

---

2. Ayşe öğretmen otobüs durağında beklerken cep telefonunu evde unuttuğunu fark ediyor ve durağın 30 m doğusundaki evine gidip telefonunu alarak durağa aynı yol üzerinden geri dönüyor.

Buna göre Ayşe öğretmenin aldığı yol ve yer değiştirmesi kaç m'dir?

	Alınan yol	Yer değiştirme
A)	60	30
B)	30	60
C)	0	60
D)	60	0
E)	30	0

PUANLAMA

Tam puan (1):

	Alınan yol	Yer değiştirme
-	D) 60	0

Puan yok (0):

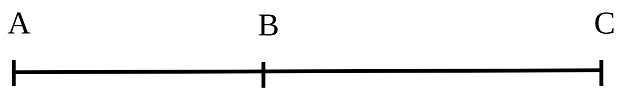
- Diğer cevaplar

SORU 3:

Kazanım 1 : Konum, alınan yol, yer değiştirme, sürat ve hız kavramlarını birbirleri ile ilişkilendirir.

Bilişsel Süreç Boyutu: Anlama

3. Bahar aşağıda gösterilen doğrusal yatay bir yürüyüş yolunda A noktasından C noktasına, sonra da C noktasından B noktasına yürüyor.



A ve B noktaları arasındaki mesafe ile Bahar'ın toplam yürüyüş süresi bilindiğine göre;

I. Alınan yol
II. Yer değiştirme
III. Sürat
IV. Hız

niceliklerinden hangileri hesaplanabilir?

A) Yalnız I

B) I ve III

C) I ve IV

D) II ve III

E) II ve IV

PUANLAMA

Tam puan (1):

- E) II ve IV

Puan yok (0):

- Diğer cevaplar

SORU 4: EBA Kuvvet ve Hareket Kazanım Testi 2-Soru 8

Kazanım 1 : Konum, alınan yol, yer değiştirme, sürat ve hız kavramlarını birbirleri ile ilişkilendirir. Bilişsel Süreç Boyutu: Anlama

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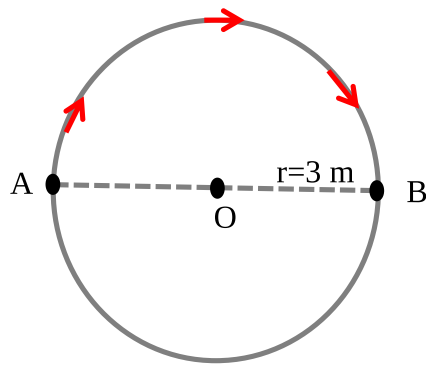
4. Bir hareketli yarıçapı 3 m olan yanda gösterilen çembersel yolda A noktasından B noktasına okla belirtilen yörünge ile 3 s' de gidiyor.
Buna göre hareketlinin sürati ve hızı kaç m/s'dir? ($\pi = 3$)



	Sürat	Hız
A)	3	1
B)	6	1
C)	3	2
D)	6	2
E)	3	6

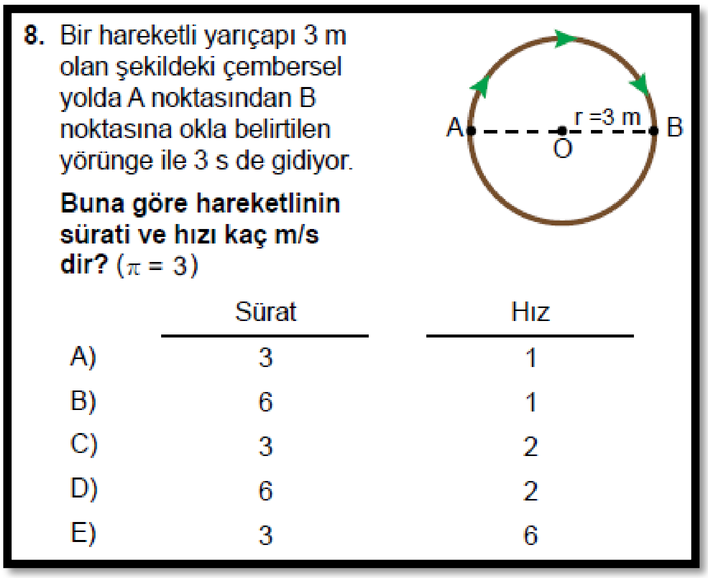
PUANLAMA

Tam puan (1):

	Sürat	Hız
- D)	6	2

Puan yok (0):

- Diğer cevaplar



8. Bir hareketli yarıçapı 3 m olan şekildeki çembersel yolda A noktasından B noktasına okla belirtilen yörünge ile 3 s de gidiyor.

Buna göre hareketlinin sürati ve hızı kaç m/s dir? ($\pi = 3$)

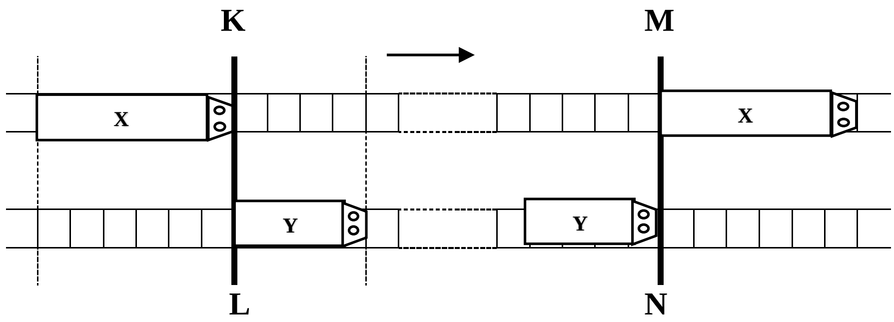
	Sürat	Hız
A)	3	1
B)	6	1
C)	3	2
D)	6	2
E)	3	6

SORU 5: 2011 YGS, Soru 3

Kazanım 1 : Konum, alınan yol, yer değiştirme, sürat ve hız kavramlarını birbirleri ile ilişkilendirir.

Bilişsel Süreç Boyutu: Anlama

5. Aşağıdaki şekilde paralel raylarda ok yönünde sabit hızlarla giden X, Y otoraylarının t_1 ve t_2 anlarındaki konumları verilmiştir. KL çizgisi ile MN çizgisi arasındaki her iki rayda da 24 bölme bulunmaktadır.



t_1 anındaki konumlar t_2 anındaki konumlar

X' in hızının büyüklüğü V_X, Y'ninki V_Y olduğuna göre, $\frac{V_X}{V_Y}$ oranı kaçtır?

(Raylardaki bölmeler eşit aralıklıdır.)

A) $\frac{9}{4}$ B) $\frac{3}{2}$ C) 1 D) $\frac{6}{5}$ E) $\frac{9}{5}$

PUANLAMA

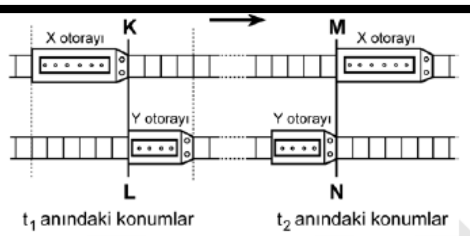
<u>Tam puan (1):</u>

- B) $\frac{3}{2}$

<u>Puan yok (0):</u>

- Diğer cevaplar

3.



Paralel raylarda ok yönünde sabit hızlarla giden X, Y otoraylarının t_1 ve t_2 anlarındaki konumları şekildeki gibidir. KL çizgisi ile MN çizgisi arasında her iki rayda da 24 bölme bulunmaktadır.

X'in hızının büyüklüğü v_X, Y'ninki de v_Y olduğuna göre, $\frac{v_X}{v_Y}$ oranı kaçtır?

(Raylardaki bölmeler eşit aralıklıdır.)

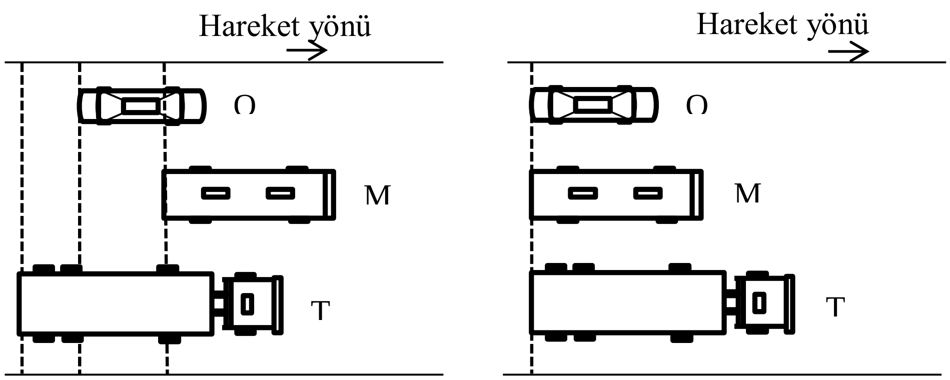
A) $\frac{9}{4}$ B) $\frac{3}{2}$ C) 1 D) $\frac{6}{5}$ E) $\frac{9}{5}$

SORU 6: 2007 ÖSS, Fen 1, Soru 11

Kazanım 1 : Konum, alınan yol, yer değiştirme, sürat ve hız kavramlarını birbirleri ile ilişkilendirir.

Bilişsel Süreç Boyutu: Anlama

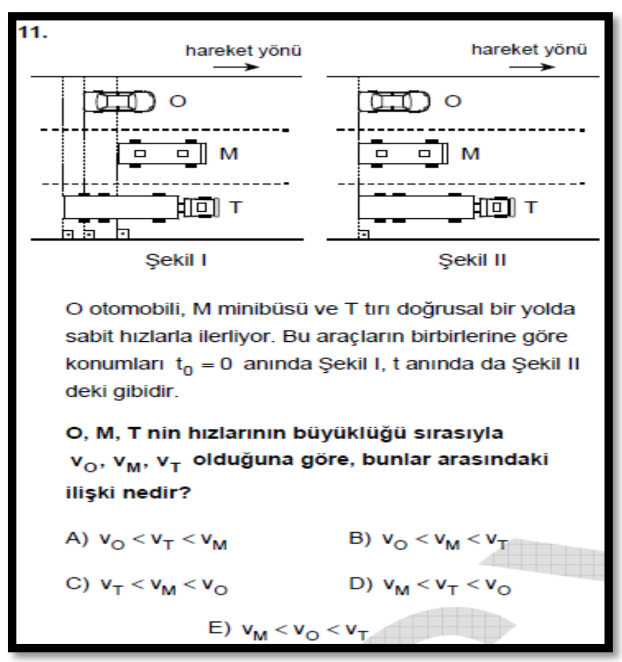
6. O otomobili, M minibüsü ve T tırı doğrusal bir yolda sabit hızlarla ilerliyor. Bu araçların birbirlerine göre konumları, $t_0=0$ anında Şekil I, t anında da Şekil II' deki gibi aşağıda verilmiştir.



Şekil I Şekil II

O, M, T'nin hızlarının büyüklüğü sırasıyla V_O, V_M, V_T olduğuna göre, bunlar arasındaki ilişki nedir?

A) $V_O < V_T < V_M$
B) $V_O < V_M < V_T$
C) $V_T < V_M < V_O$
D) $V_M < V_T < V_O$
E) $V_M < V_O < V_T$



11.

hareket yönü hareket yönü

Şekil I Şekil II

O otomobili, M minibüsü ve T tırı doğrusal bir yolda sabit hızlarla ilerliyor. Bu araçların birbirlerine göre konumları $t_0 = 0$ anında Şekil I, t anında da Şekil II deki gibidir.

O, M, T nin hızlarının büyüklüğü sırasıyla v_O, v_M, v_T olduğuna göre, bunlar arasındaki ilişki nedir?

A) $v_O < v_T < v_M$ B) $v_O < v_M < v_T$

C) $v_T < v_M < v_O$ D) $v_M < v_T < v_O$

E) $v_M < v_O < v_T$

PUANLAMA

Tam puan (1):

- E) $V_M < V_O < V_T$

Puan yok (0):

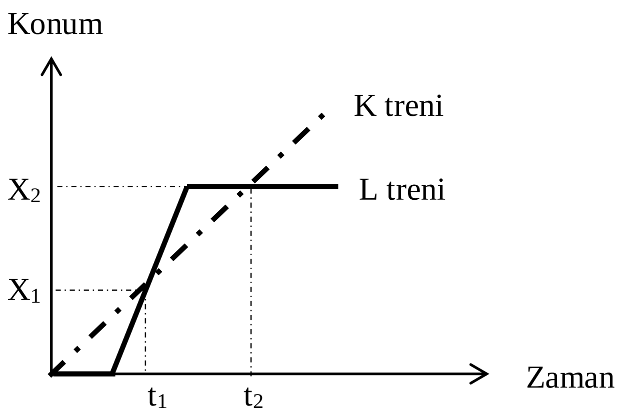
- Diğer cevaplar

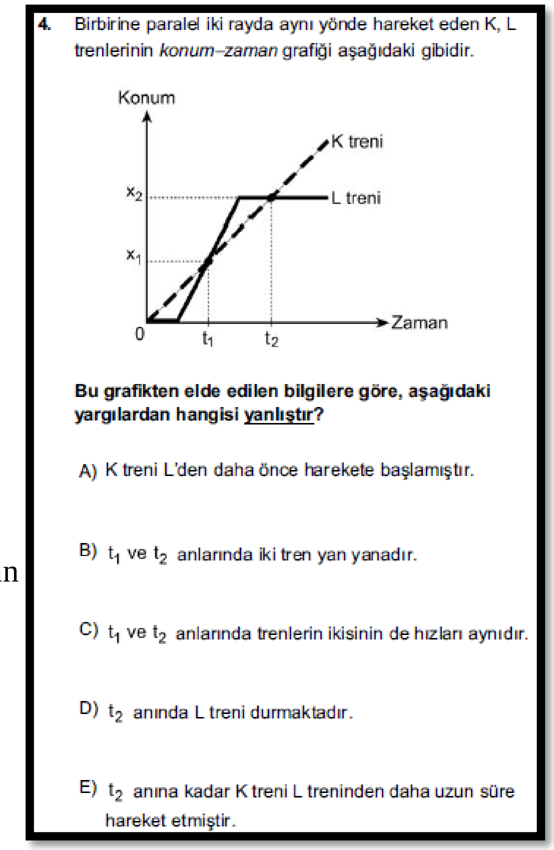
SORU 7: 2013 YGS, Soru 4'ün düzenlenmiş hali

Kazanım 2 : Konum-zaman ve hız-zaman grafiklerindeki hareketi açıklar.

Bilişsel Süreç Boyutu: Anlama

7. Birbirine paralel iki rayda aynı yönde hareket eden K ve L trenlerinin konum-zaman grafiği aşağıdaki gibidir.




4. Birbirine paralel iki rayda aynı yönde hareket eden K, L trenlerinin *konum–zaman* grafiği aşağıdaki gibidir.

Konum, K treni, L treni, x_2, x_1, 0, t_1, t_2, Zaman

Bu grafikten elde edilen bilgilere göre, aşağıdaki yargılardan hangisi <u>yanlıştır</u>?

A) K treni L'den daha önce harekete başlamıştır.

B) t_1 ve t_2 anlarında iki tren yan yanadır.

C) t_1 ve t_2 anlarında trenlerin ikisinin de hızları aynıdır.

D) t_2 anında L treni durmaktadır.

E) t_2 anına kadar K treni L treninden daha uzun süre hareket etmiştir.

Bu grafikten elde edilen bilgilere göre, trenlerin hız, konum ve hareket süreleri ile ilgili aşağıdaki yargılardan hangisi <u>yanlıştır</u>?

A) K treni L'den daha önce harekete başlamıştır.
B) t_1 ve t_2 anlarında iki tren yan yanadır.
C) t_1 ve t_2 anlarında trenlerin ikisinin de hızları aynıdır.
D) t_2 anında L treni durmaktadır.
E) t_2 anına kadar K treni L treninden daha uzun süre hareket etmiştir.

PUANLAMA

<u>Tam puan (1):</u>

- C) t_1 ve t_2 anlarında trenlerin ikisinin de hızları aynıdır.

<u>Puan yok (0):</u>

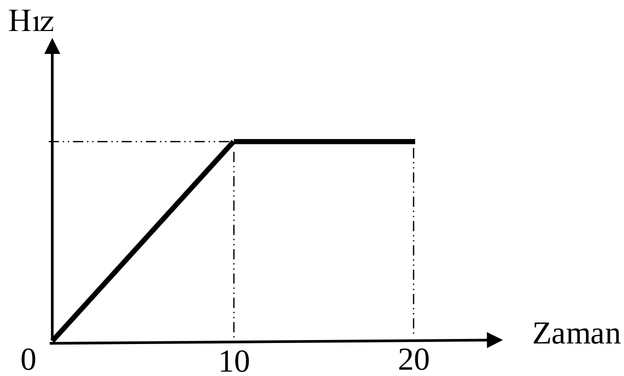
- Diğer cevaplar

SORU 8:

Kazanım 2 : Konum-zaman ve hız-zaman grafiklerindeki hareketi açıklar.

Bilişsel Süreç Boyutu: Anlama

8. Doğrusal bir yolda hareket eden aracın hız-zaman grafiği aşağıdaki gibidir.



Bu grafikten elde edilen bilgilere göre, verilen zaman aralıklarında aracın yer değiştirme, hız ve ivmesi ile ilgili aşağıdaki yargılardan hangisi yanlıştır?

A) 0-10 s zaman aralığında düzgün hızlanmıştır.
B) 0-10 s zaman aralığında ivme sabittir.
C) 10-20 s zaman aralığında durmaktadır.
D) 10-20 s zaman aralığında ivme sıfırdır.
E) 10-20 s zaman aralığındaki yer değiştirme, 0-10 s zaman aralığındaki yer değiştirmeden daha büyüktür.

PUANLAMA

Tam puan (1):

- C) 10-20 s zaman aralığında durmaktadır.

Puan yok (0):

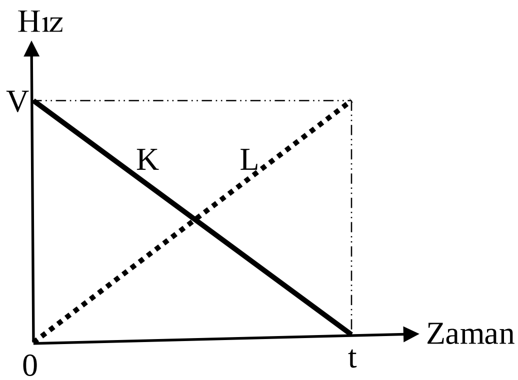
- Diğer cevaplar

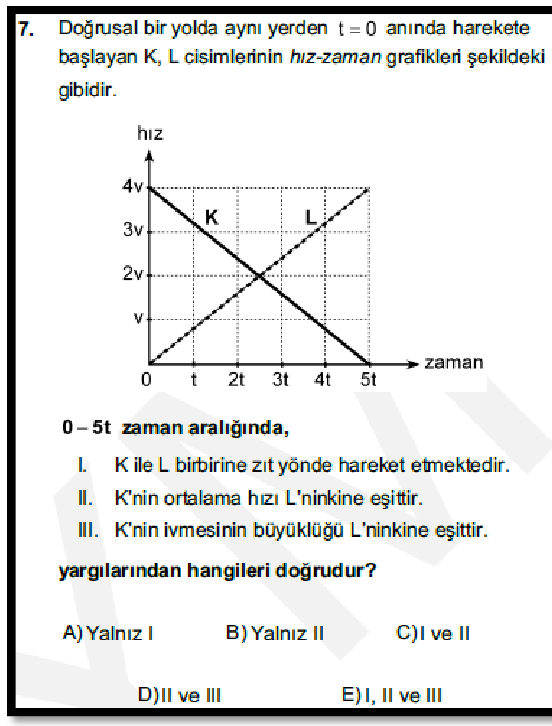
SORU 9: 2012 LYS, Soru 7

Kazanım 2 : Konum-zaman ve hız-zaman grafiklerindeki hareketi açıklar.

Bilişsel Süreç Boyutu: Anlama

9. Doğrusal bir yolda aynı yerden t=0 anında harekete başlayan K, L cisimlerinin hız-zaman grafikleri şekildeki gibidir.





7. Doğrusal bir yolda aynı yerden $t = 0$ anında harekete başlayan K, L cisimlerinin *hız-zaman* grafikleri şekildeki gibidir.

0 – 5t zaman aralığında,

I. K ile L birbirine zıt yönde hareket etmektedir.

II. K'nin ortalama hızı L'ninkine eşittir.

III. K'nin ivmesinin büyüklüğü L'ninkine eşittir.

yargılarından hangileri doğrudur?

A) Yalnız I B) Yalnız II C) I ve II

D) II ve III E) I, II ve III

0-t zaman aralığında,

I. K ve L birbirine zıt yönde hareket etmektedir.

II. K'nin ortalama hızı L'ninkine eşittir.

III. K'nin ivmesinin büyüklüğü L'ninkine eşittir.

yargılarından hangileri doğrudur?

A)Yalnız I

B)Yalnız II

C) I ve II

D) II ve III

E) I, II ve III

PUANLAMA

Tam puan (1):
- D) II ve III

Puan yok (0):
- Diğer cevaplar

SORU 10:

3. Kazanım : İvme kavramını hızlanma ve yavaşlama olayları ile ilişkilendirir.
Bilişsel Süreç Boyutu: Anlama

10. Aşağıdaki tabloda bir aracın doğrusal yolda hareket başladıktan sonra 1 s zaman aralıkları ile hız değerleri verilmiştir.

Hız (m/s)	5	10	15	15	15	10	5
Zaman (s)	1	2	3	4	5	6	7

Bu tablodan elde edilen bilgilere göre, aracın ivmesi hangi zaman aralığında sıfırdan farklı sabit bir değerdedir?

A) 1-3 s
B) 1-5 s
C) 1-7 s
D) 3-5 s
E) 3-7 s

PUANLAMA

Tam puan (1):

- A) 1-3 s

Puan yok (0):

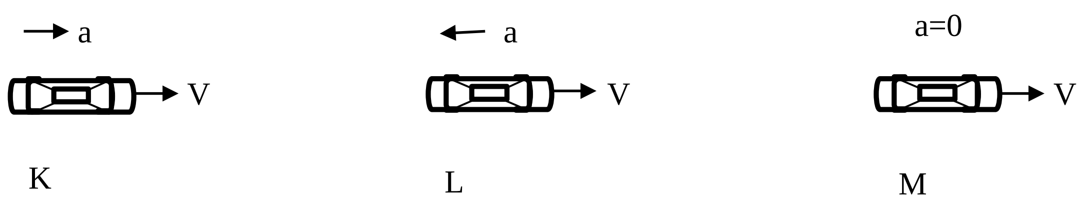
- Diğer cevaplar

SORU 11:

3. Kazanım : İvme kavramını hızlanma ve yavaşlama olayları ile ilişkilendirir.

Bilişsel Süreç Boyutu: Anlama

11.



Yukarıdaki şekilde üç aracın t=0 anında hızlarının ve hareket boyunca sabit değerde olan ivmelerinin yönleri verilmiştir. **t=0 anından kısa bir süre sonra K, L, M'nin hızlarının büyüklüğü sırasıyla V_K, V_L, V_M olduğuna göre, bunlar arasındaki ilişki nedir?**

A) $V_K > V_M > V_L$
B) $V_K > V_L > V_M$
C) $V_M > V_K > V_L$
D) $V_M > V_L > V_K$
E) $V_L > V_K > V_M$

PUANLAMA

Tam puan (1):

- A) $V_K > V_M > V_L$

Puan yok (0):

- Diğer cevaplar

SORU 12:

3. Kazanım : İvme kavramını hızlanma ve yavaşlama olayları ile ilişkilendirir.

Bilişsel Süreç Boyutu: Anlama

12. Dört farklı cismin ivmesi ile ilgili,

I. Düzgün hızlanan cismin ivmesi düzgün artmaktadır.
II. Düzgün yavaşlayan cismin ivmesi düzgün azalmaktadır.
III. Duran cisim ivmesi sıfırdır.
IV. Sabit hızla hareket eden cismin ivmesi sıfırdır.

yargılarından hangileri doğrudur?

A) Yalnız III
B) I ve II
C) III ve IV
D) I, II ve III
E) I, II, III ve IV

PUANLAMA

Tam puan (1):

- C) III ve IV

Puan yok (0):

- Diğer cevaplar

F3. Second Version of Motion Achievement Test

9. Sınıf Fizik Dersi Hareket Başarı Testi

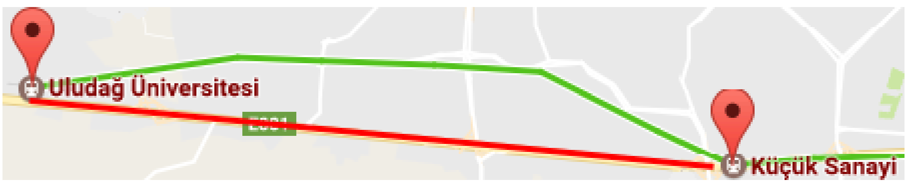
12 sorudan oluşan bu test 9. sınıf fizik dersi, Hareket ve Kuvvet ünitesinden seçilen ve yeniden düzenlenen hareket konusundaki üç kazanımın ölçülmesine yönelik hazırlanmıştır. Testi cevaplamaya dilediğiniz sorudan başlayabilirsiniz. Yanlış cevaplarınız doğru cevaplarınızı götürmeyecektir. Tüm sorular eşit puanlıdır. Testi cevaplama süreniz bir ders saatidir.

Öğrenci No: ……………………………
Şube : ……………………………
Okul : ……………………………

SORU 1:

Kazanım 1 : Konum, alınan yol, yer değiştirme, sürat ve hız kavramlarını birbirleri ile ilişkilendirir.
Bilişsel Süreç Boyutu: Anlama

1. Bursa'da Küçük Sanayi-Uludağ Üniversitesi durakları arasında seferlerini sürdüren halk otobüsleri aşağıdaki haritada kırmızı çizgi ile gösterilen güzergâhı, raylı sistem ise yeşil çizgi ile gösterilen güzergâhı kullanmaktadır.



Buna göre iki durak arasında halk otobüsü ve raylı sistemin hareketine ait niceliklerden hangisi kesinlikle aynıdır?

A) Alınan yolları

B) Yer değiştirmeleri

C) Süratleri

D) Hızları

E) Harekete başladıktan sonra herhangi bir t süre sonraki konumları

PUANLAMA

Tam puan (1):
- B) Yer değiştirmeleri

Puan yok (0):
- Diğer cevaplar

SORU 2:

Kazanım 1 : Konum, alınan yol, yer değiştirme, sürat ve hız kavramlarını birbirleri ile ilişkilendirir.
Bilişsel Süreç Boyutu: Anlama

2. Ayşe öğretmen otobüs durağında beklerken cep telefonunu evde unuttuğunu fark ediyor ve durağın 30 m doğusundaki evine gidip telefonunu alarak duraktaki aynı noktaya aynı yol üzerinden geri dönüyor.

Buna göre Ayşe öğretmenin aldığı yol ve yer değiştirmesi kaç m'dir?

	Alınan yol	Yer değiştirme
A)	30	60
B)	30	0
C)	60	0
D)	60	30
E)	0	60

PUANLAMA

Tam puan (1):

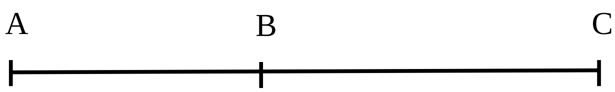
	Alınan yol	Yer değiştirme
-	C) 60	0

Puan yok (0):
- Diğer cevaplar

SORU 3:

Kazanım 1 : Konum, alınan yol, yer değiştirme, sürat ve hız kavramlarını birbirleri ile ilişkilendirir.
Bilişsel Süreç Boyutu: Anlama

3. Bahar aşağıda gösterilen doğrusal yatay bir yürüyüş yolunda A noktasından C noktasına, sonra da C noktasından B noktasına yürüyor.



A ve B noktaları arasındaki mesafe ile Bahar'ın toplam yürüyüş süresi bilindiğine göre Bahar'ın hareketi ile ilgili niceliklerden hangisi hesaplanabilir?

A) AC noktaları arasında aldığı yol

B) Toplam aldığı yol

C) BC arasındaki yer değiştirme

D) Sürat

E) Hız

PUANLAMA

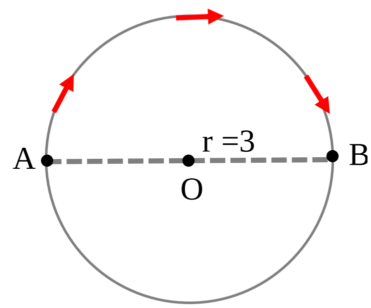
Tam puan (1):
- E) Hız

Puan yok (0):
- Diğer cevaplar

SORU 4: EBA Kuvvet ve Hareket kazanım testi 2-Soru 8'in düzenlenmiş halidir. Sorunun aslı aşağıda verilmiştir.

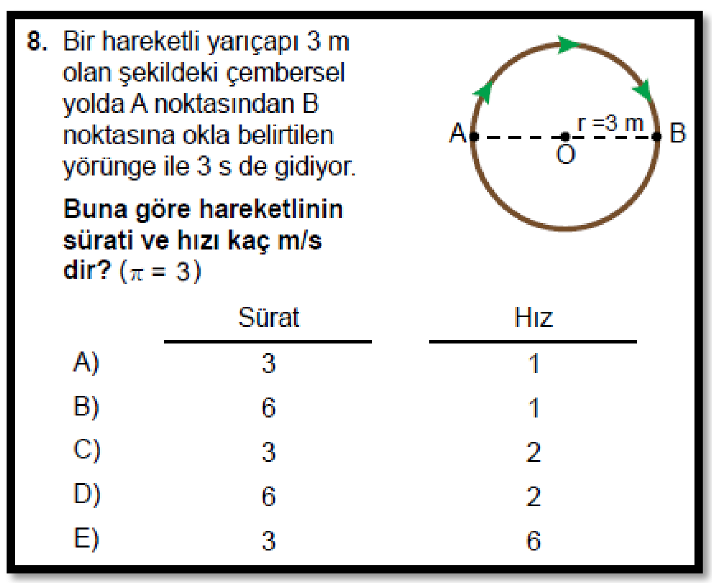
Kazanım 1 : Konum, alınan yol, yer değiştirme, sürat ve hız kavramlarını birbirleri ile ilişkilendirir. Bilişsel Süreç Boyutu: Anlama

4. Bir hareketli yarıçapı 3 m olan yanda gösterilen çembersel yolda A noktasından B noktasına okla belirtilen yörünge ile 3 s' de gidiyor.



Buna göre hareketlinin sürati ve hızı kaç m/s'dir? (π = 3 alınız.)

	Sürat	Hız
A)	3	1
B)	6	1
C)	3	2
D)	6	2
E)	3	6



8. Bir hareketli yarıçapı 3 m olan şekildeki çembersel yolda A noktasından B noktasına okla belirtilen yörünge ile 3 s de gidiyor.

r =3 m
A
B
O

Buna göre hareketlinin sürati ve hızı kaç m/s dir? (π = 3)

	Sürat	Hız
A)	3	1
B)	6	1
C)	3	2
D)	6	2
E)	3	6

PUANLAMA

Tam puan (1):

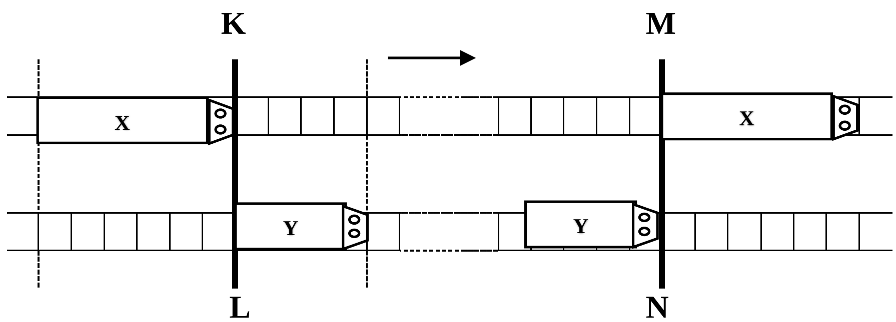
	Sürat	Hız
- C)	3	2

Puan yok (0):
- Diğer cevaplar

SORU 5: 2011 YGS, Soru 3'ün düzenlenmiş halidir. Sorunun aslı aşağıda verilmiştir.

Kazanım 1 : Konum, alınan yol, yer değiştirme, sürat ve hız kavramlarını birbirleri ile ilişkilendirir.
Bilişsel Süreç Boyutu: Anlama

5. Aşağıdaki şekilde paralel raylarda ok yönünde sabit hızlarla giden X, Y otoraylarının t_1 ve t_2 anlarındaki konumları verilmiştir. KL çizgisi ile MN çizgisi arasındaki her iki rayda da 24 bölme bulunmaktadır.



t_1 anındaki konumlar t_2 anındaki konumlar

X' in hızının büyüklüğü V_X, Y'ninki V_Y olduğuna göre, $\frac{V_X}{V_Y}$ oranı kaçtır?
(Raylardaki bölmeler eşit aralıklıdır.)

A) $\frac{9}{4}$ B) $\frac{3}{2}$ C) 1 D) $\frac{6}{5}$ E) $\frac{9}{5}$

PUANLAMA

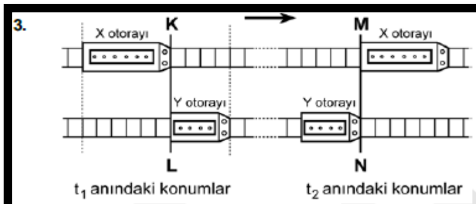
<u>Tam puan (1):</u>

- B) $\frac{3}{2}$

<u>Puan yok (0):</u>

- Diğer cevaplar

3.



Paralel raylarda ok yönünde sabit hızlarla giden X, Y otoraylarının t_1 ve t_2 anlarındaki konumları şekildeki gibidir. KL çizgisi ile MN çizgisi arasında her iki rayda da 24 bölme bulunmaktadır.

X'in hızının büyüklüğü v_X, Y'ninki de v_Y olduğuna göre, $\frac{v_X}{v_Y}$ oranı kaçtır?

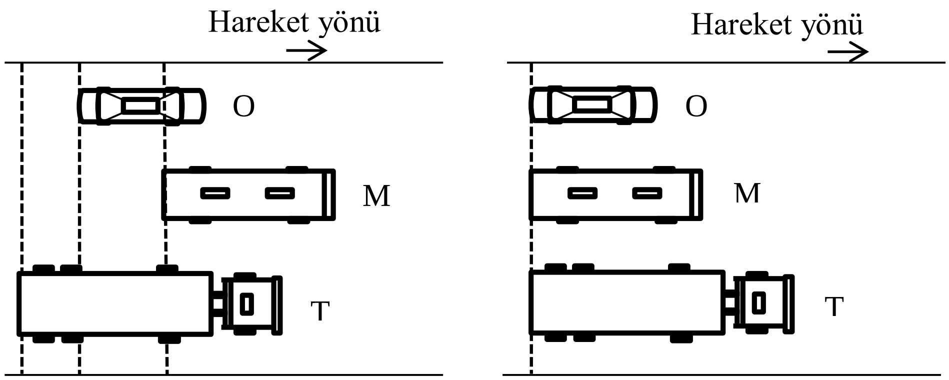
(Raylardaki bölmeler eşit aralıklıdır.)

A) $\frac{9}{4}$ B) $\frac{3}{2}$ C) 1 D) $\frac{6}{5}$ E) $\frac{9}{5}$

SORU 6: 2007 ÖSS, Fen 1, Soru 11'in düzenlenmiş halidir. Sorunun aslı aşağıda verilmiştir.

Kazanım 1 : Konum, alınan yol, yer değiştirme, sürat ve hız kavramlarını birbirleri ile ilişkilendirir.
Bilişsel Süreç Boyutu: Anlama

6. O otomobili, M minibüsü ve T tırı doğrusal bir yolda sabit hızlarla ilerliyor. Bu araçların birbirlerine göre konumları, t_0 anında Şekil I, daha sonraki t anında da Şekil II' deki gibi olmuştur.



Şekil I Şekil II

O, M, T'nin hızlarının büyüklüğü sırasıyla V_O, V_M, V_T olduğuna göre, bunlar arasındaki ilişki nedir?

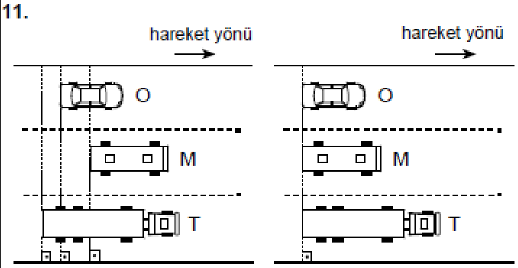
A) $V_O < V_T < V_M$
B) $V_O < V_M < V_T$
C) $V_T < V_M < V_O$
D) $V_M < V_T < V_O$
E) $V_M < V_O < V_T$

PUANLAMA

<u>Tam puan (1):</u>
- E) $V_M < V_O < V_T$

<u>Puan yok (0):</u>
- Diğer cevaplar

11.



Şekil I   Şekil II

O otomobili, M minibüsü ve T tırı doğrusal bir yolda sabit hızlarla ilerliyor. Bu araçların birbirlerine göre konumları $t_0 = 0$ anında Şekil I, t anında da Şekil II deki gibidir.

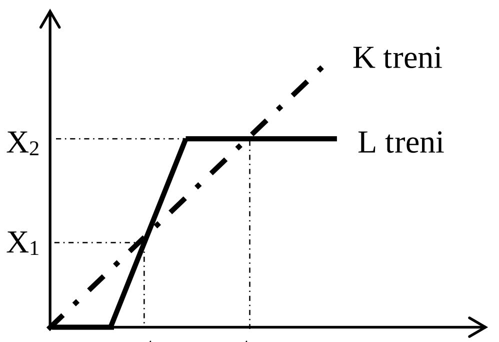
O, M, T nin hızlarının büyüklüğü sırasıyla v_O, v_M, v_T olduğuna göre, bunlar arasındaki ilişki nedir?

A) $v_O < v_T < v_M$
B) $v_O < v_M < v_T$
C) $v_T < v_M < v_O$
D) $v_M < v_T < v_O$
E) $v_M < v_O < v_T$

SORU 7: 2013 YGS, Soru 4’ün düzenlenmiş halidir. Sorunun aslı aşağıda verilmiştir.

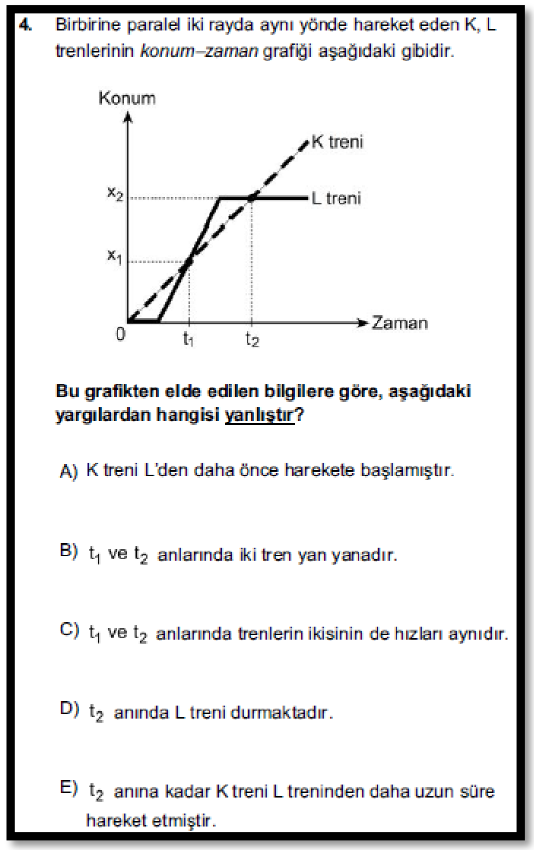
Kazanım 2 : Konum-zaman ve hız-zaman grafiklerindeki hareketi açıklar.
Bilişsel Süreç Boyutu: Anlama

7. Birbirine paralel iki rayda aynı yönde hareket eden K ve L trenlerinin konum-zaman grafiği aşağıdaki gibidir.



Bu grafikten elde edilen bilgilere göre trenlerin hız ve konumları ile ilgili aşağıdaki yargılardan hangisi <u>yanlıştır</u>?

A) t_1 ve t_2 anlarında trenlerin ikisinin de hızları aynıdır.
B) t_1 anında iki tren yan yanadır.
C) t_2 anında iki tren yan yanadır.
D) K ve L trenleri aynı konumdan harekete başlamıştır.
E) t_2 anında L treni durmaktadır.



4. Birbirine paralel iki rayda aynı yönde hareket eden K, L trenlerinin *konum–zaman* grafiği aşağıdaki gibidir.

Bu grafikten elde edilen bilgilere göre, aşağıdaki yargılardan hangisi <u>yanlıştır</u>?

A) K treni L'den daha önce harekete başlamıştır.

B) t_1 ve t_2 anlarında iki tren yan yanadır.

C) t_1 ve t_2 anlarında trenlerin ikisinin de hızları aynıdır.

D) t_2 anında L treni durmaktadır.

E) t_2 anına kadar K treni L treninden daha uzun süre hareket etmiştir.

PUANLAMA

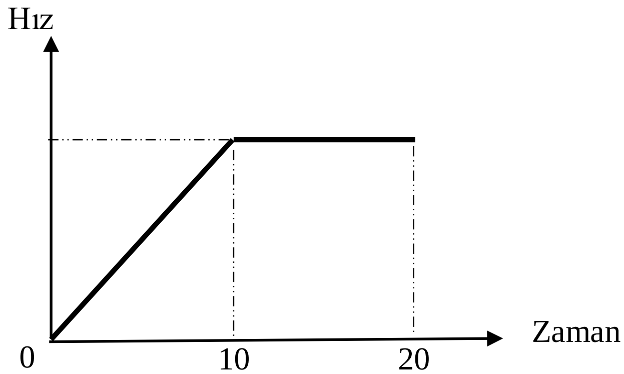
<u>Tam puan (1):</u>
- A) t_1 ve t_2 anlarında trenlerin ikisinin de hızları aynıdır.

<u>Puan yok (0):</u>
- Diğer cevaplar

SORU 8:

Kazanım 2 : Konum-zaman ve hız-zaman grafiklerindeki hareketi açıklar.
Bilişsel Süreç Boyutu: Anlama

8. Doğrusal bir yolda hareket eden aracın hız-zaman grafiği aşağıdaki gibidir.



Bu grafikten elde edilen bilgilere göre, verilen zaman aralıklarında aracın yer değiştirmesi ve hızı ile ilgili ağıdaki yargılardan hangisi doğrudur?

A) 0-10 s zaman aralığındaki yer değiştirme ile 10-20 s zaman aralığındaki yer değiştirme eşittir.
B) 0-10 s zaman aralığındaki yer değiştirme, 10-20 s zaman aralığındaki yer değiştirmeden daha büyüktür.
C) 0-10 s zaman aralığında sabit hızlıdır.
D) 10-20 s zaman aralığında durmaktadır.
E) 10-20 s zaman aralığında sabit hızlıdır.

PUANLAMA

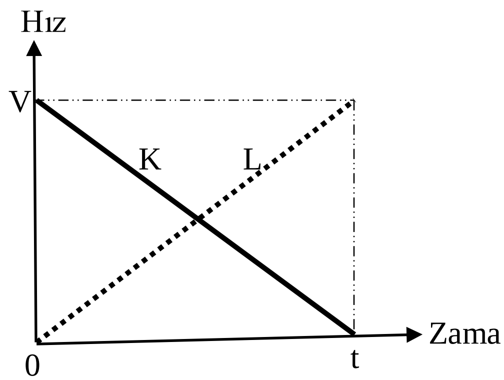
Tam puan (1):
- E) 10-20 s zaman aralığında sabit hızlıdır.

Puan yok (0):
- Diğer cevaplar

SORU 9: 2012 LYS, Soru 7'nin düzenlenmiş halidir. Sorunun aslı aşağıda verilmiştir.

Kazanım 2 : Konum-zaman ve hız-zaman grafiklerindeki hareketi açıklar.
Bilişsel Süreç Boyutu: Anlama

9. Doğrusal bir yolda aynı yerden aynı anda harekete başlayan K, L cisimlerinin hız-zaman grafikleri şekildeki gibidir.

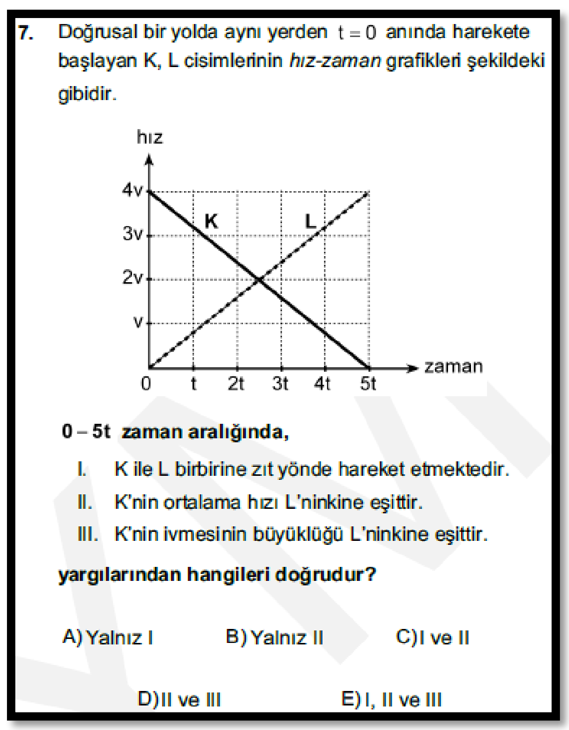


0-t zaman aralığında,

I. K ve L birbirine zıt yönde hareket etmektedir.
II. K'nin ortalama hızı L'ninkine eşittir.
III. K'nin ivmesinin büyüklüğü L'ninkine eşittir.

yargılarından hangileri doğrudur?

