THE EFFECTS OF REAL DATA BASED AND CALCULATOR SUPPORTED STATISTICS ACTIVITIES ON 7TH GRADE STUDENTS' STATISTICS PERFORMANCE AND ATTITUDE TOWARD STATISTICS

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Prof. Dr. Canan ÖZGEN
Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science

Prof. Dr. Ömer GEBAN
Head of Department

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science

Assist. Prof. Dr. Erdinç Çakıroğlu
Supervisor

Assoc. Prof. Dr. Safure Bulut (METU, SSME)

Assist. Prof. Dr. Erdinç Çakıroğlu (METU, ELE)

Assist. Prof. Dr. Semra Sungur (METU, ELE)

Dr. Yusuf KOÇ (METU, ELE)

Dr. Yeşim ÇAPA AYDIN (METU, EDS)

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name, Last name: Sevgül YILMAZ

Signature :

ABSRACT

THE EFFECTS OF REAL DATA BASED AND CALCULATOR SUPPORTED STATISTICS ACTIVITIES ON 7TH GRADE STUDENTS' STATISTICS PERFORMANCE AND ATTITUDE TOWARD STATISTICS

YILMAZ, Sevgül

M.S., Department of Secondary Science and Mathematics Education

Supervisor: Assist. Prof. Dr. Erdinç ÇAKIROĞLU

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The purpose of the study was to investigate the effects of real data based and calculator supported statistics activities on 7th grade students' statistics performance and attitudes towards statistics when the statistics performance of the students prior to the instruction and the previous mathematics grades were controlled. A quasi-experimental design was used to investigate the research problem. The research was conducted by 84 seventh grade students. There were three groups in the study. Two of them were experimental groups and one of them was control group. The first group received instruction by the traditional method (TM), the second group received instruction by real data based and calculator supported statistical activities (RDBCSSA), and the third group was instructed by real data based statistical activities (RDBSA), the number of the subjects was 28, 27 and 29 respectively.

Data were collected through three different measuring instruments: 1.Statistical Performance Test 1 (SPT1); 2.Statistical Performance Test 2 (SPT2); 3.Statistics Attitude Scale (SAS). The SPT1 was used as a pre-test. The SPT2 was administered as a post-test. SPT1 and SPT2 were used to determine the statistics performance of

the students before and after the instruction. SAS was used to determine the attitudes of the students toward statistics.

The data of this study were analyzed by analysis of variance (ANOVA) and analysis of covariance (ANCOVA). The results revealed that there was no significant mean difference among the groups with respect to statistics performance. Also there was no significant mean difference among the groups with respect to attitudes towards statistics. The mean scores of the Statistics Attitude Scale items were calculated and the results revealed that the students had positive attitudes to the statements in Statistics Attitude Subscale 1 (Confidence in Learning Statistics) and they were neutral to the statements of the Statistics Attitude Subscale 2. Also the students wrote their opinions about the teaching methods and their impressions were analyzed by making a frequency table. Most of the TM students mentioned that the examples should be more attractive such that the activity sheets could contain real data based examples. However some of the students mentioned that traditional method was good and the subject was understood very well. Most of the RDBSA students mentioned that the teaching method was enjoyable. Most of the RDBCSSA students expressed that the calculators made the lessons enjoyable and the study easy.

KeyWords: Statistics Education, Calculator Based Instruction, Real Data Based Instruction, Mathematics Education

ÖZ

GERÇEK VERİYE DAYALI VE HESAP MAKİNESİ İLE DESTEKLENEN İSTATİSTİK ETKİNLİKLERİNİN, YEDİNCİ SINIF ÖĞRENCİLERİNİN İSTATİSTİK PERFORMANSINA VE İSTATİSTİĞE YÖNELİK TUTUMUNA ETKİLERİ