A) Yalnız I
B) Yalnız II
C) I ve II
D) II ve III
E) I, II ve III



7. Doğrusal bir yolda aynı yerden $t = 0$ anında harekete başlayan K, L cisimlerinin *hız-zaman* grafikleri şekildeki gibidir.

0 – 5t zaman aralığında,

I. K ile L birbirine zıt yönde hareket etmektedir.
II. K'nin ortalama hızı L'ninkine eşittir.
III. K'nin ivmesinin büyüklüğü L'ninkine eşittir.

yargılarından hangileri doğrudur?

A) Yalnız I B) Yalnız II C) I ve II

D) II ve III E) I, II ve III

PUANLAMA

Tam puan (1):

- D) II ve III

Puan yok (0):

- Diğer cevaplar

SORU 10:

3. Kazanım : İvme kavramını hızlanma ve yavaşlama olayları ile ilişkilendirir.
Bilişsel Süreç Boyutu: Anlama

10. Bir otobüs ($0-t_1$) zaman aralığında sabit hızla yoluna devam ederken yolcu almak için (t_1-t_2) aralığında yavaşlıyor. (t_2-t_3) aralığında yolcuların binmesi için durgun bekleyen otobüs (t_3-t_4) aralığında hızlanıyor.

Buna göre hangi zaman aralıklarında otobüsün ivmesi sıfırdan farklıdır?

A) $0-t_1$ ve t_1-t_2

B) $0-t_1$ ve t_2-t_3

C) t_1-t_2 ve t_2-t_3

D) t_1-t_2 ve t_3-t_4

E) t_2-t_3 ve t_3-t_4

PUANLAMA

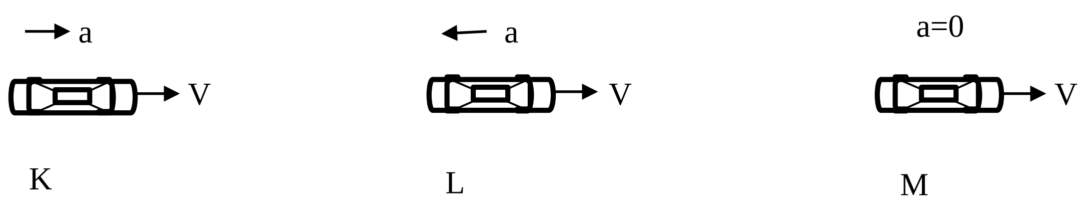
Tam puan (1):
- D) t_1-t_2 ve t_3-t_4

Puan yok (0):
- Diğer cevaplar

SORU 11:

3. Kazanım : İvme kavramını hızlanma ve yavaşlama olayları ile ilişkilendirir.
Bilişsel Süreç Boyutu: Anlama

11. K, L ve M araçlarının hızları aynı iken hareket boyunca sabit değerde olan ivmelerinin yönleri şekilde verilmiştir.



Kısa bir süre sonra K, L ve M araçlarının hızlarının büyüklüğü sırasıyla V_K, V_L, V_M olduğuna göre, bunlar arasındaki ilişki nedir?

A) $V_K > V_M > V_L$

B) $V_K > V_L > V_M$

C) $V_M > V_K > V_L$

D) $V_M > V_L > V_K$

E) $V_L > V_K > V_M$

PUANLAMA

<u>Tam puan (1):</u>

- A) $V_K > V_M > V_L$

<u>Puan yok (0):</u>

- Diğer cevaplar

SORU 12:

3. Kazanım : İvme kavramını hızlanma ve yavaşlama olayları ile ilişkilendirir.
Bilişsel Süreç Boyutu: Anlama

12. Dört farklı cismin ivmeleri ile ilgili,

I. Düzgün hızlanan cismin ivmesi düzgün artmaktadır.
II. Düzgün yavaşlayan cismin ivmesi düzgün azalmaktadır.
III. Duran cismin ivmesi sıfırdır.
IV. Sabit hızla hareket eden cismin ivmesi sıfırdır.

yargılarından hangileri doğrudur?

A) Yalnız III

B) I ve II

C) III ve IV

D) I, II ve III

E) I, II, III ve IV

PUANLAMA

Tam puan (1):
- C) III ve IV

Puan yok (0):
- Diğer cevaplar

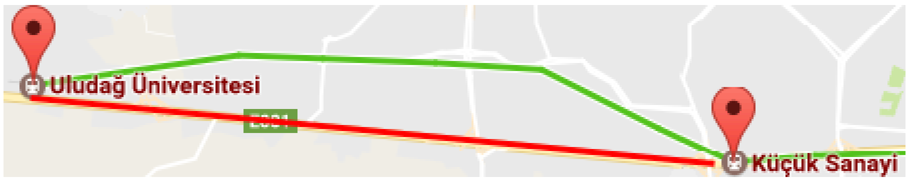
F4. Third Version of Motion Achievement Test

9. Sınıf Fizik Dersi Hareket Başarı Testi

12 sorudan oluşan bu test 9. sınıf fizik dersi, Hareket ve Kuvvet ünitesinden seçilen ve yeniden düzenlenen hareket konusundaki üç kazanımın ölçülmesine yönelik hazırlanmıştır. Testi cevaplamaya dilediğiniz sorudan başlayabilirsiniz. Yanlış cevaplarınız doğru cevaplarınızı götürmeyecektir. Tüm sorular eşit puanlıdır. Testi cevaplama süreniz bir ders saatidir.

Öğrenci No: ……………………………
Şube : ……………………………
Okul : ……………………………

1. Bursa'da Küçük Sanayi-Uludağ Üniversitesi durakları arasında seferlerini sürdüren halk otobüsleri aşağıdaki haritada kırmızı çizgi ile gösterilen güzergâhı, raylı sistem ise yeşil çizgi ile gösterilen güzergâhı kullanmaktadır.



Buna göre iki durak arasında halk otobüsü ve raylı sistemin hareketine ait niceliklerden hangisi kesinlikle aynıdır?

A) Alınan yolları

B) Yer değiştirmeleri

C) Süratleri

D) Hızları

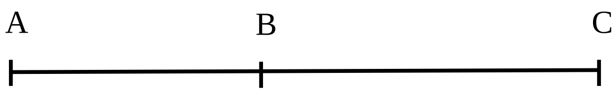
E) Harekete başladıktan sonra herhangi bir t süre sonraki konumları

2. Ayşe öğretmen otobüs durağında beklerken cep telefonunu evde unuttuğunu fark ediyor ve durağın 30 m doğusundaki evine gidip telefonunu alarak duraktaki aynı noktaya aynı yol üzerinden geri dönüyor.

Buna göre Ayşe öğretmenin aldığı yol ve yer değiştirmesinin büyüklüğü kaç m' dir?

	Alınan yol	Yer değiştirme
A)	30	60
B)	30	0
C)	60	0
D)	60	30
E)	0	60

3. Bahar aşağıda gösterilen doğrusal yatay bir yürüyüş yolunda A noktasından C noktasına, sonra da C noktasından B noktasına yürüyor.



Sadece A ve B noktaları arasındaki mesafe ile Bahar'ın toplam yürüyüş süresi bilindiğine göre Bahar'ın hareketi ile ilgili niceliklerden hangisi hesaplanabilir?

A) AC noktaları arasında aldığı yol

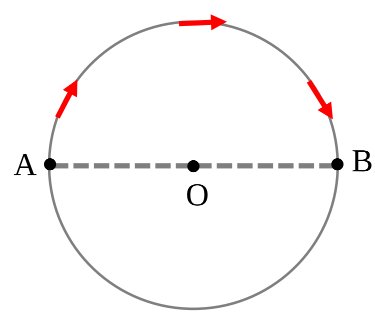
B) Toplam aldığı yol

C) BC arasındaki yer değiştirme

D) Sürat

E) Hız

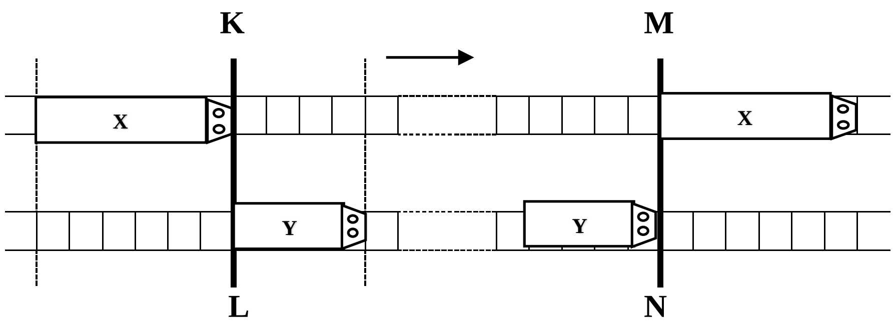
4. Bir hareketli yarıçapı 3 m olan yanda gösterilen çembersel yolda A noktasından B noktasına okla belirtilen yörünge ile 3 saniyede gidiyor.



Buna göre hareketlinin ortalama sürati ve ortalama hızı kaç m/s'dir?
($\pi = 3$ alınız.)

	Sürat	Hız
A)	3	1
B)	6	1
C)	6	2
D)	3	2
E)	3	6

5. Aşağıdaki şekilde paralel raylarda ok yönünde sabit hızlarla giden X, Y otoraylarının t_1 ve t_2 anlarındaki konumları verilmiştir. KL çizgisi ile MN çizgisi arasındaki her iki rayda da 24 bölme bulunmaktadır. X otorayı altı bölme Y otorayı ise dört bölme uzunluğundadır.

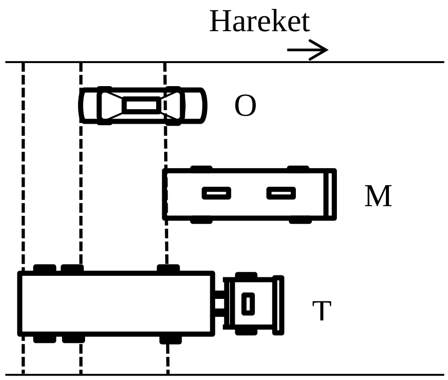


t_1 anındaki konumlar t_2 anındaki konumlar

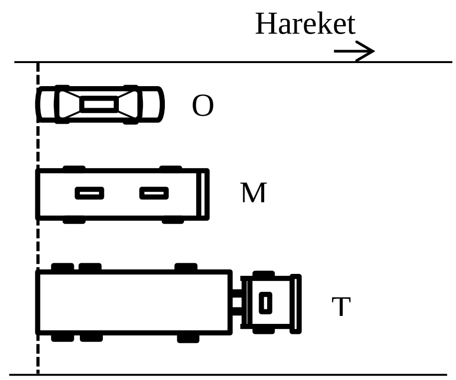
X' in hızının büyüklüğü V_X, Y'ninki V_Y olduğuna göre, $\frac{V_X}{V_Y}$ oranı kaçtır?
(Raylardaki bölmeler eşit aralıklıdır.)

A) $\frac{9}{4}$ B) $\frac{3}{2}$ C) 1 D) $\frac{6}{5}$ E) $\frac{9}{5}$

6. O otomobili, M minibüsü ve T tırı doğrusal bir yolda sabit hızlarla ilerliyor. Bu araçların birbirlerine göre konumları, t_0 anında Şekil I, daha sonraki t anında da Şekil II' deki gibi olmuştur.



Şekil I



Şekil II

O, M, T'nin hızlarının büyüklüğü sırasıyla V_O, V_M, V_T olduğuna göre, bunlar arasındaki ilişki nedir?

A) $V_O < V_T < V_M$

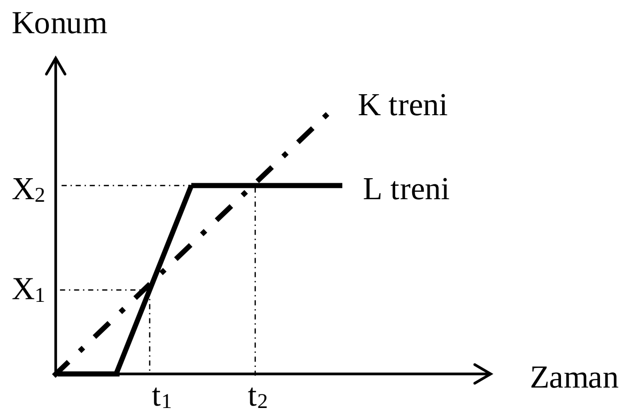
B) $V_O < V_M < V_T$

C) $V_T < V_M < V_O$

D) $V_M < V_T < V_O$

E) $V_M < V_O < V_T$

7. Birbirine paralel iki rayda aynı yönde hareket eden K ve L trenlerinin konum-zaman grafiği aşağıdaki gibidir.



Bu grafikten elde edilen bilgilere göre trenlerin hız ve konumları ile ilgili aşağıdaki yargılardan hangisi <u>yanlıştır</u>?

A) t_1 anında trenlerin hızları aynıdır.

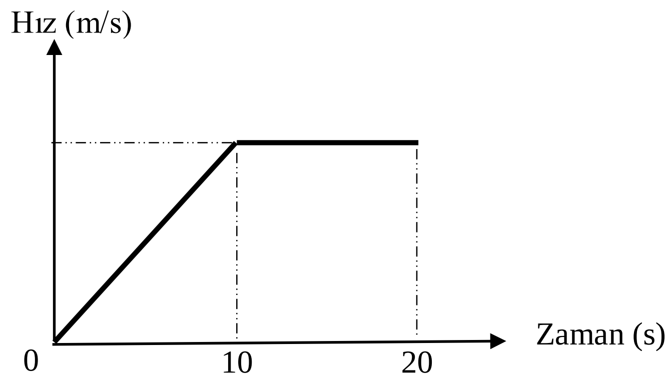
B) t_1 anında iki tren yan yanadır.

C) t_2 anında iki tren yan yanadır.

D) K ve L trenleri aynı konumdan harekete başlamıştır.

E) t_2 anında L treni durmaktadır.

8. Doğrusal bir yolda hareket eden aracın hız-zaman grafiği aşağıdaki gibidir.



Bu grafikten elde edilen bilgilere göre, verilen zaman aralıklarında aracın yer değiştirmesi ve hızı ile ilgili ağıdaki yargılardan hangisi doğrudur?

A) 0-10 s zaman aralığındaki yer değiştirme ile 10-20 s zaman aralığındaki yer değiştirme eşittir.

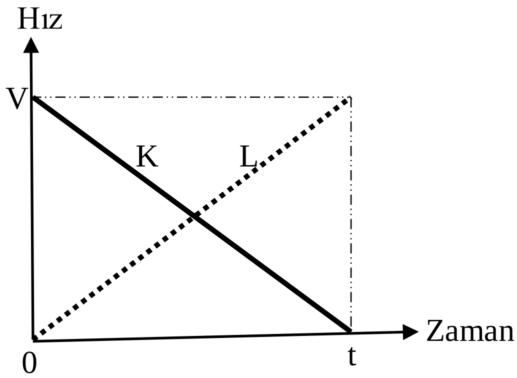
B) 0-10 s zaman aralığındaki yer değiştirme, 10-20 s zaman aralığındaki yer değiştirmeden daha büyüktür.

C) 0-10 s zaman aralığında sabit hızlıdır.

D) 10-20 s zaman aralığında durmaktadır.

E) 10-20 s zaman aralığında sabit hızlıdır.

9. Doğrusal bir yolda aynı yerden aynı anda harekete başlayan K, L cisimlerinin hız-zaman grafikleri şekildeki gibidir.



0-t zaman aralığında,

I. K ve L birbirine zıt yönde hareket etmektedir.
II. K'nin ortalama hızı L'ninkine eşittir.
III. K'nin ivmesinin büyüklüğü L'ninkine eşittir.

yargılarından hangileri doğrudur?

A) Yalnız I

B) Yalnız II

C) I ve II

D) II ve III

E) I, II ve III

10. Bir otobüs yatay doğrusal bir yolda (0-t_1) zaman aralığında sabit hızla yoluna devam ederken yolcu almak için (t_1-t_2) aralığında yavaşlıyor. (t_2-t_3) aralığında yolcuların binmesi için durgun bekleyen otobüs (t_3-t_4) aralığında ilk hareketi yönünde hızlanıyor.

Buna göre hangi zaman aralıklarında otobüsün ivmesi sıfırdan farklıdır?

A) 0-t_1 ve t_1-t_2

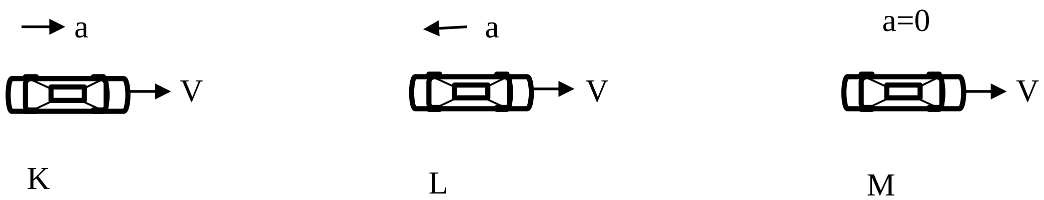
B) 0-t_1 ve t_2-t_3

C) t_1-t_2 ve t_2-t_3

D) t_1-t_2 ve t_3-t_4

E) t_2-t_3 ve t_3-t_4

11. K, L ve M araçlarının hızları aynı iken hareket boyunca sabit değerde olan ivmelerinin yönleri şekilde verilmiştir.



Bir süre sonra aynı yönde ilerleyen K, L ve M araçlarının hızlarının büyüklüğü sırasıyla V_K, V_L, V_M olduğuna göre, bu hızlar arasındaki ilişki nedir?

A) $V_K > V_M > V_L$

B) $V_K > V_L > V_M$

C) $V_M > V_K > V_L$

D) $V_M > V_L > V_K$

E) $V_L > V_K > V_M$

12. Dört farklı cismin ivmeleri ile ilgili,

I. Düzgün hızlanan cismin ivmesi düzgün artmaktadır.
II. Düzgün yavaşlayan cismin ivmesi düzgün azalmaktadır.
III. Duran cismin ivmesi sıfırdır.
IV. Sabit hızla hareket eden cismin ivmesi sıfırdır.

yargılarından hangileri doğrudur?

A) Yalnız III

B) I ve II

C) III ve IV

D) I, II ve III

E) I, II, III ve IV

F5. Tactile Graphics Testing Accommodations Condition of Motion Achievement Test (First Version)

DOKUNSAL HAREKET BAŞARI TESTİ UZMAN GÖRÜŞÜ FORMU

Bu test sizinle daha önce paylaşılan, 9. Sınıf fizik dersi Hareket ve Kuvvet ünitesinden seçilen ve yeniden düzenlenen üç kazanıma yönelik hazırlanmış olan Hareket Başarı Testi'nin 2. sürümüdür. Testin 1. sürümünde dönütleriniz doğrultusunda gerekli görülen düzenlemeler yapılmıştır.

Testin görmeyen öğrenciler için de erişilebilir olması amacıyla 2. sürüm hazırlanmıştır. Görmeyen öğrenciler sınavlarda okuyucu desteği almaktadırlar. Bu test okuyucuya görmeyen öğrenciye okuması için sunulacak testtir. 2. sürümde şekil ve grafikler sadeleştirilmiş, şekil ve grafiklerin betimlemesi yapılmış, seçenekler okuyucunun okuması gerektiği gibi düzenlenmiş, birim, sembol ve matematiksel ifadeler okunması gerektiği gibi yazılmış, altı çizili sözcüklere ilişkin parantez içinde bilgi verilmiştir. Ayrıca her soruya 1, 2 gibi rakam yazılarak değil, soruya başlandığını ifade etmek için, Soru 1, Soru 2 gibi başlangıç yapılmış, seçenekler okunmadan önce, seçeneklere geçildiğini belirtmek için "seçenekler" yazılmıştır. Testte gördüğünüz şekillerin kabartma baskı ile çıktısı alınacak ve sınavda ilgili sorularda öğrenciye sunulacaktır.

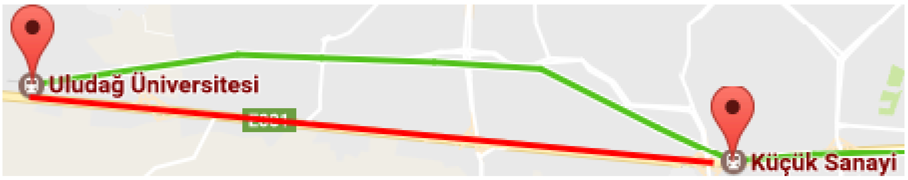
Değerlendirmenizi kolaylaştırmak amacıyla testin her sorusunun 1. ve 2. sürümdeki hali peş peşe konulmuştur. Sizden alınan dönütler sonucunda testte düzenlemeler yapılacaktır. Testi tabloda verilen değerlendirme ölçütleri doğrultusunda incelemeniz, bu maddelerin kapsamadığı ve belirtmek istediğiniz bir görüşünüz varsa "Diğer görüşler" kısmına yazmanız testin 2. sürümünün geliştirilmesi için önemlidir.

Verdiğiniz katkı için teşekkür ederiz.

Değerlendirme ölçütleri		**Evet**	**Hayır**	**Açıklama**
1.	Okuyucuya bilgi kısmında yazılan açıklamalar uygun mu?			
2.	Şekil ve grafiklerde yapılan sadeleştirmeler uygun mu?			
3.	Sorulardaki betimlemeler şekiller ile uyumlu mu?			
4.	Betimlemeler dil ve anlam bilgisi olarak 9. sınıf öğrencileri için uygun mu?			
5.	Seçeneklerde yapılan düzenlemeler uygun mu?			
6.	Birim, sembol ve matematiksel ifadelerin okunması gerektiği gibi yazılması uygun mu?			
7.	Her soruya Soru1, Soru 2 gibi başlangıç yapılması uygun mu?			
8.	Seçeneklerden önce "Seçenekler" yazılması uygun mu?			
9.	Altı çizili sözcükler ile ilgili parantez içinde bilgi verilmesi uygun mu?			
10.	2. sürüm için düzenlenen ve 1. sürümdekine eşdeğer olmayan bir soru var mı?			
11.	Testin erişilebilirliğini artırmaya yönelik farklı öneriniz var mı?			
12.	Testin cevaplanması için 60 dakika süre verilmesi uygun mu?			
13.	Diğer görüşler:			

1. SÜRÜM (KÖR ÖĞRENCİLER İÇİN SINAV DÜZENLEMESİ YOK)

1. Bursa'da Küçük Sanayi-Uludağ Üniversitesi durakları arasında seferlerini sürdüren halk otobüsleri aşağıdaki haritada kırmızı çizgi ile gösterilen güzergâhı, raylı sistem ise yeşil çizgi ile gösterilen güzergâhı kullanmaktadır.



Buna göre iki durak arasında halk otobüsü ve raylı sistemin hareketine ait niceliklerden hangisi kesinlikle aynıdır?

A) Alınan yolları

B) Yer değiştirmeleri

C) Süratleri

D) Hızları

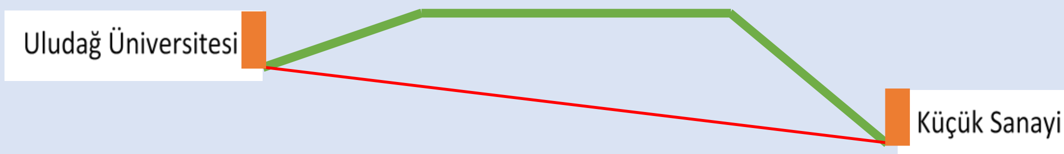
E) Harekete başladıktan sonra herhangi bir t süre sonraki konumları

2. SÜRÜM (SINAV DÜZENLEMELERİ KULLANILMIŞ)

SORU 1. Bursa'da Küçük Sanayi ile Uludağ Üniversitesi durakları arasında seferlerini sürdüren halk otobüsleri size verilecek kabartma şekilde ince çizgi ile gösterilen güzergâhı, raylı sistem ise kalın çizgi ile gösterilen güzergâhı kullanmaktadır.

Okuyucuya bilgi:

-Aşağıdaki şeklin kabartma baskısına öğrencinin parmakları ile dokunmasını sağlayınız. Öğrenci kabartma baskıya dokunduktan sonra şeklin betimlemesini okuyunuz.



Betimleme: Şekilde dikdörtgen ile temsil edilen Küçük Sanayi ve Uludağ Üniversitesi durakları arasında biri ince biri kalın çizgi ile gösterilen iki güzergah görülmekte.

Buna göre iki durak arasında halk otobüsü ve raylı sistemin hareketine ait niceliklerden hangisi kesinlikle aynıdır?

Seçenekler

A) Alınan yolları

B) Yer değiştirmeleri

C) Süratleri

D) Hızları

E) Harekete başladıktan sonra herhangi bir t süre sonraki konumları

1. SÜRÜM (KÖR ÖĞRENCİLER İÇİN SINAV DÜZENLEMESİ YOK)

2. Ayşe öğretmen otobüs durağında beklerken cep telefonunu evde unuttuğunu fark ediyor ve durağın 30 m doğusundaki evine gidip telefonunu alarak duraktaki aynı noktaya aynı yol üzerinden geri dönüyor.

Buna göre Ayşe öğretmenin aldığı yol ve yer değiştirmesinin büyüklüğü kaç m'dir?

	Alınan yol	Yer değiştirme
A)	30	60
B)	30	0
C)	60	0
D)	60	30
E)	0	60

2. SÜRÜM (SINAV DÜZENLEMELERİ KULLANILMIŞ)

SORU 2. Ayşe öğretmen otobüs durağında beklerken cep telefonunu evde unuttuğunu fark ediyor ve durağın 30 metre doğusundaki evine gidip telefonunu alarak duraktaki aynı noktaya aynı yol üzerinden geri dönüyor.

Buna göre Ayşe öğretmenin aldığı yol ve yer değiştirmesinin büyüklüğü kaç metredir?

Seçenekler

A) Alınan yol 30, yer değiştirme 60

B) Alınan yol 30, yer değiştirme 0

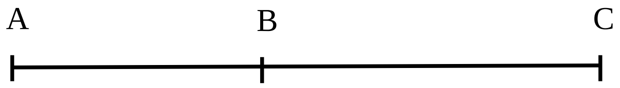
C) Alınan yol 60, yer değiştirme 0

D) Alınan yol 60, yer değiştirme 30

E) Alınan yol 0, yer değiştirme 60

1. SÜRÜM (KÖR ÖĞRENCİLER İÇİN SINAV DÜZENLEMESİ YOK)

3. Bahar aşağıda gösterilen doğrusal yatay bir yürüyüş yolunda A noktasından C noktasına, sonra da C noktasından B noktasına yürüyor.



Sadece A ve B noktaları arasındaki mesafe ile Bahar'ın toplam yürüyüş süresi bilindiğine göre Bahar'ın hareketi ile ilgili niceliklerden hangisi hesaplanabilir?

A) AC noktaları arasında aldığı yol

B) Toplam aldığı yol

C) BC arasındaki yer değiştirme

D) Sürat

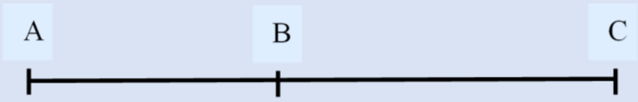
E) Hız

2. SÜRÜM (SINAV DÜZENLEMELERİ KULLANILMIŞ)

SORU 3. Bahar size kabartma baskı ile sunulacak doğrusal yatay bir yürüyüş yolunda A noktasından C noktasına, sonra da C noktasından B noktasına yürüyor.

Okuyucuya bilgi:

-Aşağıdaki şeklin kabartma baskısına öğrencinin parmakları ile dokunmasını sağlayınız. Öğrenci kabartma baskıya dokunduktan sonra şeklin betimlemesini okuyunuz.



Betimleme: Şekilde doğrusal yatay bir çizgi ve çizgi üzerinde sırasıyla soldan sağa A, B ve C noktaları görülmekte.

Sadece A ve B noktaları arasındaki mesafe ile Bahar'ın toplam yürüyüş süresi bilindiğine göre Bahar'ın hareketi ile ilgili niceliklerden hangisi hesaplanabilir?

Seçenekler

A) AC noktaları arasında aldığı yol

B) Toplam aldığı yol

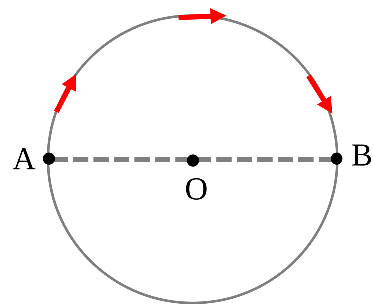
C) BC arasındaki yer değiştirme

D) Sürat

E) Hız

1. SÜRÜM (KÖR ÖĞRENCİLER İÇİN SINAV DÜZENLEMESİ YOK)

4. Bir hareketli yarıçapı 3 m olan yanda gösterilen çembersel yolda A noktasından B noktasına okla belirtilen yörünge ile 3 saniyede gidiyor.



Buna göre hareketlinin ortalama sürati ve ortalama hızı kaç m/s' dir? ($\pi = 3$ alınız.)

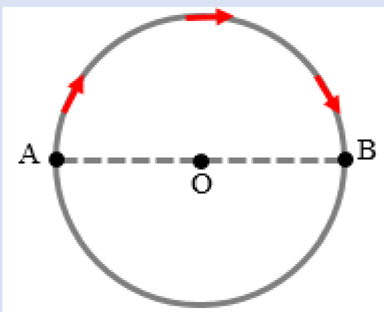
	Sürat	Hız
A)	3	1
B)	6	1
C)	6	2
D)	3	2
E)	3	6

2. SÜRÜM (SINAV DÜZENLEMELERİ KULLANILMIŞ)

SORU 4. Bir hareketli yarıçapı 3 metre olan, kabartma baskı ile gösterilen çembersel yolda A noktasından B noktasına okla belirtilen yörünge ile 3 saniyede gidiyor.

Okuyucuya bilgi:

-Aşağıdaki şeklin kabartma baskısına öğrencinin parmakları ile dokunmasını sağlayınız. Öğrenci kabartma baskıya dokunduktan sonra şeklin betimlemesini okuyunuz.



Betimleme: Şekilde merkezi O noktası olan bir çember, çember üzerinde işaretlenen A ve B noktaları, AOB noktalarından geçen kesikli düz bir çizgi görülmekte. Çemberin üzerinde A'dan B'ye doğru yönelen üç ok bulunmakta.

Buna göre hareketlinin ortalama sürati ve ortalama hızı kaç metre bölü saniyedir? (pi sayısını 3 olarak alınız.)

Seçenekler

A) Sürat 3, hız 1

B) Sürat 6, hız 1

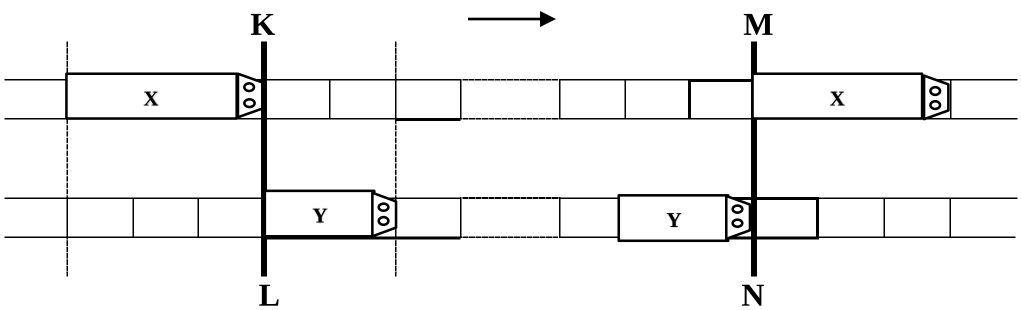
C) Sürat 6, hız 2

D) Sürat 3, hız 2

E) Sürat 3, hız 6

1. SÜRÜM (KÖR ÖĞRENCİLER İÇİN SINAV DÜZENLEMESİ YOK)

5. Aşağıdaki şekilde paralel raylarda ok yönünde sabit hızlarla giden X, Y otoraylarının t_1 ve t_2 anlarındaki konumları verilmiştir. KL çizgisi ile MN çizgisi arasındaki her iki rayda da 12 bölme bulunmaktadır. X otorayı üç bölme Y otorayı ise iki bölme uzunluğundadır.



t_1 anındaki konumlar t_2 anındaki konumlar

X' in hızının büyüklüğü V_X, Y'ninki V_Y olduğuna göre, $\frac{V_X}{V_Y}$ oranı kaçtır?
(Raylardaki bölmeler eşit aralıklıdır.)

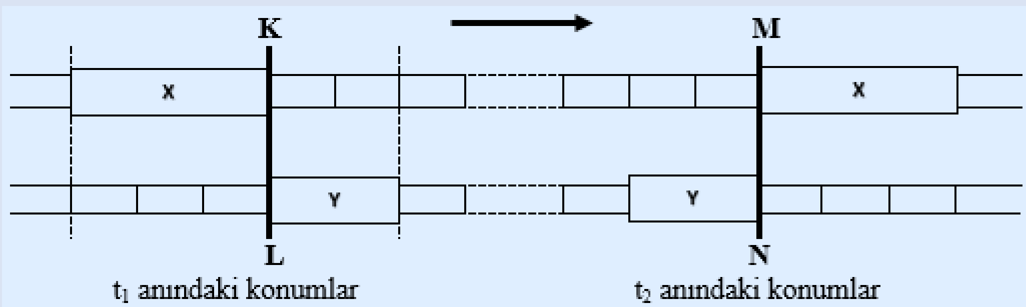
A) $\frac{9}{4}$ B) $\frac{3}{2}$ C) 1 D) $\frac{6}{5}$ E) $\frac{9}{5}$

2. SÜRÜM

SORU 5. Aşağıdaki kabartma şekilde paralel raylarda ok yönünde sabit hızlarla giden X, Y otoraylarının t_1 ve t_2 anlarındaki konumları verilmiştir. KL çizgisi ile MN çizgisi arasındaki her iki rayda da 12 bölme bulunmaktadır. X otorayı üç bölme Y otorayı ise iki bölme uzunluğundadır.

Okuyucuya bilgi:

-Aşağıdaki şeklin kabartma baskısına öğrencinin parmakları ile dokunmasını sağlayınız. Öğrenci kabartma baskıya dokunduktan sonra şeklin betimlemesini okuyunuz.



Betimleme: Şekilde birbirine paralel bölmeli raylar üzerinde sağa doğru hareket eden dikdörtgen ile temsil edilen X ve Y otorayları ve bölmeli raylar görülmekte.

Otorayların t_1 anındaki konumları: 3 bölme uzunluğundaki X otorayının ön tarafı KL dikey çizgisinde. 2 bölme uzunluğundaki Y otorayının arka tarafı KL dikey çizgisinde.

Otorayların t_2 anındaki konumları: 3 bölme uzunluğundaki X otorayının arka tarafı MN dikey çizgisinde. 2 bölme uzunluğundaki Y otorayının ön tarafı MN dikey çizgisinde.

X' in hızının büyüklüğü V_X, Y'ninki V_Y olduğuna göre, V_X bölü V_Y oranı kaçtır?

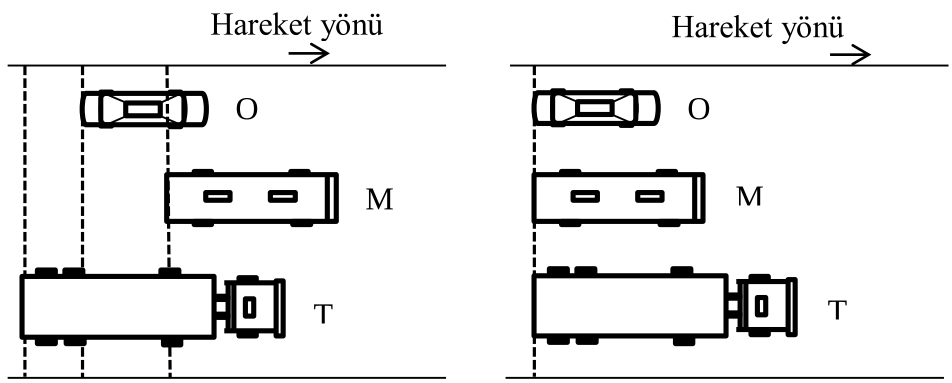
(Raylardaki bölmeler eşit aralıklıdır.)

Seçenekler

A) $\frac{9}{4}$ B) $\frac{3}{2}$ C) 1 D) $\frac{6}{5}$ E) $\frac{9}{5}$

1. SÜRÜM (KÖR ÖĞRENCİLER İÇİN SINAV DÜZENLEMESİ YOK)

6. O otomobili, M minibüsü ve T tırı doğrusal bir yolda sabit hızlarla ilerliyor. Bu araçların birbirlerine göre konumları, t_0 anında Şekil I, daha sonraki t anında da Şekil II' deki gibi olmuştur.



Şekil I

Şekil II

O, M, T'nin hızlarının büyüklüğü sırasıyla V_O, V_M, V_T olduğuna göre, bunlar arasındaki ilişki nedir?

A) $V_O < V_T < V_M$

B) $V_O < V_M < V_T$

C) $V_T < V_M < V_O$

D) $V_M < V_T < V_O$

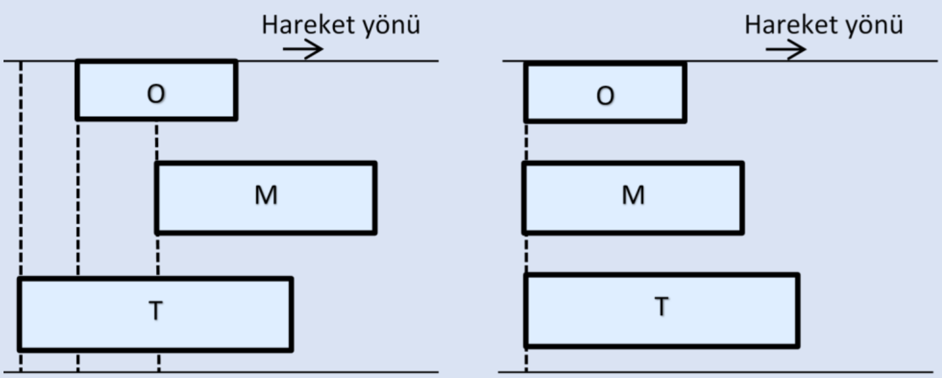
E) $V_M < V_O < V_T$

2. SÜRÜM

SORU 6. O otomobili, M minibüsü ve T tırı doğrusal bir yolda sabit hızlarla ilerliyor. Bu araçların birbirlerine göre konumları, t_0 anında Şekil I, daha sonraki t anında da Şekil II' deki gibi kabartılmıştır.

Okuyucuya bilgi:

-Aşağıdaki şeklin kabartma baskısına öğrencinin parmakları ile dokunmasını sağlayınız. Öğrenci kabartma baskıya dokunduktan sonra şeklin betimlemesini okuyunuz.



Şekil I

Şekil II

Betimleme: Şekil I ve Şekil II'de sağa doğru hareket eden ve dikdörtgen ile temsil edilen O, M, T araçları görülmekte.

Şekil 1'in betimlemesi: Araçlarının her birinin arka kısmı farklı hizalarda. Bu hizalar dikey kesikli üç farklı çizgi ile belirtilmiş.

Şekil 2'nin betimlemesi: Araçlarının her birinin arka kısmı aynı hizada. Bu hiza dikey kesikli bir çizgi ile belirtilmiş.

O, M, T'nin hızlarının büyüklüğü sırasıyla V_O, V_M, V_T olduğuna göre, bunlar arasındaki ilişki nedir?

Seçenekler

A) V_O küçüktür V_T küçüktür V_M

B) V_O küçüktür V_M küçüktür V_T

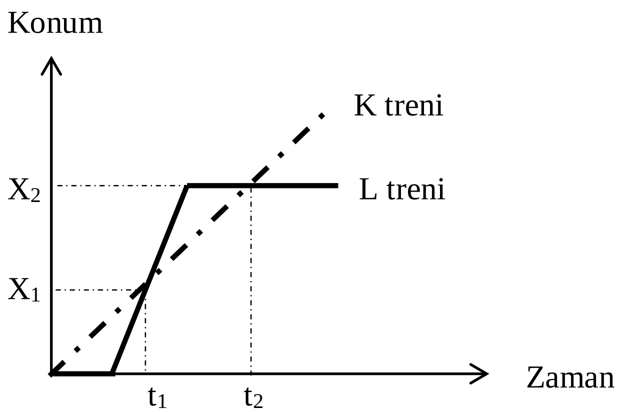
C) V_T küçüktür V_M küçüktür V_O

D) V_M küçüktür V_T küçüktür V_O

E) V_M küçüktür V_O küçüktür V_T

1. SÜRÜM (KÖR ÖĞRENCİLER İÇİN SINAV DÜZENLEMESİ YOK)

7. Birbirine paralel iki rayda aynı yönde hareket eden K ve L trenlerinin konum-zaman grafiği aşağıdaki gibidir.



Bu grafikten elde edilen bilgilere göre trenlerin hız ve konumları ile ilgili aşağıdaki yargılardan hangisi yanlıştır?

A) t_1 anında trenlerin hızları aynıdır.

B) t_1 anında iki tren yan yanadır.

C) t_2 anında iki tren yan yanadır.

D) K ve L trenleri aynı konumdan harekete başlamıştır.

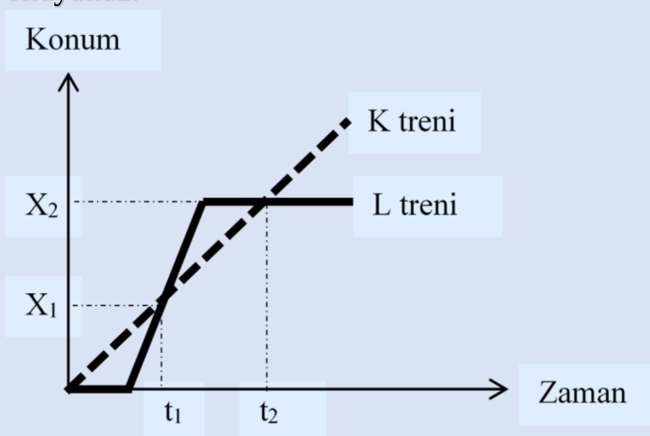
E) t_2 anında L treni durmaktadır.

2. SÜRÜM

SORU 7. Birbirine paralel iki rayda aynı yönde hareket eden K ve L trenlerinin konum-zaman grafiği kabartma baskıda olduğu gibidir.

Okuyucuya bilgi:

-Aşağıdaki grafiğin kabartma baskısına öğrencinin parmakları ile dokunmasını sağlayınız. Öğrenci kabartma baskıya dokunduktan sonra grafiğin betimlemesini okuyunuz.



Betimleme: K treninin hareketi kesikli doğrusal çizgi, L treninin hareketi kesikli olmayan doğrusal çizgi ile belirtilmiş. Çizgilerin başlangıç noktası aynı.

Yatay eksen: Zaman, t_1 ve t_2 noktaları işaretlenmiş.

Düşey eksen: Konum, X_1 ve X_2 noktaları işaretlenmiş.

Yatay eksen t_1, düşey eksen X_1 iken ve yatay eksen t_2, düşey eksen X_2 iken çizgiler kesişmiş.

Bu grafikten elde edilen bilgilere göre trenlerin hız ve konumları ile ilgili aşağıdaki yargılardan hangisi yanlıştır? (Yanlıştır'ın altı çizili)

Seçenekler

A) t_1 anında trenlerin hızları aynıdır.

B) t_1 anında iki tren yan yanadır.

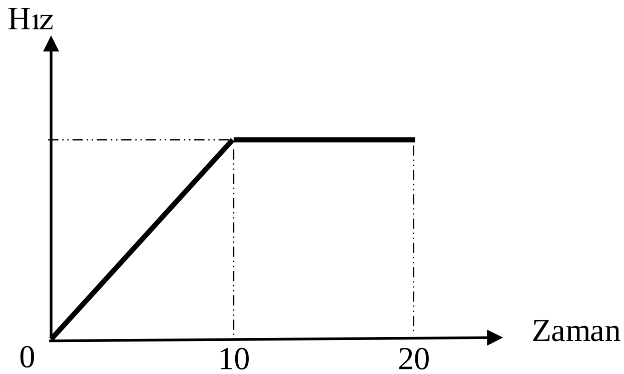
C) t_2 anında iki tren yan yanadır.

D) K ve L trenleri aynı konumdan harekete başlamıştır.

E) t_2 anında L treni durmaktadır.

1. SÜRÜM (KÖR ÖĞRENCİLER İÇİN SINAV DÜZENLEMESİ YOK)

8. Doğrusal bir yolda hareket eden aracın hız-zaman grafiği aşağıdaki gibidir.



Bu grafikten elde edilen bilgilere göre, verilen zaman aralıklarında aracın yer değiştirmesi ve hızı ile ilgili ağıdaki yargılardan hangisi doğrudur?

A) 0-10 s zaman aralığındaki yer değiştirme ile 10-20 s zaman aralığındaki yer değiştirme eşittir.

B) 0-10 s zaman aralığındaki yer değiştirme, 10-20 s zaman aralığındaki yer değiştirmeden daha büyüktür.

C) 0-10 s zaman aralığında sabit hızlıdır.

D) 10-20 s zaman aralığında durmaktadır.

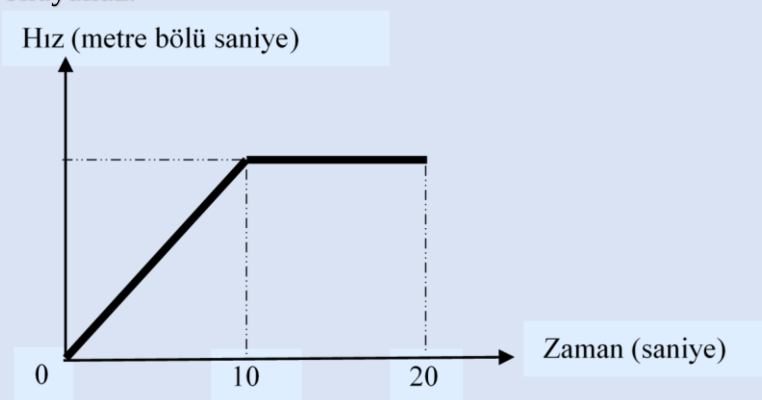
E) 10-20 s zaman aralığında sabit hızlıdır.