YILMAZ, Sevgül
Yüksek Lisans, Orta Öğretim Fen ve Matematik Alanları Eğitimi Bölümü
Tez Yöneticisi: Yard. Doç. Dr. Erdinç ÇAKIROĞLU
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Bu çalışmanın amacı, gerçek veriye dayalı ve hesap makinesi ile desteklenen istatistik etkinliklerinin, yedinci sınıf öğrencilerinin istatistik performansı ve istatistiğe yönelik tutumları üzerindeki etkisini, öğrencilerin öğretimden önceki istatistik performansları ve önceki matematik notları kontrol edilerek incelemektir. Araştırma problemini incelemek için yarı deneysel bir yöntem kullanılmıştır. Çalışma 84 yedinci sınıf öğrencisi ile uygulanmıştır. Çalışmada üç grup vardı. Gruplardan ikisi deneysel, diğeri kontrol grubu olarak ayrılmıştır. Birinci grup geleneksel yöntem (GY) ile öğretim aldı, ikinci grup gerçek veriye dayalı ve hesap makinesi destekli istatistik etkinlikleri (GBDHMDİE) ile öğretim almıştır ve üçüncü grup gerçek veriye dayalı istatistik etkinlikleri (GBDİE) ile öğretim almıştır. Denek sayıları sırayla 28, 27 and 29'dur.

Bu araştırmada veri üç farklı ölçme aracı kullanılarak derlenmiştir: 1. İstatistik Performans Testi 1 (İPT1); 2. İstatistik Performans Testi 2 (İPT2); 3. İstatistik Tutum

Ölçeği (İTÖ). İPT1 öntest olarak kullanılmıştır. İPT2 ise sontest olarak uygulanmıştır. İPT1 ve İPT2 testleri öğrencilerin çalışmadan önceki ve sonraki istatistik performanslarını belirlemek amaçlı kullanılmıştır. İTÖ öğrencilerin istatistiğe karşı tutumlarını belirlemek amaçlı uygulanmıştır.

Bu araştırmanın verilerini analiz etmek için varyans ve kovaryans analizi kullanılmıştır. Sonuçlar, gruplar arasında istatistik performansı açısından anlamlı bir farkın olmadığını göstermektedir. Yine, gruplar arasında istatistik tutumu açısından da anlamlı bir fark yoktur. İstatistik Tutum Ölçeğinin maddelerinin ortalama puanları hesaplanmıştır ve sonuçlar, öğrencilerin İstatistik Tutum Altölçeği 1 (İstatistik Öğrenmede Güven) ifadelerine karşı pozitif tutumları olduğunu ve İstatistik Tutum Altölçeği 2 (İstatistikten Zevk Alma) ifadelerine karşı tarafsız oldukları ortaya çıkarmıştır. Aynı zamanda öğrenciler öğretim yöntemleri ile ilgili görüşleri yazdılar ve izlenimleri frekans tablosu yapılarak analiz edildi. Çoğu GY öğrencisi örneklerin daha ilgi çekici olabileceğini öyleki çalışma kağıtlarının gerçek veriye dayalı örnekler içerebileceğini belirtmişlerdir. Bununla birlikte bazı öğrenciler geleneksel yöntemin iyi bir yöntem olduğu ve konunun iyi anlaşıldığını ifade etmişlerdir. GBDİE öğrencilerinin çoğu öğretim yöntemlerinin eğlenceli olduğunu belirtmişlerdir. GBDHMDİE öğrencilerinin çoğunluğu ise hesap makinelerinin dersleri eğlenceli hale getirdiğini ve çalışmayı kolaylaştırdığını ifade etmişlerdir.

Anahtar Kelimeler: İstatistik Eğitimi, Hesap Makinesine Dayalı Öğretim, Gerçek Veriye Dayalı Öğretim, Matematik Öğretimi

Dedicated to the families of Yılmaz and Fıçıcı

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ABBREVIATIONS

Abbreviation	Explanation
TM	Traditional Method
RDBSA	Real Data Based Statistical Activities
RDBCSSA	Real Data Based and Calculator Supported Statistical Activities
SPT	Statistics Performance Test
SAS	Statistics Attitude Scale
NCTM	National Council of Teachers of Mathematics

CHAPTER I

INTRODUCTION

The importance of the statistics education and the need for a reform in the instruction practices has been recently recognized in the school mathematics curriculum. Çakıroğlu (1994) explained that since statistical data take more place in our lives, the skills to work with such information became more important in the society when the newspapers are examined, it can be seen that statistics is integrated with many aspects of our lives. To be able to benefit from statistical information the students are expected to develop statistical methods as a way of decision-making. Statistical literacy is given more importance in the reform movement of the statistics instruction and the students should judge statistical claims from the media to being statistically literate (Watson & Moritz, 1997). Moore (1997) focused on a movement to reform the teaching of statistics such that the researchers and teachers should focus on the synergy between content, pedagogy, and technology.