2. SÜRÜM

SORU 8. Doğrusal bir yolda hareket eden aracın hız-zaman grafiği kabartması aşağıdaki gibidir.

Okuyucuya bilgi:

-Aşağıdaki grafiğin kabartma baskısına öğrencinin parmakları ile dokunmasını sağlayınız. Öğrenci kabartma baskıya dokunduktan sonra grafiğin betimlemesini okuyunuz.



Betimleme:

Yatay eksen: Zaman (saniye), 10 ve 20 değerleri işaretlenmiş.

Düşey eksen: Hız (metre bölü saniye). Tek bölme.

0 ile 10 saniye aralığı: Hem zamanda hem de hızda artış gösteren doğrusal çizgi.

10 ile 20 saniye aralığı: Zaman eksenine paralel çizgi.

Bu grafikten elde edilen bilgilere göre, verilen zaman aralıklarında aracın yer değiştirmesi ve hızı ile ilgili aşağıdaki yargılardan hangisi doğrudur?

Seçenekler

A) 0 ile 10 saniye zaman aralığındaki yer değiştirme ile 10 ile 20 saniye zaman aralığındaki yer değiştirme eşittir.

B) 0 ile 10 saniye zaman aralığındaki yer değiştirme, 10 ile 20 saniye zaman aralığındaki yer değiştirmeden daha büyüktür.

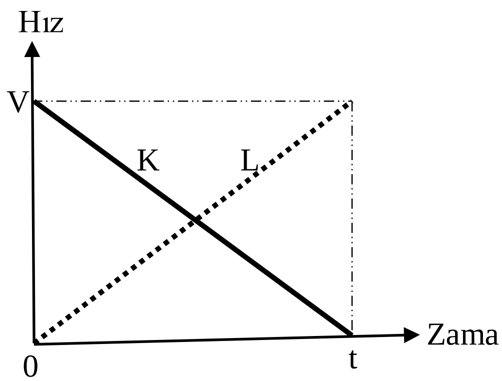
C) 0 ile 10 saniye zaman aralığında sabit hızlıdır.

D) 10 ile 20 saniye zaman aralığında durmaktadır.

E) 10 ile 20 saniye zaman aralığında sabit hızlıdır.

1. SÜRÜM (KÖR ÖĞRENCİLER İÇİN SINAV DÜZENLEMESİ YOK)

9. Doğrusal bir yolda aynı yerden aynı anda harekete başlayan K, L cisimlerinin hız-zaman grafikleri şekildeki gibidir.



0-t zaman aralığında,

I. K ve L birbirine zıt yönde hareket etmektedir.
II. K’nin ortalama hızı L’ninkine eşittir.
III. K’nin ivmesinin büyüklüğü L’ninkine eşittir.

yargılarından hangileri doğrudur?

A) Yalnız I

B) Yalnız II

C) I ve II

D) II ve III

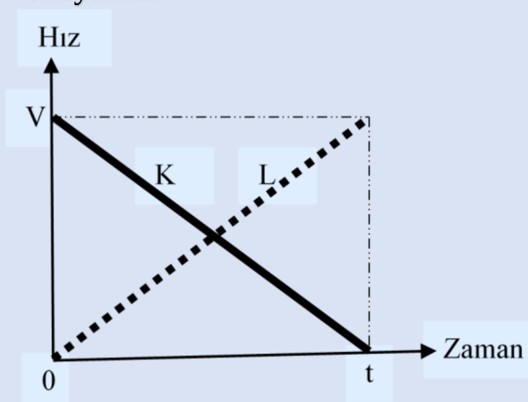
E) I, II ve III

2. SÜRÜM

SORU 9. Doğrusal bir yolda aynı yerden aynı anda harekete başlayan K ve L cisimlerinin hız-zaman grafiği kabartması aşağıdaki gibidir.

Okuyucuya bilgi:

-Aşağıdaki grafiğin kabartma baskısına öğrencinin parmakları ile dokunmasını sağlayınız. Öğrenci kabartma baskıya dokunduktan sonra grafiğin betimlemesini okuyunuz.



Betimleme: K cismi kesikli olmayan doğrusal çizgi, L cismi kesikli doğrusal çizgi ile belirtilmiş.

Yatay eksen: Zaman, t anı işaretlenmiş.

Düşey eksen: Hız, V hızı işaretlenmiş.

Eksenlerin kesişimi 0 noktası.

Kesikli olmayan doğrusal çizgi (K) V noktasında başlayıp t noktasında sona ermiş.

Kesikli doğrusal çizgi (L) 0 noktasında başlayıp t ve V noktalarının kesişiminde sona ermiş.

0 ile t zaman aralığında,

I. K ve L birbirine zıt yönde hareket etmektedir.
II. K'nin ortalama hızı L'ninkine eşittir.
III. K'nin ivmesinin büyüklüğü L'ninkine eşittir.

yargılarından hangileri doğrudur?

Seçenekler

A) Yalnız I. Yani K ve L birbirine zıt yönde hareket etmektedir.

B) Yalnız II. Yani K'nin ortalama hızı L'ninkine eşittir.

C) I ve II. Yani

I. K ve L birbirine zıt yönde hareket etmektedir.

II. K'nin ortalama hızı L'ninkine eşittir.

D) II ve III. Yani

II. K'nin ortalama hızı L'ninkine eşittir.

III. K'nin ivmesinin büyüklüğü L'ninkine eşittir.

E) I, II ve III. Yani

I. K ve L birbirine zıt yönde hareket etmektedir.

II. K'nin ortalama hızı L'ninkine eşittir.

III. K'nin ivmesinin büyüklüğü L'ninkine eşittir.

1. SÜRÜM (KÖR ÖĞRENCİLER İÇİN SINAV DÜZENLEMESİ YOK)

10. Bir otobüs yatay doğrusal bir yolda (0-t_1) zaman aralığında sabit hızla yoluna devam ederken yolcu almak için (t_1-t_2) aralığında yavaşlıyor. (t_2-t_3) aralığında yolcuların binmesi için durgun bekleyen otobüs (t_3-t_4) aralığında ilk hareketi yönünde hızlanıyor.

Buna göre hangi zaman aralıklarında otobüsün ivmesi sıfırdan farklıdır?

A) 0-t_1 ve t_1-t_2

B) 0-t_1 ve t_2-t_3

C) t_1-t_2 ve t_2-t_3

D) t_1-t_2 ve t_3-t_4

E) t_2-t_3 ve t_3-t_4

2. SÜRÜM

SORU 10. Bir otobüs yatay doğrusal bir yolda 0 ile t_1 zaman aralığında sabit hızla yoluna devam ederken yolcu almak için t_1 ile t_2 aralığında yavaşlıyor. t_2 ile t_3 aralığında yolcuların binmesi için durgun bekleyen otobüs t_3 ile t_4 aralığında ilk hareketi yönünde hızlanıyor.

Buna göre hangi zaman aralıklarında otobüsün ivmesi sıfırdan farklıdır?

Seçenekler

A) 0 ile t_1 ve t_1 ile t_2

B) 0 ile t_1 ve t_2 ile t_3

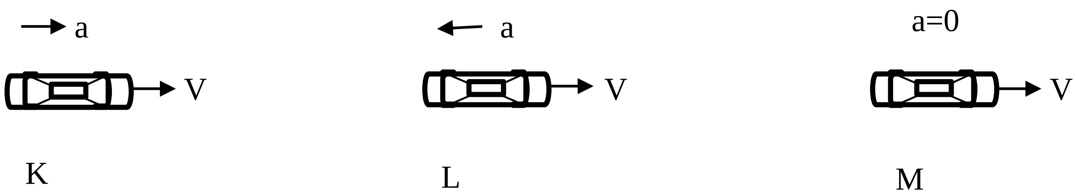
C) t_1 ile t_2 ve t_2 ile t_3

D) t_1 ile t_2 ve t_3 ile t_4

E) t_2 ile t_3 ve t_3 ile t_4

1. SÜRÜM (KÖR ÖĞRENCİLER İÇİN SINAV DÜZENLEMESİ YOK)

11. K, L ve M araçlarının hızları aynı iken hareket boyunca sabit değerde olan ivmelerinin yönleri şekilde verilmiştir.



Bir süre sonra aynı yönde ilerleyen K, L ve M araçlarının hızlarının büyüklüğü sırasıyla V_K, V_L, V_M olduğuna göre, bu hızlar arasındaki ilişki nedir?

A) $V_K > V_M > V_L$

B) $V_K > V_L > V_M$

C) $V_M > V_K > V_L$

D) $V_M > V_L > V_K$

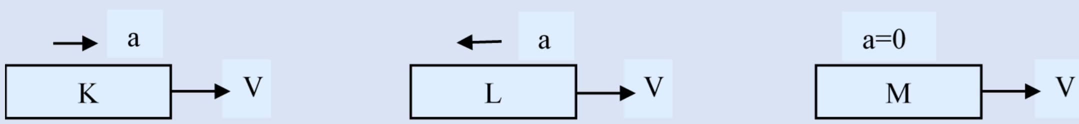
E) $V_L > V_K > V_M$

2. SÜRÜM

SORU 11. K, L ve M araçlarının hızları aynı iken hareket boyunca sabit değerde olan ivmelerinin yönleri kabartma şekilde verilmiştir.

Okuyucuya bilgi:

-Aşağıdaki şeklin kabartma baskısına öğrencinin parmakları ile dokunmasını sağlayınız. Öğrenci kabartma baskıya dokunduktan sonra şeklin betimlemesini okuyunuz.



Betimleme: Şekilde dikdörtgen ile temsil edilen K, L, ve M araçları görülmekte.

K, L ve M araçlarının her birinin sağ tarafında sağa doğru ok işareti, okun yanında V harfi.

K aracının üzerinde sağa doğru olan ok işaretinin yanında a harfi yazıyor.

L aracının üzerinde sola doğru olan ok işaretinin yanında a harfi yazıyor.

M aracının üzerinde a eşittir sıfır yazıyor.

Bir süre sonra aynı yönde ilerleyen K, L ve M araçlarının hızlarının büyüklüğü sırasıyla V_K, V_L, V_M olduğuna göre, bu hızlar arasındaki ilişki nedir?

Seçenekler

A) V_K büyüktür V_M büyüktür V_L

B) V_K büyüktür V_L büyüktür V_M

C) V_M büyüktür V_K büyüktür V_L

D) V_M büyüktür V_L büyüktür V_K

E) V_L büyüktür V_K büyüktür V_M

1. SÜRÜM (KÖR ÖĞRENCİLER İÇİN SINAV DÜZENLEMESİ YOK)

12. Dört farklı cismin ivmeleri ile ilgili,

I. Düzgün hızlanan cismin ivmesi düzgün artmaktadır.
II. Düzgün yavaşlayan cismin ivmesi düzgün azalmaktadır.
III. Duran cismin ivmesi sıfırdır.
IV. Sabit hızla hareket eden cismin ivmesi sıfırdır.

yargılarından hangileri doğrudur?

A) Yalnız III

B) I ve II

C) III ve IV

D) I, II ve III

E) I, II, III ve IV

2. SÜRÜM

SORU 12. Dört farklı cismin ivmeleri ile ilgili,

I. Düzgün hızlanan cismin ivmesi düzgün artmaktadır.
II. Düzgün yavaşlayan cismin ivmesi düzgün azalmaktadır.
III. Duran cismin ivmesi sıfırdır.
IV. Sabit hızla hareket eden cismin ivmesi sıfırdır.

yargılarından hangileri doğrudur?

Seçenekler

A) Yalnız III. Yani duran cismin ivmesi sıfırdır.

B) I ve II. Yani

I. Düzgün hızlanan cismin ivmesi düzgün artmaktadır.

II. Düzgün yavaşlayan cismin ivmesi düzgün azalmaktadır.

C) III ve IV. Yani

III. Duran cismin ivmesi sıfırdır.

IV. Sabit hızla hareket eden cismin ivmesi sıfırdır.

D) I, II ve III. Yani

I. Düzgün hızlanan cismin ivmesi düzgün artmaktadır.

II. Düzgün yavaşlayan cismin ivmesi düzgün azalmaktadır.

III. Duran cismin ivmesi sıfırdır.

E) I, II, III ve IV. Yani

I. Düzgün hızlanan cismin ivmesi düzgün artmaktadır.

II. Düzgün yavaşlayan cismin ivmesi düzgün azalmaktadır.

III. Duran cismin ivmesi sıfırdır.

IV. Sabit hızla hareket eden cismin ivmesi sıfırdır.

F6. Tactile Graphics Testing Accommodations Condition of Motion Achievement Test (Second Version)

9. Sınıf Fizik Dersi Hareket Başarı Testi

12 sorudan oluşan bu test 9. sınıf fizik dersi, Hareket ve Kuvvet ünitesinden seçilen ve yeniden düzenlenen hareket konusundaki üç kazanımın ölçülmesine yönelik hazırlanmıştır. Testi cevaplamaya dilediğiniz sorudan başlayabilirsiniz. Yanlış cevaplarınız doğru cevaplarınızı götürmeyecektir. Tüm sorular eşit puanlıdır. Testi cevaplama süreniz bir buçuk ders saatidir.

Öğrenci No: ……………………………

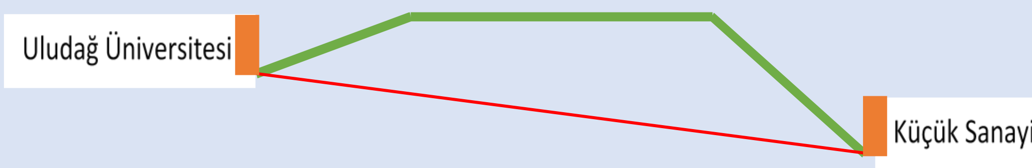
Şube : ……………………………

Okul : ……………………………

SORU 1. Bursa'da Küçük Sanayi ile Uludağ Üniversitesi durakları arasında seferlerini sürdüren halk otobüsleri size verilecek kabartma şekilde ince çizgi ile gösterilen güzergâhı, raylı sistem ise kalın çizgi ile gösterilen güzergâhı kullanmaktadır.

Okuyucuya bilgi:

-Aşağıdaki şeklin kabartma baskısına öğrencinin parmakları ile dokunmasını sağlayınız. Öğrenci kabartma baskıya dokunduktan sonra şeklin betimlemesini okuyunuz.



Betimleme: Şekilde dikdörtgen ile temsil edilen Küçük Sanayi ve Uludağ Üniversitesi durakları arasında üst tarafta kalın çizgiler ve alt tarafta ince çizgi ile gösterilen iki güzergâh görülmekte.

Buna göre iki durak arasında halk otobüsü ve raylı sistemin hareketine ait niceliklerden hangisi kesinlikle aynıdır?

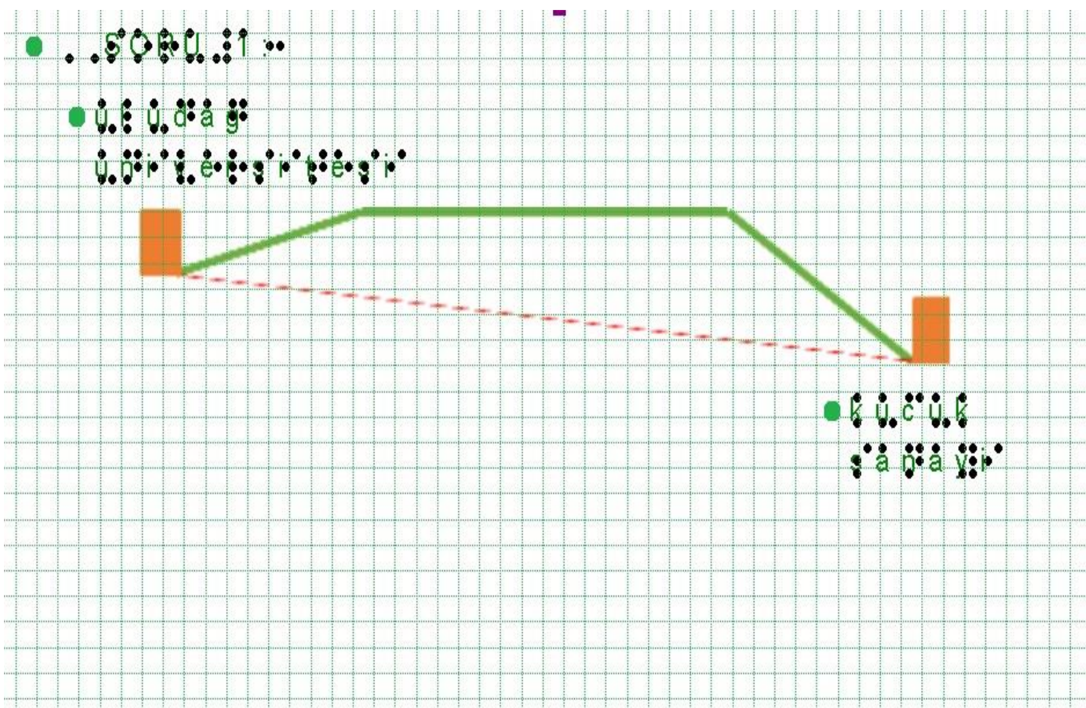
Seçenekler

A) Alınan yolları
B) Yer değiştirmeleri
C) Süratleri
D) Hızları
E) Harekete başladıktan sonra herhangi bir t süre sonraki konumları

SORU 1

Şekil

Kabartma



SORU 2. Ayşe öğretmen otobüs durağında beklerken cep telefonunu evde unuttuğunu fark ediyor ve durağın 30 metre doğusundaki evine gidip telefonunu alarak duraktaki aynı noktaya aynı yol üzerinden geri dönüyor.

Buna göre Ayşe öğretmenin aldığı yol ve yer değiştirmesinin büyüklüğü kaç metredir?

Seçenekler

A) Alınan yol 30, yer değiştirme 60

B) Alınan yol 30, yer değiştirme 0

C) Alınan yol 60, yer değiştirme 0

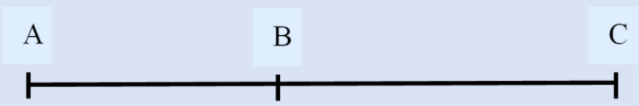
D) Alınan yol 60, yer değiştirme 30

E) Alınan yol 0, yer değiştirme 60

SORU 3. Bahar, size kabartma baskı ile sunulacak doğrusal yatay bir yürüyüş yolunda A noktasından C noktasına, sonra da C noktasından B noktasına yürüyor.

Okuyucuya bilgi:

-Aşağıdaki şeklin kabartma baskısına öğrencinin parmakları ile dokunmasını sağlayınız. Öğrenci kabartma baskıya dokunduktan sonra şeklin betimlemesini okuyunuz.



Betimleme: Şekilde doğrusal yatay bir çizgi ve çizgi üzerinde sırasıyla soldan sağa A, B ve C noktaları görülmekte.

Sadece A ve B noktaları arasındaki mesafe ile Bahar'ın toplam yürüyüş süresi bilindiğine göre Bahar'ın hareketi ile ilgili niceliklerden hangisi hesaplanabilir?

Seçenekler

A) AC noktaları arasında aldığı yol

B) Toplam aldığı yol

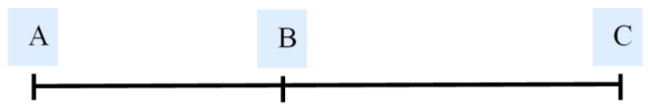
C) BC arasındaki yer değiştirme

D) Sürat

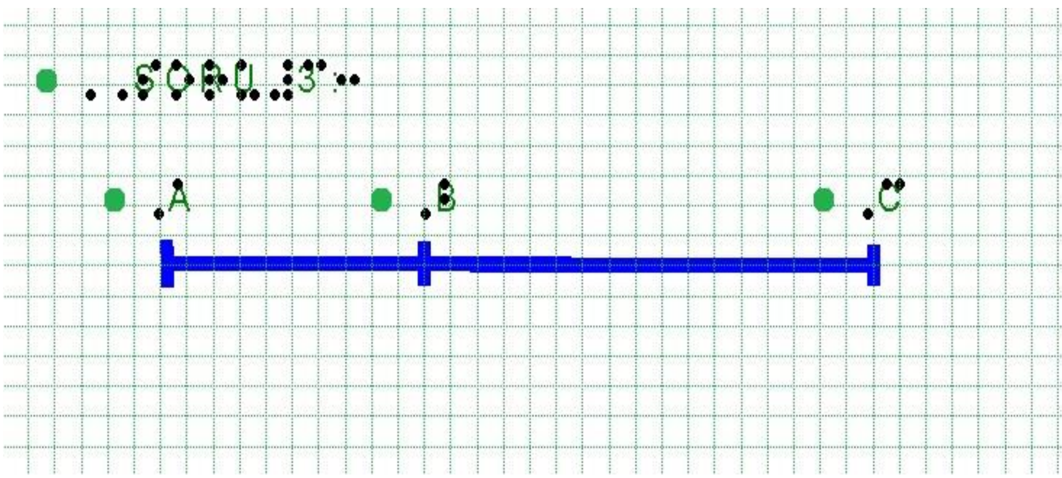
E) Hız

SORU 3

Şekil



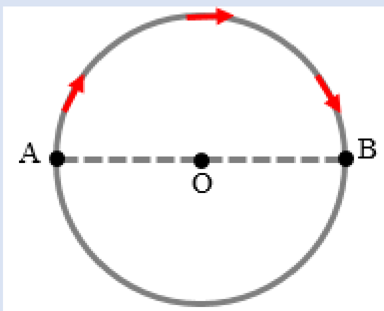
Kabartma



SORU 4. Bir hareketli yarıçapı 3 metre olan, kabartma baskı ile gösterilen çembersel yolda A noktasından B noktasına okla belirtilen yörünge ile 3 saniyede gidiyor.

Okuyucuya bilgi:

-Aşağıdaki şeklin kabartma baskısına öğrencinin parmakları ile dokunmasını sağlayınız. Öğrenci kabartma baskıya dokunduktan sonra şeklin betimlemesini okuyunuz.



Betimleme: Şekilde merkezi O noktası olan bir çember, çember üzerinde işaretlenen A ve B noktaları, AOB noktalarından geçen kesikli düz bir çizgi görülmekte. Çemberin üzerinde A'dan B'ye doğru yönelen üç ok bulunmakta.

Buna göre hareketlinin ortalama sürati ve ortalama hızı kaç metre bölü saniyedir? (pi sayısını 3 olarak alınız.)

Seçenekler

A) Sürat 3, hız 1

B) Sürat 6, hız 1

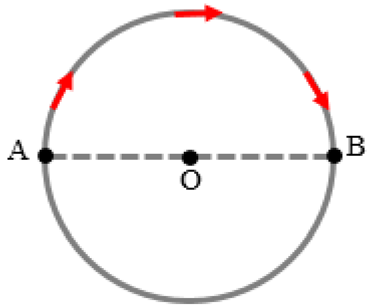
C) Sürat 6, hız 2

D) Sürat 3, hız 2

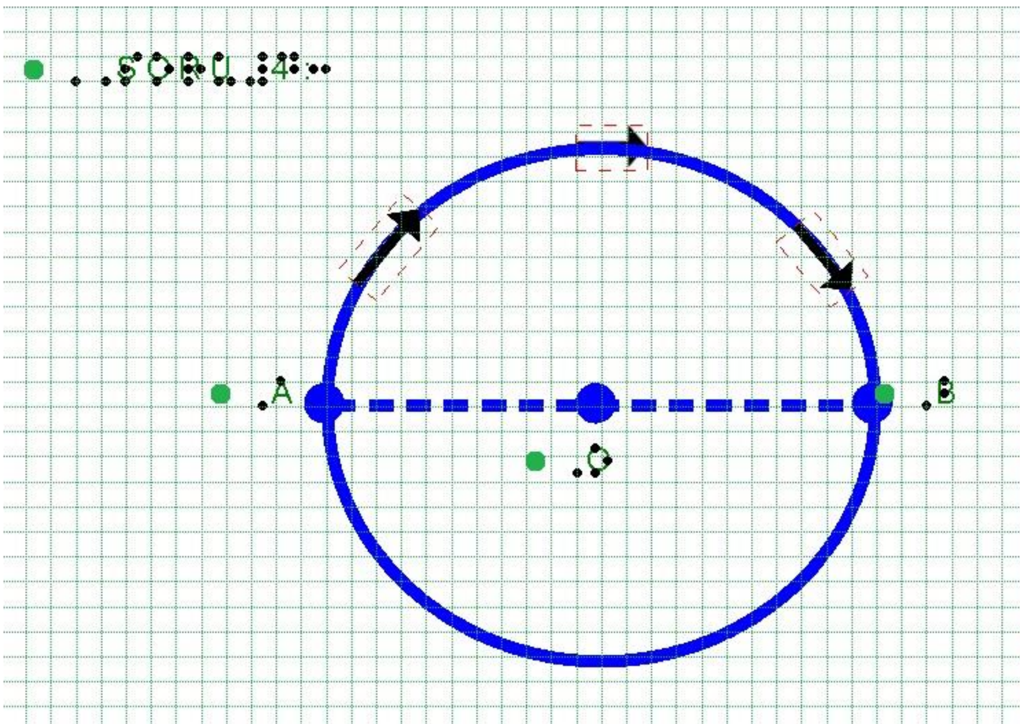
E) Sürat 3, hız 6

SORU 4

Şekil



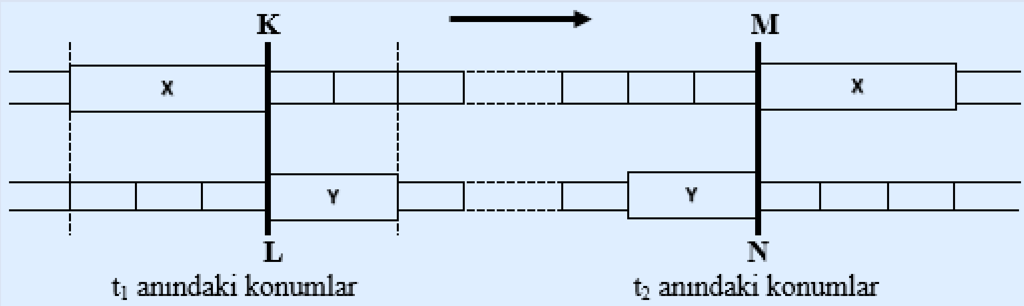
Kabartma



SORU 5. Aşağıdaki kabartma şekilde paralel raylarda ok yönünde sabit hızlarla giden X, Y otoraylarının t_1 ve t_2 anlarındaki konumları verilmiştir. KL çizgisi ile MN çizgisi arasındaki her iki rayda da 12 bölme bulunmaktadır. X otorayı üç bölme Y otorayı ise iki bölme uzunluğundadır.

Okuyucuya bilgi:

-Aşağıdaki şeklin kabartma baskısına öğrencinin parmakları ile dokunmasını sağlayınız. Öğrenci kabartma baskıya dokunduktan sonra şeklin betimlemesini okuyunuz.



Betimleme: Şekilde birbirine paralel bölmeli raylar üzerinde sağa doğru hareket eden dikdörtgen ile temsil edilen X ve Y otorayları ve bölmeli raylar görülmekte.

Otorayların t_1 anındaki konumları: 3 bölme uzunluğundaki X otorayının ön tarafı KL dikey çizgisinde. 2 bölme uzunluğundaki Y otorayının arka tarafı KL dikey çizgisinde.
Otorayların t_2 anındaki konumları: 3 bölme uzunluğundaki X otorayının arka tarafı MN dikey çizgisinde. 2 bölme uzunluğundaki Y otorayının ön tarafı MN dikey çizgisinde.

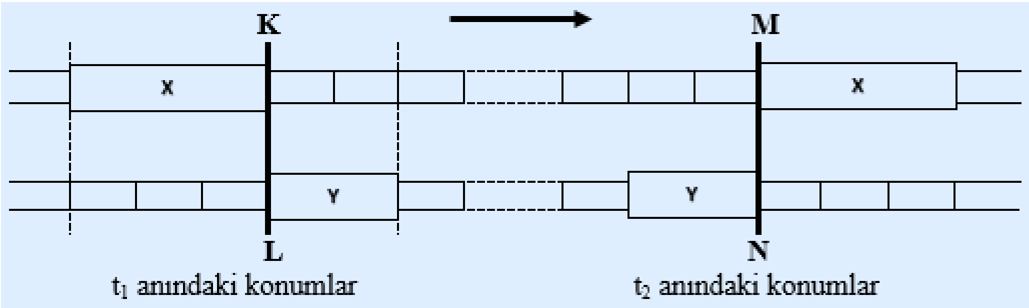
X' in hızının büyüklüğü V_X, Y'ninki V_Y olduğuna göre, V_X bölü V_Y oranı kaçtır?
(Raylardaki bölmeler eşit aralıklıdır.)

Seçenekler

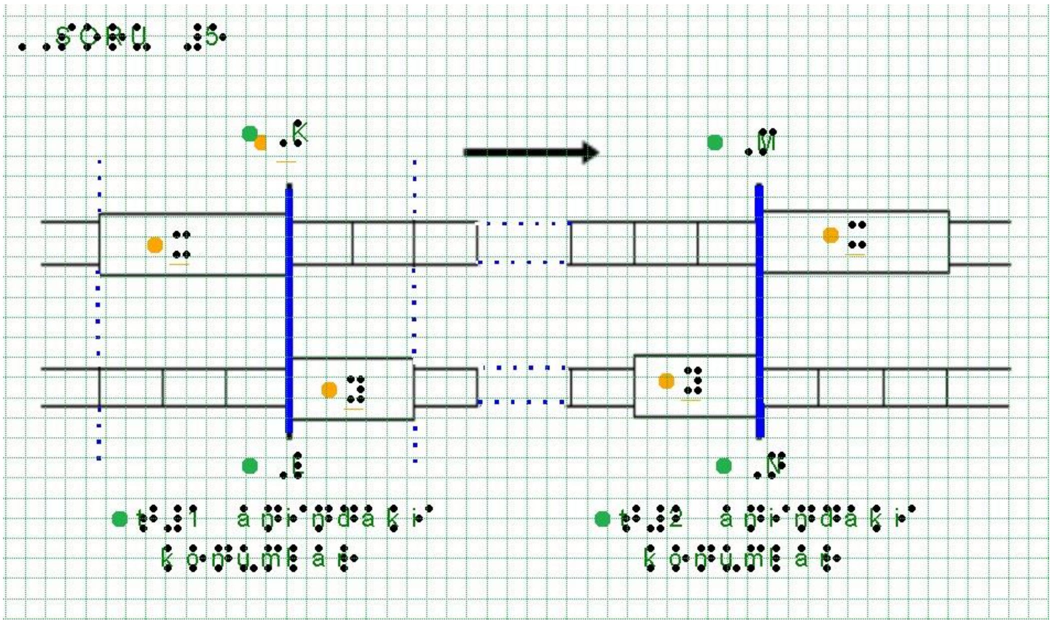
A) $\frac{9}{4}$ B) $\frac{3}{2}$ C) 1 D) $\frac{6}{5}$ E) $\frac{9}{5}$

SORU 5

Şekil



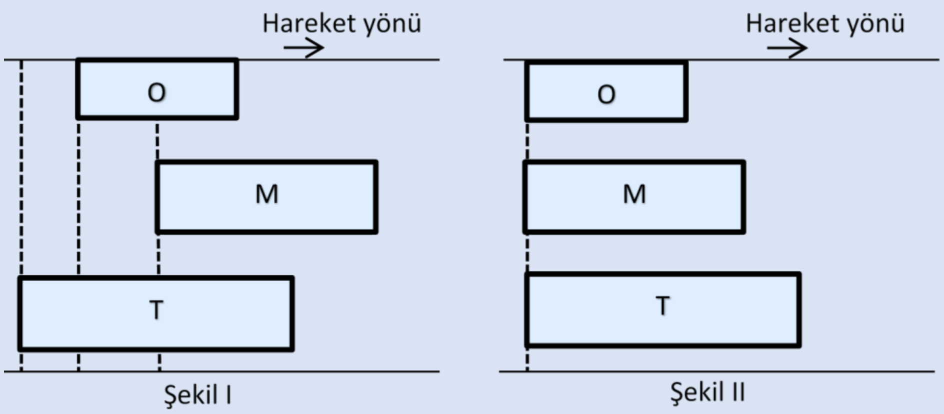
Kabartma



SORU 6. O otomobili, M minibüsü ve T tırı doğrusal bir yolda sabit hızlarla ilerliyor. Bu araçların birbirlerine göre konumları, t_0 anında Şekil I, daha sonraki t anında da Şekil II' deki gibi kabartılmıştır.

Okuyucuya bilgi:

-Aşağıdaki şeklin kabartma baskısına öğrencinin parmakları ile dokunmasını sağlayınız. Öğrenci kabartma baskıya dokunduktan sonra şeklin betimlemesini okuyunuz.



Betimleme: Şekil I ve Şekil II'de sağa doğru hareket eden ve dikdörtgen ile temsil edilen O, M, T araçları görülmekte.

Şekil 1'in betimlemesi: Araçlarının her birinin arka kısmı farklı hizalarda. Bu hizalar dikey kesikli üç farklı çizgi ile belirtilmiş.

Şekil 2'nin betimlemesi: Araçlarının her birinin arka kısmı aynı hizada. Bu hiza dikey kesikli bir çizgi ile belirtilmiş.

O, M, T'nin hızlarının büyüklüğü sırasıyla V_O, V_M, V_T olduğuna göre, bunlar arasındaki ilişki nedir?

Seçenekler

A) V_O küçüktür V_T küçüktür V_M

B) V_O küçüktür V_M küçüktür V_T

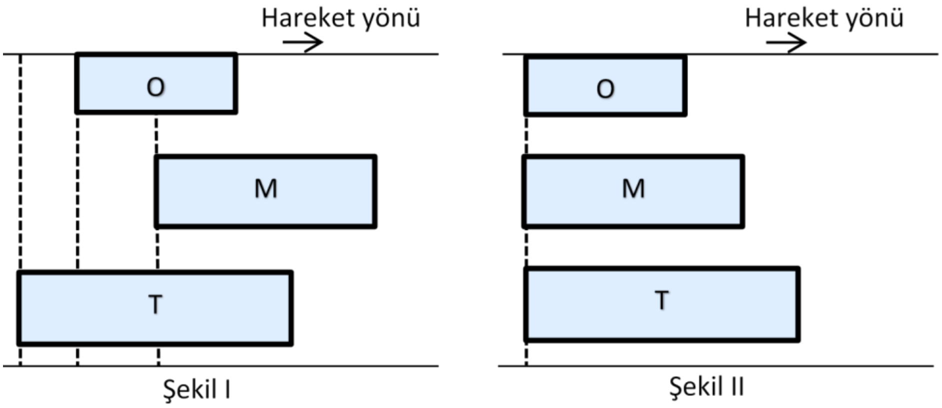
C) V_T küçüktür V_M küçüktür V_O

D) V_M küçüktür V_T küçüktür V_O

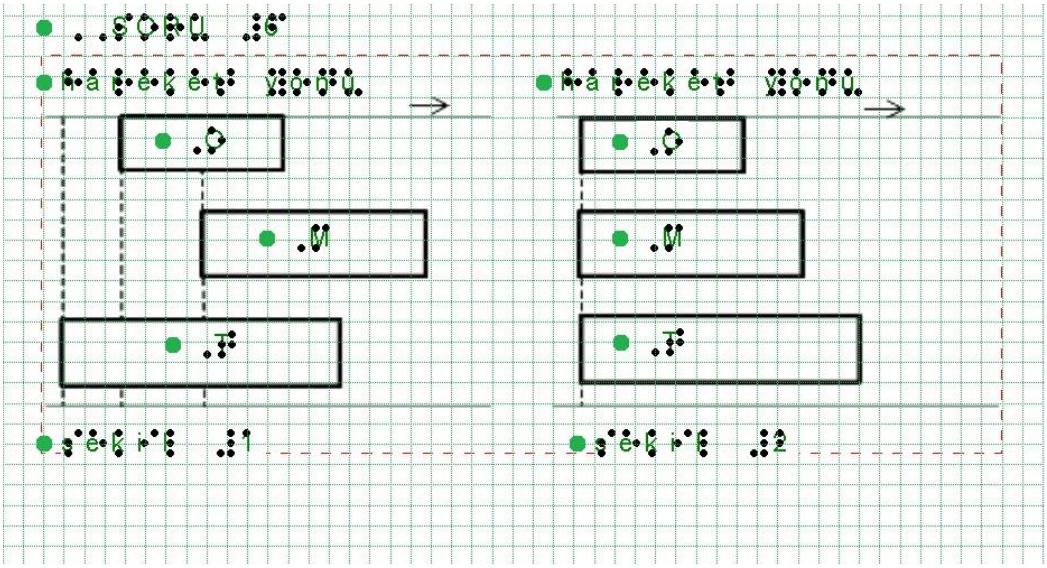
E) V_M küçüktür V_O küçüktür V_T

SORU 6

Şekil



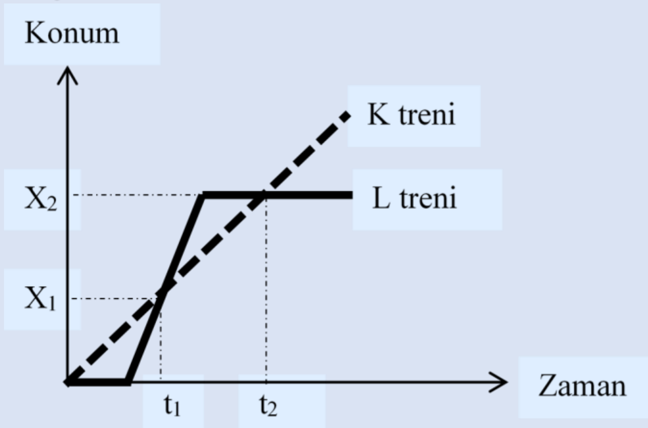
Kabartma



SORU 7. Birbirine paralel iki rayda aynı yönde hareket eden K ve L trenlerinin konum-zaman grafiği kabartma baskıda olduğu gibidir.

Okuyucuya bilgi:

-Aşağıdaki grafiğin kabartma baskısına öğrencinin parmakları ile dokunmasını sağlayınız. Öğrenci kabartma baskıya dokunduktan sonra grafiğin betimlemesini okuyunuz.



Betimleme: K treninin hareketi kesikli doğrusal çizgi, L treninin hareketi kesikli olmayan doğrusal çizgi ile belirtilmiş. Çizgilerin başlangıç noktası aynı.

Yatay eksen: Zaman, t_1 ve t_2 noktaları işaretlenmiş.

Düşey eksen: Konum, X_1 ve X_2 noktaları işaretlenmiş.

Yatay eksen t_1, düşey eksen X_1 iken ve yatay eksen t_2, düşey eksen X_2 iken çizgiler kesişmiş.

Bu grafikten elde edilen bilgilere göre trenlerin hız ve konumları ile ilgili aşağıdaki yargılardan hangisi yanlıştır? (Yanlıştır'ın altı çizili)

Seçenekler

A) t_1 anında trenlerin hızları aynıdır.

B) t_1 anında iki tren yan yanadır.

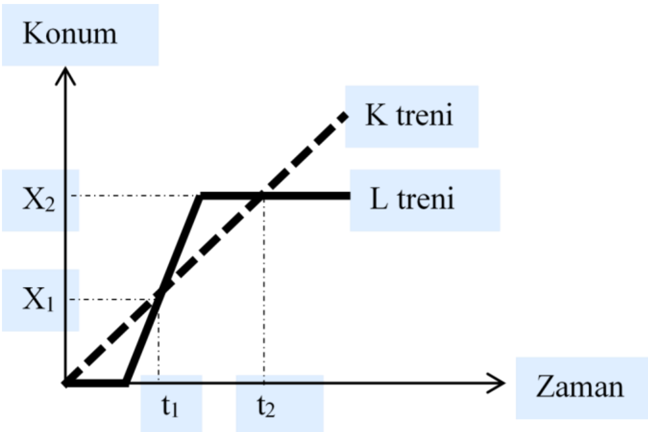
C) t_2 anında iki tren yan yanadır.

D) K ve L trenleri aynı konumdan harekete başlamıştır.

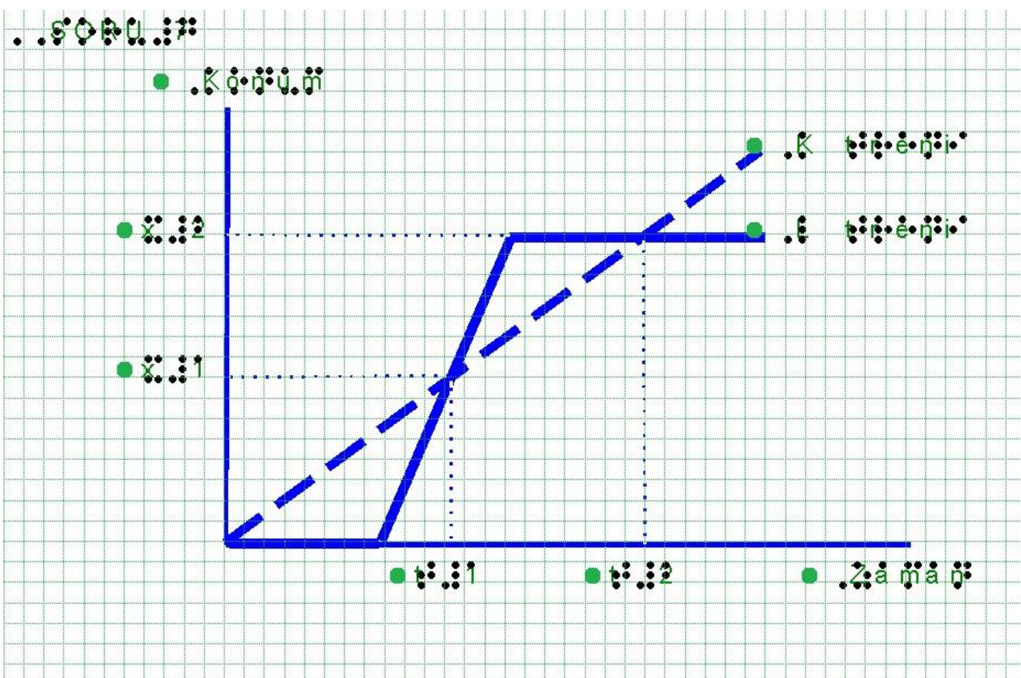
E) t_2 anında L treni durmaktadır.

SORU 7

Grafik



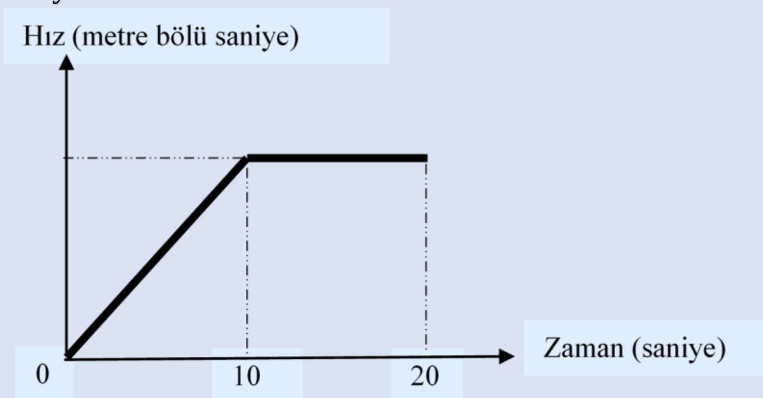
Kabartma



SORU 8. Doğrusal bir yolda hareket eden aracın hız-zaman grafiği kabartması aşağıdaki gibidir.

Okuyucuya bilgi:

-Aşağıdaki grafiğin kabartma baskısına öğrencinin parmakları ile dokunmasını sağlayınız. Öğrenci kabartma baskıya dokunduktan sonra grafiğin betimlemesini okuyunuz.



Betimleme:

Yatay eksen: Zaman (saniye), 10 ve 20 değerleri işaretlenmiş.

Düşey eksen: Hız (metre bölü saniye). Tek bölme.

0 ile 10 saniye aralığı: Hem zamanda hem de hızda artış gösteren doğrusal çizgi.

10 ile 20 saniye aralığı: Zaman eksenine paralel çizgi.

Bu grafikten elde edilen bilgilere göre, verilen zaman aralıklarında aracın yer değiştirmesi ve hızı ile ilgili aşağıdaki yargılardan hangisi doğrudur?

Seçenekler

A) 0 ile 10 saniye zaman aralığındaki yer değiştirme ile 10 ile 20 saniye zaman aralığındaki yer değiştirme eşittir.

B) 0 ile 10 saniye zaman aralığındaki yer değiştirme, 10 ile 20 saniye zaman aralığındaki yer değiştirmeden daha büyüktür.

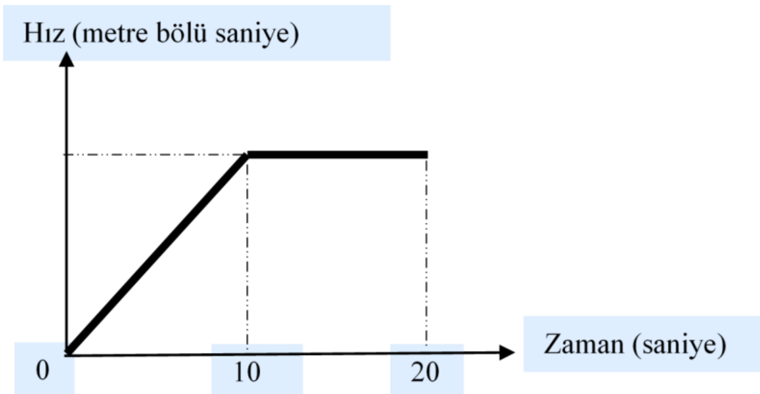
C) 0 ile 10 saniye zaman aralığında sabit hızlıdır.