As access to technology continues to grow in schools through-out the world, technology will become an inescapable part of data analysis (Shaughnessy, Garfield and Greer, 1996). Various new technologies offer opportunities and facilities to statistics education such that graphing calculators now have statistical capabilities and they have the advantages of lower cost and portability. Also calculators free students and teachers from computing statistics. Ersoy (2005) explained that calculators are usable in the mathematics teaching and learning process. In Turkey, there are limited number of studies about the integration of calculators with the teaching and learning of statistics concepts. Therefore it is essential to conduct research about the use of calculators in the statistics instruction.

Several researches have been conducted to determine the attitudes of the students towards statistics. Gal, Ginsburg and Schau (1997) stated that students' attitudes and beliefs can impede learning statistics, and may affect the extent to which students will develop useful statistical thinking skills and apply what they have learned outside the classroom. They alerted educators about the importance of assessing student attitudes and beliefs regarding statistics. Çalıkoğlu (2000) recommended that the instructors should be informed about how to teach their students to apply their knowledge and skills to solve real world problems and how students can develop positive attitude towards subject area and how to understand their students' learning style differences. So that empirical researches should be done to determine the attitudes of the students towards statistics.

The objectives of the statistics instruction are being determined by the researchers in such a way that learning should be connected to what students know and to the real world. What could be done to make the statistics learning more effective? Singer and Willett (1990) stated that artificial data sets should be eliminated from the curriculum and that they should be replaced with real data sets. As Shaughnessy, Garfield and Greer (1996) mentioned, there is a need to determine how important it is for students to gather and manipulate real data themselves and how important it is for students to construct their own statistical measures. These topics should be researched within the nature of general statistical reasoning and statistical literacy.

Do the objectives of our statistical program cover the goals to be statistically literate with the technological support? What can be done to make the students statistically literate with the technological support in our educational program? These questions were the main starting points of this research. In this study, the instructions were planed in this sense and the effects of the different teaching methods on the statistical performance of the students were analyzed. The attitudes of the students were also analyzed since the attitudes of the students towards statistics may influence the statistics learning process.

1.1 Statement of the Problem

The purpose of the study was to investigate the effects of real data based and calculator supported statistics activities on 7th grade students' statistics performance and attitudes towards statistics when the statistics performance of the students prior to the instruction and the previous mathematics grades were controlled. Real data based statistical activities were based on the sport news taken from the newspapers and magazines. The calculators used in this study had statistical functions-such as data collection and data summarization.

Thus the study aimed to answer the following question:

What are the effects of real data based and calculator supported statistical activities on 7th grade students' statistics performance and attitudes towards statistics when the statistics performance of the students prior to the instruction and the previous mathematics grades were controlled?

The sub problems of the study were:

1. What is the effect of real data based and calculator supported statistics activities on 7th grade students' statistics performance when the statistics performance of the students prior to the instruction and the previous mathematics grades were controlled?

2. What is the effect of real data based and calculator supported statistics activities on 7th grade students' attitudes towards statistics?

1.2 Definitions of Important Terms

The definitions of important terms in this study were given below to clarify and to avoid possible semantic difficulties.
Performance refers to carrying out or bringing to completion of a physical activity or production of some significance, which display one's knowledge and judgment while engaged in the task.

Statistical Performance refers to the subjects' score on the "Statistical Performance Test 1 (SPT1)" and "Statistical Performance Test 2 (SPT2)"

Attitudes toward statistics represent a summation of emotions and feeling experienced over time in the context of learning statistics (Gal, Ginsburg and Schau, 1997)

Teaching method refers to the method of instruction; either by the traditional method, either by the real data based statistics activities (RDBSA) or by the real data based and calculator supported statistical activities.

Previous Mathematics Grade refers to subjects' mathematics course grades in the fall semester of the 2000–2001 academic years. It was out of five.

Control Group (CG) refers to the group that received instruction with the traditional method.

Experimental Group (EG) refers to the group instructed either by the real data -based statistics activities or the group instructed by the real data based and calculator supported statistical activities.

Real Data Based Statistics Activities (RDBSA) refers to the method in which students given statistics activities which were based on real data

Real Data Based and Calculator Supported Statistics Activities (RDBCSSA) refers to the method in which students given statistics activities which were based on real data and the activity sheets were supported by the calculators including statistical functions.