D) 10 ile 20 saniye zaman aralığında durmaktadır.

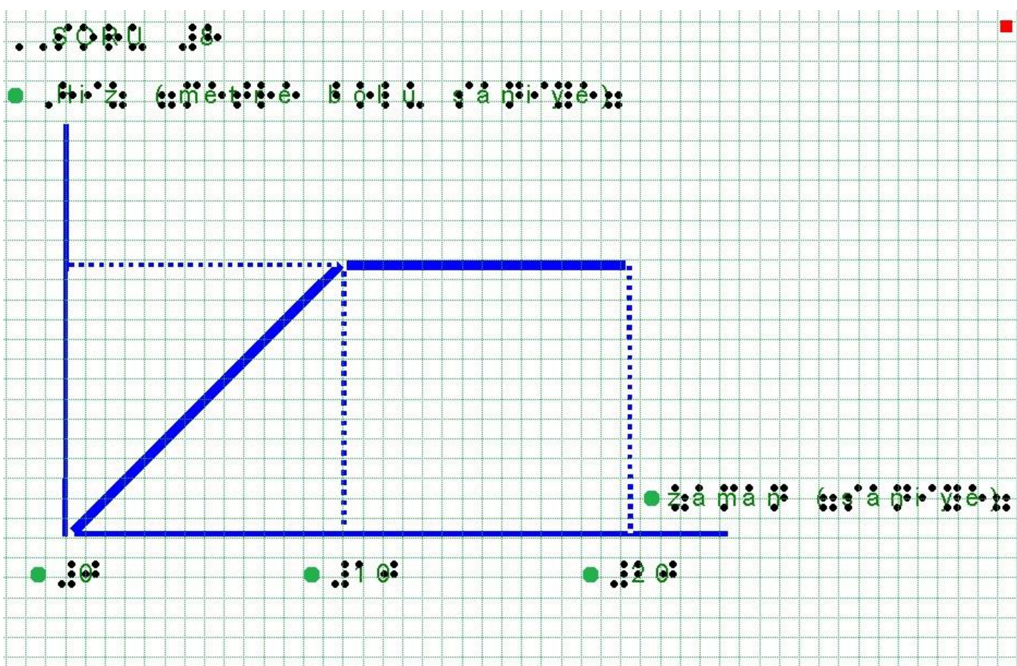
E) 10 ile 20 saniye zaman aralığında sabit hızlıdır.

SORU 8

Grafik



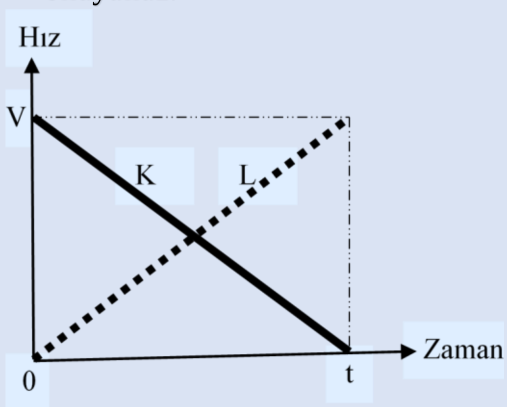
Kabartma



SORU 9. Doğrusal bir yolda aynı yerden aynı anda harekete başlayan K ve L cisimlerinin hız-zaman grafiği kabartması aşağıdaki gibidir.

Okuyucuya bilgi:

-Aşağıdaki grafiğin kabartma baskısına öğrencinin parmakları ile dokunmasını sağlayınız. Öğrenci kabartma baskıya dokunduktan sonra grafiğin betimlemesini okuyunuz.



Betimleme: K cismi kesikli olmayan doğrusal çizgi, L cismi kesikli doğrusal çizgi ile belirtilmiş.

Yatay eksen: Zaman, t anı işaretlenmiş.

Düşey eksen: Hız, V hızı işaretlenmiş.

Eksenlerin kesişimi 0 noktası.

Kesikli olmayan doğrusal çizgi (K) V noktasında başlayıp t noktasında sona ermiş.

Kesikli doğrusal çizgi (L) 0 noktasında başlayıp, t noktasından çıkan düşey ve V noktasından çıkan yatay hizalama çizgisinin kesişiminde sona ermiş.

0 ile t zaman aralığında,

I. K ve L birbirine zıt yönde hareket etmektedir.

II. K'nin ortalama hızı L'ninkine eşittir.

III. K'nin ivmesinin büyüklüğü L'ninkine eşittir.

yargılarından hangileri doğrudur?

Seçenekler

A) Yalnız I. Yani K ve L birbirine zıt yönde hareket etmektedir.

B) Yalnız II. Yani K'nin ortalama hızı L'ninkine eşittir.

C) I ve II. Yani

I. K ve L birbirine zıt yönde hareket etmektedir.

II. K'nin ortalama hızı L'ninkine eşittir.

D) II ve III. Yani

II. K'nin ortalama hızı L'ninkine eşittir.

III. K'nin ivmesinin büyüklüğü L'ninkine eşittir.

E) I, II ve III. Yani

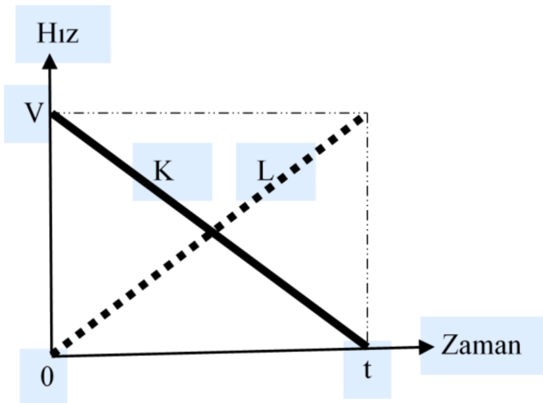
I. K ve L birbirine zıt yönde hareket etmektedir.

II. K'nin ortalama hızı L'ninkine eşittir.

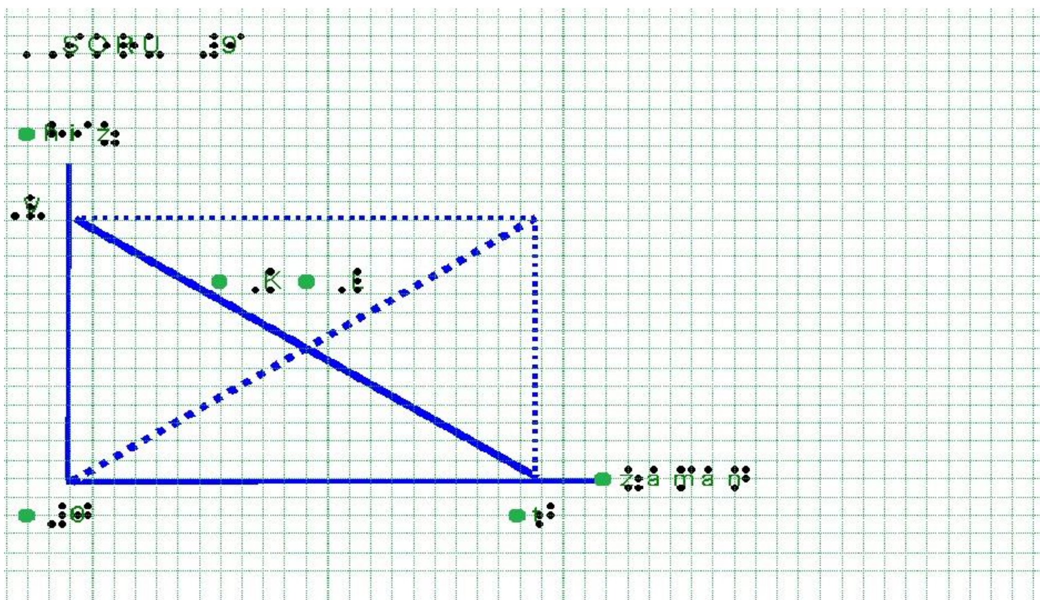
III. K'nin ivmesinin büyüklüğü L'ninkine eşittir.

SORU 9

Grafik



Kabartma



SORU 10. Bir otobüs yatay doğrusal bir yolda 0 ile t_1 zaman aralığında sabit hızla yoluna devam ederken yolcu almak için t_1 ile t_2 aralığında yavaşlıyor. t_2 ile t_3 aralığında yolcuların binmesi için durgun bekleyen otobüs t_3 ile t_4 aralığında ilk hareketi yönünde hızlanıyor.

Buna göre hangi zaman aralıklarında otobüsün ivmesi sıfırdan farklıdır?

Seçenekler

A) 0 ile t_1 ve t_1 ile t_2

B) 0 ile t_1 ve t_2 ile t_3

C) t_1 ile t_2 ve t_2 ile t_3

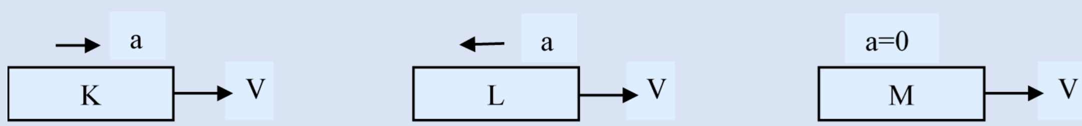
D) t_1 ile t_2 ve t_3 ile t_4

E) t_2 ile t_3 ve t_3 ile t_4

SORU 11. K, L ve M araçlarının hızları aynı iken hareket boyunca sabit değerde olan ivmelerinin yönleri kabartma şekilde verilmiştir.

Okuyucuya bilgi:

-Aşağıdaki şeklin kabartma baskısına öğrencinin parmakları ile dokunmasını sağlayınız. Öğrenci kabartma baskıya dokunduktan sonra şeklin betimlemesini okuyunuz.



Betimleme: Şekilde dikdörtgen ile temsil edilen K, L ve M araçları görülmekte.

K, L ve M araçlarının her birinin sağ tarafında sağa doğru ok işareti, okun yanında V harfi.

K aracının üzerinde sağa doğru olan ok işaretinin yanında a harfi yazıyor.

L aracının üzerinde sola doğru olan ok işaretinin yanında a harfi yazıyor.

M aracının üzerinde a eşittir sıfır yazıyor.

Bir süre sonra aynı yönde ilerleyen K, L ve M araçlarının hızlarının büyüklüğü sırasıyla V_K, V_L, V_M olduğuna göre, bu hızlar arasındaki ilişki nedir?

Seçenekler

A) V_K büyüktür V_M büyüktür V_L

B) V_K büyüktür V_L büyüktür V_M

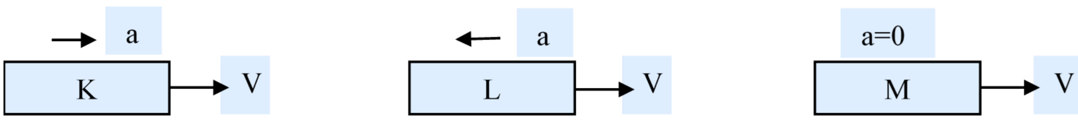
C) V_M büyüktür V_K büyüktür V_L

D) V_M büyüktür V_L büyüktür V_K

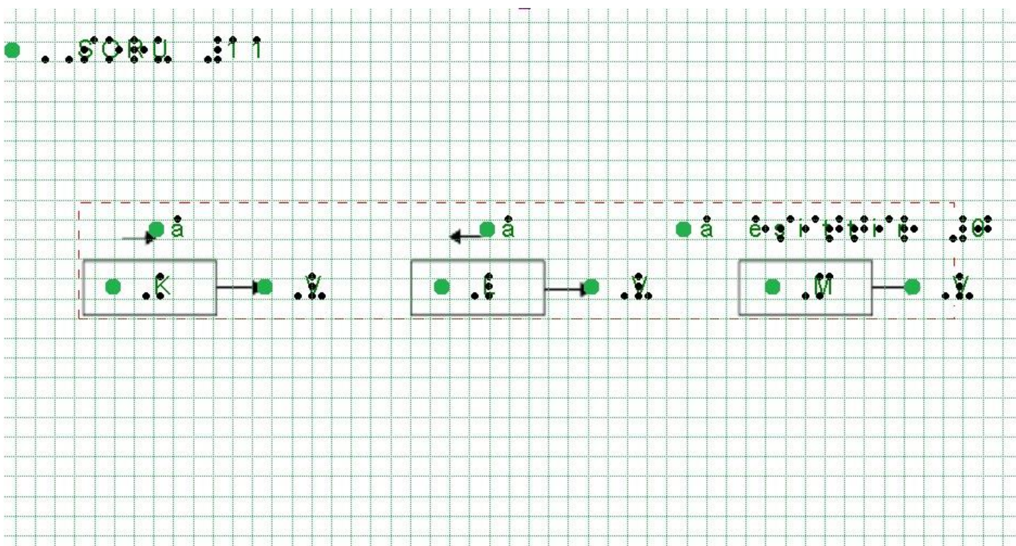
E) V_L büyüktür V_K büyüktür V_M

SORU 11

Şekil



Kabartma



SORU 12. Dört farklı cismin ivmeleri ile ilgili,

I. Düzgün hızlanan cismin ivmesi düzgün artmaktadır.
II. Düzgün yavaşlayan cismin ivmesi düzgün azalmaktadır.
III. Duran cismin ivmesi sıfırdır.
IV. Sabit hızla hareket eden cismin ivmesi sıfırdır.

yargılarından hangileri doğrudur?

Seçenekler

A) Yalnız III. Yani duran cismin ivmesi sıfırdır.

B) I ve II. Yani

I. Düzgün hızlanan cismin ivmesi düzgün artmaktadır.

II. Düzgün yavaşlayan cismin ivmesi düzgün azalmaktadır.

C) III ve IV. Yani

III. Duran cismin ivmesi sıfırdır.

IV. Sabit hızla hareket eden cismin ivmesi sıfırdır.

D) I, II ve III. Yani

I. Düzgün hızlanan cismin ivmesi düzgün artmaktadır.

II. Düzgün yavaşlayan cismin ivmesi düzgün azalmaktadır.

III. Duran cismin ivmesi sıfırdır.

E) I, II, III ve IV. Yani

I. Düzgün hızlanan cismin ivmesi düzgün artmaktadır.

V. Düzgün yavaşlayan cismin ivmesi düzgün azalmaktadır.

VI. Duran cismin ivmesi sıfırdır.

VII. Sabit hızla hareket eden cismin ivmesi sıfırdır.

F7. Tactile Graphics Testing Accommodations Condition of Motion Achievement Test (Third Version)

THIRD VERSION OF TAMAT FOR BLIND AND SIGHTED STUDENTS

9. Sınıf Fizik Dersi Hareket Başarı Testi (Kör Öğrenciler İçin)

12 sorudan oluşan bu test 9. sınıf fizik dersi, Hareket ve Kuvvet ünitesinden seçilen ve yeniden düzenlenen hareket konusundaki üç kazanımın ölçülmesine yönelik hazırlanmıştır. Testi cevaplamaya dilediğiniz sorudan başlayabilirsiniz. Yanlış cevaplarınız doğru cevaplarınızı götürmeyecektir. Tüm sorular eşit puanlıdır. Testi cevaplama süreniz bir buçuk ders saatidir.

Öğrenci No: ……………………………

Şube : ……………………………

Okul : ……………………………

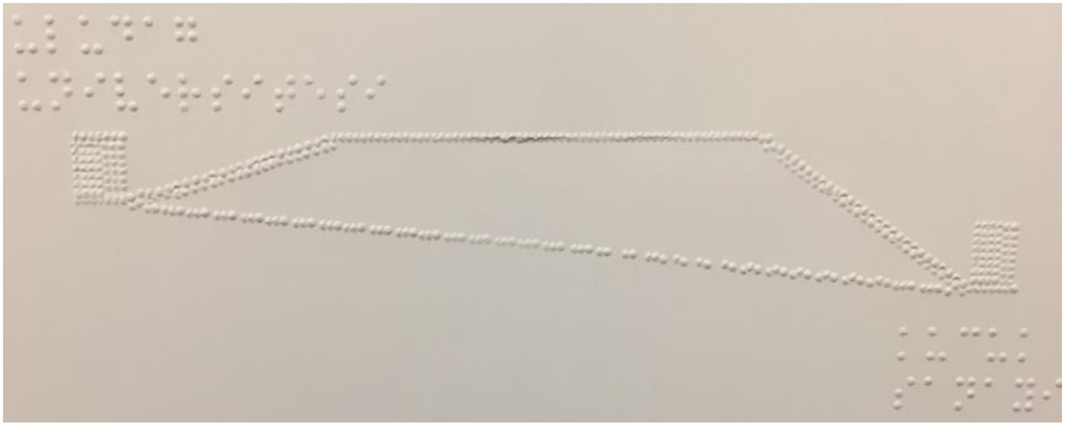
SORU 1. Aşağıdaki kabartma şekilde Bursa’daki Küçük Sanayi ile Uludağ Üniversitesi durakları dikdörtgenler ile temsil edilmiştir. Duraklar arasında seferlerini sürdüren halk otobüsleri şekilde tek parça ince çizgi ile gösterilen alt taraftaki güzergâhı, raylı sistem ise üç parçadan oluşan kalın çizgi ile gösterilen üstteki güzergâhı kullanmaktadır.

Açıklama

Halk otobüsleri

Raylı sistem

Duraklar



Buna göre iki durak arasında halk otobüsü ve raylı sistemin hareketine ait niceliklerden hangisi kesinlikle aynıdır?

Seçenekler

A) Alınan yolları

B) Yer değiştirmeleri

C) Süratleri

D) Hızları

E) Harekete başladıktan sonra herhangi bir t süre sonraki konumları

SORU 2. Ayşe öğretmen otobüs durağında beklerken cep telefonunu evde unuttuğunu fark ediyor ve durağın 30 metre doğusundaki evine gidip telefonunu alarak duraktaki aynı noktaya aynı yol üzerinden geri dönüyor.

Buna göre Ayşe öğretmenin aldığı yol ve yer değiştirmesinin büyüklüğü sırasıyla kaç metredir?

Seçenekler

A) 30 ve 60

B) 30 ve 0

C) 60 ve 0

D) 60 ve 30

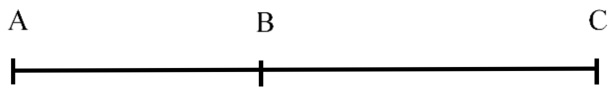
E) 0 ve 60

SORU 3. Bahar aşağıdaki kabartma şekilde gösterilen doğrusal yatay yürüyüş yolunda önce A noktasından B noktasına sonra C noktasına, sonra da C noktasından B noktasına yürüyor.

Açıklama

Yürüyüş yolu

A, B ve C noktaları



Sadece A ve B noktaları arasındaki mesafe ile Bahar'ın toplam yürüyüş süresi bilindiğine göre Bahar'ın hareketi ile ilgili aşağıdaki niceliklerden hangisi hesaplanabilir?

Seçenekler

A) AC noktaları arasında aldığı yol

B) Toplam aldığı yol

C) BC arasındaki yer değiştirme

D) Sürat

E) Hız

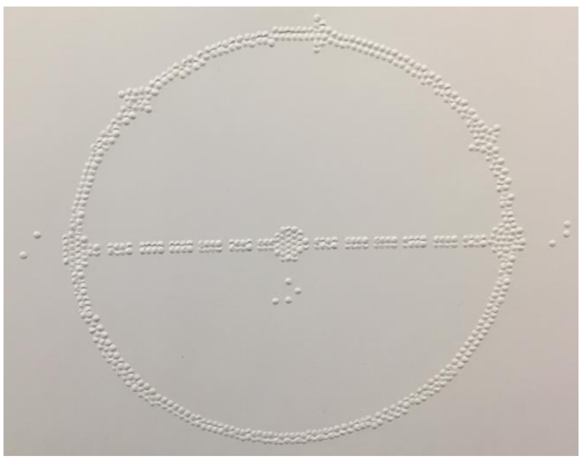
SORU 4. Bir çocuk, yarıçapı 3 metre, merkezi O noktası olan, kabartma şekil ile gösterilen çembersel yolda, A noktasından B noktasına üç adet okla çember üzerinde belirtilen yörünge ile 3 saniyede gidiyor.

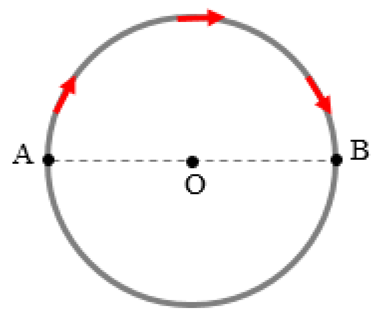
Açıklama

Ok işareti →

Çemberin merkezinden geçen kesikli çizgi - - - - - - - - -

A, O ve B noktaları ●





Buna göre çocuğun ortalama sürati ve ortalama hızı sırasıyla kaç metre bölü saniyedir? (pi sayısını 3 olarak alınız.)

Seçenekler

A) 3 ve 1

B) 6 ve 1

C) 6 ve 2

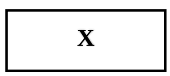
D) 3 ve 2

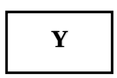
E) 3 ve 6

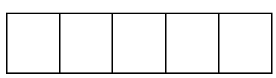
SORU 5. Yatay düzlemdeki paralel raylar eşit büyüklükteki dikdörtgen bölmeler ile gösterilmiş, raylarda ok yönünde sabit hızlarla giden X ve Y vagonları ise büyük dikdörtgenler ile kabarta şekilde temsil edilmiştir. Vagonların t_1 ve t_2 anlarındaki konumları, rayları dik olarak kesen KL ve MN düşey çizgilerine göre görülmektedir. KL ve MN çizgileri arasında her iki rayda da 12 bölme bulunmaktadır. t_1 anında üç bölme uzunluğundaki X vagonunun ön tarafı KL çizgisinde iken iki bölme uzunluğundaki Y vagonunun arka tarafı KL çizgisindedir. t_2 anında X vagonunun arka tarafı MN çizgisinde iken Y vagonunun ön tarafı MN çizgisindedir.

Açıklama

Ok işareti 

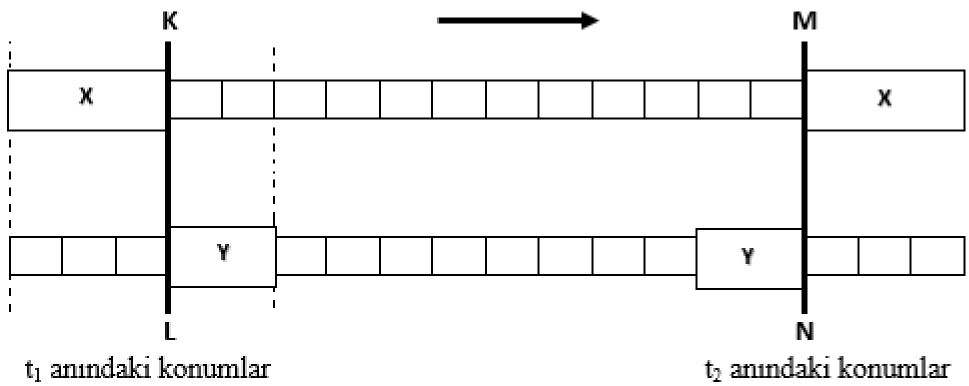
X vagonu 

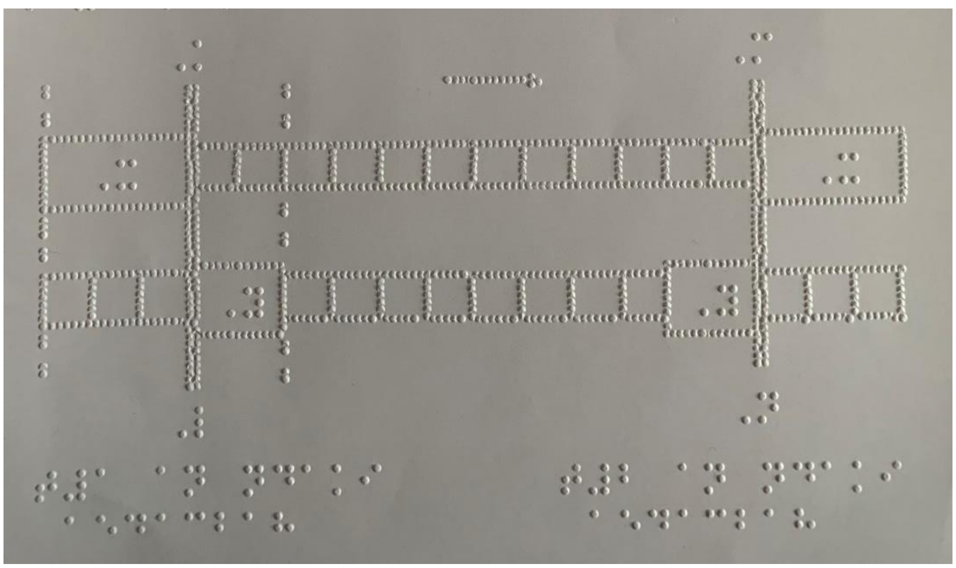
Y vagonu 

Raylar 

KL ve MN düşey çizgileri

Düşey kesikli hizalama çizgileri





X' in hızının büyüklüğü V_X, Y'ninki V_Y olduğuna göre, V_X bölü V_Y oranı kaçtır?
(Raylardaki bölmeler eşit aralıklıdır.)

Seçenekler

A) $\frac{9}{4}$ B) $\frac{3}{2}$ C) 1 D) $\frac{6}{5}$ E) $\frac{9}{5}$

SORU 6. O otomobili, M minibüsü ve T tırı doğrusal yatay bir yolda sabit hızlarla ilerliyor. Farklı boylardaki dikdörtgenler ile temsil edilen araçların birbirlerine göre konumları düşey kesikli çizgiler ile t_0 anı ve t anı için ayrı ayrı kabartılmıştır. t_0 anında araçlarının her birinin arka kısmı farklı hizalarda, t anında ise araçlarının her birinin arka kısmı aynı hizadadır.

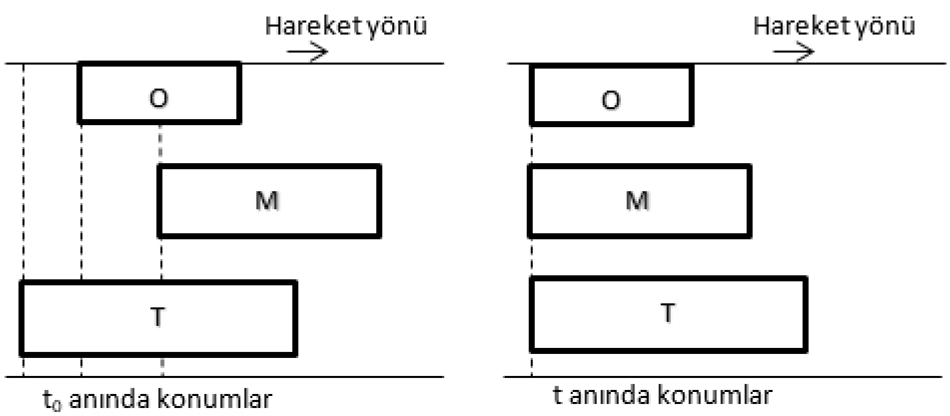
Açıklama

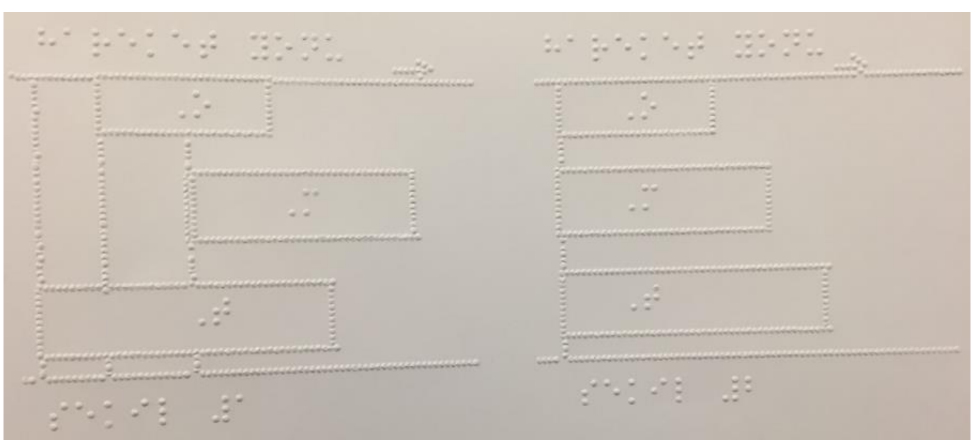
Ok işareti 

Düşey kesikli hizalama çizgileri

Küçüktür işareti <

Araçlar 





O, M, T taşıtlarının hızlarının büyüklüğü sırasıyla V_O, V_M, V_T olduğuna göre, bunlar arasındaki ilişki nedir?

Seçenekler

A) $V_O < V_T < V_M$

B) $V_O < V_M < V_T$

C) $V_T < V_M < V_O$

D) $V_M < V_T < V_O$

E) $V_M < V_O < V_T$

SORU 7. Birbirine paralel iki rayda aynı yönde hareket eden K ve L trenlerinin konum-zaman grafiği kabartma baskıda olduğu gibidir. Baskıda yatay eksende olan zaman için t_1 ve t_2 noktaları işaretlenmiş, düşey eksen olan konumda ise X_1 ve X_2 noktaları işaretlenmiştir. K treninin hareketi kesikli tek parça doğrusal çizgi, L treninin hareketi kesikli olmayan üç parça doğrusal çizgi ile belirtilmiştir. Çizgilerin başlangıç noktası aynıdır. Çizgiler iki noktada kesişmiştir. Birinci kesişim t_1'den çıkan düşey ve X_1'den çıkan yatay hizalama çizgisinin kesişimi, ikinci kesişim noktası ise t_2'den çıkan düşey ve X_2'den çıkan yatay hizalama çizgisinin kesişim noktasıdır.

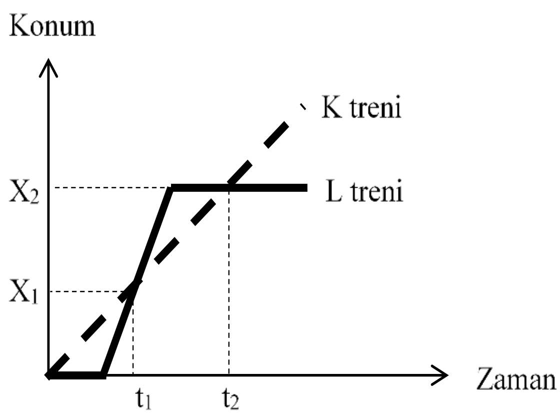
Açıklama

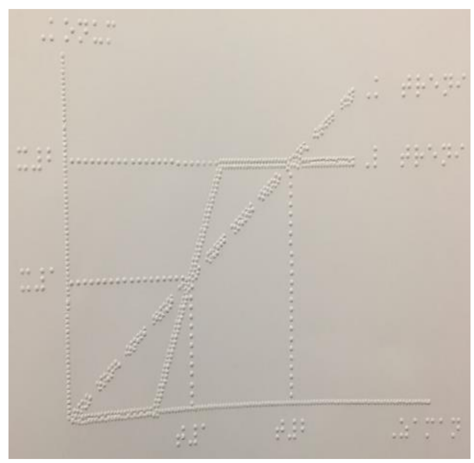
Kesikli hizalama çizgileri

K treni

L treni

Eksen çizgileri





Bu grafikten elde edilen bilgilere göre trenlerin hız ve konumları ile ilgili aşağıdaki yargılardan hangisi yanlıştır? (Yanlıştır'ın altı çizili)

Seçenekler

A) t_1 anında trenlerin hızları aynıdır.

B) t_1 anında iki tren yan yanadır.

C) t_2 anında iki tren yan yanadır.

D) K ve L trenleri aynı konumdan harekete başlamıştır.

E) t_2 anında L treni durmaktadır.

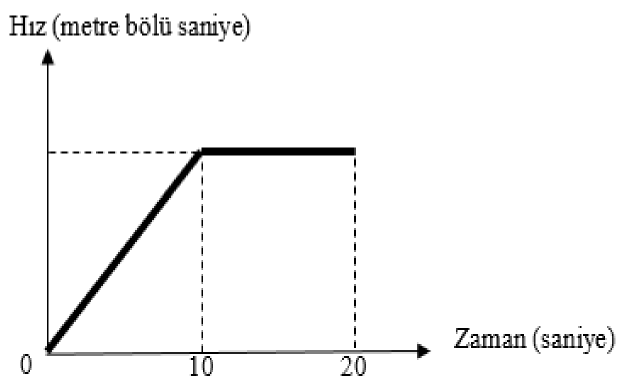
SORU 8. Doğrusal bir yolda hareket eden aracın hız-zaman grafiği kabartma baskıda olduğu gibidir. Aracın hareketi kesikli olmayan iki parça doğrusal çizgi ile belirtilmiştir. Yatay eksende olan zaman için 10 ve 20 noktaları, düşey eksen olan hızda değeri belirsiz bir nokta ve eksenlerin kesişiminde 0 noktası işaretlenmiştir. İlk çizginin başlangıç noktası 0 noktasıdır.

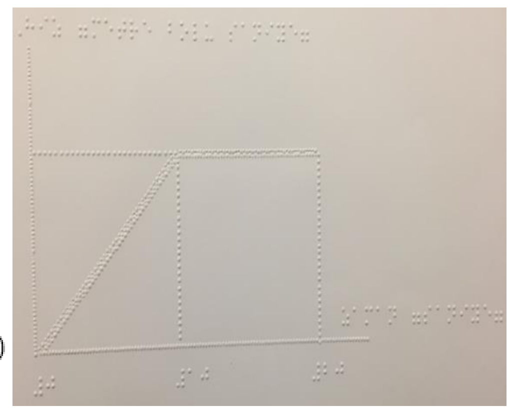
Açıklama

Kesikli hizalama çizgileri

Araç

Eksen çizgileri





Bu grafikten elde edilen bilgilere göre, verilen zaman aralıklarında aracın yer değiştirmesi ve hızı ile ilgili aşağıdaki yargılardan hangisi doğrudur?

Seçenekler

A) 0 ile 10 saniye zaman aralığındaki yer değiştirme ile 10 ile 20 saniye zaman aralığındaki yer değiştirme eşittir.

B) 0 ile 10 saniye zaman aralığındaki yer değiştirme, 10 ile 20 saniye zaman aralığındaki yer değiştirmeden daha büyüktür.

C) 0 ile 10 saniye zaman aralığında sabit hızlıdır.

D) 10 ile 20 saniye zaman aralığında durmaktadır.

E) 10 ile 20 saniye zaman aralığında sabit hızlıdır.

SORU 9. Doğrusal bir yolda aynı yerden aynı anda harekete başlayan K ve L cisimlerinin hız-zaman grafiği kabartma baskıda olduğu gibidir. K cisminin hareketi kesikli olmayan, L cisminin hareketi ise kesikli tek parça çizgi ile belirtilmiştir. Yatay eksende olan zaman için t noktası, düşey eksen olan hızda V noktası ve eksenlerin kesişiminde 0 noktası işaretlenmiştir. K çizgisi V noktasında başlayıp t noktasında sona ermiş, L çizgisi 0 noktasında başlayıp, t noktasından çıkan düşey ve V noktasından çıkan yatay hizalama çizgisinin kesişiminde sona ermiştir.

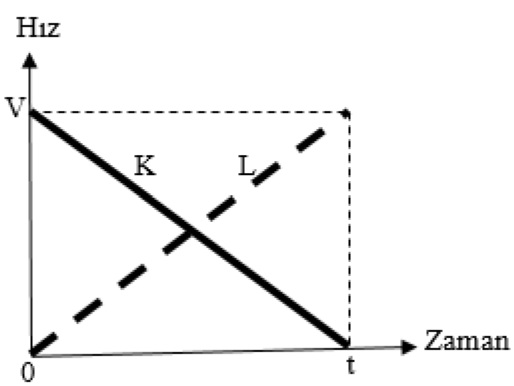
Açıklama

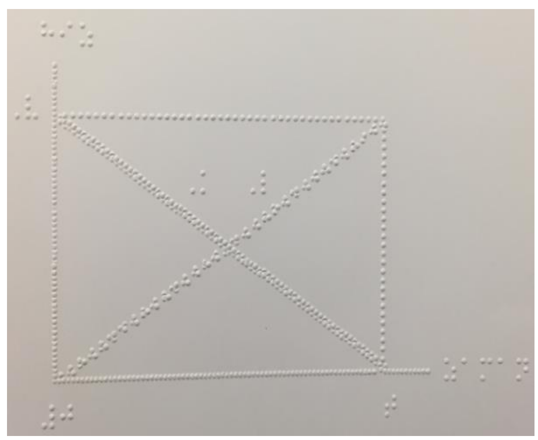
Kesikli hizalama çizgileri

K cismi

L cismi

Eksen çizgileri





0 ile t zaman aralığında,

I. K ve L birbirine zıt yönde hareket etmektedir.
II. K'nin ortalama hızı L'ninkine eşittir.
III. K'nin ivmesinin büyüklüğü L'ninkine eşittir.

yargılarından hangileri doğrudur?

Seçenekler

A) Yalnız I

B) Yalnız II

C) I ve II

D) II ve III

E) I, II ve III

SORU 10. Bir otobüs yatay doğrusal bir yolda 0 ile t_1 zaman aralığında sabit hızla yoluna devam ederken yolcu almak için t_1 ile t_2 aralığında yavaşlıyor. t_2 ile t_3 aralığında yolcuların binmesi için durgun bekleyen otobüs t_3 ile t_4 aralığında ilk hareketi yönünde hızlanıyor.

Buna göre hangi zaman aralıklarında otobüsün ivmesi sıfırdan farklıdır?

Seçenekler

A) 0 ile t_1 ve t_1 ile t_2

B) 0 ile t_1 ve t_2 ile t_3

C) t_1 ile t_2 ve t_2 ile t_3

D) t_1 ile t_2 ve t_3 ile t_4

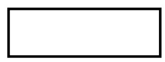
E) t_2 ile t_3 ve t_3 ile t_4

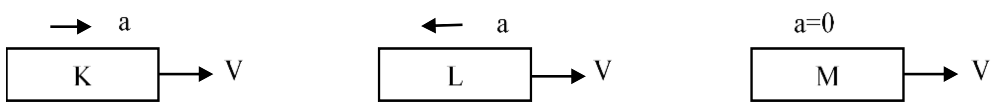
SORU 11. Dikdörtgenler ile temsil edilen K, L ve M araçlarının hızları aynı iken hareket boyunca sabit değerde olan ivmelerinin yönleri kabartma şekilde verilmiştir.

Açıklama

Ok işareti $\longrightarrow$

Büyüktür işareti >

Araçlar 



Bir süre sonra K, L ve M araçları aynı yönde ilerlerken hızlarının büyüklüğü sırasıyla V_K, V_L, V_M olduğuna göre, bu hızlar arasındaki ilişki nedir?

Seçenekler

A) $V_K > V_M > V_L$

B) $V_K > V_L > V_M$

C) $V_M > V_K > V_L$

D) $V_M > V_L > V_K$

E) $V_L > V_K > V_M$

SORU 12. Dört farklı cismin ivmeleri ile ilgili,

I. Düzgün hızlanan cismin ivmesi düzgün artmaktadır.
II. Düzgün yavaşlayan cismin ivmesi düzgün azalmaktadır.
III. Duran cismin ivmesi sıfırdır.
IV. Sabit hızla hareket eden cismin ivmesi sıfırdır.

yargılarından hangileri doğrudur?

Seçenekler

A) Yalnız III

B) I ve II

C) III ve IV

D) I, II ve III

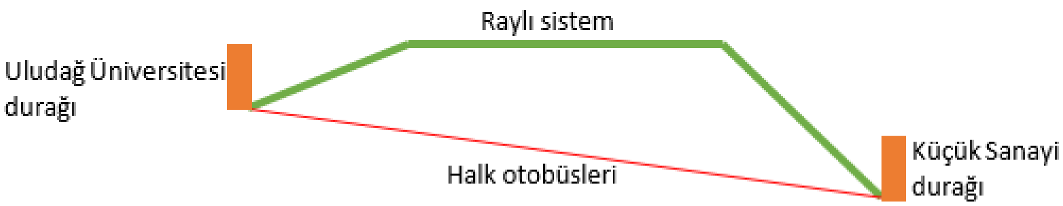
E) I, II, III ve IV

9. Sınıf Fizik Dersi Hareket Başarı Testi
(Gören Öğrenciler İçin)

12 sorudan oluşan bu test 9. sınıf fizik dersi, Hareket ve Kuvvet ünitesinden seçilen ve yeniden düzenlenen hareket konusundaki üç kazanımın ölçülmesine yönelik hazırlanmıştır. Testi cevaplamaya dilediğiniz sorudan başlayabilirsiniz. Yanlış cevaplarınız doğru cevaplarınızı götürmeyecektir. Tüm sorular eşit puanlıdır. Testi cevaplama süreniz bir ders saatidir.

Öğrenci No: ……………………………
Şube : ……………………………
Okul : ……………………………

1. Aşağıdaki şekilde Bursa'daki Küçük Sanayi ile Uludağ Üniversitesi durakları dikdörtgenler ile temsil edilmiştir. Duraklar arasında seferlerini sürdüren halk otobüsleri şekilde tek parça ince çizgi ile gösterilen alt taraftaki güzergâhı, raylı sistem ise üç parçadan oluşan kalın çizgi ile gösterilen üstteki güzergâhı kullanmaktadır.



Buna göre iki durak arasında halk otobüsü ve raylı sistemin hareketine ait niceliklerden hangisi kesinlikle aynıdır?

A) Alınan yolları

B) Yer değiştirmeleri

C) Süratleri

D) Hızları

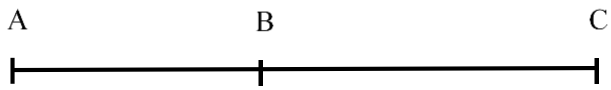
E) Harekete başladıktan sonra herhangi bir t süre sonraki konumları

2. Ayşe öğretmen otobüs durağında beklerken cep telefonunu evde unuttuğunu fark ediyor ve durağın 30 m doğusundaki evine gidip telefonunu alarak duraktaki aynı noktaya aynı yol üzerinden geri dönüyor.

Buna göre Ayşe öğretmenin aldığı yol ve yer değiştirmesinin büyüklüğü sırasıyla kaç m'dir?

	Alınan yol	Yer değiştirme
A)	30	60
B)	30	0
C)	60	0
D)	60	30
E)	0	60

3. Bahar aşağıdaki şekilde gösterilen doğrusal yatay yürüyüş yolunda önce A noktasından B noktasına sonra C noktasına, sonra da C noktasından B noktasına yürüyor.



Yürüyüş yolu

Sadece A ve B noktaları arasındaki mesafe ile Bahar'ın toplam yürüyüş süresi bilindiğine göre Bahar'ın hareketi ile ilgili aşağıdaki niceliklerden hangisi hesaplanabilir?

A) AC noktaları arasında aldığı yol

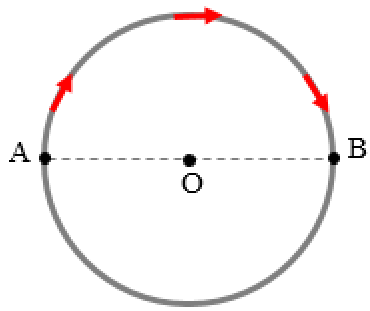
B) Toplam aldığı yol

C) BC arasındaki yer değiştirme

D) Sürat

E) Hız

4. Bir çocuk, yarıçapı 3 m, merkezi O noktası olan, şekil ile gösterilen çembersel yolda, A noktasından B noktasına üç adet okla çember üzerinde belirtilen yörünge ile 3 s'de gidiyor.

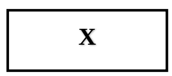


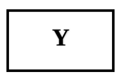
Buna göre çocuğun ortalama sürati ve ortalama hızı sırasıyla kaç m/s'dir? (π=3)

	Sürat	Hız
A)	3	1
B)	6	1
C)	3	2
D)	6	2
E)	3	6

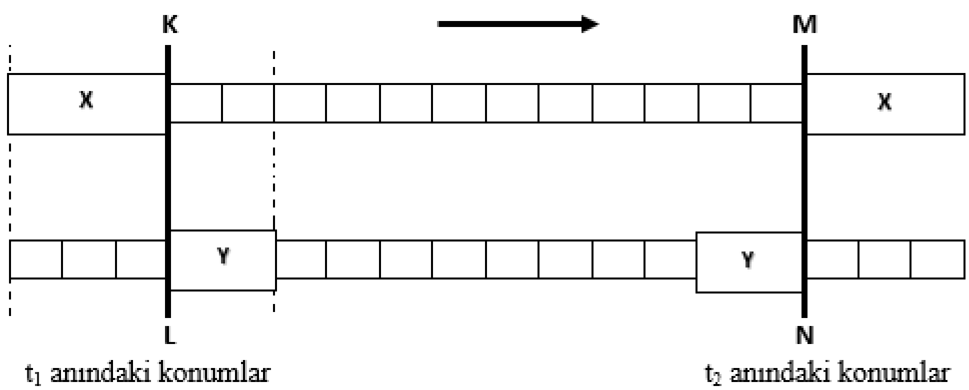
5. Yatay düzlemdeki paralel raylar eşit büyüklükteki dikdörtgen bölmeler ile gösterilmiş, raylarda ok yönünde sabit hızlarla giden X ve Y vagonları ise büyük dikdörtgenler ile şekilde temsil edilmiştir. Vagonların t_1 ve t_2 anlarındaki konumları, rayları dik olarak kesen KL ve MN düşey çizgilerine göre görülmektedir. KL ve MN çizgileri arasında her iki rayda da 12 bölme bulunmaktadır. t_1 anında üç bölme uzunluğundaki X vagonunun ön tarafı KL çizgisinde iken iki bölme uzunluğundaki Y vagonunun arka tarafı KL çizgisindedir. t_2 anında X vagonunun arka tarafı MN çizgisinde iken Y vagonunun ön tarafı MN çizgisindedir.

Açıklamalar:

X vagonu 

Y vagonu 

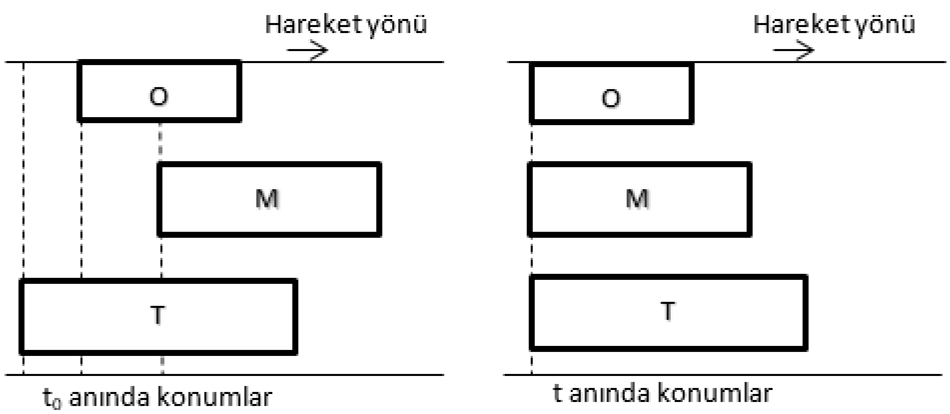
Raylar



X' in hızının büyüklüğü V_X, Y'ninki V_Y olduğuna göre $\frac{V_X}{V_Y}$ oranı kaçtır?
(Raylardaki bölmeler eşit aralıklıdır.)

A) $\frac{9}{4}$ B) $\frac{3}{2}$ C) 1 D) $\frac{6}{5}$ E) $\frac{9}{5}$

6. O otomobili, M minibüsü ve T tırı doğrusal yatay bir yolda sabit hızlarla ilerliyor. Farklı boylardaki dikdörtgenler ile temsil edilen araçların birbirlerine göre konumları düşey kesikli çizgiler ile t_0 anı ve t anı için ayrı ayrı gösterilmiştir. t_0 anında araçlarının her birinin arka kısmı farklı hizalarda, t anında ise araçlarının her birinin arka kısmı aynı hizadadır.



O, M, T taşıtlarının hızlarının büyüklüğü sırasıyla V_O, V_M, V_T olduğuna göre, bunlar arasındaki ilişki nedir?

A) $V_O < V_T < V_M$

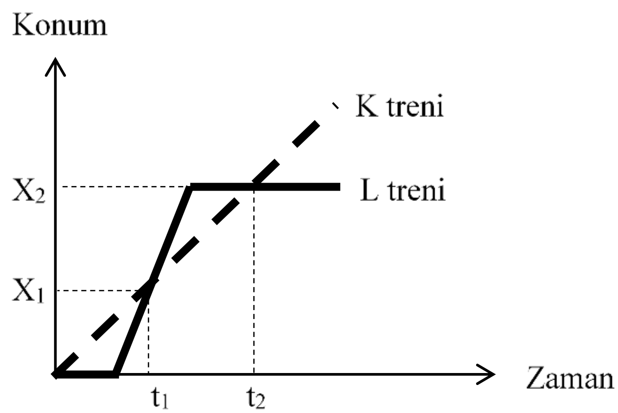
B) $V_O < V_M < V_T$

C) $V_T < V_M < V_O$

D) $V_M < V_T < V_O$

E) $V_M < V_O < V_T$

7. Birbirine paralel iki rayda aynı yönde hareket eden K ve L trenlerinin konum-zaman grafiği aşağıdaki gibidir. Yatay eksende olan zaman için t_1 ve t_2 noktaları işaretlenmiş, düşey eksen olan konumda ise X_1 ve X_2 noktaları işaretlenmiştir. K treninin hareketi kesikli tek parça doğrusal çizgi, L treninin hareketi kesikli olmayan üç parça doğrusal çizgi ile belirtilmiştir. Çizgilerin başlangıç noktası aynıdır. Çizgiler iki noktada kesişmiştir. Birinci kesişim t_1'den çıkan düşey ve X_1'den çıkan yatay hizalama çizgisinin kesişimi, ikinci kesişim noktası ise t_2'den çıkan düşey ve X_2'den çıkan yatay hizalama çizgisinin kesişim noktasıdır.



Bu grafikten elde edilen bilgilere göre trenlerin hız ve konumları ile ilgili aşağıdaki yargılardan hangisi <u>yanlıştır</u>?

A) t_1 anında trenlerin hızları aynıdır.

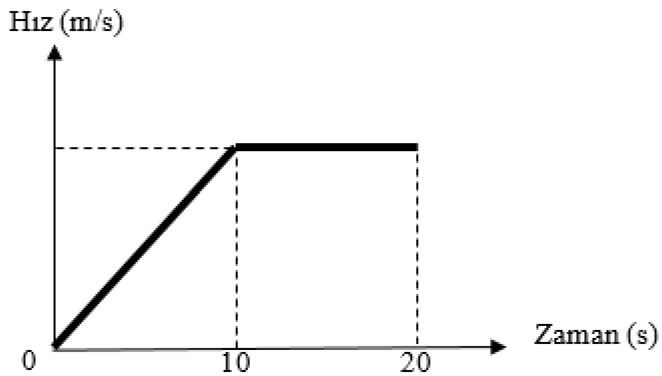
B) t_1 anında iki tren yan yanadır.

C) t_2 anında iki tren yan yanadır.

D) K ve L trenleri aynı konumdan harekete başlamıştır.

E) t_2 anında L treni durmaktadır.

8. Doğrusal bir yolda hareket eden aracın hız-zaman grafiği aşağıdaki gibidir. Aracın hareketi kesikli olmayan iki parça doğrusal çizgi ile belirtilmiştir. Yatay eksende olan zaman için 10 ve 20 noktaları, düşey eksen olan hızda değeri belirsiz bir nokta ve eksenlerin kesişiminde 0 noktası işaretlenmiştir. İlk çizginin başlangıç noktası 0 noktasıdır.



Bu grafikten elde edilen bilgilere göre, verilen zaman aralıklarında aracın yer değiştirmesi ve hızı ile ilgili aşağıdaki yargılardan hangisi doğrudur?

A) 0 ile 10 s zaman aralığındaki yer değiştirme ile 10 ile 20 s zaman aralığındaki yer değiştirme eşittir.

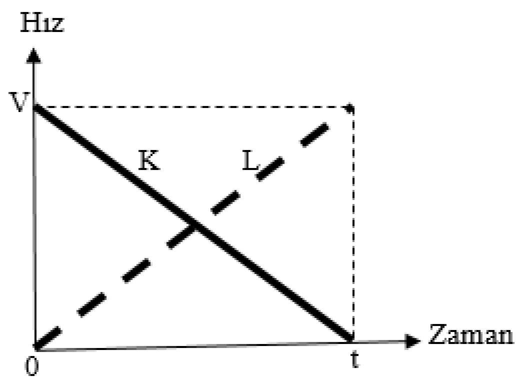
B) 0 ile 10 s zaman aralığındaki yer değiştirme, 10 ile 20 s zaman aralığındaki yer değiştirmeden daha büyüktür.

C) 0 ile 10 s zaman aralığında sabit hızlıdır.

D) 10 ile 20 s zaman aralığında durmaktadır.

E) 10 ile 20 s zaman aralığında sabit hızlıdır.

9. Doğrusal bir yolda aynı yerden aynı anda harekete başlayan K ve L cisimlerinin hız-zaman grafiği aşağıdaki gibidir. K cisminin hareketi kesikli olmayan, L cisminin hareketi ise kesikli tek parça çizgi ile belirtilmiştir. Yatay eksende olan zaman için t noktası, düşey eksen olan hızda V noktası ve eksenlerin kesişiminde 0 noktası işaretlenmiştir. K çizgisi V noktasında başlayıp t noktasında sona ermiş, L çizgisi 0 noktasında başlayıp, t noktasından çıkan düşey ve V noktasından çıkan yatay hizalama çizgisinin kesişiminde sona ermiştir.



0 ile t zaman aralığında,

I. K ve L birbirine zıt yönde hareket etmektedir.
II. K'nin ortalama hızı L'ninkine eşittir.
III. K'nin ivmesinin büyüklüğü L'ninkine eşittir.

yargılarından hangileri doğrudur?

A) Yalnız I

B) Yalnız II

C) I ve II

D) II ve III

E) I, II ve III

10. Bir otobüs (0-t_1) zaman aralığında sabit hızla yoluna devam ederken yolcu almak için (t_1-t_2) aralığında yavaşlıyor. (t_2-t_3) aralığında yolcuların binmesi için durgun bekleyen otobüs (t_3-t_4) aralığında hızlanıyor.

Buna göre hangi zaman aralıklarında otobüsün ivmesi sıfırdan farklıdır?

A) 0-t_1 ve t_1-t_2

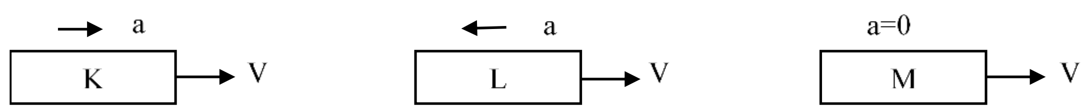
B) 0-t_1 ve t_2-t_3

C) t_1-t_2 ve t_2-t_3

D) t_1-t_2 ve t_3-t_4

E) t_2-t_3 ve t_3-t_4

11. Dikdörtgenler ile temsil edilen K, L ve M araçlarının hızları aynı iken hareket boyunca sabit değerde olan ivmelerinin yönleri şekilde verilmiştir.



Bir süre sonra K, L ve M araçları aynı yönde ilerlerken hızlarının büyüklüğü sırasıyla V_K, V_L, V_M olduğuna göre, bu hızlar arasındaki ilişki nedir?

A) $V_K > V_M > V_L$

B) $V_K > V_L > V_M$

C) $V_M > V_K > V_L$

D) $V_M > V_L > V_K$

E) $V_L > V_K > V_M$

12. Dört farklı cismin ivmeleri ile ilgili,

I.	Düzgün hızlanan cismin ivmesi düzgün artmaktadır.
II.	Düzgün yavaşlayan cismin ivmesi düzgün azalmaktadır.
III.	Duran cismin ivmesi sıfırdır.
IV.	Sabit hızla hareket eden cismin ivmesi sıfırdır.

yargılarından hangileri doğrudur?

A) Yalnız III

B) I ve II

C) III ve IV

D) I, II ve III

E) I, II, III ve IV

F8. Verbal Descriptions Testing Accommodations Condition of Motion Achievement Test (First Version)

FIRST VERSION OF VAMAT

9. Sınıf Fizik Dersi Hareket Başarı Testi

12 sorudan oluşan bu test 9. sınıf fizik dersi, Hareket ve Kuvvet ünitesinden seçilen ve yeniden düzenlenen hareket konusundaki üç kazanımın ölçülmesine yönelik hazırlanmıştır. Testi cevaplamaya dilediğiniz sorudan başlayabilirsiniz. Yanlış cevaplarınız doğru cevaplarınızı götürmeyecektir. Tüm sorular eşit puanlıdır. Testi cevaplama süreniz bir buçuk ders saatidir.

Öğrenci No: ……………………………

Şube : ……………………………

Okul : ……………………………

1. Bursa’daki Küçük Sanayi ile Uludağ Üniversitesi durakları arasında halk otobüsleri ve raylı sistem ulaşım sağlamaktadır. Halk otobüsleri Küçük Sanayi durağından çıktığında kuzeybatı yönünde ilerleyerek Uludağ Üniversitesine ulaşıyor. Raylı sistem Küçük Sanayi durağından çıktığında ise önce kuzeybatı, sonra batı, son olarak da güneybatı yönünde uzanarak Uludağ Üniversitesi’ne ulaşıyor.

Buna göre iki durak arasında halk otobüsü ve raylı sistemin hareketine ait niceliklerden hangisi kesinlikle aynıdır?

A) Alınan yolları

B) Yer değiştirmeleri

C) Süratleri

D) Hızları

E) Harekete başladıktan sonra herhangi bir t süre sonraki konumları

2. Ayşe öğretmen otobüs durağında beklerken cep telefonunu evde unuttuğunu fark ediyor ve durağın 30 metre doğusundaki evine gidip telefonunu alarak duraktaki aynı noktaya aynı yol üzerinden geri dönüyor.

Buna göre Ayşe öğretmenin aldığı yol ve yer değiştirmesinin büyüklüğü sırasıyla kaç m’dir?

	Alınan yol	Yer değiştirme
A)	30	60
B)	30	0
C)	60	0
D)	60	30
E)	0	60

3. Doğrusal yatay bir yürüyüş yolunda sırasıyla soldan sağa A, B ve C noktaları işaretlenmiştir. Bahar bu yürüyüş yolunda önce A noktasından B noktasına, sonra C noktasına, sonra da C noktasından B noktasına yürüyor.

Sadece A ve B noktaları arasındaki mesafe ile Bahar'ın toplam yürüyüş süresi bilindiğine göre Bahar'ın hareketi ile ilgili aşağıdaki niceliklerden hangisi hesaplanabilir?

A) AC noktaları arasında aldığı yol

B) Toplam aldığı yol

C) BC arasındaki yer değiştirme

D) Sürat

E) Hız

4. Merkezi O noktası olan bir çemberin üzerinde A ve B noktaları bulunmaktadır. A noktası çemberin saat 9 noktasında, B noktası çemberin saat 3 noktasında bulunmaktadır. A, O ve B noktaları doğrusal bir çizgi ile birleştirilmiştir. Bir çocuk yarıçapı 3 m olan bu çember üzerinde A noktasından B noktasına, saat yönünde 3 s'de ilerlemektedir.

Buna göre hareketlinin ortalama sürati ve ortalama hızı sırasıyla kaç m/s'dir? (π=3)

	Sürat	Hız
A)	3	1
B)	6	1
C)	3	2
D)	6	2
E)	3	6

5. Yatay düzlemde bölmeleri eşit aralıklı olan paralel iki ray bulunmaktadır. Raylardan birinde X, diğerinde Y vagonu sağa doğru ilerlemektedir. X vagonu üç bölme, Y vagonu 2 bölme uzunluğundadır. Vagonlarının t_1 anındaki konumu rayları dik olarak kesen sol taraftaki KL düşey çizgisine göre, t_2 anındaki konumu rayları dik olarak kesen sağ taraftaki MN düşey çizgisine göre belirlenmektedir. KL ve MN çizgileri arasında her iki rayda da 12 bölme bulunmaktadır. t_1 anında X vagonunun ön tarafı KL çizgisinde iken Y vagonunun arka tarafı KL çizgisindedir. t_2 anında X vagonunun arka tarafı MN çizgisinde iken Y vagonunun ön tarafı MN çizgisindedir.

X' in hızının büyüklüğü V_X, Y'ninki V_Y olduğuna göre, $\frac{V_X}{V_Y}$ oranı kaçtır?

A) $\frac{9}{4}$ B) $\frac{3}{2}$ C) 1 D) $\frac{6}{5}$ E) $\frac{9}{5}$

6. Otomobil, minibüs ve tır doğrusal yatay bir yolda sabit hızlarla sağa doğru ilerliyor. Araçlardan en uzunu tır, en kısası ise otomobildir. İlk durum olan t_0 anında her aracın arka tarafının hizası incelendiğinde tır en geride, otomobil ortada, minibüs ise en öndedir. İkinci durum olan t anında ise araçların arka kısımları aynı hizadadır.

Otobüs, minibüs ve tırın hızlarının büyüklüğü sırasıyla V_O, V_M, V_T olduğuna göre, bunlar arasındaki ilişki nedir?

A) $V_O < V_T < V_M$

B) $V_O < V_M < V_T$

C) $V_T < V_M < V_O$

D) $V_M < V_T < V_O$

E) $V_M < V_O < V_T$

7. Birbirine paralel iki rayda aynı yönde hareket eden K ve L trenlerinin konum-zaman grafiği verilmiştir. Yatayda zaman ekseni, düşeyde konum ekseni bulunmaktadır. Zaman ekseninde t_1 ve t_2, konum ekseninde ise X_1 ve X_2 noktaları işaretlenmiştir.

K treninin hareketini gösteren çizgi,

- eksenlerin kesişim noktasından başlayarak hem zaman hem de konum ekseni boyunca sürekli artış göstermiştir.

L treninin hareketini gösteren çizgi,

- eksenlerin kesişim noktasından başlayarak t_1 noktasından daha önceki bir noktaya kadar sadece zaman ekseninde artış göstermiş,
- bu nokta ile t_2 noktasından daha önceki bir nokta arasında hem zaman hem de konum ekseni boyunca artış göstermiş,
- bu noktadan sonra ise yine sadece zaman ekseninde artış göstermiştir.

K ve L trenlerinin hareketini gösteren çizgiler iki noktada kesişmiştir. Birinci kesişim t_1'den çıkan düşey ve X_1'den çıkan yatay hizalama çizgisinin kesişimi, ikinci kesişim noktası ise t_2'den çıkan düşey ve X_2'den çıkan yatay hizalama çizgisinin kesişim noktasıdır.

Bu grafikten elde edilen bilgilere göre trenlerin hız ve konumları ile ilgili aşağıdaki yargılardan hangisi <u>yanlıştır</u>?

A) t_1 anında trenlerin hızları aynıdır.

B) t_1 anında iki tren yan yanadır.

C) t_2 anında iki tren yan yanadır.

D) K ve L trenleri aynı konumdan harekete başlamıştır.

E) t_2 anında L treni durmaktadır.

8. Doğrusal bir yolda hareket eden aracın hız-zaman grafiği verilmiştir. Yatayda birimi s olan zaman ekseni ve düşeyde birimi m/s olan hız ekseni bulunmaktadır. Zaman ekseninde 10. ve 20. s'ler, hız ekseninde değeri belirsiz bir nokta ve eksenlerin kesişiminde 0 noktası işaretlenmiştir.
Aracın hareketini gösteren çizgi,

- 0 ile 10 s arasında hem zaman hem de hız ekseni boyunca sürekli artış göstermiş,
- 10 ile 20 s aralığında sadece zaman ekseninde artış göstermiştir.

Bu grafikten elde edilen bilgilere göre, verilen zaman aralıklarında aracın yer değiştirmesi ve hızı ile ilgili aşağıdaki yargılardan hangisi doğrudur?

A) 0 ile 10 s zaman aralığındaki yer değiştirme ile 10 ile 20 s zaman aralığındaki yer değiştirme eşittir.

B) 0 ile 10 s zaman aralığındaki yer değiştirme, 10 ile 20 s zaman aralığındaki yer değiştirmeden daha büyüktür.

C) 0 ile 10 s zaman aralığında sabit hızlıdır.

D) 10 ile 20 s zaman aralığında durmaktadır.

E) 10 ile 20 s zaman aralığında sabit hızlıdır.

9. Doğrusal bir yolda aynı yerden aynı anda harekete başlayan K ve L cisimlerinin hız-zaman grafiği verilmiştir. Yatayda zaman ekseni ve düşeyde hız ekseni bulunmaktadır. Zaman ekseninde t noktası, hız ekseninde V noktası ve eksenlerin kesişiminde 0 noktası işaretlenmiştir.

K treninin hareketini gösteren çizgi,

- 0 ile t zaman aralığında hız ekseni üzerindeki V noktasından başlayıp, sürekli olarak zaman ekseninde artış, hız ekseninde azalış göstererek zaman ekseni üzerindeki t noktasında sona ermiştir,

L treninin hareketini gösteren çizgi,

- 0 ile t zaman aralığında 0 noktasından başlayıp, hem zaman hem de hız ekseni boyunca sürekli artış göstererek t noktasından çıkan düşey ve V noktasından çıkan yatay hizalama çizgisinin kesişiminde sona ermiştir.

0 ile t zaman aralığında,

I. K ve L birbirine zıt yönde hareket etmektedir.
II. K'nin ortalama hızı L'ninkine eşittir.
III. K'nin ivmesinin büyüklüğü L'ninkine eşittir.

yargılarından hangileri doğrudur?

A) Yalnız I

B) Yalnız II

C) I ve II

D) II ve III

E) I, II ve III

10. Bir otobüs ($0-t_1$) zaman aralığında sabit hızla yoluna devam ederken yolcu almak için (t_1-t_2) aralığında yavaşlıyor. (t_2-t_3) aralığında yolcuların binmesi için durgun bekleyen otobüs (t_3-t_4) aralığında hızlanıyor.

Buna göre hangi zaman aralıklarında otobüsün ivmesi sıfırdan farklıdır?

A) $0-t_1$ ve t_1-t_2

B) $0-t_1$ ve t_2-t_3

C) t_1-t_2 ve t_2-t_3

D) t_1-t_2 ve t_3-t_4

E) t_2-t_3 ve t_3-t_4

11. K, L ve M araçlarının hızlarının büyüklüğü V kadar ve doğuya doğru iken hareket boyunca sabit değerde olan ivmelerinin yönleri şu şekilde açıklanmıştır:

- K aracının büyüklüğü a kadar olan ivmesi doğuya doğru,
- L aracının büyüklüğü a kadar olan ivmesi batıya doğru,
- M aracının ivmesi sıfır.

Bir süre sonra K, L ve M araçları aynı yönde ilerlerken hızlarının büyüklüğü sırasıyla V_K, V_L, V_M olduğuna göre, bu hızlar arasındaki ilişki nedir?

A) $V_K > V_M > V_L$

B) $V_K > V_L > V_M$

C) $V_M > V_K > V_L$

D) $V_M > V_L > V_K$

E) $V_L > V_K > V_M$

12. Dört farklı cismin ivmeleri ile ilgili,

I. Düzgün hızlanan cismin ivmesi düzgün artmaktadır.
II. Düzgün yavaşlayan cismin ivmesi düzgün azalmaktadır.
III. Duran cismin ivmesi sıfırdır.
IV. Sabit hızla hareket eden cismin ivmesi sıfırdır.

yargılarından hangileri doğrudur?

A) Yalnız III

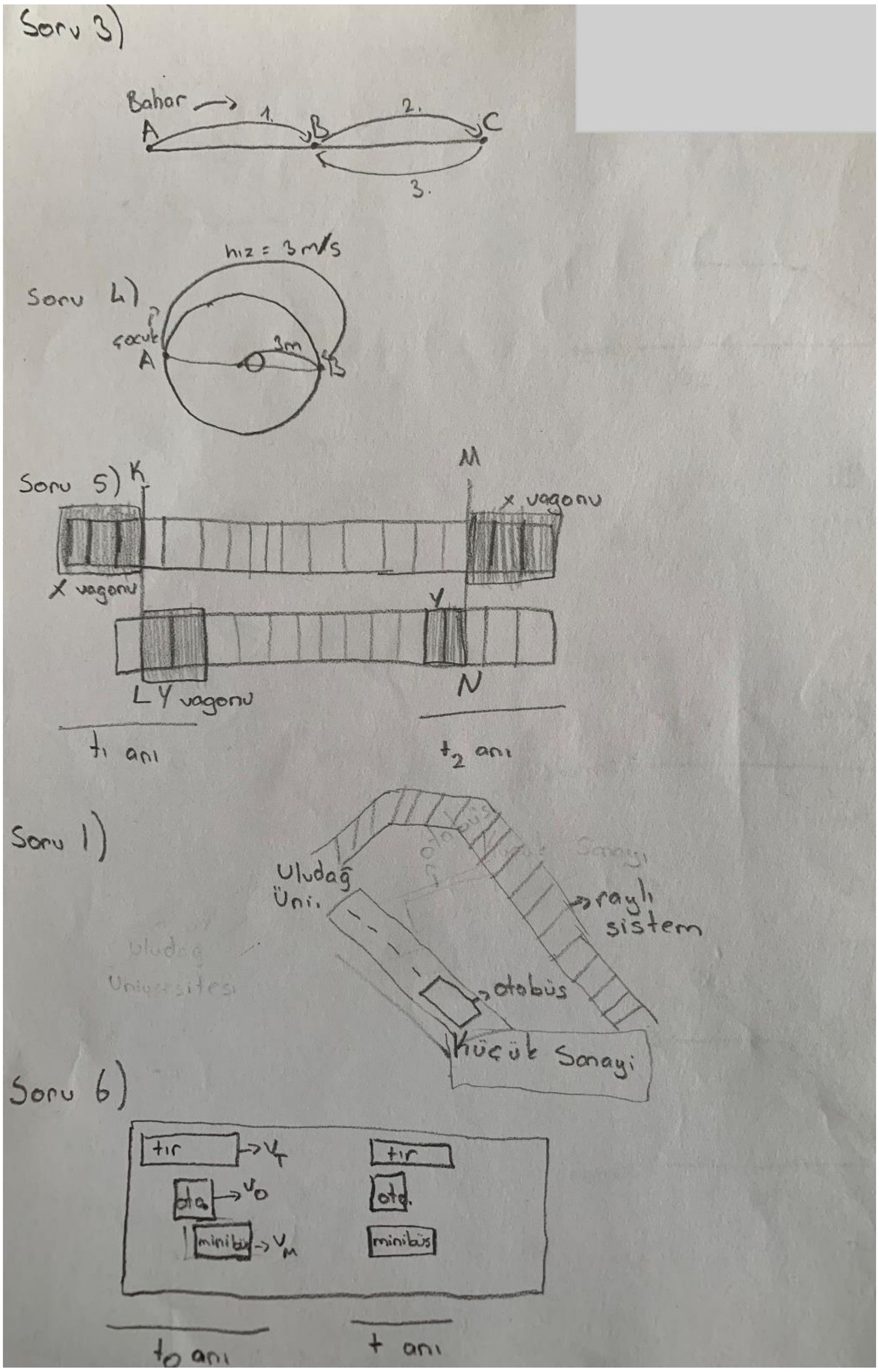
B) I ve II

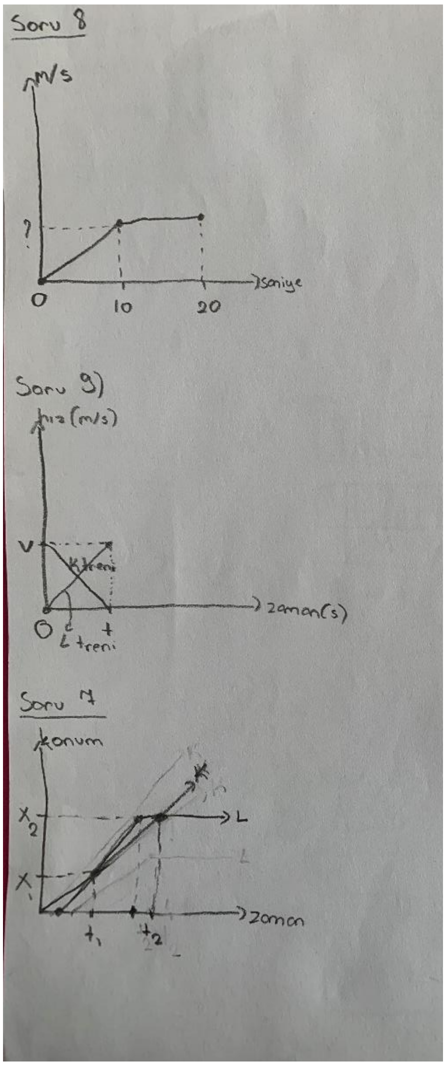
C) III ve IV

D) I, II ve III

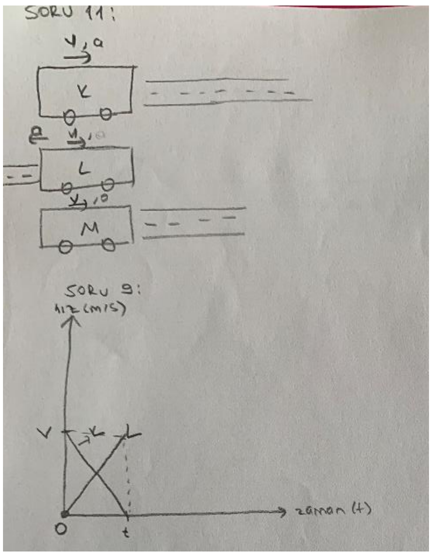
E) I, II, III ve IV

F9. Drawings of Sighted Students

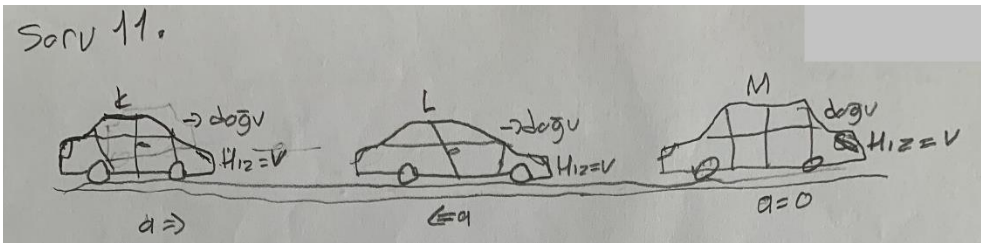


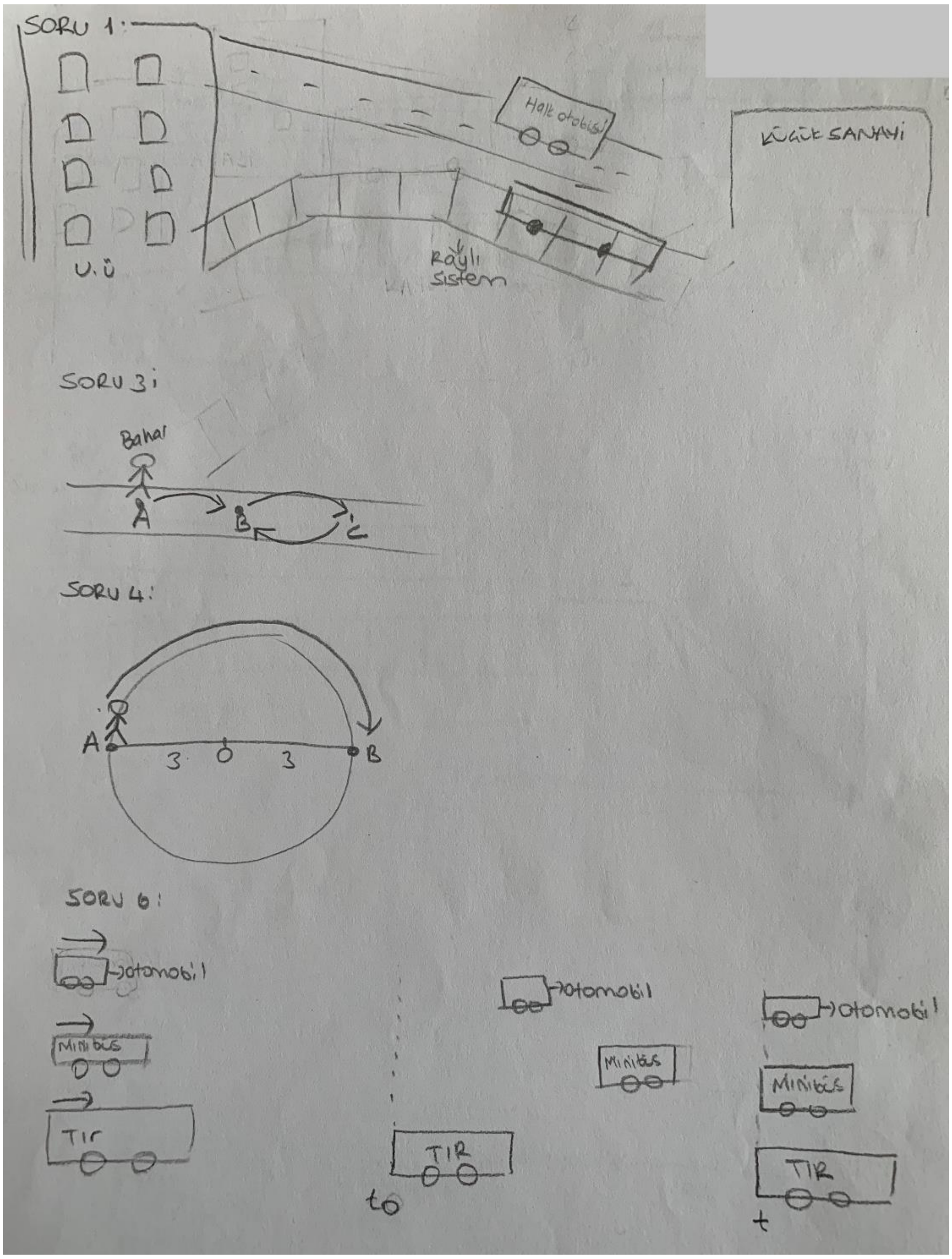


Soru 8
m/s
?
0
10
20
saniye
Soru 9)
hız (m/s)
V
K treni
zaman(s)
0
t
L treni
Soru 7
konum
X_2
X_1
K
L
zaman
t_1
t_2



SORU 11:
K
L
M
SORU 9:
hız (m/s)
V
K
L
zaman (t)
0
t


Soru 11.
K
doğu
Hız=V
a
L
doğu
Hız=V
a
M
doğu
Hız=V
a=0


SORU 1:
Halk otobüsü
Küçük SANAYİ
Raylı sistem
SORU 3:
Bahar
A
B
C
SORU 4:
A
3
O
3
B
SORU 6:
otomobil
Minibüs
Tır
otomobil
Minibüs
TIR
t0
otomobil
Minibüs
TIR
t

F10. Pilot Tests of NAMAT, TAMAT and VAMAT

PILOT TEST OF NAMAT

9. Sınıf Fizik Dersi Hareket Başarı Testi
(SINAV DÜZENLEMESİ YAPILMAYAN)

12 sorudan oluşan bu test 9. sınıf fizik dersi, Hareket ve Kuvvet ünitesinden seçilen ve yeniden düzenlenen hareket konusundaki üç kazanımın ölçülmesine yönelik hazırlanmıştır. Testi cevaplamaya dilediğiniz sorudan başlayabilirsiniz. Yanlış cevaplarınız doğru cevaplarınızı götürmeyecektir. Tüm sorular eşit puanlıdır.

1. Bursa'da Küçük Sanayi-Uludağ Üniversitesi durakları arasında seferlerini sürdüren halk otobüsleri aşağıdaki haritada kırmızı çizgi ile gösterilen güzergâhı, raylı sistem ise yeşil çizgi ile gösterilen güzergâhı kullanmaktadır.

Buna göre iki durak arasında halk otobüsü ve raylı sistemin hareketine ait niceliklerden hangisi kesinlikle aynıdır?

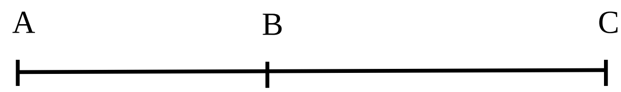
A) Alınan yolları
B) Yer değiştirmeleri
C) Süratleri
D) Hızları
E) Harekete başladıktan sonra herhangi bir t süre sonraki konumları

2. Ayşe öğretmen otobüs durağında beklerken cep telefonunu evde unuttuğunu fark ediyor ve durağın 30 m doğusundaki evine gidip telefonunu alarak duraktaki aynı noktaya aynı yol üzerinden geri dönüyor.

Buna göre Ayşe öğretmenin aldığı yol ve yer değiştirmesinin büyüklüğü sırasıyla kaç m'dir?

	Alınan yol	Yer değiştirme
A)	30	60
B)	30	0
C)	60	0
D)	60	30
E)	0	60

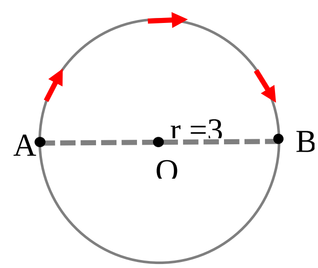
3. Bahar aşağıdaki şekilde gösterilen doğrusal yatay yürüyüş yolunda A noktasından B noktasına sonra C noktasına, sonra da C noktasından B noktasına yürüyor.



Sadece A ve B noktaları arasındaki mesafe ile Bahar'ın toplam yürüyüş süresi bilindiğine göre Bahar'ın hareketi ile ilgili aşağıdaki niceliklerden hangisi hesaplanabilir?

A) AC noktaları arasında aldığı yol
B) Toplam aldığı yol
C) BC arasındaki yer değiştirme
D) Sürat
E) Hız

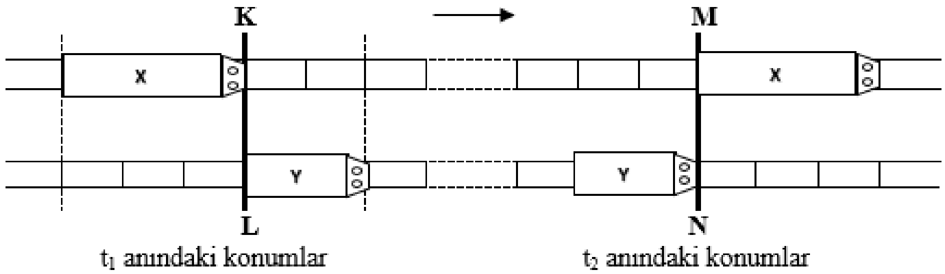
4. Bir çocuk, yarıçapı 3 m, merkezi O noktası olan, şekilde gösterilen çembersel yolda, A noktasından B noktasına üç adet okla çember üzerinde belirtilen yörünge ile 3 s'de gidiyor.



Buna göre çocuğun sürati ve hızının büyüklüğü sırasıyla kaç m/s'dir? (π=3)

	Sürat	Hız
A)	3	1
B)	6	1
C)	3	2
D)	6	2
E)	3	6

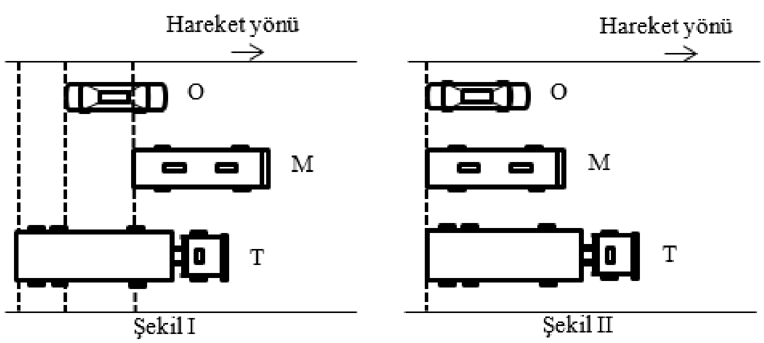
5. Aşağıdaki şekilde paralel raylarda ok yönünde sabit hızlarla giden X, Y vagonlarının t_1 ve t_2 anlarındaki konumları verilmiştir. KL çizgisi ile MN çizgisi arasındaki her iki rayda da 12 bölme bulunmaktadır.



X' in hızının büyüklüğü V_X, Y'ninki V_Y olduğuna göre, $\frac{V_X}{V_Y}$ oranı kaçtır?
(Raylardaki bölmeler eşit aralıklıdır.)

A) $\frac{9}{4}$ B) $\frac{3}{2}$ C) 1 D) $\frac{6}{5}$ E) $\frac{9}{5}$

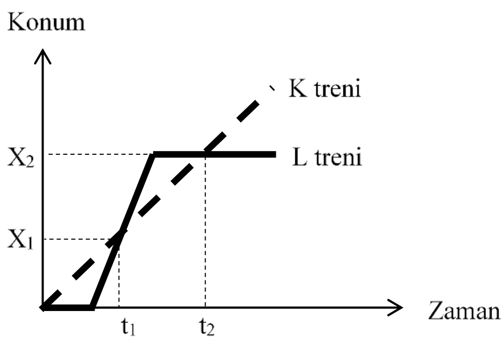
6. O otomobili, M minibüsü ve T tırı doğrusal bir yolda sabit hızlarla ilerliyor. Bu araçların birbirlerine göre konumları, t_0 anında Şekil I, daha sonraki t anında da Şekil II' deki gibi olmuştur.



O, M, T'nin hızlarının büyüklüğü sırasıyla V_O, V_M, V_T olduğuna göre, bunlar arasındaki ilişki nedir?

A) $V_O < V_T < V_M$
B) $V_O < V_M < V_T$
C) $V_T < V_M < V_O$
D) $V_M < V_T < V_O$
E) $V_M < V_O < V_T$

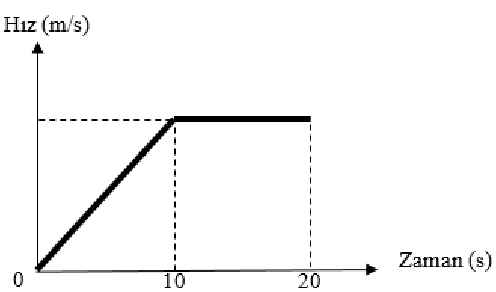
7. Birbirine paralel iki rayda aynı yönde hareket eden K ve L trenlerinin konum-zaman grafiği aşağıdaki gibidir.



Bu grafikten elde edilen bilgilere göre trenlerin hız ve konumları ile ilgili aşağıdaki yargılardan hangisi yanlıştır?

A) t_1 anında trenlerin hızları aynıdır.
B) t_1 anında iki tren yan yanadır.
C) t_2 anında iki tren yan yanadır.
D) K ve L trenleri aynı konumdan harekete başlamıştır.
E) t_2 anında L treni durmaktadır.

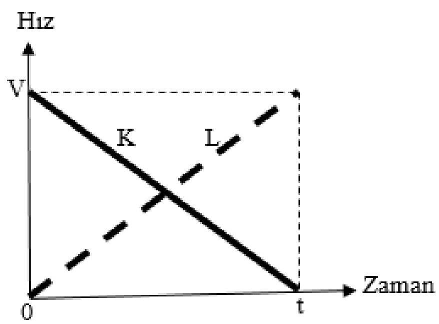
8. Doğrusal bir yolda hareket eden aracın hız-zaman grafiği aşağıdaki gibidir.



Bu grafikten elde edilen bilgilere göre, verilen zaman aralıklarında aracın yer değiştirmesi ve hızı ile ilgili ağıdaki yargılardan hangisi doğrudur?

A) 0-10 s zaman aralığındaki yer değiştirme ile 10-20 s zaman aralığındaki yer değiştirme eşittir.
B) 0-10 s zaman aralığındaki yer değiştirme, 10-20 s zaman aralığındaki yer değiştirmeden daha büyüktür.
C) 0-10 s zaman aralığında sabit hızlıdır.
D) 10-20 s zaman aralığında durmaktadır.
E) 10-20 s zaman aralığında sabit hızlıdır.

9. Doğrusal bir yolda aynı yerden aynı anda harekete başlayan K, L cisimlerinin hız-zaman grafikleri şekildeki gibidir.



0-t zaman aralığında,

I. K ve L birbirine zıt yönde hareket etmektedir.
II. K'nin ortalama hızı L'ninkine eşittir.
III. K'nin ivmesinin büyüklüğü L'ninkine eşittir.

yargılarından hangileri doğrudur?

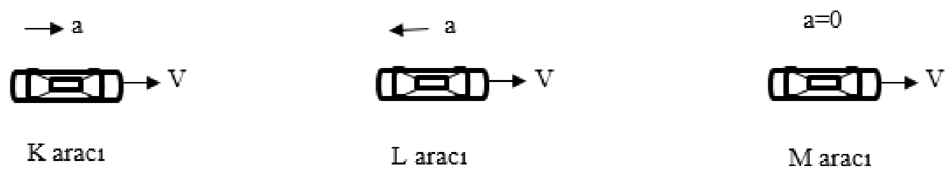
A) Yalnız I
B) Yalnız II
C) I ve II
D) II ve III
E) I, II ve III

10. Bir otobüs (0-t_1) zaman aralığında sabit hızla yoluna devam ederken yolcu almak için (t_1-t_2) aralığında yavaşlıyor. (t_2-t_3) aralığında yolcuların binmesi için durgun bekleyen otobüs (t_3-t_4) aralığında hızlanıyor.

Buna göre hangi zaman aralıklarında otobüsün ivmesi sıfırdan farklıdır?

A) 0-t_1 ve t_1-t_2
B) 0-t_1 ve t_2-t_3
C) t_1-t_2 ve t_2-t_3
D) t_1-t_2 ve t_3-t_4
E) t_2-t_3 ve t_3-t_4

11. K, L ve M araçlarının hızları aynı iken hareket boyunca sabit değerde olan ivmelerinin yönleri şekilde verilmiştir.



Bir süre sonra K, L ve M araçları aynı yönde ilerlerken hızlarının büyüklüğü sırasıyla V_K, V_L, V_M olduğuna göre, bu hızlar arasındaki ilişki nedir?

A) $V_K > V_M > V_L$
B) $V_K > V_L > V_M$
C) $V_M > V_K > V_L$
D) $V_M > V_L > V_K$
E) $V_L > V_K > V_M$

12. Dört farklı cismin ivmeleri ile ilgili,

I. Düzgün hızlanan cismin ivmesi düzgün artmaktadır.
II. Düzgün yavaşlayan cismin ivmesi düzgün azalmaktadır.
III. Duran cismin ivmesi sıfırdır.
IV. Sabit hızla hareket eden cismin ivmesi sıfırdır.

yargılarından hangileri doğrudur?

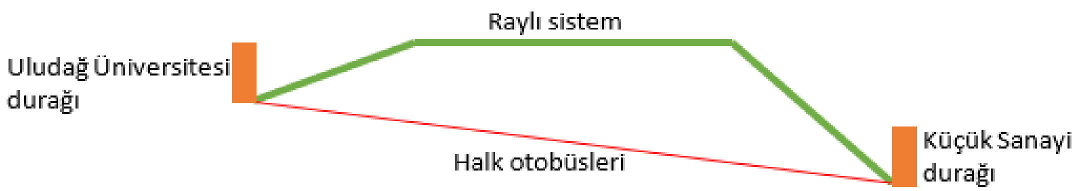
A) Yalnız III
B) I ve II
C) III ve IV
D) I, II ve III
E) I, II, III ve IV

PILOT TEST OF TAMAT

9. Sınıf Fizik Dersi Hareket Başarı Testi
(DOKUNSAL SINAV DÜZENLEMELERİ YAPILAN)

12 sorudan oluşan bu test 9. sınıf fizik dersi, Hareket ve Kuvvet ünitesinden seçilen ve yeniden düzenlenen hareket konusundaki üç kazanımın ölçülmesine yönelik hazırlanmıştır. Testi cevaplamaya dilediğiniz sorudan başlayabilirsiniz. Yanlış cevaplarınız doğru cevaplarınızı götürmeyecektir. Tüm sorular eşit puanlıdır.