Data Handling refers to the organizing, describing, representing, and analyzing of the data, with a heavily reliance on visual displays such as diagrams, graphs, charts and plots.

Statistical Literacy refers to the reading, interpreting and constructing tables, charts and graphs related to the real data context.

1.3 Significance of the Study

In the past decade, topics in statistics instruction have begun to play an important role in the mathematics curricula in many countries (Shaughnessy, Garfield, Greer, 1996). Shaughnessy et al. mentioned that special attention is given to the use of technology in teaching data handling, to the importance of professional development of teachers of data handling, and to some issues for research in the teaching and learning of data handling.

Several researches have been conducted to make the statistics learning more effective. Singer and Willett (1990) proposed to the integration of real data into applied statistics curricula and to prepare real data based activity sheets. They believed that this practice enhance an interest in learning to do good data analysis. Also they argued that artificial data sets should be eliminated from the curriculum and that they should be replaced with real data sets. The activity sheets used in this study were prepared in this sense. The activity sheets contained real data sets. Therefore this study may provide information about the effectiveness of real data use in statistics education.

Attitudes of the students towards statistics have being important in the statistics instruction researches. Gal, Ginsburg and Schau (1997) explained that to make the learning of statistics less fearful and more effective, especially among college students but also at earlier stages, further attention should be focused on the attitudes and beliefs of the students towards statistics. While many teachers of statistics are likely to focus on transmitting knowledge, many students are likely to have trouble with statistics due to non-cognitive factors, such as negative attitudes or beliefs towards statistics (Gal & Ginsburg, 1994). So that it is important to determine the attitudes of the students towards statistics. In this study, Statistics Attitude Scale (SAS) was designed and used to determine the statistics attitudes of the students towards statistics.

Moore (1997) stated that statistical education now takes place in a new social context and the researchers and teachers should focus on the synergy between content, pedagogy, and technology. As he explained, the changing nature of our discipline demands revised content for statistics instruction, and technology strongly influence both what we teach and how we teach.

There is a need for studies related to the teaching statistics around the world and in Turkey (Çakıroğlu, 1994; Ersoy, 1991). So that the study is worthwhile to conduct to analyze the effects of the real data based activities and calculators on the students' statistics performance and attitudes towards statistics.

CHAPTER II

THE LITERATURE REVIEW

This chapter is devoted to the general views on statistics instruction, literature about the attitude of the students towards statistics and literature about the use of technology in statistics instruction.

2.1 Statistics Instruction

In the past decade, topics in statistics instruction have begun to play an important role in the mathematics curricula in many countries (Shaughnessy, Garfield & Greer, 1996). Mills (2004) stated that there has been a shift on how to teach statistics to the students of different ages as well as to the students in a variety of different fields. A movement to reform the teaching of statistics calls for researchers and teachers to focus on the synergy between content, pedagogy, and technology (Moore, 1997).

The teachers take an important role in the reform of the statistic instruction. Watson and Moritz (1997) proposed that teachers need to be aware of the tires of statistical understanding that are relevant and in this way, they may structure activities to allow for development in each tires, as well as to encourage students to move through each tier to reach a stage where they can coherently question statistical claims, made by others. Statistics instruction should put students into a rich situation and ask them to make sense of it. Students should be encouraged to come up with their own observation, patterns, and visual representations of data (Shaughnessy, Garfield and Greer, 1996). Shaughnessy et al. stated that most new curricula are shifting the role

of the teacher away from the traditional transition of information to the facilitation of learning. This change creates an enormous need for professional development and teacher in-service programs in statistics instruction.

The International Statistics Institute (ISI) in Voorburg, the Netherlands, has played a major role in drawing attention to issues in statistics education and in stimulating research on the teaching and learning of statistics, primarily through sponsoring conferences and publishing conference proceedings. Since, 1982, ISI has sponsored four International Conferences on Teaching Statistics (ICOTS 1,2,3 & 4) and eight roundtables on statistical education. The following themes were revealed:

1) The clarification of goals for teaching statistics,
2) Difficulties in preparing teachers to teach statistics,
3) Use and misuse of technology to teach statistics, and
4) Empirical researches on teaching and learning statistics.