1. Aşağıdaki şekilde Bursa'daki Küçük Sanayi ile Uludağ Üniversitesi durakları dikdörtgenler ile temsil edilmiştir. Duraklar arasında seferlerini sürdüren halk otobüsleri şekilde tek parça ince çizgi ile gösterilen alt taraftaki güzergâhı, raylı sistem ise üç parçadan oluşan kalın çizgi ile gösterilen üstteki güzergâhı kullanmaktadır.



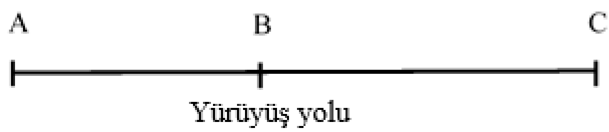
Buna göre iki durak arasında halk otobüsü ve raylı sistemin hareketine ait niceliklerden hangisi kesinlikle aynıdır?

A) Alınan yolları
B) Yer değiştirmeleri
C) Süratleri
D) Hızları
E) Harekete başladıktan sonra herhangi bir t süre sonraki konumları

2. Ayşe öğretmen otobüs durağında beklerken cep telefonunu evde unuttuğunu fark ediyor ve durağın 30 m doğusundaki evine gidip telefonunu alarak duraktaki aynı noktaya aynı yol üzerinden geri dönüyor.
Buna göre Ayşe öğretmenin aldığı yol ve yer değiştirmesinin büyüklüğü sırasıyla kaç m'dir?

	Alınan yol	Yer değiştirme
A)	30	60
B)	30	0
C)	60	0
D)	60	30
E)	0	60

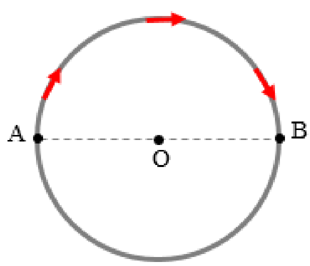
3. Bahar aşağıdaki şekilde gösterilen doğrusal yatay yürüyüş yolunda önce A noktasından B noktasına sonra C noktasına, sonra da C noktasından B noktasına yürüyor.



Sadece A ve B noktaları arasındaki mesafe ile Bahar'ın toplam yürüyüş süresi bilindiğine göre Bahar'ın hareketi ile ilgili aşağıdaki niceliklerden hangisi hesaplanabilir?

A) AC noktaları arasında aldığı yol
B) Toplam aldığı yol
C) BC arasındaki yer değiştirme
D) Sürat
E) Hız

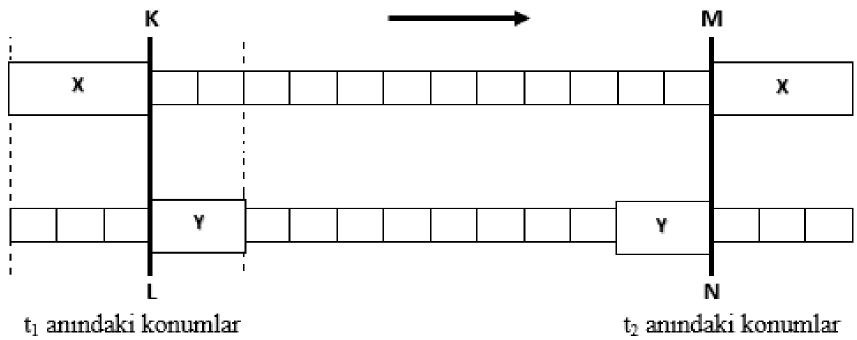
4. Bir çocuk, yarıçapı 3 m, merkezi O noktası olan, şekilde gösterilen çembersel yolda, A noktasından B noktasına üç adet okla çember üzerinde belirtilen yörünge ile 3 s'de gidiyor.



Buna göre çocuğun ortalama sürati ve ortalama hızı sırasıyla kaç m/s'dir? (π=3)

	Sürat	Hız
A)	3	1
B)	6	1
C)	3	2
D)	6	2
E)	3	6

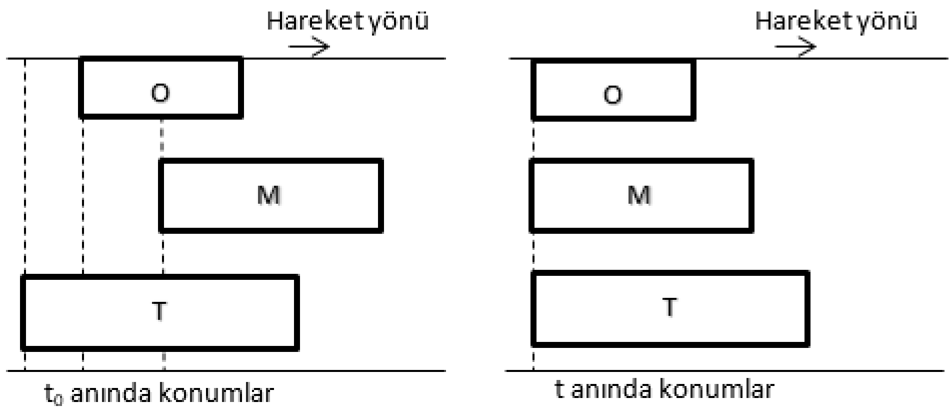
5. Aşağıdaki şekilde yatay düzlemdeki paralel raylar eşit büyüklükteki dikdörtgen bölmeler ile gösterilmiş, raylarda ok yönünde sabit hızlarla giden X ve Y vagonları ise büyük dikdörtgenler ile temsil edilmiştir. Vagonların t_1 ve t_2 anlarındaki konumları, rayları dik olarak kesen KL ve MN düşey çizgilerine göre görülmektedir. KL ve MN çizgileri arasında her iki rayda da 12 bölme bulunmaktadır. t_1 anında üç bölme uzunluğundaki X vagonunun ön tarafı KL çizgisinde iken iki bölme uzunluğundaki Y vagonunun arka tarafı KL çizgisindedir. t_2 anında X vagonunun arka tarafı MN çizgisinde iken Y vagonunun ön tarafı MN çizgisindedir.



X' in hızının büyüklüğü V_X, Y'ninki V_Y olduğuna göre $\frac{V_X}{V_Y}$ oranı kaçtır?
(Raylardaki bölmeler eşit aralıklıdır.)

A) $\frac{9}{4}$ B) $\frac{3}{2}$ C) 1 D) $\frac{6}{5}$ E) $\frac{9}{5}$

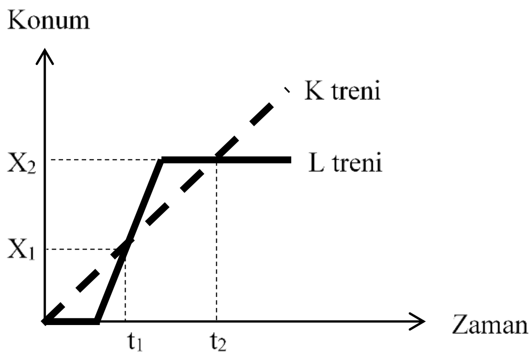
6. O otomobili, M minibüsü ve T tırı doğrusal yatay bir yolda sabit hızlarla ilerliyor. Farklı boylardaki dikdörtgenler ile temsil edilen araçların birbirlerine göre konumları düşey kesikli çizgiler ile t_0 anı ve t anı için ayrı ayrı gösterilmiştir. t_0 anında araçlarının her birinin arka kısmı farklı hizalarda, t anında ise araçlarının her birinin arka kısmı aynı hizadadır.



O, M, T taşıtlarının hızlarının büyüklüğü sırasıyla V_O, V_M, V_T olduğuna göre, bunlar arasındaki ilişki nedir?

A) $V_O < V_T < V_M$
B) $V_O < V_M < V_T$
C) $V_T < V_M < V_O$
D) $V_M < V_T < V_O$
E) $V_M < V_O < V_T$

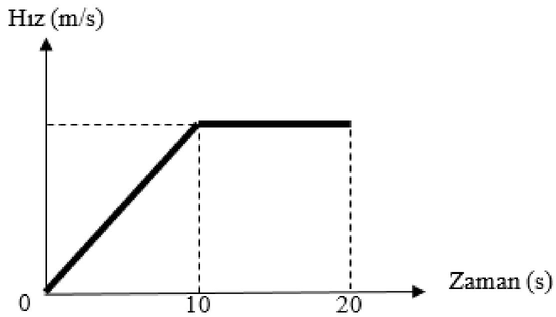
7. Birbirine paralel iki rayda aynı yönde hareket eden K ve L trenlerinin konum-zaman grafiği aşağıdaki gibidir. Yatay eksende olan zaman için t_1 ve t_2 noktaları işaretlenmiş, düşey eksen olan konumda ise X_1 ve X_2 noktaları işaretlenmiştir. K treninin hareketi kesikli tek parça doğrusal çizgi, L treninin hareketi kesikli olmayan üç parça doğrusal çizgi ile belirtilmiştir. Çizgilerin başlangıç noktası aynıdır. Çizgiler iki noktada kesişmiştir. Birinci kesişim t_1'den çıkan düşey ve X_1'den çıkan yatay hizalama çizgisinin kesişimi, ikinci kesişim noktası ise t_2'den çıkan düşey ve X_2'den çıkan yatay hizalama çizgisinin kesişim noktasıdır.



Bu grafikten elde edilen bilgilere göre trenlerin hız ve konumları ile ilgili aşağıdaki yargılardan hangisi <u>yanlıştır</u>?

A) t_1 anında trenlerin hızları aynıdır.
B) t_1 anında iki tren yan yanadır.
C) t_2 anında iki tren yan yanadır.
D) K ve L trenleri aynı konumdan harekete başlamıştır.
E) t_2 anında L treni durmaktadır.

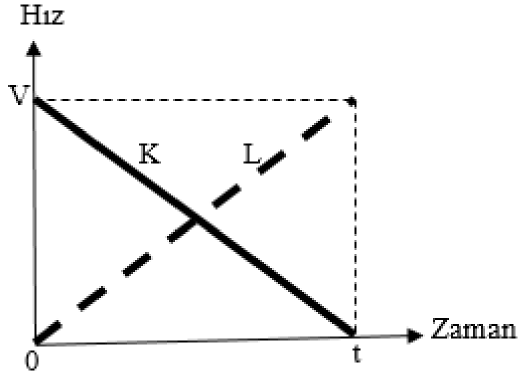
8. Doğrusal bir yolda hareket eden aracın hız-zaman grafiği aşağıdaki gibidir. Yatay eksende olan zaman için 10 ve 20 noktaları, düşey eksen olan hızda değeri belirsiz bir nokta ve eksenlerin kesişiminde 0 noktası işaretlenmiştir. Aracın hareketi kesikli olmayan iki parça doğrusal çizgi ile belirtilmiştir. İlk çizginin başlangıç noktası 0 noktasıdır.



Bu grafikten elde edilen bilgilere göre, verilen zaman aralıklarında aracın yer değiştirmesi ve hızı ile ilgili aşağıdaki yargılardan hangisi doğrudur?

A) 0 ile 10 s zaman aralığındaki yer değiştirme ile 10 ile 20 s zaman aralığındaki yer değiştirme eşittir.
B) 0 ile 10 s zaman aralığındaki yer değiştirme, 10 ile 20 s zaman aralığındaki yer değiştirmeden daha büyüktür.
C) 0 ile 10 s zaman aralığında sabit hızlıdır.
D) 10 ile 20 s zaman aralığında durmaktadır.
E) 10 ile 20 s zaman aralığında sabit hızlıdır.

9. Doğrusal bir yolda aynı yerden aynı anda harekete başlayan K ve L cisimlerinin hız-zaman grafiği aşağıdaki gibidir. K cisminin hareketi kesikli olmayan, L cisminin hareketi ise kesikli tek parça çizgi ile belirtilmiştir. Yatay eksende olan zaman için t noktası, düşey eksen olan hızda V noktası ve eksenlerin kesişiminde 0 noktası işaretlenmiştir. K çizgisi V noktasında başlayıp t noktasında sona ermiş, L çizgisi 0 noktasında başlayıp, t noktasından çıkan düşey ve V noktasından çıkan yatay hizalama çizgisinin kesişiminde sona ermiştir.



0 ile t zaman aralığında,

I. K ve L birbirine zıt yönde hareket etmektedir.

II. K'nin ortalama hızı L'ninkine eşittir.

III. K'nin ivmesinin büyüklüğü L'ninkine eşittir.

yargılarından hangileri doğrudur?

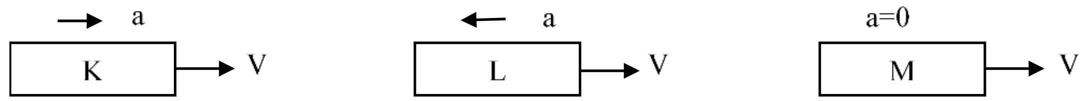
A) Yalnız I
B) Yalnız II
C) I ve II
D) II ve III
E) I, II ve III

10. Bir otobüs (0-t_1) zaman aralığında sabit hızla yoluna devam ederken yolcu almak için (t_1-t_2) aralığında yavaşlıyor. (t_2-t_3) aralığında yolcuların binmesi için durgun bekleyen otobüs (t_3-t_4) aralığında hızlanıyor.

Buna göre hangi zaman aralıklarında otobüsün ivmesi sıfırdan farklıdır?

A) 0-t_1 ve t_1-t_2
B) 0-t_1 ve t_2-t_3
C) t_1-t_2 ve t_2-t_3
D) t_1-t_2 ve t_3-t_4
E) t_2-t_3 ve t_3-t_4

11. Dikdörtgenler ile temsil edilen K, L ve M araçlarının hızları aynı iken hareket boyunca sabit değerde olan ivmelerinin yönleri şekilde verilmiştir.



Bir süre sonra K, L ve M araçları aynı yönde ilerlerken hızlarının büyüklüğü sırasıyla V_K, V_L, V_M olduğuna göre, bu hızlar arasındaki ilişki nedir?

A) $V_K > V_M > V_L$
B) $V_K > V_L > V_M$
C) $V_M > V_K > V_L$
D) $V_M > V_L > V_K$
E) $V_L > V_K > V_M$

12. Dört farklı cismin ivmeleri ile ilgili,

I. Düzgün hızlanan cismin ivmesi düzgün artmaktadır.
II. Düzgün yavaşlayan cismin ivmesi düzgün azalmaktadır.
III. Duran cismin ivmesi sıfırdır.
IV. Sabit hızla hareket eden cismin ivmesi sıfırdır.

yargılarından hangileri doğrudur?

A) Yalnız III
B) I ve II
C) III ve IV
D) I, II ve III
E) I, II, III ve IV

PILOT TEST OF VAMAT

9. Sınıf Fizik Dersi Hareket Başarı Testi (BETİMLEME YAPILAN)

12 sorudan oluşan bu test 9. sınıf fizik dersi, Hareket ve Kuvvet ünitesinden seçilen ve yeniden düzenlenen hareket konusundaki üç kazanımın ölçülmesine yönelik hazırlanmıştır. Testi cevaplamaya dilediğiniz sorudan başlayabilirsiniz. Yanlış cevaplarınız doğru cevaplarınızı götürmeyecektir. Tüm sorular eşit puanlıdır.

1. Bursa'daki Küçük Sanayi ile Uludağ Üniversitesi durakları arasında halk otobüsleri ve raylı sistem ulaşım sağlamaktadır. Halk otobüsleri Küçük Sanayi durağından çıktığında kuzeybatı yönünde ilerleyerek Uludağ Üniversitesine ulaşıyor. Raylı sistem Küçük Sanayi durağından çıktığında ise önce kuzeybatı, sonra batı, son olarak da güneybatı yönünde uzanarak Uludağ Üniversitesi'ne ulaşıyor.

Buna göre iki durak arasında halk otobüsü ve raylı sistemin hareketine ait niceliklerden hangisi kesinlikle aynıdır?

A) Alınan yolları
B) Yer değiştirmeleri
C) Süratleri
D) Hızları
E) Harekete başladıktan sonra herhangi bir t süre sonraki konumları

2. Ayşe öğretmen otobüs durağında beklerken cep telefonunu evde unuttuğunu fark ediyor ve durağın 30 metre doğusundaki evine gidip telefonunu alarak duraktaki aynı noktaya aynı yol üzerinden geri dönüyor.

Buna göre Ayşe öğretmenin aldığı yol ve yer değiştirmesinin büyüklüğü sırasıyla kaç m'dir?

	Alınan yol	Yer değiştirme
A)	30	60
B)	30	0
C)	60	0
D)	60	30
E)	0	60

3. Doğrusal yatay bir yürüyüş yolunda sırasıyla soldan sağa A, B ve C noktaları işaretlenmiştir. Bahar bu yürüyüş yolunda önce A noktasından B noktasına, sonra C noktasına, sonra da C noktasından B noktasına yürüyor.

Sadece A ve B noktaları arasındaki mesafe ile Bahar'ın toplam yürüyüş süresi bilindiğine göre Bahar'ın hareketi ile ilgili aşağıdaki niceliklerden hangisi hesaplanabilir?

A) AC noktaları arasında aldığı yol
B) Toplam aldığı yol
C) BC arasındaki yer değiştirme
D) Sürat
E) Hız

4. Merkezi O noktası olan bir çembersel yol üzerinde A ve B noktaları bulunmaktadır. A noktası çembersel yolun saat 9 noktasında, B noktası çembersel yolun saat 3 noktasında bulunmaktadır. A, O ve B noktaları doğrusal bir çizgi ile birleştirilmiştir. Bir çocuk yarıçapı 3 m olan bu çembersel yol üzerinde A noktasından B noktasına, saat yönünde 3 s'de ilerlemektedir.

Buna göre hareketlinin ortalama sürati ve ortalama hızı sırasıyla kaç m/s'dir? (π=3)

	Sürat	Hız
A)	3	1
B)	6	1
C)	3	2
D)	6	2
E)	3	6

5. Yatay düzlemde bölmeleri eşit aralıklı olan paralel iki ray bulunmaktadır. Raylardan birinde X, diğerinde Y vagonu sağa doğru ilerlemektedir. X vagonu üç bölme, Y vagonu iki bölme uzunluğundadır. Vagonlarının t_1 anındaki konumu rayları dik olarak kesen sol taraftaki KL düşey çizgisine göre, t_2 anındaki konumu rayları dik olarak kesen sağ taraftaki MN düşey çizgisine göre belirlenmektedir. KL ve MN çizgileri arasında her iki rayda da 12 bölme bulunmaktadır. t_1 anında X vagonunun ön tarafı KL çizgisinde iken Y vagonunun arka tarafı KL çizgisindedir. t_2 anında X vagonunun arka tarafı MN çizgisinde iken Y vagonunun ön tarafı MN çizgisindedir.

X' in hızının büyüklüğü V_X, Y'ninki V_Y olduğuna göre, $\frac{V_X}{V_Y}$ oranı kaçtır?

A) $\frac{9}{4}$ B) $\frac{3}{2}$ C) 1 D) $\frac{6}{5}$ E) $\frac{9}{5}$

6. Otomobil, minibüs ve tır doğrusal yatay bir yolda sabit hızlarla sağa doğru ilerliyor. Araçlardan en uzunu tır, en kısası ise otomobildir. İlk durum olan t_0 anında her aracın arka tarafının hizası incelendiğinde tır en geride, otomobil ortada, minibüs ise en öndedir. İkinci durum olan t anında ise araçların arka kısımları aynı hizadadır.

Otobüs, minibüs ve tırın hızlarının büyüklüğü sırasıyla V_O, V_M, V_T olduğuna göre, bunlar arasındaki ilişki nedir?

A) $V_O < V_T < V_M$
B) $V_O < V_M < V_T$
C) $V_T < V_M < V_O$
D) $V_M < V_T < V_O$
E) $V_M < V_O < V_T$

7. Birbirine paralel iki rayda aynı yönde hareket eden K ve L trenlerinin konum-zaman grafiği verilmiştir. Yatayda zaman ekseni, düşeyde konum ekseni bulunmaktadır. Zaman ekseninde t_1 ve t_2, konum ekseninde ise X_1 ve X_2 noktaları işaretlenmiştir.

K ve L trenlerinin hareketini gösteren çizgiler iki noktada kesişmiştir. Birinci kesişim t_1'den çıkan düşey ve X_1'den çıkan yatay hizalama çizgisinin kesişimi, ikinci kesişim noktası ise t_2'den çıkan düşey ve X_2'den çıkan yatay hizalama çizgisinin kesişim noktasıdır.

K treninin hareketini gösteren çizgi,

- eksenlerin kesişim noktasından başlayarak hem zaman hem de konum ekseni boyunca sürekli artış göstermiştir.

L treninin hareketini gösteren çizgi,

- eksenlerin kesişim noktasından başlayarak t_1 noktasından daha önceki bir noktaya kadar sadece zaman ekseninde artış göstermiş,
- bu nokta ile t_2 noktasından daha önceki bir nokta arasında hem zaman hem de konum ekseni boyunca artış göstermiş,
- bu noktadan sonra ise yine sadece zaman ekseninde artış göstermiştir.

Bu grafikten elde edilen bilgilere göre trenlerin hız ve konumları ile ilgili aşağıdaki yargılardan hangisi <u>yanlıştır</u>?

A) t_1 anında trenlerin hızları aynıdır.
B) t_1 anında iki tren yan yanadır.
C) t_2 anında iki tren yan yanadır.
D) K ve L trenleri aynı konumdan harekete başlamıştır.
E) t_2 anında L treni durmaktadır.

8. Doğrusal bir yolda hareket eden aracın hız-zaman grafiği verilmiştir. Yatayda birimi s olan zaman ekseni ve düşeyde birimi m/s olan hız ekseni bulunmaktadır. Zaman ekseninde 10. ve 20. s'ler, hız ekseninde değeri belirsiz bir nokta ve eksenlerin kesişiminde 0 noktası işaretlenmiştir.

Aracın hareketini gösteren çizgi,

- 0 ile 10 s arasında hem zaman hem de hız ekseni boyunca sürekli artış göstermiş, 10 s anında hız eksenindeki değeri belirsiz noktaya ulaşmıştır.
- 10 ile 20 s aralığında sadece zaman ekseninde artış göstermiştir.

Bu grafikten elde edilen bilgilere göre, verilen zaman aralıklarında aracın yer değiştirmesi ve hızı ile ilgili aşağıdaki yargılardan hangisi doğrudur?

A) 0 ile 10 s zaman aralığındaki yer değiştirme ile 10 ile 20 s zaman aralığındaki yer değiştirme eşittir.
B) 0 ile 10 s zaman aralığındaki yer değiştirme, 10 ile 20 s zaman aralığındaki yer değiştirmeden daha büyüktür.
C) 0 ile 10 s zaman aralığında sabit hızlıdır.
D) 10 ile 20 s zaman aralığında durmaktadır.
E) 10 ile 20 s zaman aralığında sabit hızlıdır.

9. Doğrusal bir yolda aynı yerden aynı anda harekete başlayan K ve L cisimlerinin hız-zaman grafiği verilmiştir. Yatayda zaman ekseni ve düşeyde hız ekseni bulunmaktadır. Zaman ekseninde t noktası, hız ekseninde V noktası ve eksenlerin kesişiminde 0 noktası işaretlenmiştir.

K treninin hareketini gösteren çizgi,

- 0 ile t zaman aralığında hız ekseni üzerindeki V noktasından başlayıp, sürekli olarak zaman ekseninde artış, hız ekseninde azalış göstererek zaman ekseni üzerindeki t noktasında sona ermiştir,

L treninin hareketini gösteren çizgi,

- 0 ile t zaman aralığında 0 noktasından başlayıp, hem zaman hem de hız ekseni boyunca sürekli artış göstererek t noktasından çıkan düşey ve V noktasından çıkan yatay hizalama çizgisinin kesişiminde sona ermiştir.

0 ile t zaman aralığında,

I. K ve L birbirine zıt yönde hareket etmektedir.
II. K'nin ortalama hızı L'ninkine eşittir.
III. K'nin ivmesinin büyüklüğü L'ninkine eşittir.

yargılarından hangileri doğrudur?

A) Yalnız I
B) Yalnız II
C) I ve II
D) II ve III
E) I, II ve III

10. Bir otobüs (0-t_1) zaman aralığında sabit hızla yoluna devam ederken yolcu almak için (t_1-t_2) aralığında yavaşlıyor. (t_2-t_3) aralığında yolcuların binmesi için durgun bekleyen otobüs (t_3-t_4) aralığında hızlanıyor.

Buna göre hangi zaman aralıklarında otobüsün ivmesi sıfırdan farklıdır?

A) 0-t_1 ve t_1-t_2
B) 0-t_1 ve t_2-t_3
C) t_1-t_2 ve t_2-t_3
D) t_1-t_2 ve t_3-t_4
E) t_2-t_3 ve t_3-t_4

11. K, L ve M araçlarının hızlarının büyüklüğü V kadar ve doğuya doğru iken hareket boyunca sabit değerde olan ivmelerinin yönleri şu şekilde açıklanmıştır:

- K aracının büyüklüğü a kadar olan ivmesi doğuya doğru,
- L aracının büyüklüğü a kadar olan ivmesi batıya doğru,
- M aracının ivmesi sıfır.

Bir süre sonra K, L ve M araçları aynı yönde ilerlerken hızlarının büyüklüğü sırasıyla V_K, V_L, V_M olduğuna göre, bu hızlar arasındaki ilişki nedir?

A) $V_K > V_M > V_L$
B) $V_K > V_L > V_M$
C) $V_M > V_K > V_L$
D) $V_M > V_L > V_K$
E) $V_L > V_K > V_M$

12. Dört farklı cismin ivmeleri ile ilgili,

I. Düzgün hızlanan cismin ivmesi düzgün artmaktadır.
II. Düzgün yavaşlayan cismin ivmesi düzgün azalmaktadır.
III. Duran cismin ivmesi sıfırdır.
IV. Sabit hızla hareket eden cismin ivmesi sıfırdır.

yargılarından hangileri doğrudur?

A) Yalnız III
B) I ve II
C) III ve IV
D) I, II ve III
E) I, II, III ve IV

F11. Last Version of NAMAT for Blind and Sighted Students

9. Sınıf Fizik Dersi Hareket Başarı Testi (Kör Öğrenciler/Sınav düzenlemesi kullanılmayan test)

12 sorudan oluşan bu test 9. sınıf fizik dersi, Hareket ve Kuvvet ünitesinden seçilen ve yeniden düzenlenen hareket konusundaki üç kazanımın ölçülmesine yönelik hazırlanmıştır. Testteki şekil ve grafik içeren sorular size sorulmayacaktır. Testi cevaplamaya dilediğiniz sorudan başlayabilirsiniz. Yanlış cevaplarınız doğru cevaplarınızı götürmeyecektir. Tüm sorular eşit puanlıdır.

SORU 1. Şekil içerdiği için kör öğrenciye sunulmayacak.

SORU 2. Ayşe öğretmen otobüs durağında beklerken cep telefonunu evde unuttuğunu fark ediyor ve durağın 30 metre doğusundaki evine gidip telefonunu alarak duraktaki aynı noktaya aynı yol üzerinden geri dönüyor.

Buna göre Ayşe öğretmenin aldığı yol ve yer değiştirmesinin büyüklüğü sırasıyla kaç metredir?

Seçenekler

A) 30 ve 0
B) 30 ve 60
C) 60 ve 30
D) 0 ve 60
E) 60 ve 0

SORU 3. Şekil içerdiği için kör öğrenciye sunulmayacak.

SORU 4. Şekil içerdiği için kör öğrenciye sunulmayacak.

SORU 5. Şekil içerdiği için kör öğrenciye sunulmayacak.

SORU 6. Şekil içerdiği için kör öğrenciye sunulmayacak.

SORU 7. Şekil içerdiği için kör öğrenciye sunulmayacak.

SORU 8. Şekil içerdiği için kör öğrenciye sunulmayacak.

SORU 9. Şekil içerdiği için kör öğrenciye sunulmayacak.

SORU 10. Bir otobüs yatay doğrusal bir yolda 0 ile t_1 zaman aralığında sabit hızla yoluna devam ederken yolcu almak için t_1 ile t_2 aralığında yavaşlıyor. t_2 ile t_3 aralığında yolcuların binmesi için durgun bekleyen otobüs t_3 ile t_4 aralığında ilk hareketi yönünde hızlanıyor.

Buna göre hangi zaman aralıklarında otobüsün ivmesi sıfırdan farklıdır?

Seçenekler

A) 0 ile t_1 ve t_1 ile t_2
B) 0 ile t_1 ve t_2 ile t_3
C) t_1 ile t_2 ve t_2 ile t_3
D) t_2 ile t_3 ve t_3 ile t_4
E) t_1 ile t_2 ve t_3 ile t_4

SORU 11. Şekil içerdiği için kör öğrenciye sunulmayacak.

SORU 12. Üç farklı cismin ivmeleri ile ilgili,

1. Düzgün hızlanan cismin ivmesi düzgün artmaktadır.
2. Duran cismin ivmesi sıfırdır.
3. Sabit hızla hareket eden cismin ivmesi sıfırdır.

yargılarından hangileri doğrudur?

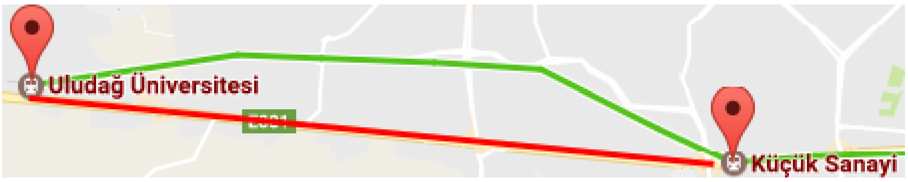
Seçenekler

A) Yalnız 2
B) 2 ve 3
C) 1 ve 2
D) 1 ve 3
E) 1, 2, 3

9. Sınıf Fizik Dersi Hareket Başarı Testi (Gören Öğrenciler/Sınav düzenlemesi kullanılmayan test)

12 sorudan oluşan bu test 9. sınıf fizik dersi, Hareket ve Kuvvet ünitesinden seçilen ve yeniden düzenlenen hareket konusundaki üç kazanımın ölçülmesine yönelik hazırlanmıştır. Testi cevaplamaya dilediğiniz sorudan başlayabilirsiniz. Yanlış cevaplarınız doğru cevaplarınızı götürmeyecektir. Tüm sorular eşit puanlıdır.

1. Bursa'da Küçük Sanayi-Uludağ Üniversitesi durakları arasında seferlerini sürdüren halk otobüsleri aşağıdaki haritada kırmızı çizgi ile gösterilen güzergâhı, raylı sistem ise yeşil çizgi ile gösterilen güzergâhı kullanmaktadır.



Buna göre iki durak arasında halk otobüsü ve raylı sistemin hareketine ait niceliklerden hangisi kesinlikle aynıdır?

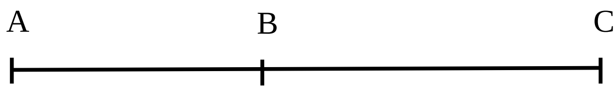
A) Alınan yolları
B) Yer değiştirmeleri
C) Sürateleri
D) Hızları
E) Harekete başladıktan sonra herhangi bir t süre sonraki konumları

2. Ayşe öğretmen otobüs durağında beklerken cep telefonunu evde unuttuğunu fark ediyor ve durağın 30 m doğusundaki evine gidip telefonunu alarak duraktaki aynı noktaya aynı yol üzerinden geri dönüyor.

Buna göre Ayşe öğretmenin aldığı yol ve yer değiştirmesinin büyüklüğü sırasıyla kaç m'dir?

Alınan yol	Yer değiştirme
A) 30	0
B) 30	60
C) 60	30
D) 0	60
E) 60	0

3. Bahar aşağıdaki şekilde gösterilen doğrusal yatay yürüyüş yolunda A noktasından B noktasına sonra C noktasına, sonra da C noktasından B noktasına yürüyor.

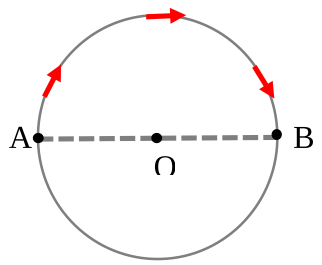


Sadece A ve B noktaları arasındaki mesafe ile Bahar'ın toplam yürüyüş süresi bilindiğine göre Bahar'ın hareketi ile ilgili aşağıdaki niceliklerden hangisi hesaplanabilir?

A) Hız
B) Sürat
C) AC noktaları arasında aldığı yol
D) Toplam aldığı yol
E) BC arasındaki yer değiştirme

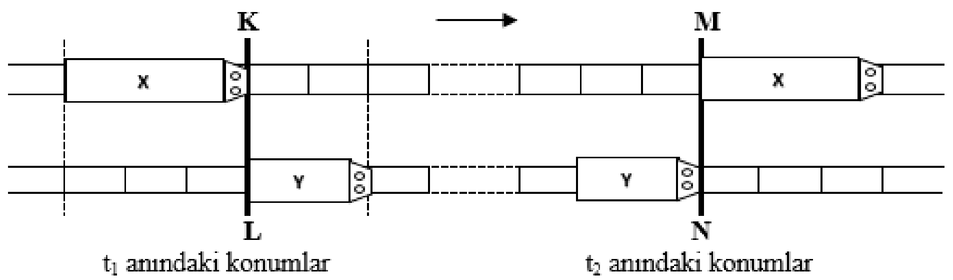
4. Bir çocuk, yarıçapı 3 metre, merkezi O noktası olan, şekilde gösterilen çembersel yolda, A noktasından B noktasına çember üzerinde üç adet okla belirtilen yörünge ile 3 saniyede gidiyor. Çember üzerinde AB yörüngesinin uzunluğu 9 m'dir.

Buna göre çocuğun sürati ve hızının büyüklüğü sırasıyla kaç m/s'dir?



	Sürat	Hız
A)	3	1
B)	6	1
C)	3	2
D)	6	2
E)	3	6

5. Aşağıdaki şekilde paralel raylarda ok yönünde sabit hızlarla giden X, Y vagonlarının t_1 ve t_2 anlarındaki konumları verilmiştir. KL çizgisi ile MN çizgisi arasındaki her iki rayda da 12 bölme bulunmaktadır.

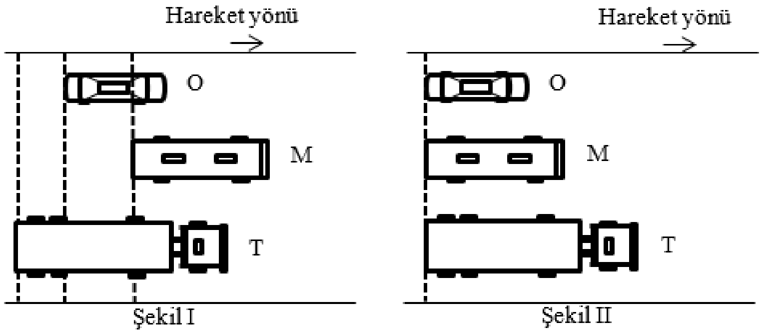


X' in hızının büyüklüğü V_X, Y'ninki V_Y olduğuna göre, $\frac{V_X}{V_Y}$ oranı kaçtır?

(Raylardaki bölmeler eşit aralıklıdır.)

A) $\frac{9}{4}$ B) $\frac{9}{5}$ C) $\frac{3}{2}$ D) $\frac{4}{3}$ E) $\frac{6}{5}$

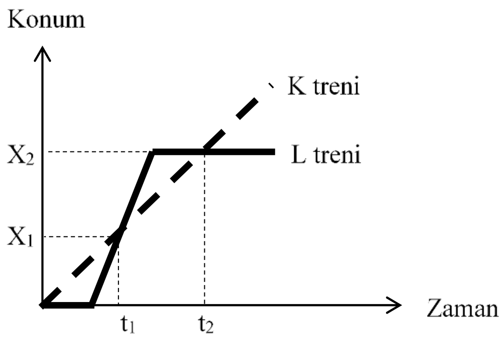
6. O otomobili, M minibüsü ve T tırı doğrusal bir yolda sabit hızlarla ilerliyor. Bu araçların birbirlerine göre konumları, t_0 anında Şekil I, daha sonraki t anında da Şekil II' deki gibi olmuştur.



O, M, T'nin hızlarının büyüklüğü sırasıyla V_O, V_M, V_T olduğuna göre, bunlar arasındaki ilişki nedir?

A) $V_O < V_T < V_M$
B) $V_O < V_M < V_T$
C) $V_T < V_M < V_O$
D) $V_M < V_O < V_T$
E) $V_M < V_T < V_O$

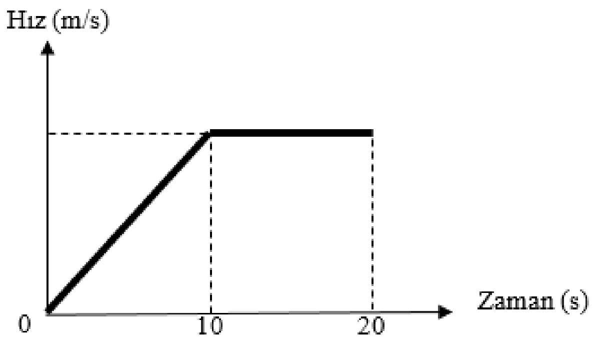
7. Birbirine paralel iki rayda aynı yönde hareket eden K ve L trenlerinin konum-zaman grafiği aşağıdaki gibidir.



Bu grafikten elde edilen bilgilere göre trenlerin hız veya konumları ile ilgili aşağıdaki yargılardan hangisi <u>yanlıştır</u>?

A) t_1 anında trenlerin hızları aynıdır.
B) t_2 anında L treni durmaktadır.
C) K ve L trenleri aynı konumdan harekete başlamıştır.
D) t_1 anında iki tren yan yanadır.
E) t_2 anında iki tren yan yanadır.

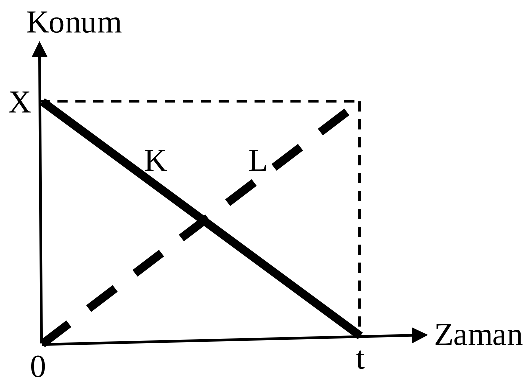
8. Doğrusal bir yolda hareket eden aracın hız-zaman grafiği aşağıdaki gibidir.



Bu grafikten elde edilen bilgilere göre, verilen zaman aralıklarında aracın hızı veya yer değiştirmesi ile ilgili aşağıdaki yargılardan hangisi doğrudur?

A) 0-10 s zaman aralığındaki yer değiştirme ile 10-20 s zaman aralığındaki yer değiştirme eşittir.
B) 0-10 s zaman aralığındaki yer değiştirme, 10-20 s zaman aralığındaki yer değiştirmeden daha büyüktür.
C) 10-20 s zaman aralığında durmaktadır.
D) 10-20 s zaman aralığında sabit hızlıdır.
E) 10-20 s zaman aralığında yavaşlamaktadır.

9. Doğrusal bir yolda aynı anda harekete başlayan K ve L cisimlerinin konum-zaman grafikleri şekildeki gibidir.



0-t zaman aralığında,

I. K ve L birbirine zıt yönde hareket etmektedir.
II. t süre sonunda K ve L'nin yer değiştirmelerinin büyüklüğü eşittir.
III. K ve L t anında aynı konumdadır.

yargılarından hangileri doğrudur?

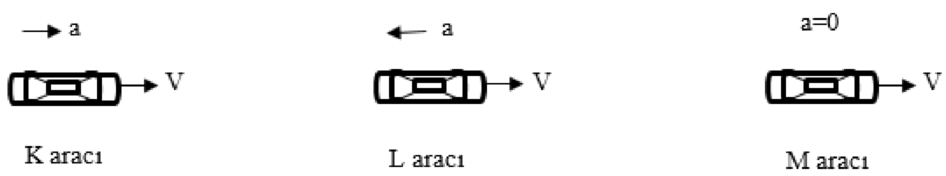
A) Yalnız I
B) Yalnız II
C) I ve II
D) II ve III
E) I, II ve III

10. Bir otobüs yatay doğrusal bir yolda (0-t_1) zaman aralığında sabit hızla yoluna devam ederken yolcu almak için (t_1-t_2) aralığında yavaşlıyor. (t_2-t_3) aralığında yolcuların binmesi için durgun bekleyen otobüs (t_3-t_4) aralığında hızlanıyor.

Buna göre hangi zaman aralıklarında otobüsün ivmesi sıfırdan farklıdır?

A) 0-t_1 ve t_1-t_2
B) 0-t_1 ve t_2-t_3
C) t_1-t_2 ve t_2-t_3
D) t_2-t_3 ve t_3-t_4
E) t_1-t_2 ve t_3-t_4

11. K, L ve M araçlarının hızları aynı iken hareket boyunca sabit değerde olan ivmelerinin yönleri şekilde verilmiştir.



Bir süre sonra K, L ve M araçları aynı yönde ilerlerken hızlarının büyüklüğü sırasıyla V_K, V_L, V_M olduğuna göre, bu hızlar arasındaki ilişki nedir?

A) $V_K > V_M > V_L$
B) $V_K > V_L > V_M$
C) $V_M > V_K > V_L$
D) $V_M > V_L > V_K$
E) $V_L > V_K > V_M$

12. Üç farklı cismin ivmeleri ile ilgili,

I. Düzgün hızlanan cismin ivmesi düzgün artmaktadır.
II. Duran cismin ivmesi sıfırdır.
III. Sabit hızla hareket eden cismin ivmesi sıfırdır.

yargılarından hangileri doğrudur?

A) Yalnız II
B) II ve III
C) I ve II
D) I ve III
E) I, II ve III

F12. Last Version of VAMAT for Blind and Sighted Students

9. Sınıf Fizik Dersi Hareket Başarı Testi (Kör Öğrenciler/ Betimlemeli)

12 sorudan oluşan bu test 9. sınıf fizik dersi, Hareket ve Kuvvet ünitesinden seçilen ve yeniden düzenlenen hareket konusundaki üç kazanımın ölçülmesine yönelik hazırlanmıştır. Testi cevaplamaya dilediğiniz sorudan başlayabilirsiniz. Yanlış cevaplarınız doğru cevaplarınızı götürmeyecektir. Tüm sorular eşit puanlıdır.

SORU 1. Bursa'daki Küçük Sanayi ile Uludağ Üniversitesi durakları arasında halk otobüsleri ve raylı sistem ulaşım sağlamaktadır. Halk otobüsleri Küçük Sanayi durağından çıktığında kuzeybatı yönünde ilerleyerek Uludağ Üniversitesine ulaşıyor. Raylı sistem Küçük Sanayi durağından çıktığında ise önce kuzeybatı, sonra batı, son olarak da güneybatı yönünde uzanarak Uludağ Üniversitesi'ne ulaşıyor.
Buna göre iki durak arasında halk otobüsü ve raylı sistemin hareketine ait niceliklerden hangisi kesinlikle aynıdır?

Seçenekler

A) Alınan yolları
B) Yer değiştirmeleri
C) Süratleri
D) Hızları
E) Harekete başladıktan sonra herhangi bir t süre sonraki konumları

SORU 2. Ayşe öğretmen otobüs durağında beklerken cep telefonunu evde unuttuğunu fark ediyor ve durağın 30 metre doğusundaki evine gidip telefonunu alarak duraktaki aynı noktaya aynı yol üzerinden geri dönüyor.
Buna göre Ayşe öğretmenin aldığı yol ve yer değiştirmesinin büyüklüğü sırasıyla kaç metredir?

Seçenekler

A) 30 ve 0
B) 30 ve 60
C) 60 ve 30
D) 0 ve 60
E) 60 ve 0

SORU 3. Doğrusal yatay bir yürüyüş yolunda sırasıyla soldan sağa A, B ve C noktaları işaretlenmiştir. Bahar bu yürüyüş yolunda önce A noktasından B noktasına, sonra C noktasına, sonra da C noktasından B noktasına yürüyor.
Sadece A ve B noktaları arasındaki mesafe ile Bahar'ın toplam yürüyüş süresi bilindiğine göre Bahar'ın hareketi ile ilgili aşağıdaki niceliklerden hangisi hesaplanabilir?

Seçenekler
A) Hız
B) Sürat
C) AC noktaları arasında aldığı yol
D) Toplam aldığı yol
E) BC arasındaki yer değiştirme

SORU 4. Merkezi O noktası olan bir çemberin üzerinde A ve B noktaları bulunmaktadır. A noktası çemberin saat 9 noktasında, B noktası çemberin saat 3 noktasında bulunmaktadır. A, O ve B noktaları doğrusal bir çizgi ile birleştirilmiştir. Bir çocuk yarıçapı 3 metre olan bu çember üzerinde A noktasından B noktasına, saat yönünde 3 saniyede ilerlemektedir. Çember üzerinde AB yörüngesinin uzunluğu 9 metredir.
Buna göre hareketlinin sürati ve hızının büyüklüğü sırasıyla kaç m/s (metre bölü saniye)'dir?

Seçenekler
A) 3 ve 1
B) 6 ve 1
C) 3 ve 2
D) 6 ve 2
E) 3 ve 6

SORU 5. Yatay düzlemde bölmeleri eşit aralıklı olan paralel iki ray bulunmaktadır. Raylardan birinde X, diğerinde Y vagonu sağa doğru ilerlemektedir. X vagonu üç bölme, Y vagonu 2 bölme uzunluğundadır. Vagonlarının t_1 anındaki konumu rayları dik olarak kesen sol taraftaki KL düşey çizgisine göre, t_2 anındaki konumu rayları dik olarak kesen sağ taraftaki MN düşey çizgisine göre belirlenmektedir. KL ve MN çizgileri arasında her iki rayda da 12 bölme bulunmaktadır. t_1 anında X vagonunun ön tarafı KL çizgisinde iken Y vagonunun arka tarafı KL çizgisindedir. t_2 anında X vagonunun arka tarafı MN çizgisinde iken Y vagonunun ön tarafı MN çizgisindedir.
X' in hızının büyüklüğü V_X, Y'ninki V_Y olduğuna göre, $\frac{V_X}{V_Y}$ (V_X bölü V_Y) oranı kaçtır?

Seçenekler
A) $\frac{9}{4}$ B) $\frac{9}{5}$ C) $\frac{3}{2}$ D) $\frac{4}{3}$ E) $\frac{6}{5}$

SORU 6. Otomobil, minibüs ve tır doğrusal yatay bir yolda sabit hızlarla sağa doğru ilerliyor. Araçlardan en uzunu tır, en kısası ise otomobildir. İlk durum olan t_0 anında her aracın arka tarafının hizası incelendiğinde tır en geride, otomobil ortada, minibüs ise en öndedir. İkinci durum olan t anında ise araçların arka kısımları aynı hizadadır. **Otobüs, minibüs ve tırın hızlarının büyüklüğü sırasıyla V_O, V_M, V_T olduğuna göre, bunlar arasındaki ilişki nedir?**

Seçenekler (Okuyucuya not: < Küçüktür işareti)

A) $V_O < V_T < V_M$
B) $V_O < V_M < V_T$
C) $V_T < V_M < V_O$
D) $V_M < V_O < V_T$
E) $V_M < V_T < V_O$

SORU 7. Birbirine paralel iki rayda aynı yönde hareket eden K ve L trenlerinin konum-zaman grafiği betimlenmiştir. Yatayda zaman ekseni, düşeyde konum ekseni bulunmaktadır. Zaman ekseninde t_1 ve t_2, konum ekseninde ise X_1 ve X_2 noktaları işaretlenmiştir.
K ve L trenlerinin hareketini gösteren çizgiler iki noktada kesişmiştir. Birincisi t_1'den çıkan düşey ve X_1'den çıkan yatay hizalama çizgisinin kesiştiği nokta (t_1, X_1), ikincisi t_2'den çıkan düşey ve X_2'den çıkan yatay hizalama çizgisinin kesiştiği noktadır (t_2, X_2).
K treninin hareketini gösteren çizgi,

- eksenlerin kesişim noktasından başlayarak, (t_1, X_1) ve (t_2, X_2) noktalarından geçip hem zaman hem de konum ekseni boyunca sürekli artış göstermiştir.

L treninin hareketini gösteren çizgi,

- eksenlerin kesişim noktasından başlayarak t_1 noktasından daha önceki bir noktaya kadar sadece zaman ekseninde artış göstermiş,
- bu nokta ile t_2 noktasından daha önceki bir nokta arasında, (t_1, X_1) noktasından geçip hem zaman hem de konum ekseni boyunca artış göstermiş ve konum ekseninde X_2'ye ulaşmış,
- bu noktadan sonra ise yine sadece zaman ekseninde artış göstermiştir.

Bu grafikten elde edilen bilgilere göre trenlerin hız veya konumları ile ilgili aşağıdaki yargılardan hangisi <u>yanlıştır</u>? (Yanlıştır'ın altı çizili)

Seçenekler

A) t_1 anında trenlerin hızları aynıdır.
B) t_2 anında L treni durmaktadır.
C) K ve L trenleri aynı konumdan harekete başlamıştır.
D) t_1 anında iki tren yan yanadır.
E) t_2 anında iki tren yan yanadır.

SORU 8. Doğrusal bir yolda hareket eden aracın hız-zaman grafiği betimlenmiştir. Yatayda birimi s (saniye) olan zaman ekseni ve düşeyde birimi m/s (metre bölü saniye) olan hız ekseni bulunmaktadır. Zaman ekseninde 10. ve 20. saniyeler, hız ekseninde değeri belirsiz bir nokta ve eksenlerin kesişiminde 0 (sıfır) noktası işaretlenmiştir.
Aracın hareketini gösteren çizgi,

- 0 ile 10 saniye arasında hem zaman hem de hız ekseni boyunca sürekli artış göstermiş, hız ekseninde değeri belirsiz noktaya ulaşmış,
- 10 ile 20 saniye aralığında sadece zaman ekseninde artış göstermiştir.

Bu grafikten elde edilen bilgilere göre, verilen zaman aralıklarında aracın hızı veya yer değiştirmesi ile ilgili aşağıdaki yargılardan hangisi doğrudur?

Seçenekler
A) 0 ile 10 saniye zaman aralığındaki yer değiştirme ile 10 ile 20 saniye zaman aralığındaki yer değiştirme eşittir.
B) 0 ile 10 saniye zaman aralığındaki yer değiştirme, 10 ile 20 saniye zaman aralığındaki yer değiştirmeden daha büyüktür.
C) 10 ile 20 saniye zaman aralığında durmaktadır.
D) 10 ile 20 saniye zaman aralığında sabit hızlıdır.
E) 10 ile 20 saniye zaman aralığında yavaşlamaktadır.

SORU 9. Doğrusal bir yolda aynı anda harekete başlayan K ve L cisimlerinin konum-zaman grafiği verilmiştir. Yatayda zaman ekseni ve düşeyde konum ekseni bulunmaktadır. Zaman ekseninde t noktası, konum ekseninde X noktası ve eksenlerin kesişiminde 0 (sıfır) noktası işaretlenmiştir.

K treninin hareketini gösteren çizgi,

- 0 ile t zaman aralığında konum ekseni üzerindeki X noktasından başlayıp, sürekli olarak zaman ekseninde artış, konum ekseninde azalış göstererek zaman ekseni üzerindeki t noktasında sona ermiştir,

L treninin hareketini gösteren çizgi,

- 0 ile t zaman aralığında 0 noktasından başlayıp, hem zaman hem de konum ekseni boyunca sürekli artış göstererek t noktasından çıkan düşey ve X noktasından çıkan yatay hizalama çizgisinin kesişiminde sona ermiştir.

0 ile t zaman aralığında,

1. K ve L birbirine zıt yönde hareket etmektedir.
2. t süre sonunda K ve L'nin yer değiştirmelerinin büyüklüğü eşittir.
3. K ve L t anında aynı konumdadır.

yargılarından hangileri doğrudur?

Seçenekler
A) Yalnız 1
B) Yalnız 2
C) 1 ve 2
D) 2 ve 3
E) 1, 2 ve 3

SORU 10. Bir otobüs yatay doğrusal bir yolda 0 (sıfır) ile t_1 zaman aralığında sabit hızla yoluna devam ederken yolcu almak için t_1 ile t_2 aralığında yavaşlıyor. t_2 ile t_3 aralığında yolcuların binmesi için durgun bekleyen otobüs t_3 ile t_4 aralığında ilk hareketi yönünde hızlanıyor.
Buna göre hangi zaman aralıklarında otobüsün ivmesi sıfırdan farklıdır?

Seçenekler

A) 0 ile t_1 ve t_1 ile t_2
B) 0 ile t_1 ve t_2 ile t_3
C) t_1 ile t_2 ve t_2 ile t_3
D) t_2 ile t_3 ve t_3 ile t_4
E) t_1 ile t_2 ve t_3 ile t_4

SORU 11. K, L ve M araçlarının hızlarının büyüklüğü V kadar ve doğuya doğru iken hareket boyunca sabit değerde olan ivmelerinin yönleri şu şekilde açıklanmıştır:
- K aracının büyüklüğü a kadar olan ivmesi doğuya doğru,
- L aracının büyüklüğü a kadar olan ivmesi batıya doğru,
- M aracının ivmesi sıfır.

Bir süre sonra K, L ve M araçları aynı yönde ilerlerken hızlarının büyüklüğü sırasıyla V_K, V_L, V_M olduğuna göre, bu hızlar arasındaki ilişki nedir?

Seçenekler (Okuyucuya not: > Büyüktür işareti)

A) $V_K > V_M > V_L$
B) $V_K > V_L > V_M$
C) $V_M > V_K > V_L$
D) $V_M > V_L > V_K$
E) $V_L > V_K > V_M$

SORU 12. Üç farklı cismin ivmeleri ile ilgili,
1. Düzgün hızlanan cismin ivmesi düzgün artmaktadır.
2. Duran cismin ivmesi sıfırdır.
3. Sabit hızla hareket eden cismin ivmesi sıfırdır.

yargılarından hangileri doğrudur?

Seçenekler

A) Yalnız 2
B) 2 ve 3
C) 1 ve 2
D) 1 ve 3
E) 1, 2, 3

9. Sınıf Fizik Dersi Hareket Başarı Testi (Gören Öğrenciler/ Betimlemeli)

12 sorudan oluşan bu test 9. sınıf fizik dersi, Hareket ve Kuvvet ünitesinden seçilen ve yeniden düzenlenen hareket konusundaki üç kazanımın ölçülmesine yönelik hazırlanmıştır. Testi cevaplamaya dilediğiniz sorudan başlayabilirsiniz. Yanlış cevaplarınız doğru cevaplarınızı götürmeyecektir. Tüm sorular eşit puanlıdır.

SORU 1. Bursa'daki Küçük Sanayi ile Uludağ Üniversitesi durakları arasında halk otobüsleri ve raylı sistem ulaşım sağlamaktadır. Halk otobüsleri Küçük Sanayi durağından çıktığında kuzeybatı yönünde ilerleyerek Uludağ Üniversitesine ulaşıyor. Raylı sistem Küçük Sanayi durağından çıktığında ise önce kuzeybatı, sonra batı, son olarak da güneybatı yönünde uzanarak Uludağ Üniversitesi'ne ulaşıyor.
Buna göre iki durak arasında halk otobüsü ve raylı sistemin hareketine ait niceliklerden hangisi kesinlikle aynıdır?

A) Alınan yolları
B) Yer değiştirmeleri
C) Süratleri
D) Hızları
E) Harekete başladıktan sonra herhangi bir t süre sonraki konumları

SORU 2. Ayşe öğretmen otobüs durağında beklerken cep telefonunu evde unuttuğunu fark ediyor ve durağın 30 metre doğusundaki evine gidip telefonunu alarak duraktaki aynı noktaya aynı yol üzerinden geri dönüyor.
Buna göre Ayşe öğretmenin aldığı yol ve yer değiştirmesinin büyüklüğü sırasıyla kaç metredir?

A) 30 ve 0
B) 30 ve 60
C) 60 ve 30
D) 0 ve 60
E) 60 ve 0

SORU 3. Doğrusal yatay bir yürüyüş yolunda sırasıyla soldan sağa A, B ve C noktaları işaretlenmiştir. Bahar bu yürüyüş yolunda önce A noktasından B noktasına, sonra C noktasına, sonra da C noktasından B noktasına yürüyor.
Sadece A ve B noktaları arasındaki mesafe ile Bahar'ın toplam yürüyüş süresi bilindiğine göre Bahar'ın hareketi ile ilgili aşağıdaki niceliklerden hangisi hesaplanabilir?

A) Hız
B) Sürat
C) AC noktaları arasında aldığı yol
D) Toplam aldığı yol
E) BC arasındaki yer değiştirme

SORU 4. Merkezi O noktası olan bir çemberin üzerinde A ve B noktaları bulunmaktadır. A noktası çemberin saat 9 noktasında, B noktası çemberin saat 3 noktasında bulunmaktadır. A, O ve B noktaları doğrusal bir çizgi ile birleştirilmiştir. Bir çocuk yarıçapı 3 metre olan bu çember üzerinde A noktasından B noktasına, saat yönünde 3 saniyede ilerlemektedir. Çember üzerinde AB yörüngesinin uzunluğu 9 metredir.
Buna göre hareketlinin sürati ve hızının büyüklüğü sırasıyla kaç m/s'dir?

A) 3 ve 1
B) 6 ve 1
C) 3 ve 2
D) 6 ve 2
E) 3 ve 6

SORU 5. Yatay düzlemde bölmeleri eşit aralıklı olan paralel iki ray bulunmaktadır. Raylardan birinde X, diğerinde Y vagonu sağa doğru ilerlemektedir. X vagonu üç bölme, Y vagonu 2 bölme uzunluğundadır. Vagonlarının t_1 anındaki konumu rayları dik olarak kesen sol taraftaki KL düşey çizgisine göre, t_2 anındaki konumu rayları dik olarak kesen sağ taraftaki MN düşey çizgisine göre belirlenmektedir. KL ve MN çizgileri arasında her iki rayda da 12 bölme bulunmaktadır. t_1 anında X vagonunun ön tarafı KL çizgisinde iken Y vagonunun arka tarafı KL çizgisindedir. t_2 anında X vagonunun arka tarafı MN çizgisinde iken Y vagonunun ön tarafı MN çizgisindedir.

X' in hızının büyüklüğü V_X, Y'ninki V_Y olduğuna göre, $\frac{V_X}{V_Y}$ oranı kaçtır?

$A)$ $\frac{9}{4}$ B) $\frac{9}{5}$ C) $\frac{3}{2}$ D) $\frac{4}{3}$ E) $\frac{6}{5}$

SORU 6. Otomobil, minibüs ve tır doğrusal yatay bir yolda sabit hızlarla sağa doğru ilerliyor. Araçlardan en uzunu tır, en kısası ise otomobildir. İlk durum olan t_0 anında her aracın arka tarafının hizası incelendiğinde tır en geride, otomobil ortada, minibüs ise en öndedir. İkinci durum olan t anında ise araçların arka kısımları aynı hizadadır.
Otobüs, minibüs ve tırın hızlarının büyüklüğü sırasıyla V_O, V_M, V_T olduğuna göre, bunlar arasındaki ilişki nedir?

A) $V_O < V_T < V_M$
B) $V_O < V_M < V_T$
C) $V_T < V_M < V_O$
D) $V_M < V_O < V_T$
E) $V_M < V_T < V_O$

SORU 7. Birbirine paralel iki rayda aynı yönde hareket eden K ve L trenlerinin konum-zaman grafiği betimlenmiştir. Yatayda zaman ekseni, düşeyde konum ekseni bulunmaktadır. Zaman ekseninde t_1 ve t_2, konum ekseninde ise X_1 ve X_2 noktaları işaretlenmiştir.
K ve L trenlerinin hareketini gösteren çizgiler iki noktada kesişmiştir. Birincisi t_1'den çıkan düşey ve X_1'den çıkan yatay hizalama çizgisinin kesiştiği nokta (t_1, X_1), ikincisi t_2'den çıkan düşey ve X_2'den çıkan yatay hizalama çizgisinin kesiştiği noktadır (t_2, X_2).
K treninin hareketini gösteren çizgi,

- eksenlerin kesişim noktasından başlayarak, (t_1, X_1) ve (t_2, X_2) noktalarından geçip hem zaman hem de konum ekseni boyunca sürekli artış göstermiştir.

L treninin hareketini gösteren çizgi,

- eksenlerin kesişim noktasından başlayarak t_1 noktasından daha önceki bir noktaya kadar sadece zaman ekseninde artış göstermiş,
- bu nokta ile t_2 noktasından daha önceki bir nokta arasında, (t_1, X_1) noktasından geçip hem zaman hem de konum ekseni boyunca artış göstermiş ve konum ekseninde X_2'ye ulaşmış,
- bu noktadan sonra ise yine sadece zaman ekseninde artış göstermiştir.

Bu grafikten elde edilen bilgilere göre trenlerin hız veya konumları ile ilgili aşağıdaki yargılardan hangisi <u>yanlıştır</u>?

A) t_1 anında trenlerin hızları aynıdır.
B) t_2 anında L treni durmaktadır.
C) K ve L trenleri aynı konumdan harekete başlamıştır.
D) t_1 anında iki tren yan yanadır.
E) t_2 anında iki tren yan yanadır.

SORU 8. Doğrusal bir yolda hareket eden aracın hız-zaman grafiği betimlenmiştir. Yatayda birimi saniye olan zaman ekseni ve düşeyde birimi m/s olan hız ekseni bulunmaktadır. Zaman ekseninde 10. ve 20. saniyeler, hız ekseninde değeri belirsiz bir nokta ve eksenlerin kesişiminde 0 noktası işaretlenmiştir.
Aracın hareketini gösteren çizgi,

- 0 ile 10 saniye arasında hem zaman hem de hız ekseni boyunca sürekli artış göstermiş, hız eksenindeki değeri belirsiz noktaya ulaşmış,
- 10 ile 20 saniye aralığında sadece zaman ekseninde artış göstermiştir.

Bu grafikten elde edilen bilgilere göre, verilen zaman aralıklarında aracın hızı veya yer değiştirmesi ile ilgili aşağıdaki yargılardan hangisi doğrudur?

A) 0 ile 10 saniye zaman aralığındaki yer değiştirme ile 10 ile 20 saniye zaman aralığındaki yer değiştirme eşittir.
B) 0 ile 10 saniye zaman aralığındaki yer değiştirme, 10 ile 20 saniye zaman aralığındaki yer değiştirmeden daha büyüktür.
C) 10 ile 20 saniye zaman aralığında durmaktadır.
D) 10 ile 20 saniye zaman aralığında sabit hızlıdır.
E) 10 ile 20 saniye zaman aralığında yavaşlamaktadır.

SORU 9. Doğrusal bir yolda aynı anda harekete başlayan K ve L cisimlerinin konum-zaman grafiği verilmiştir. Yatayda zaman ekseni ve düşeyde konum ekseni bulunmaktadır. Zaman ekseninde t noktası, konum ekseninde X noktası ve eksenlerin kesişiminde 0 (sıfır) noktası işaretlenmiştir.

K treninin hareketini gösteren çizgi,

- 0 ile t zaman aralığında konum ekseni üzerindeki X noktasından başlayıp, sürekli olarak zaman ekseninde artış, konum ekseninde azalış göstererek zaman ekseni üzerindeki t noktasında sona ermiştir,

L treninin hareketini gösteren çizgi,

- 0 ile t zaman aralığında 0 noktasından başlayıp, hem zaman hem de konum ekseni boyunca sürekli artış göstererek t noktasından çıkan düşey ve X noktasından çıkan yatay hizalama çizgisinin kesişiminde sona ermiştir.

0 ile t zaman aralığında,

I. K ve L birbirine zıt yönde hareket etmektedir.
II. t süre sonunda K ve L'nin yer değiştirmelerinin büyüklüğü eşittir.
III. K ve L t anında aynı konumdadır.

yargılarından hangileri doğrudur?

A) Yalnız I
B) Yalnız II
C) I ve II
D) II ve III
E) I, II ve III

SORU 10. Bir otobüs yatay doğrusal bir yolda 0 ile t_1 zaman aralığında sabit hızla yoluna devam ederken yolcu almak için t_1 ile t_2 aralığında yavaşlıyor. t_2 ile t_3 aralığında yolcuların binmesi için durgun bekleyen otobüs t_3 ile t_4 aralığında ilk hareketi yönünde hızlanıyor.
Buna göre hangi zaman aralıklarında otobüsün ivmesi sıfırdan farklıdır?

A) 0 ile t_1 ve t_1 ile t_2
B) 0 ile t_1 ve t_2 ile t_3
C) t_1 ile t_2 ve t_2 ile t_3
D) t_2 ile t_3 ve t_3 ile t_4
E) t_1 ile t_2 ve t_3 ile t_4

SORU 11. K, L ve M araçlarının hızlarının büyüklüğü V kadar ve doğuya doğru iken hareket boyunca sabit değerde olan ivmelerinin yönleri şu şekilde açıklanmıştır:

- K aracının büyüklüğü a kadar olan ivmesi doğuya doğru,
- L aracının büyüklüğü a kadar olan ivmesi batıya doğru,
- M aracının ivmesi sıfır.

Bir süre sonra K, L ve M araçları aynı yönde ilerlerken hızlarının büyüklüğü sırasıyla V_K, V_L, V_M olduğuna göre, bu hızlar arasındaki ilişki nedir?

A) $V_K > V_M > V_L$
B) $V_K > V_L > V_M$
C) $V_M > V_K > V_L$
D) $V_M > V_L > V_K$
E) $V_L > V_K > V_M$

SORU 12. Üç farklı cismin ivmeleri ile ilgili,

1. Düzgün hızlanan cismin ivmesi düzgün artmaktadır.
2. Duran cismin ivmesi sıfırdır.
3. Sabit hızla hareket eden cismin ivmesi sıfırdır.

yargılarından hangileri doğrudur?

Seçenekler

A) Yalnız 2
B) 2 ve 3
C) 1 ve 2
D) 1 ve 3
E) 1, 2, 3

F13. The Last Version of TAMAT for Blind and Sighted Students

9. Sınıf Fizik Dersi Hareket Başarı Testi (Kör öğrenciler/ Dokunsal Grafikler)

12 sorudan oluşan bu test 9. sınıf fizik dersi, Hareket ve Kuvvet ünitesinden seçilen ve yeniden düzenlenen hareket konusundaki üç kazanımın ölçülmesine yönelik hazırlanmıştır. Testi cevaplamaya dilediğiniz sorudan başlayabilirsiniz. Yanlış cevaplarınız doğru cevaplarınızı götürmeyecektir. Tüm sorular eşit puanlıdır.

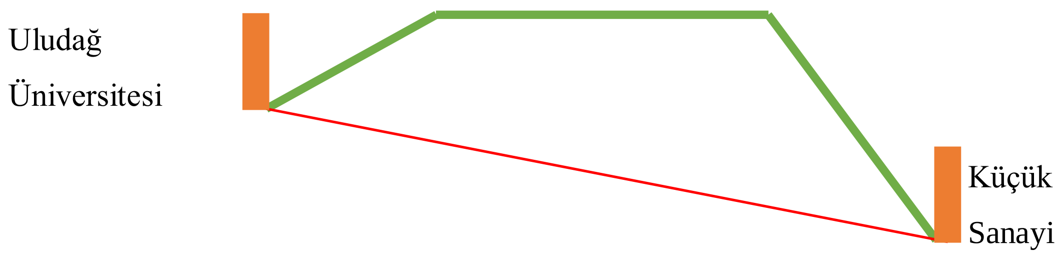
Soru 1. Kabartma şekilde Bursa'daki Küçük Sanayi ile Uludağ Üniversitesi durakları dikdörtgenler ile temsil edilmiştir. Duraklar arasında seferlerini sürdüren halk otobüsleri şekilde tek parça ince çizgi ile gösterilen alt taraftaki güzergâhı, raylı sistem ise üç parçadan oluşan kalın çizgi ile gösterilen üstteki güzergâhı kullanmaktadır.

Açıklama

Halk otobüsleri

Raylı sistem

Duraklar



(Okuyucu tarafından öğrenciye Soru 1'e ait kabartma şekil sunulacak)

Buna göre iki durak arasında halk otobüsü ve raylı sistemin hareketine ait niceliklerden hangisi kesinlikle aynıdır?

Seçenekler

A) Alınan yolları
B) Yer değiştirmeleri
C) Süratleri
D) Hızları
E) Harekete başladıktan sonra herhangi bir t süre sonraki konumları

Soru 1’e ait kabartma şekil

Soru 2. Ayşe öğretmen otobüs durağında beklerken cep telefonunu evde unuttuğunu fark ediyor ve durağın 30 metre doğusundaki evine gidip telefonunu alarak duraktaki aynı noktaya aynı yol üzerinden geri dönüyor.

Buna göre Ayşe öğretmenin aldığı yol ve yer değiştirmesinin büyüklüğü sırasıyla kaç metredir?

Seçenekler

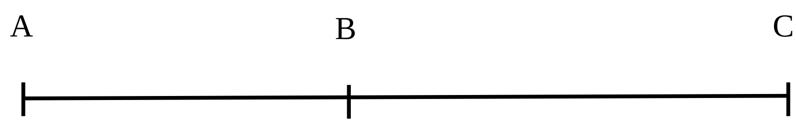
A) 30 ve 0
B) 30 ve 60
C) 60 ve 30
D) 0 ve 60
E) 60 ve 0

Soru 3. Bahar aşağıdaki kabartma şekilde gösterilen doğrusal yatay yürüyüş yolunda önce A noktasından B noktasına sonra C noktasına, sonra da C noktasından B noktasına yürüyor.

Açıklama

Yürüyüş yolu

A, B ve C noktaları



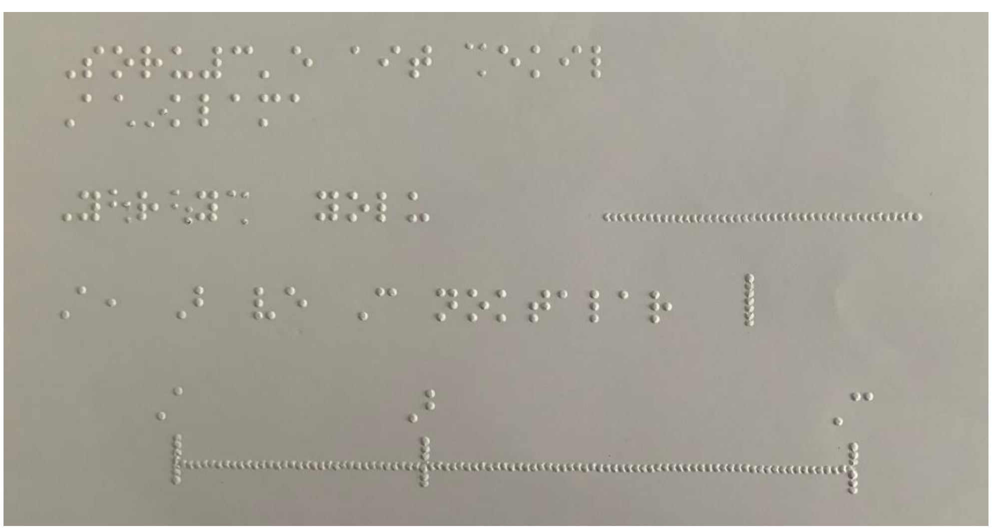
(Okuyucu tarafından öğrenciye Soru 3'e ait kabartma şekil sunulacak)

Sadece A ve B noktaları arasındaki mesafe ile Bahar'ın toplam yürüyüş süresi bilindiğine göre Bahar'ın hareketi ile ilgili aşağıdaki niceliklerden hangisi hesaplanabilir?

Seçenekler

A) Hız
B) Sürat
C) AC noktaları arasında aldığı yol
D) Toplam aldığı yol
E) BC arasındaki yer değiştirme

Soru 3'e ait kabartma şekil



Soru 4. Bir çocuk, yarıçapı 3 metre, merkezi O noktası olan, kabartma şekil ile gösterilen çembersel yolda, A noktasından B noktasına çember üzerinde üç adet okla belirtilen yörünge ile 3 saniyede gidiyor. Çember üzerinde AB yörüngesinin uzunluğu 9 metredir.

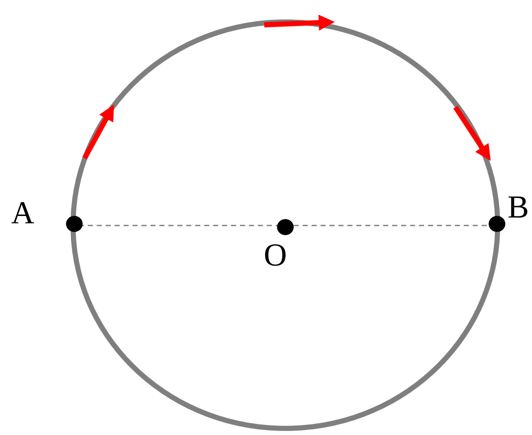
Soru 4'e ait şekil

Açıklama

Ok işareti

Çemberin merkezinden geçen kesikli çizgi

A, O ve B noktaları



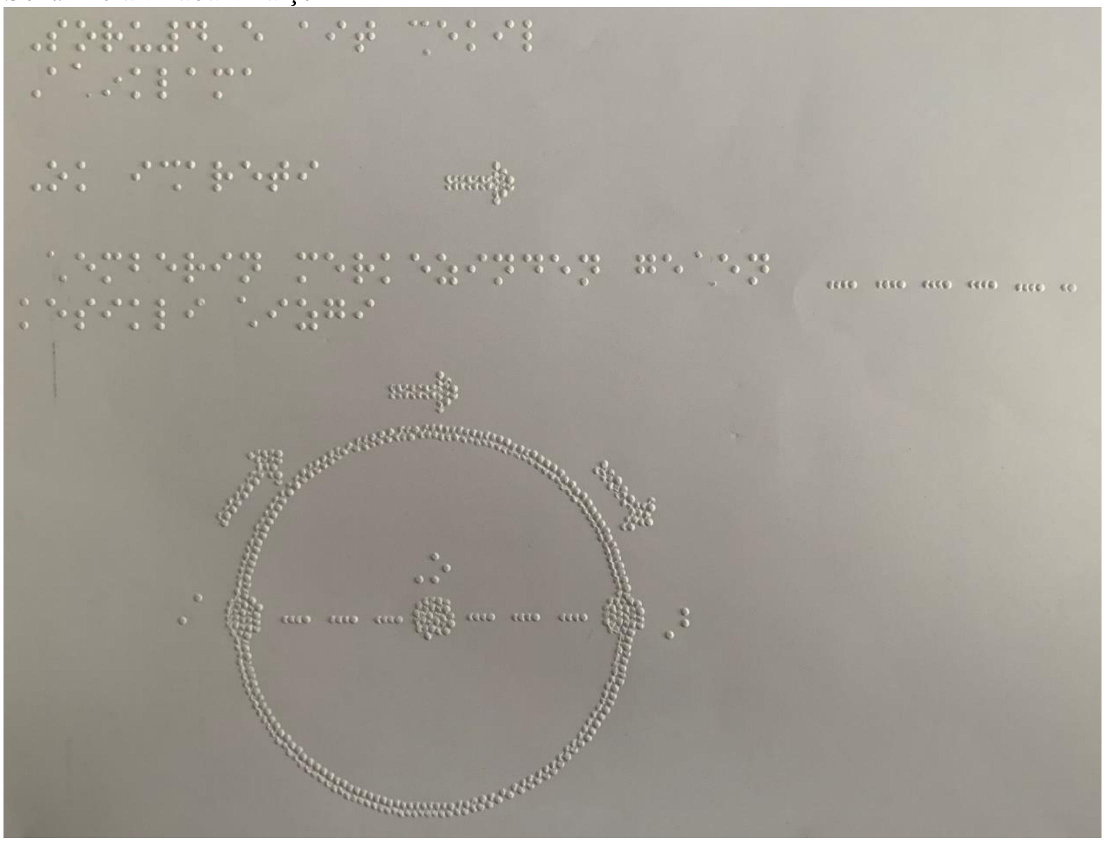
(Okuyucu tarafından öğrenciye Soru 4'e ait kabartma şekil sunulacak)

Buna göre çocuğun sürati ve hızının büyüklüğü sırasıyla kaç m/s (metre/saniye)'dir?

Seçenekler

A) 3 ve 1
B) 6 ve 1
C) 3 ve 2
D) 6 ve 2
E) 3 ve 6

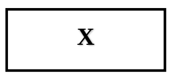
Soru 4'e ait kabartma şekil

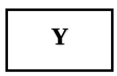


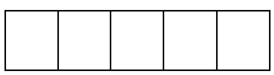
Soru 5. Kabarta şekilde yatay düzlemdeki paralel raylar eşit büyüklükteki dikdörtgen bölmeler ile gösterilmiş, raylarda ok yönünde sabit hızlarla giden X ve Y vagonları ise büyük dikdörtgenler ile temsil edilmiştir. Vagonların t_1 ve t_2 anlarındaki konumları, rayları dik olarak kesen KL ve MN düşey çizgilerine göre görülmektedir. KL ve MN çizgileri arasında her iki rayda da 12 bölme bulunmaktadır. t_1 anında üç bölme uzunluğundaki X vagonunun ön tarafı KL çizgisinde iken iki bölme uzunluğundaki Y vagonunun arka tarafı KL çizgisindedir. t_2 anında X vagonunun arka tarafı MN çizgisinde iken Y vagonunun ön tarafı MN çizgisindedir.

Açıklama

Ok işareti

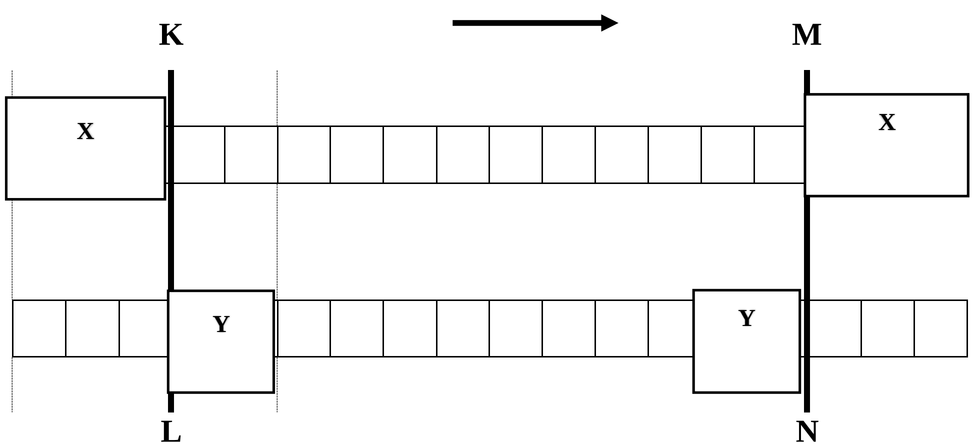
X vagonu 

Y vagonu 

 Raylar

KL ve MN düşey çizgileri

Düşey kesikli hizalama çizgileri



t_1 anındaki konumlar t_2 anındaki konumlar

(Okuyucu tarafından öğrenciye Soru 5'e ait kabartma şekil sunulacak)

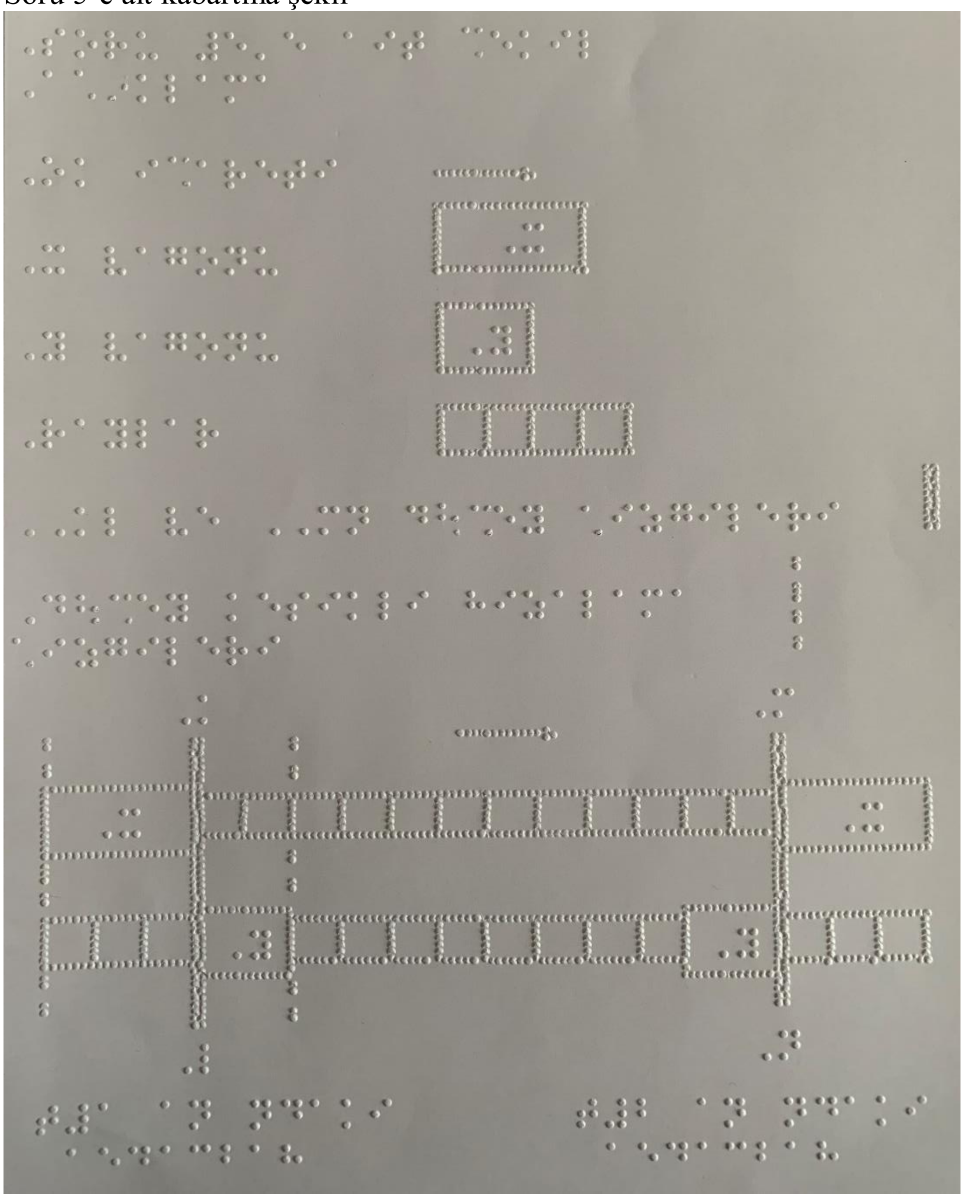
X' in hızının büyüklüğü V_X, Y'ninki V_Y olduğuna göre, $\frac{V_X}{V_Y}$ (V_X bölü V_Y) oranı kaçtır?

(Raylardaki bölmeler eşit aralıklıdır.)

Seçenekler

A) $\frac{9}{4}$ B) $\frac{9}{5}$ C) $\frac{3}{2}$ D) $\frac{4}{3}$ E) $\frac{6}{5}$

Soru 5'e ait kabartma şekil



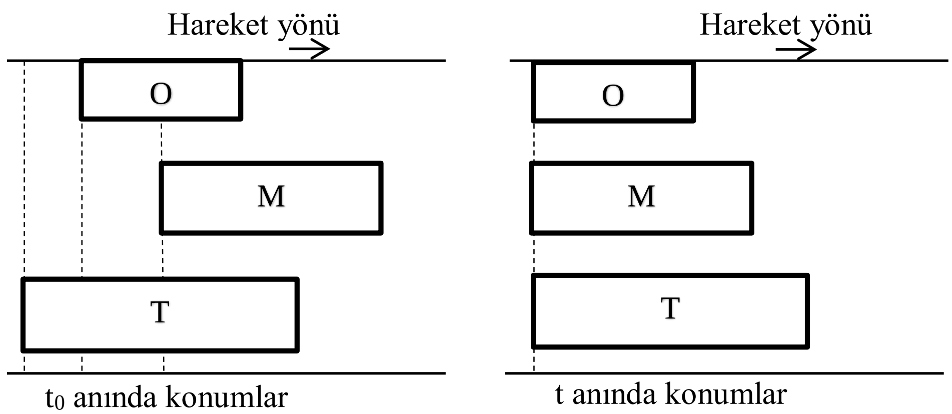
Soru 6. O otomobili, M minibüsü ve T tırı doğrusal yatay bir yolda sabit hızlarla ilerliyor. Farklı boylardaki dikdörtgenler ile temsil edilen araçların birbirlerine göre konumları düşey kesikli çizgiler ile t_0 anı ve t anı için ayrı ayrı kabartılmıştır. t_0 anında araçlarının her birinin arka kısmı farklı hizalarda, t anında ise araçlarının her birinin arka kısmı aynı hizadadır.

Açıklama

Ok işareti →

Düşey kesikli hizalama çizgileri

Araçlar 



(Okuyucu tarafından öğrenciye Soru 6'ya ait kabartma şekil sunulacak)

O, M, T taşıtlarının hızlarının büyüklüğü sırasıyla V_O, V_M, V_T olduğuna göre, bunlar arasındaki ilişki nedir?

Seçenekler (Okuyucuya not: < Küçüktür işareti)

A) $V_O < V_T < V_M$
B) $V_O < V_M < V_T$
C) $V_T < V_M < V_O$
D) $V_M < V_O < V_T$
E) $V_M < V_T < V_O$

Soru 6'ya ait kabartma şekil

Soru 7. Birbirine paralel iki rayda aynı yönde hareket eden K ve L trenlerinin konum-zaman grafiği kabartma baskıda olduğu gibidir. Baskıda yatay eksende olan zaman için t_1 ve t_2 noktaları işaretlenmiş, düşey eksen olan konumda ise X_1 ve X_2 noktaları işaretlenmiştir. K treninin hareketi kesikli tek parça doğrusal çizgi, L treninin hareketi kesikli olmayan üç parça doğrusal çizgi ile belirtilmiştir. Çizgiler eksenlerin kesişim noktasından başlamış ve iki noktada kesişmiştir. Birinci kesişim t_1'den çıkan düşey ve X_1'den çıkan yatay hizalama çizgisinin kesişimi (t_1, X_1), ikinci nokta ise t_2'den çıkan düşey ve X_2'den çıkan yatay hizalama çizgisinin kesişim noktasıdır (t_2, X_2).

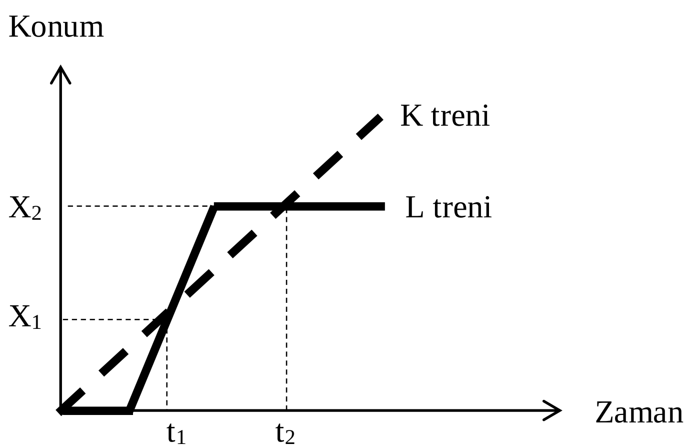
Açıklama

Kesikli hizalama çizgileri

K treni

L treni

Eksen çizgileri



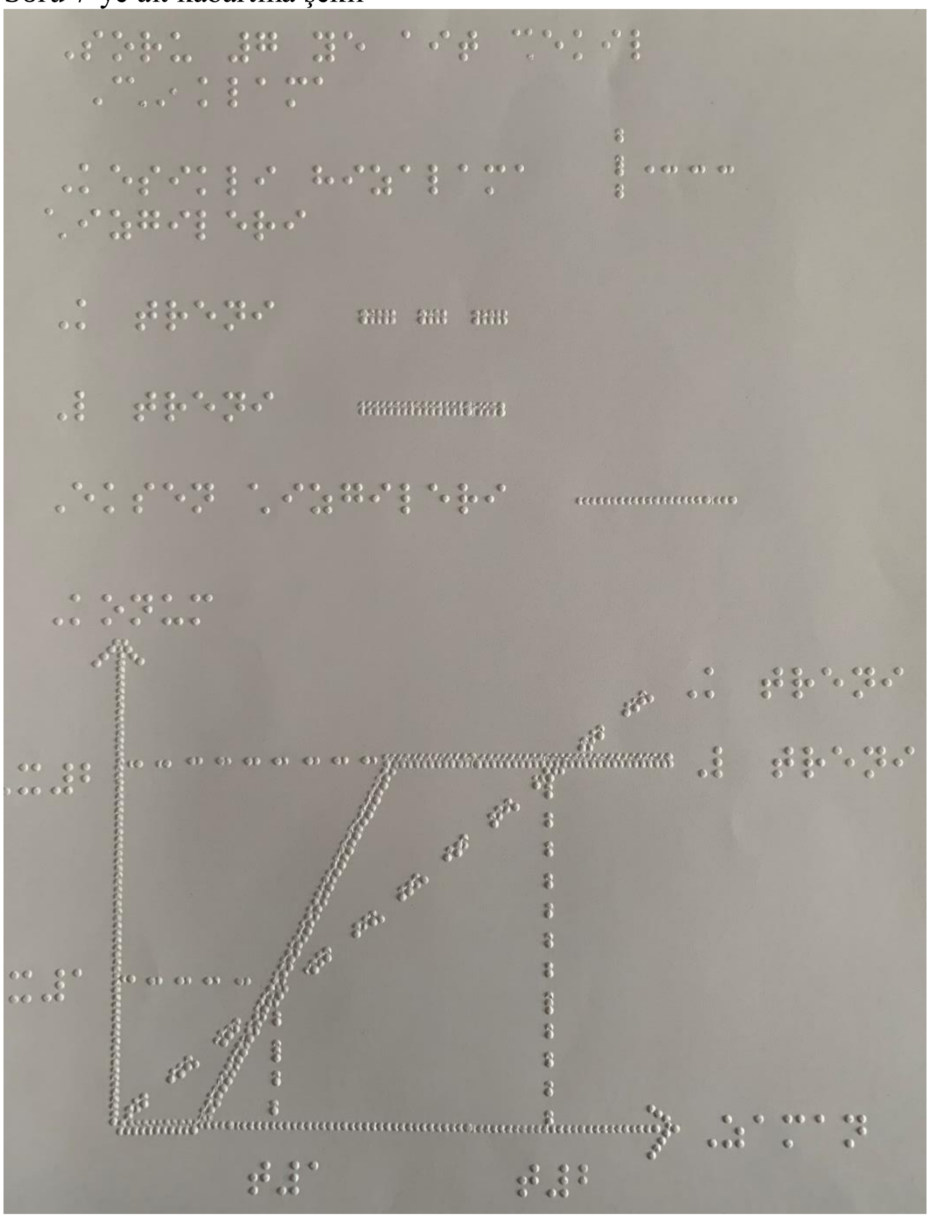
(Okuyucu tarafından öğrenciye Soru 7'ye ait kabartma şekil sunulacak)

Bu grafikten elde edilen bilgilere göre trenlerin hız veya konumları ile ilgili aşağıdaki yargılardan hangisi <u>yanlıştır</u>? (Yanlıştır'ın altı çizili)

Seçenekler

A) t_1 anında trenlerin hızları aynıdır.
B) t_2 anında L treni durmaktadır.
C) K ve L trenleri aynı konumdan harekete başlamıştır.
D) t_1 anında iki tren yan yanadır.
E) t_2 anında iki tren yan yanadır.