Shaughnessy et al. (1996) stated that the ICOTS1 in 1982 focused on the importance of teaching statistics, its goals and the difficulty of integrating statistics into the already crowed mathematics curriculum. The second ICOTS conference in 1986 shifted a concern about issues related to training teachers to teach statistics. Shaughnessy et al. stated that at the third ICOTS in 1990, researches were shared on the assessment of teachers' knowledge and evaluation of teacher-training projects in statistics. Papers presented at ICOTS4 in 1994 discussed implications of technology for distance learning and the use of ultimate media for teaching statistics, as well as the increasing capabilities of new technologies to enhance particular aspects of teaching and learning statistics (Shaughnessy, Garfield and Greer, 1996).

Empirical researches have been done on teaching and learning statistics. Capraro, Kulm, and Capraro (2005) searched the statistical conceptions and misconceptions of middle grade students, the implications for representing and interpreting data, and the reasons which cause the persistence of these misconceptions. They found that the

students exhibited misconceptions regarding representing data graphically, interpreting the meaning of typicality, and plotting 0 above the x-axis. Hawkins and Kapadia (1984) stated that the students exhibited misconceptions about the statistics concepts because of the contemporary education. They explained that the contemporary education forces deterministic cognitive strategies rather than supporting the development of concepts in a deterministic environment. So the researchers suggest clarifying the objectives of the contemporary statistic instruction.

Assessment of the students in the statistics performance is given importance since the researchers should determine the current situation of the statistics instruction and also to determine the effects of the reform movements on the student's statistics performance. Garfield and Chance (2000) stated that we need ways to assess the application or transfer of students' learning to interpretive or functional tasks as those encountered in media or outside the classroom. They argued that the challenge in assessment of statistics is that it should involve examining not only what students think when asked to reflect on a graph or report in the media but also their tendency to do so without being cued. Watson (1997) stated that the students may be asked to read and critique a newspaper article, responding to particular questions such as (a) what do you think is the purpose of the research study described in this article? (b) What method or methods were used to answer the research question? c) What questions would you like to ask the investigator to better understand the study? (d) Are there any aspects of the study that might make you question the conclusions presented in the article? He explained that brief graphs or articles may be used to assess students' statistical thinking, including their understanding of basic terminology, their ability to interpret concepts in wider context, and their ability to question claims based on data.

In order to make the students appreciate the statistical methods as a way of decision making, mathematical modeling of problems surroundings the children should be one of the main and fundamental activities. Watson and Moritz (1997) explained the importance of using the media in relation to the statistics instruction. They stated that

the need for statistical literacy is firmly placed in the school curriculum, it is hoped that more voices will be raised to stress the importance of developing high level statistical questioning skills applicable in many contexts.

In USA, the National Council of Teachers of Mathematics has determined some curriculum and evaluation standards for school mathematics (NCTM, 1989). Within these standards, they stated that mathematics instructional programs should include attention to statistics so that all the students can

- pose questions and collect, organize, and represent data to answer those questions;
- interpret data using methods of exploratory data analysis;
- develop and evaluate inferences, predictions, and arguments that are on data;

Knowledge of statistics is clearly necessary for students to become informed citizens and intelligent consumers, and statistical reasoning needs to be learned. Also work in data analysis, statistics offers a natural way for students to connect mathematics with other school subjects and with experiences they have in their daily lives (NCTM, 1989).

Also, Çakıroğlu (1994) recommended that in statistics teaching students should be active and learning should be connected to what students know and to the real world. He stated that teaching modules exemplifying real life application must apply stimuli that make clear to the students why do we need data collection, why exactly that type data is needed, and what are the main features of the statistical decisions.

Statistics instruction with traditional methods is often viewed as being ineffective because they fail to establish a clear link between statistics and its uses in the real world (Yılmaz, 1996). Yılmaz (1996) proposed that the objectives of the statistics instruction should be based on the following competencies: (1) ability to link

statistics and real-world situations, (2) knowledge of basic statistical concepts, (3) ability to synthesize the components of a statistical study and to communicate the results in a clear manner. Singer and Willett (1990) stated that artificial data sets are often used to demonstrate statistical methods in applied statistics courses and textbooks. They mentioned that this practice removes much of the intrinsic interest in learning to do good data analysis and contributes to the myth that statistics is dry and dull. They argued that artificial data sets should be eliminated from the curriculum and they should be replaced with real data sets. Real data supplemented by suitable background material enable students to acquire analytic skills in an authentic research context and enable instructors to demonstrate how statistical analysis is used to model real world phenomena (Singer & Willett, 1990). Also Çalıkoğlu (2000) stated that it is necessary to use real world problems in understanding statistical methods and the value of statistics in daily life. She also mentioned that the students do not forget the statistical methods which are based on real world problems. Cobb (1993) discussed the pedagogical advantages and disadvantages of real world data sets.