Soru 7'ye ait kabartma şekil



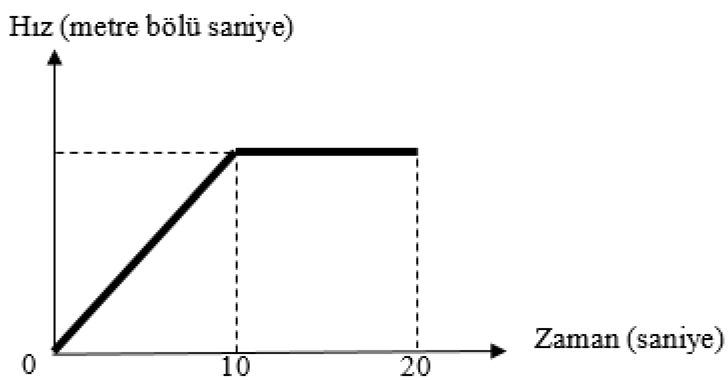
Soru 8. Doğrusal bir yolda hareket eden aracın hız-zaman grafiği kabartma baskıda olduğu gibidir. Yatay eksende olan zaman için 10 ve 20 noktaları, düşey eksen olan hızda değeri belirsiz bir nokta ve eksenlerin kesişiminde 0 noktası işaretlenmiştir Aracın hareketi kesikli olmayan iki parça doğrusal çizgi ile belirtilmiştir. Çizgi 0 (sıfır) noktasından başlamıştır.

Açıklama

Kesikli hizalama çizgileri

Araç

Eksen çizgileri



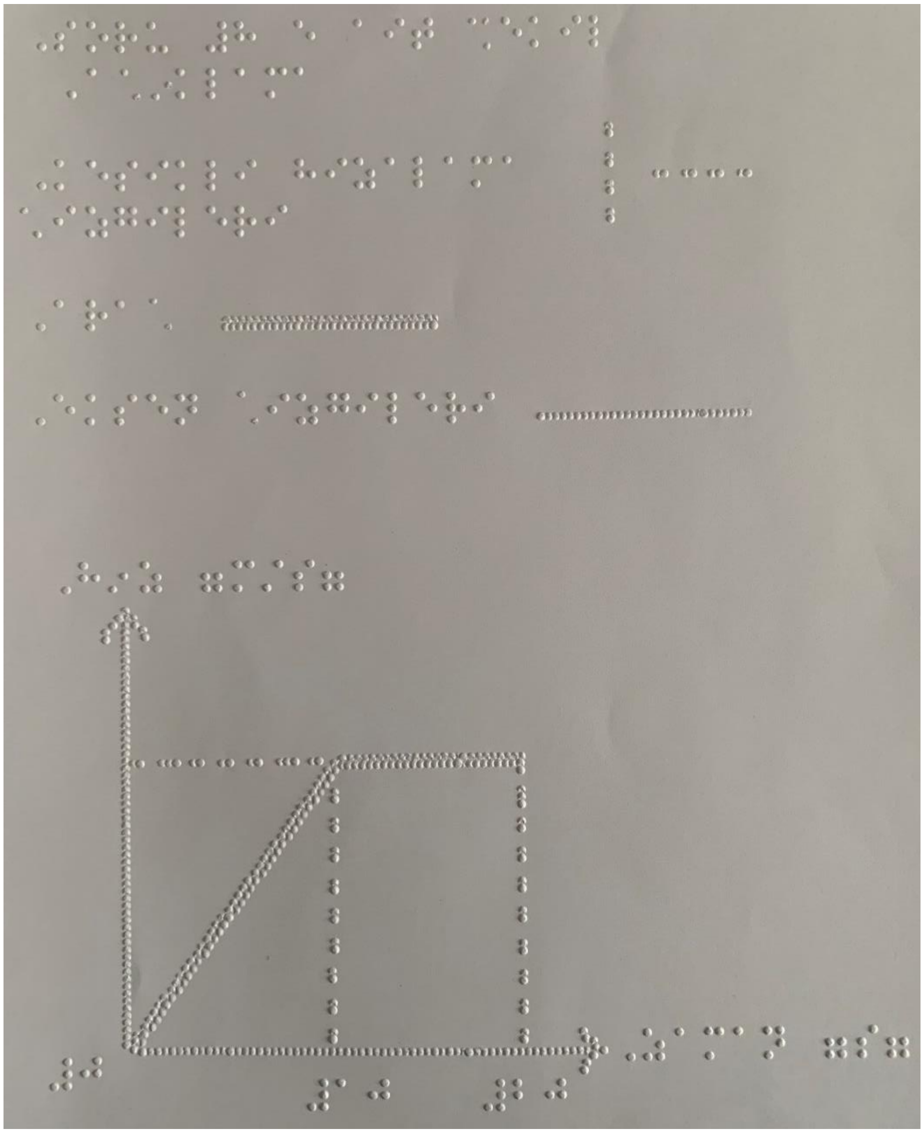
(Okuyucu tarafından öğrenciye Soru 8'e ait kabartma şekil sunulacak)

Bu grafikten elde edilen bilgilere göre, verilen zaman aralıklarında aracın hızı veya yer değiştirmesi ile ilgili aşağıdaki yargılardan hangisi doğrudur?

Seçenekler

A) 0 ile 10 saniye zaman aralığındaki yer değiştirme ile 10 ile 20 saniye zaman aralığındaki yer değiştirme eşittir.
B) 0 ile 10 saniye zaman aralığındaki yer değiştirme, 10 ile 20 saniye zaman aralığındaki yer değiştirmeden daha büyüktür.
C) 10 ile 20 saniye zaman aralığında durmaktadır.
D) 10 ile 20 saniye zaman aralığında sabit hızlıdır.
E) 10 ile 20 saniye zaman aralığında yavaşlamaktadır.

Soru 8'e ait kabartma şekil



Soru 9. Doğrusal bir yolda aynı anda harekete başlayan K ve L cisimlerinin konum-zaman grafiği kabartma baskıda olduğu gibidir. Yatay eksende olan zaman için t noktası, düşey eksen olan konumda X noktası ve eksenlerin kesişiminde 0 (sıfır) noktası işaretlenmiştir. K cisminin hareketi kesikli olmayan, L cisminin hareketi ise kesikli tek parça çizgi ile belirtilmiştir. K çizgisi X noktasından, L çizgisi 0 noktasında başlamıştır.

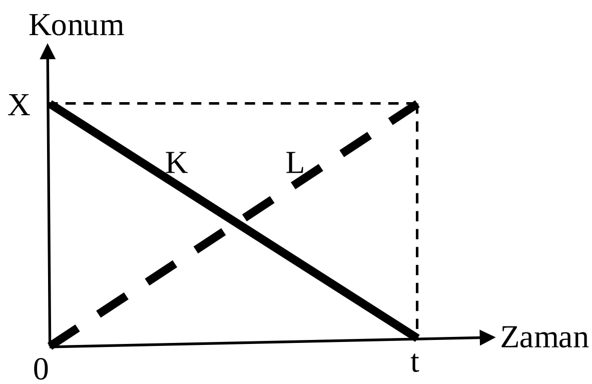
Açıklama

Kesikli hizalama çizgileri

K cismi

L cismi

Eksen çizgileri



(Okuyucu tarafından öğrenciye Soru 9'a ait kabartma şekil sunulacak)

0 ile t zaman aralığında,

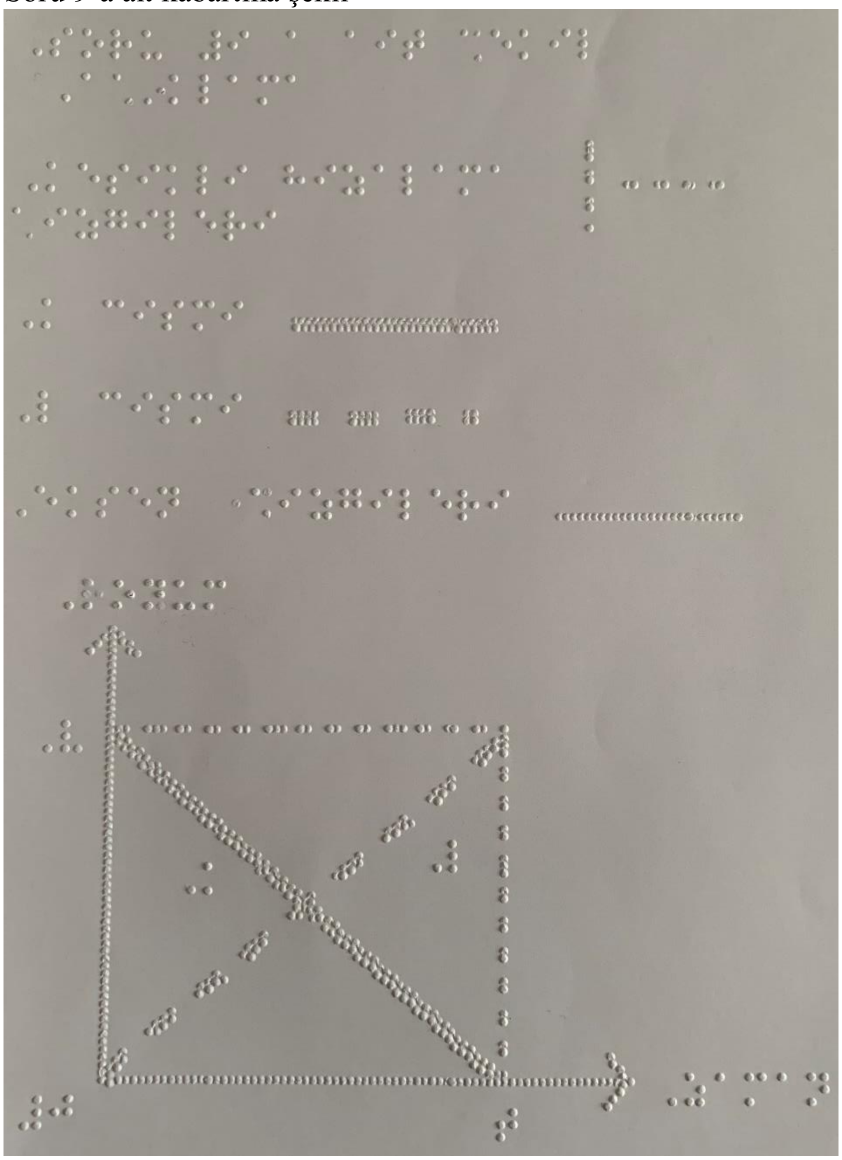
1. K ve L birbirine zıt yönde hareket etmektedir.
2. t süre sonunda K ve L'nin yer değiştirmelerinin büyüklüğü eşittir.
3. K ve L t anında aynı konumdadır.

yargılarından hangileri doğrudur?

Seçenekler

A) Yalnız 1
B) Yalnız 2
C) 1 ve 2
D) 2 ve 3
E) 1, 2 ve 3

Soru 9'a ait kabartma şekil



Soru 10. Bir otobüs yatay doğrusal bir yolda 0 (sıfır) ile t_1 zaman aralığında sabit hızla yoluna devam ederken yolcu almak için t_1 ile t_2 aralığında yavaşlıyor. t_2 ile t_3 aralığında yolcuların binmesi için durgun bekleyen otobüs t_3 ile t_4 aralığında ilk hareketi yönünde hızlanıyor.

Buna göre hangi zaman aralıklarında otobüsün ivmesi sıfırdan farklıdır?

Seçenekler

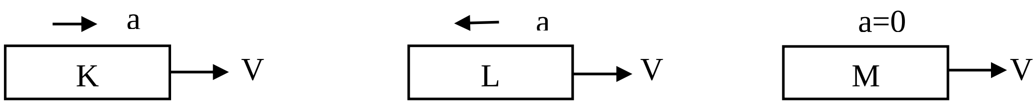
A) 0 ile t_1 ve t_1 ile t_2
B) 0 ile t_1 ve t_2 ile t_3
C) t_1 ile t_2 ve t_2 ile t_3
D) t_2 ile t_3 ve t_3 ile t_4
E) t_1 ile t_2 ve t_3 ile t_4

Soru 11. Dikdörtgenler ile temsil edilen K, L ve M araçlarının hızları aynı iken hareket boyunca sabit değerde olan ivmelerinin yönleri kabartma şekilde verilmiştir.

Açıklama

Ok işareti 

Araçlar 



(Okuyucu tarafından öğrenciye Soru 11'e ait kabartma şekil sunulacak)

Bir süre sonra K, L ve M araçları aynı yönde ilerlerken hızlarının büyüklüğü sırasıyla V_K, V_L, V_M olduğuna göre, bu hızlar arasındaki ilişki nedir?

Seçenekler (Okuyucuya not: > Büyüktür işareti)

A) $V_K > V_M > V_L$
B) $V_K > V_L > V_M$
C) $V_M > V_K > V_L$
D) $V_M > V_L > V_K$
E) $V_L > V_K > V_M$

Soru 11'e ait kabartma şekil

Soru 12. Üç farklı cismin ivmeleri ile ilgili,

1. Düzgün hızlanan cismin ivmesi düzgün artmaktadır.
2. Duran cismin ivmesi sıfırdır.
3. Sabit hızla hareket eden cismin ivmesi sıfırdır.

yargılarından hangileri doğrudur?

Seçenekler

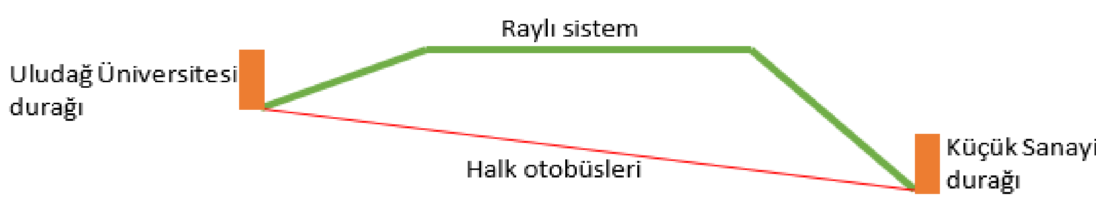
A) Yalnız 2
B) 2 ve 3
C) 1 ve 2
D) 1 ve 3
E) 1, 2, 3

9. Sınıf Fizik Dersi Hareket Başarı Testi (Gören öğrenciler/ Dokunsal Grafikler)

Görmeyenlere dokunsal, görenlere kâğıt kalem testi olarak uygulanacaktır.

12 sorudan oluşan bu test 9. sınıf fizik dersi, Hareket ve Kuvvet ünitesinden seçilen ve yeniden düzenlenen hareket konusundaki üç kazanımın ölçülmesine yönelik hazırlanmıştır. Testi cevaplamaya dilediğiniz sorudan başlayabilirsiniz. Yanlış cevaplarınız doğru cevaplarınızı götürmeyecektir. Tüm sorular eşit puanlıdır.

1. Aşağıdaki şekilde Bursa'daki Küçük Sanayi ile Uludağ Üniversitesi durakları dikdörtgenler ile temsil edilmiştir. Duraklar arasında seferlerini sürdüren halk otobüsleri şekilde tek parça ince çizgi ile gösterilen alt taraftaki güzergâhı, raylı sistem ise üç parçadan oluşan kalın çizgi ile gösterilen üstteki güzergâhı kullanmaktadır.



Buna göre iki durak arasında halk otobüsü ve raylı sistemin hareketine ait niceliklerden hangisi kesinlikle aynıdır?

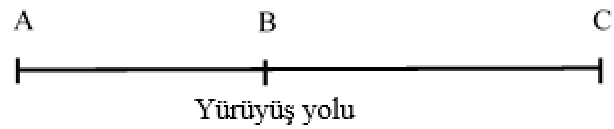
A) Alınan yolları
B) Yer değiştirmeleri
C) Süratleri
D) Hızları
E) Harekete başladıktan sonra herhangi bir t süre sonraki konumları

2. Ayşe öğretmen otobüs durağında beklerken cep telefonunu evde unuttuğunu fark ediyor ve durağın 30 m doğusundaki evine gidip telefonunu alarak duraktaki aynı noktaya aynı yol üzerinden geri dönüyor.

Buna göre Ayşe öğretmenin aldığı yol ve yer değiştirmesinin büyüklüğü sırasıyla kaç m'dir?

	Alınan yol	Yer değiştirme
A)	30	0
B)	30	60
C)	60	30
D)	0	60
E)	60	0

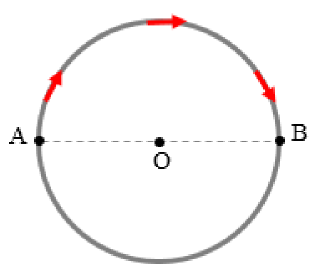
3. Bahar aşağıdaki şekilde gösterilen doğrusal yatay yürüyüş yolunda önce A noktasından B noktasına sonra C noktasına, sonra da C noktasından B noktasına yürüyor.



Sadece A ve B noktaları arasındaki mesafe ile Bahar'ın toplam yürüyüş süresi bilindiğine göre Bahar'ın hareketi ile ilgili aşağıdaki niceliklerden hangisi hesaplanabilir?

A) Hız
B) Sürat
C) AC noktaları arasında aldığı yol
D) Toplam aldığı yol
E) BC arasındaki yer değiştirme

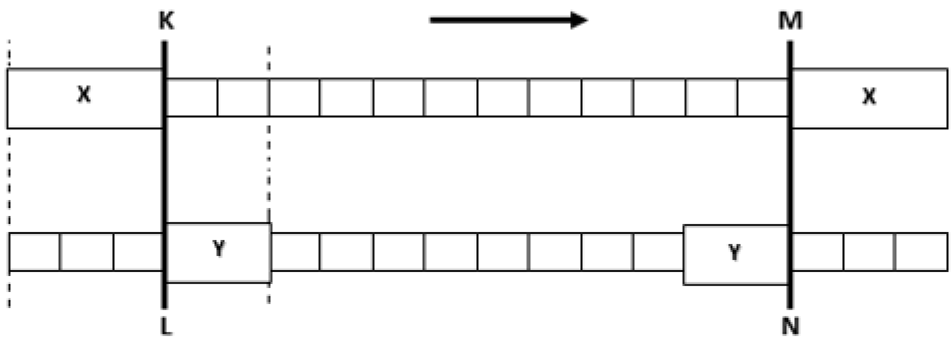
4. Bir çocuk, yarıçapı 3 m, merkezi O noktası olan, şekilde gösterilen çembersel yolda, A noktasından B noktasına çember üzerinde üç adet okla belirtilen yörünge ile 3 s'de gidiyor. Çember üzerinde AB yörüngesinin uzunluğu 9 m'dir.



Buna göre çocuğun sürati ve hızının büyüklüğü sırasıyla kaç m/s'dir?

	Sürat	Hız
A)	3	1
B)	6	1
C)	3	2
D)	6	2
E)	3	6

5. Aşağıdaki şekilde yatay düzlemdeki paralel raylar eşit büyüklükteki dikdörtgen bölmeler ile gösterilmiş, raylarda ok yönünde sabit hızlarla giden X ve Y vagonları ise büyük dikdörtgenler ile temsil edilmiştir. Vagonların t_1 ve t_2 anlarındaki konumları, rayları dik olarak kesen KL ve MN düşey çizgilerine göre görülmektedir. KL ve MN çizgileri arasında her iki rayda da 12 bölme bulunmaktadır. t_1 anında üç bölme uzunluğundaki X vagonunun ön tarafı KL çizgisinde iken iki bölme uzunluğundaki Y vagonunun arka tarafı KL çizgisindedir. t_2 anında X vagonunun arka tarafı MN çizgisinde iken Y vagonunun ön tarafı MN çizgisindedir.

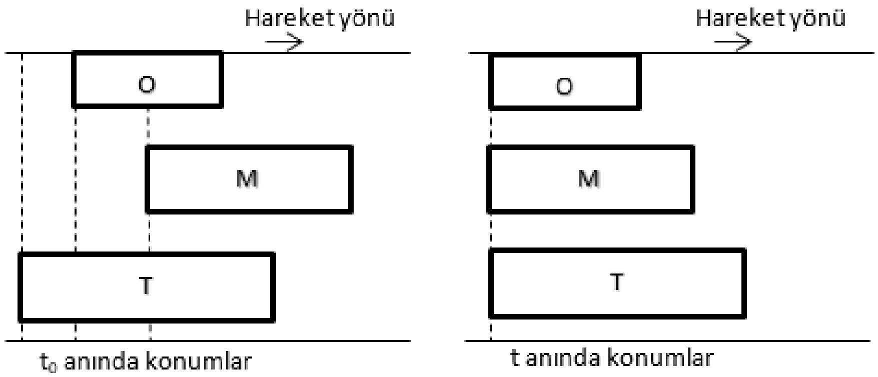


t_1 anındaki konumlar t_2 anındaki konumlar

X' in hızının büyüklüğü V_X, Y'ninki V_Y olduğuna göre $\frac{V_X}{V_Y}$ oranı kaçtır?
(Raylardaki bölmeler eşit aralıklıdır.)

A) $\frac{9}{4}$ B) $\frac{9}{5}$ C) $\frac{3}{2}$ D) $\frac{4}{3}$ E) $\frac{6}{5}$

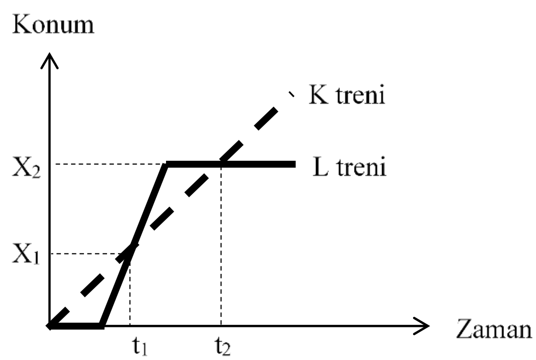
6. O otomobili, M minibüsü ve T tırı doğrusal yatay bir yolda sabit hızlarla ilerliyor. Farklı boylardaki dikdörtgenler ile temsil edilen araçların birbirlerine göre konumları düşey kesikli çizgiler ile t_0 anı ve t anı için ayrı ayrı gösterilmiştir. t_0 anında araçlarının her birinin arka kısmı farklı hizalarda, t anında ise araçlarının her birinin arka kısmı aynı hizadadır.



O, M, T taşıtlarının hızlarının büyüklüğü sırasıyla V_O, V_M, V_T olduğuna göre, bunlar arasındaki ilişki nedir?

A) $V_O < V_T < V_M$
B) $V_O < V_M < V_T$
C) $V_T < V_M < V_O$
D) $V_M < V_O < V_T$
E) $V_M < V_T < V_O$

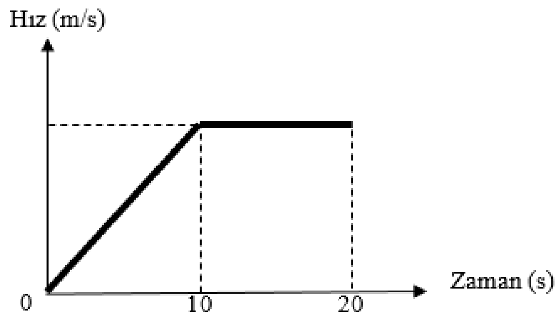
7. Birbirine paralel iki rayda aynı yönde hareket eden K ve L trenlerinin konum-zaman grafiği aşağıdaki gibidir. Yatay eksende olan zaman için t_1 ve t_2 noktaları işaretlenmiş, düşey eksen olan konumda ise X_1 ve X_2 noktaları işaretlenmiştir. K treninin hareketi kesikli tek parça doğrusal çizgi, L treninin hareketi kesikli olmayan üç parça doğrusal çizgi ile belirtilmiştir. Çizgiler eksenlerin kesişim noktasından başlamış ve iki noktada kesişmiştir. Birinci kesişim t_1'den çıkan düşey ve X_1'den çıkan yatay hizalama çizgisinin kesişimi (t_1, X_1), ikinci nokta ise t_2'den çıkan düşey ve X_2'den çıkan yatay hizalama çizgisinin kesişim noktasıdır (t_2, X_2).



Bu grafikten elde edilen bilgilere göre trenlerin hız veya konumları ile ilgili aşağıdaki yargılardan hangisi <u>yanlıştır</u>?

A) t_1 anında trenlerin hızları aynıdır.
B) t_2 anında L treni durmaktadır.
C) K ve L trenleri aynı konumdan harekete başlamıştır.
D) t_1 anında iki tren yan yanadır.
E) t_2 anında iki tren yan yanadır.

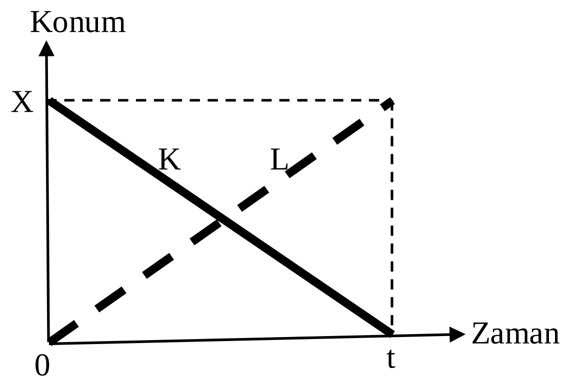
8. Doğrusal bir yolda hareket eden aracın hız-zaman grafiği aşağıdaki gibidir. Yatay eksende olan zaman için 10 ve 20 noktaları, düşey eksen olan hızda değeri belirsiz bir nokta ve eksenlerin kesişiminde 0 noktası işaretlenmiştir Aracın hareketi kesikli olmayan iki parça doğrusal çizgi ile belirtilmiştir. Çizgi 0 noktasından başlamıştır.



Bu grafikten elde edilen bilgilere göre, verilen zaman aralıklarında aracın hızı veya yer değiştirmesi ile ilgili aşağıdaki yargılardan hangisi doğrudur?

A) 0 ile 10 s zaman aralığındaki yer değiştirme ile 10 ile 20 s zaman aralığındaki yer değiştirme eşittir.
B) 0 ile 10 s zaman aralığındaki yer değiştirme, 10 ile 20 s zaman aralığındaki yer değiştirmeden daha büyüktür.
C) 10 ile 20 s zaman aralığında durmaktadır.
D) 10 ile 20 s zaman aralığında sabit hızlıdır.
E) 10 ile 12 s zaman aralığında yavaşlamaktadır.

9. Doğrusal bir yolda aynı anda harekete başlayan K ve L cisimlerinin konum-zaman grafiği aşağıdaki gibidir. Yatay eksende olan zaman için t noktası, düşey eksen olan konumda X noktası ve eksenlerin kesişiminde 0 noktası işaretlenmiştir. K cisminin hareketi kesikli olmayan, L cisminin hareketi ise kesikli tek parça çizgi ile belirtilmiştir. K çizgisi X noktasından, L çizgisi 0 noktasında başlamıştır.



0 ile t zaman aralığında,

I. K ve L birbirine zıt yönde hareket etmektedir.
II. t süre sonunda K ve L'nin yer değiştirmelerinin büyüklüğü eşittir.
III. K ve L t anında aynı konumdadır.

yargılarından hangileri doğrudur?

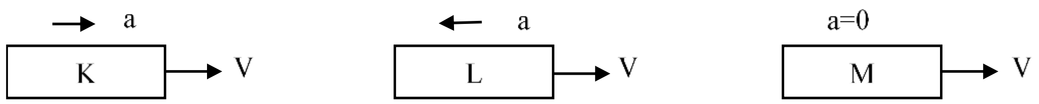
A) Yalnız I
B) Yalnız II
C) I ve II
D) II ve III
E) I, II ve III

10. Bir otobüs (0-t_1) zaman aralığında sabit hızla yoluna devam ederken yolcu almak için (t_1-t_2) aralığında yavaşlıyor. (t_2-t_3) aralığında yolcuların binmesi için durgun bekleyen otobüs (t_3-t_4) aralığında hızlanıyor.

Buna göre hangi zaman aralıklarında otobüsün ivmesi sıfırdan farklıdır?

A) 0-t_1 ve t_1-t_2
B) 0-t_1 ve t_2-t_3
C) t_1-t_2 ve t_2-t_3
D) t_2-t_3 ve t_3-t_4
E) t_1-t_2 ve t_3-t_4

11. Dikdörtgenler ile temsil edilen K, L ve M araçlarının hızları aynı iken hareket boyunca sabit değerde olan ivmelerinin yönleri şekilde verilmiştir.



Bir süre sonra K, L ve M araçları aynı yönde ilerlerken hızlarının büyüklüğü sırasıyla V_K, V_L, V_M olduğuna göre, bu hızlar arasındaki ilişki nedir?

A) $V_K > V_M > V_L$
B) $V_K > V_L > V_M$
C) $V_M > V_K > V_L$
D) $V_M > V_L > V_K$
E) $V_L > V_K > V_M$

12. Üç farklı cismin ivmeleri ile ilgili,

I. Düzgün hızlanan cismin ivmesi düzgün artmaktadır.
II. Duran cismin ivmesi sıfırdır.
III. Sabit hızla hareket eden cismin ivmesi sıfırdır.

yargılarından hangileri doğrudur?

A) Yalnız II
B) II ve III
C) I ve II
D) I ve III
E) I, II ve III

G. Teacher Guide for Testing Accommodations

SINAV DÜZENLEMELERİNE YÖNELİK ÖĞRETMEN KILAVUZU

Lütfen aşağıdaki maddeleri dikkatlice okuyunuz. Testin tüm gruplarda aynı düzende yürütülebilmesi için burada belirtilen ifadeler son derece önemlidir.

Desteğiniz için teşekkürlerimi sunarım.

- Öğrencinin sizi rahatça duyabileceği bir yere oturunuz.
- Teste başlamadan kitapçığın ilgili kısımlarını doldurunuz.
- Test yönergesini öğrenciye okuyunuz.
- Her 10 dakikada öğrencilere süreyi hatırlatınız.
- Türkçeyi doğru ve yalın kullanınız.
- Okuma hızınızı ve akıcılığınızı öğrencinizin görüşünü de alarak adaya uygun olarak ayarlayınız.
- Soru metinini öğrencinizin takip edebileceği hız ve ses tonunda tane tane okuyunuz.
- Soruyu okumaya başlarken, kaçıncı sorusunu okuduğunuzu söyleyiniz.
- Soruyu öğrencinizin isteği kadar tekrar ediniz.
- Öğrenci sizi önce soru kökünü, soru metnini ya da numaralandırılmış yargıları okumanız konusunda yönlendirirse, bir okuma sıralaması tercihinde bulunursa soruyu öğrencinin belirttiği sırada okuyunuz.
- Test soruları hakkında yorum yapmayınız.
- Öğrenci cevap vermek yerine size "A seçeneği olabilir", "B şıkkı mı acaba?", …vb. ifadeler kullandığında "Cevabın nedir?" diye sorunuz.
- Doğru seçenek hakkında görüş belirtmeyiniz.
- Öğrenci sorunun ya da seçeneklerin hatalı/eksik olduğunu belirtiyorsa "En doğru olduğunu düşündüğü seçeneği cevaplamasını" söyleyiniz. Sorunun sınavdan sonra inceleneceğini ve kontrol edileceğini belirtiniz.
- Seçeneklere geçerken "Seçenekler" deyiniz.
- Soru cümlesi ya da seçeneklerde altı çizilmiş sözcük ya da cümle varsa, kitapçıkta bu sözcüğün ardında (yanlıştırın altı çizili) ifadesi bulunmaktadır. Parantez içindeki bu ifadeleri okuyunuz.
- Sorularda parantez içerisinde başka ifadeler de bulunabilir. "Parantez içinde" deyiniz, gerekli ifadeyi okuyunuz, daha sonra bir saniye kadar bekleyip okumaya devam ediniz.
- Sorularda kullanılan birim ve semboller için gerekli yerlerde parantez içinde açıklama yapılmıştır. m/s (metre bölü saniye) gibi. Bu ifadeleri okuyunuz.
- Seçeneklerde yer alan semboller için seçeneklere geçilmeden önce parantez içinde okuyucuya not yazılmıştır. (Okuyucuya not: > Büyüktür işareti) gibi. Seçeneklerdeki sembolleri parantez içindeki açıklaması ile uyumlu şekilde okuyunuz.

- Her dokunsal grafik öncesinde yer alan *Açıklamalar* kısmında yazanları öğrenciye okuyunuz.
- Açıklamalar kısmında her ifadeyi okuduktan sonra, ifade ile ilgili olan dokunsal alan üzerinde öğrencinin parmağına nazikçe rehberlik ediniz. Öğrenci bunu istemezse rehberlik etmeyiniz.
- Açıklamalar kısmından sonra dokunsal grafik alanı üzerinde öğrencinin parmağına şeklin üzerinde rehberlik ediniz. Öğrenci parmağını soruda bahsi geçen bir noktaya/bölgeye götürmenizi isterse götürünüz.
- Öğrenci dokunsal grafikleri incelerken soruyu okumanızı isterse okuyunuz.
- Dokunsal grafiği açıklamayınız ya da tarif etmeyiniz.
- Öğrencinin işaretlenmesini istediği seçeneği işaretledikten sonra, bir daha yüksek sesle tekrarlayarak öğrencinin onayını alınız.
- Test süresi dolduğunda kitapçığını kapatınız.

H. Test Instructions Form

GÖREN ÖĞRENCİ SINAV YÖNERGESİ

Size sunulacak testler 9. sınıf fizik dersi, Hareket ve Kuvvet ünitesinden seçilen ve yeniden düzenlenen hareket konusundaki üç kazanımın ölçülmesine yönelik hazırlanmıştır. Size kısa aralıklarla üç test sunulacaktır. Her test, bir önceki testin tüm kitapçıkları sizden toplandıktan sonra başlayacaktır. Size verilen testi cevaplamaya dilediğiniz sorudan başlayabilirsiniz. Yanlış cevaplarınız doğru cevaplarınızı götürmeyecektir. Cevaplarınızı testin sonundaki alana kodlamayı unutmayınız. Tüm sorular eşit puanlıdır. Her test kitapçığının başında, test için verilen süre belirtilmiştir. Lütfen teste başlamadan kitapçığın başındaki ilgili kısımları doldurunuz.

GÖRMEYEN ÖĞRENCİ SINAV YÖNERGESİ

Size sunulacak testler 9. sınıf fizik dersi, Hareket ve Kuvvet ünitesinden seçilen ve yeniden düzenlenen hareket konusundaki üç kazanımın ölçülmesine yönelik hazırlanmıştır. Size kısa aralıklarla üç test sunulacaktır. Her test, bir önceki testin tüm kitapçıkları sizden toplandıktan sonra başlayacaktır. Size verilen testi cevaplamaya dilediğiniz sorudan başlayabilirsiniz. Yanlış cevaplarınız doğru cevaplarınızı götürmeyecektir. Tüm sorular eşit puanlıdır. Her testin başlangıcında test için verilen süre size söylenecektir. Sınav sırasında:

- Okuyucuyu rahatça duyabildiğinizden emin olun.
- Okuyucunun okuma hızı ve akıcılığını uygun bulmuyorsanız görüşünüzü belirtin. “Daha hızlı/yavaş okuyabilirsiniz” gibi.
- Sorunun tekrar okunmasını istiyorsanız okuyucuya söyleyin.
- Sorunun tamamının değil belirli kısmının okunması istiyorsanız bunu açıkça belirtin. “Seçenekleri tekrar okur musunuz?” gibi.
- Önce soru kökünün, soru metninin ya da numaralandırılmış yargıların okunması konusunda tercihiniz olursa belirtin.
- Okuyucudan test soruları hakkında yorum ya da açıklama yapmasını istemeyin.
- Cevabınızı anlaşılır şekilde söyleyin.
- Eğer isterseniz dokunsal grafiklerde okuyucu parmağınıza rehberlik edebilir.
- Parmağınızın soruda bahsi geçen bir noktaya/bölgeye götürülmesini isterseniz okuyucuya söyleyiniz.
- Dokunsal grafikleri parmağınızla incelerken okuyucudan soruyu ya da seçenekleri okumasını isteyebilirsiniz.

I. Observation Checklist for Testing Accommodations

SINAV UZLAŞMALARI İÇİN GÖZLEM KONTROL LİSTESİ

Okul : Sınav düzenlemesi yapılmayan HBT ( )

Sınıf : Betimlemeli HBT ( )

Tarih : Dokunsal HBT ( )

		Evet	Hayır	Açıklama
Gören öğrenciler;				
Testi fiziki koşulları uygun bir ortamda aldılar.				
Test sorularını okumak konusunda sıkıntı yaşamadılar.				
Test sorularını kodlamak konusunda sıkıntı yaşamadılar.				
Verilen süre içinde testi cevapladılar.				
Görmeyen öğrenciler;				
Bireysel Uygulama	Öğrenci testi, fiziki koşulları gören öğrenciler ile eşdeğer olan bir ortamda aldı.			
Okuyucu	Öğrencinin kendisini rahatlıkla duyabileceği bir yere oturdu.			
	Soruları test kitapçığında yazıldığı gibi eksiksiz okudu.			
	Okuma hızını ve ses tonunu öğrencinin görüşünü alarak ayarladı.			
	Öğrenci istediğinde soruları tekrar okudu.			
	Soruları hakkında yorum yapmadı.			
	Doğru seçenek hakkında görüş belirtmedi.			
	Türkçeyi doğru ve yalın kullandı.			
	Eğer sorularda özel açıklamalar yapılmışsa (altı çizili sözcük,			

	sembol açıklamaları gibi) bu açıklamalara uydu.			
	Öğrenci istediğinde kabartma metin ya da kabartma şekillere dokunması konusunda öğrenciye rehberlik etti.			
Kodlayıcı	Öğrencinin adını test kitapçığına yazdı.			
	Öğrenci cevapladığında cevapları kitapçığa anlaşılır şekilde kodladı.			
	Kodlamayı yaptıktan sonra, bir daha yüksek sesle tekrarlayarak cevabı teyit etti.			
	Kodlama ile ilgili işlemleri öğrencinin görüşünü alarak uygun hızda ayarladı.			
Ek Süre	Öğrenciye %50 ek süre verildi.			
Dokunsal kitapçık	Öğrenci elini kabartma test kitabındaki yazı/şekillerin üzerinde uygun şekilde gezdirdi.			
Dokunsal şekiller	Öğrenci elini kabartma şekillerin üzerinde uygun şekilde gezdirdi.			

J. Sample Pages of Ninth Grade Physics Textbook

Gören öğrenci ders kitabı, sf. 113

Bir yaya, kuş bakışı görüntüsü yukarıda verilen yolu izleyerek A konumundan B konumuna ulaşıyor. Buna göre,

a) Yayanın katettiği yolun uzunluğu kaç metredir?

b) Yaya kaç m yer değiştirme yapmıştır?

c) Yolcu, mavi çizgili yolu izleyerek A noktasına geri dönerse toplamda kaç metre yol almış ve kaç m yer değiştirme yapmış olur?

Kör öğrenci için hazırlanan ders kitabında ilgili şeklin betimlemesi ve mürekkep baskısı

Betimleme 9 (sf 113-Örnek soru):

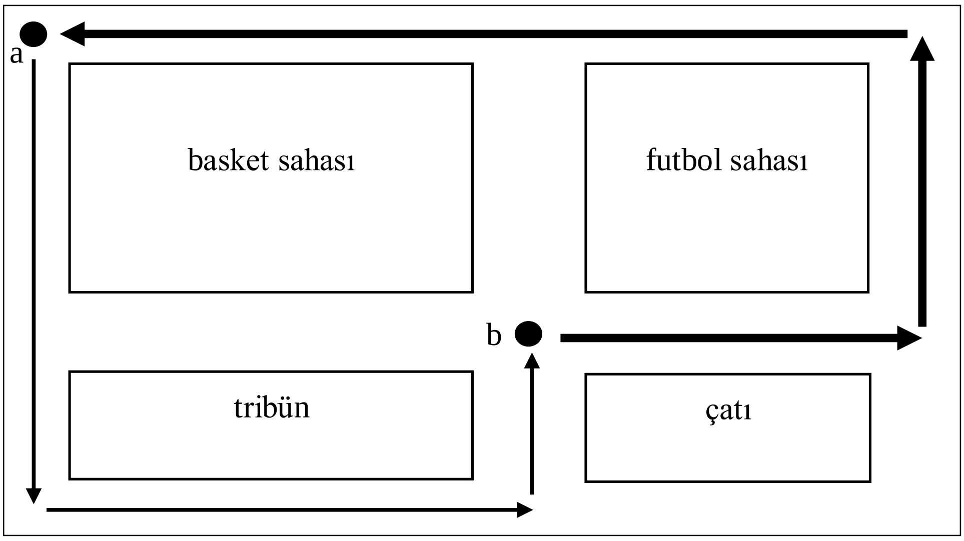
Şekilde dikdörtgen çerçevenin içinde sol üstte basket sahası, sol altta tribün, sağ üstte futbol sahası, sağ altta bina çatısı kuşbakışı görülmektedir. a noktası dikdörtgen çerçevenin sol üst köşesindedir. a noktasından güneye 33 m, doğuya 24 m, kuzeye 23 m uzunluğunda oklar çizilmiştir. Oklar b noktasına ulaşmaktadır. b noktasından doğuya 19 m, kuzeye 10 m, batıya 43 m uzunluğunda kalın oklar çizilmiştir. Oklar A noktasına ulaşmaktadır.

Açıklamalar:

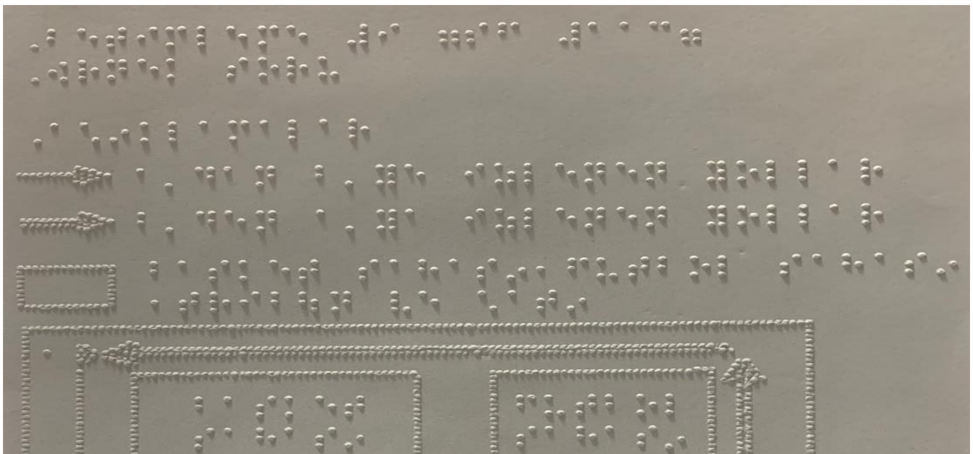
a’dan b’ye izlenen yollar

b’den a’ya izlenen yollar

basket sahası, futbol sahası, tribün ve çatılar



Kör öğrenci için hazırlanan ders kitabında ilgili şeklin Braille baskısı



K. Permission

T.C.
MİLLÎ EĞİTİM BAKANLIĞI
Yenilik ve Eğitim Teknolojileri Genel Müdürlüğü

Sayı : 81576613/605.01/21287855 — 08.11.2018
Konu: Araştırma İzni

ORTA DOĞU TEKNİK ÜNİVERSİTESİ REKTÖRLÜĞÜNE

İlgi: a)Orta Doğu Teknik Üniversitesi Rektörlüğünün 02/11/2018 tarihli ve 54850036-044-E52 sayılı yazısı
b) Millî Eğitim Bakanlığının 22/08/2017 tarihli ve 35558626-10.06.01-E.12607291 (2017/25) sayılı genelge

İlgi yazı (a) ile Orta Doğu Teknik Üniversitesi Ortaöğretim Fen ve Matematik Alanları Eğitimi Anabilim Dalı Doktora Programı öğrencisi Arzu ÖDEN ACAR'ın "Sınav Uzlaşması Kullanımının Dokuzuncu Sınıf Gören ve Total Görmeyen Öğrencilerin Hareket Konusunda Başarılarına Etkisi" konulu doktora tezi kapsamında hazırladığı veri toplam araçlarının İstanbul, Balıkesir, Bilecik, Bursa, Çanakkale, Kocaeli, Sakarya ve Yalova illerinde bulunan her tür ve derecedeki liselerde öğretim gören öğrencilere uygulanmasına yönelik araştırma izin talebi Genel Müdürlüğümüz tarafından incelenmiştir.

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Gereğini bilgilerinize rica ederim.

Anıl YILMAZ
Bakan a.
Genel Müdür V.

Güvenli Elektronik İmzalı
Aslı ile Aynıdır
08/11/2018
Sevda BERKİTEN
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08 EKİM 2018

Konu: Değerlendirme Sonucu

Gönderen: ODTÜ İnsan Araştırmaları Etik Kurulu (İAEK)

İlgi: İnsan Araştırmaları Etik Kurulu Başvurusu

Sayın Doç.Dr. Ali ERYILMAZ

Danışmanlığını yaptığınız doktora öğrencisi Arzu ÖDEN ACAR'ın **"Sınav Uzlaşması Kullanımının Dokuzuncu Sınıf Gören ve Total Göremeyen Öğrencilerin Hareket Konusunda Başarılarına Etkisi"** başlıklı araştırmanız İnsan Araştırmaları Etik Kurulu tarafından uygun görülerek gerekli onay **2018-EGT-131** protokol numarası ile **22.10.2018 - 31.06.2019** tarihleri arasında geçerli olmak üzere verilmiştir.

Bilgilerinize saygılarımla sunarım.

Prof. Dr. Ş. Halil TURAN
Başkan V

Prof. Dr. Ayhan SOL
Üye

Prof. Dr. Ayhan Gürbüz DEMİR
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FOREIGN LANGUAGES

English