Advantages of using real-data sets are:

- Many of the data sets have a complex structure and are rich with statistical interesting features.
- Data sets have unmistaken real-world import.
- Materials to support particular curricular uses can be prepared in advance.

Disadvantages of using real world data sets are:

- Students are not involved in any aspect of data production.
- Analysis of the data takes students over ground that has already been covered by others.
- Random variability remains implicit, hidden in the invisible past.

Shaughnessy et al. (1996) argued that while there are pedagogical advantages of user-constructed data in the instruction of the statistics, they may interfere with

teaching prototypical data representation techniques in a timely fashion. They stated that there is a need to determine how important it is for students to gather and manipulate real data themselves and how important it is for students to construct their own statistical measures. These are topics that need to be researched within the nature of general statistical reasoning and statistical literacy.

Current recommendations for reforming statistics education include the use of cooperative learning activities as a form of active learning to supplement or replace traditional lectures (Garfield, 1993). Instead of traditional lectures where teachers "tell" students information that they are to "remember", teachers are encouraged to introduce active-learning activities where students are able to construct knowledge. One way for teachers to incorporate active learning in their classes is to structure opportunities for students to learn together in small groups (National Council of Teachers of Mathematics, 1989). Research findings in many studies suggest that the use of small group learning activities leads to better group productivity, improved attitudes and sometimes increased achievement (Garfield, 1995). Small-group learning activities may be designed to encourage students to construct knowledge as they learn new material, transforming the classroom into a community of learner, actively working together to understand statistics (Garfield, 1993). Also Mckeachie, Pintrich, Yi-Guang and Smith (1986) stated that in small-group learning activates students teach each other and having students teach each other is an effective way to increase student learning.

Considerable attention has been given to the teaching of statistics at both elementary and secondary schools but such a change, progress and development is still an issue and one of the current problems in Turkey, because of several constraints and the lack of some resources, e.g. instructional materials, trained and experienced teachers, etc. (Ersoy, 1991). When National Ministry of Education Mathematics Program (1998) for the Grades 6, 7 and 8 were examined, it was seen that statistics instruction takes place only in the seventh grade at the middle grades. There were 45 objectives in the seventh grade mathematics program but only two of them were about statistics

instruction. In total there were 379 instructional objectives in seventh grade mathematics curriculum, but only 13 of them were about statistics. The statistics topics are not integrated with the other mathematics topics. The objectives of the statistics were distinct from each other, which were redundant. The main components of the statistics unit in the curriculum included the graphs and the calculation of the mean, mode and the median. Students were expected to understand the types of the graphs, read and interpret a given graph and the table, and draw a graph of the given data set. The students were only expected to calculate the central tendency values of the data, interpretations of these values were not included in the objective of the statistic curriculum. However in this study the students were expected to interpret the central tendency values of the data set. The mathematics program of the 6^{th}, 7^{th} and 8^{th} grades was changed in 2005. The program will began to be applied in the seventh grades in the 2007. Statistics teaching will take place in the all (6, 7 and 8 grade) grade levels. The statistics topics are well integrated with the other mathematics topics. They are integrated to other topics of the mathematics curriculum.

2.2 Attitude of the Students towards Statistics

Current researches for reforming statistics education recommend to the researchers to interest the attitudes of the students and to make research about the attitudes of the students towards statistics. Çalıkoğlu (2000) stated that students' characteristics such as attitudes toward statistics and mathematics, learning style characteristics should be considered in statistics courses. Gal and Ginsburg (1994) stated that while many teachers of statistics are likely to focus on transmitting knowledge, many students are likely to have trouble with statistics due to non-cognitive factors, such as negative attitudes or beliefs towards statistics. They explained that such factors can impede learning of statistics and apply what they have learned outside the classroom. Student attitudes and beliefs about statistics can affect the extent to which students will develop useful statistical thinking skills, whether they will apply what they have learned outside of the classroom, and whether or not students will choose to enroll in

further statistics courses, and negative student attitudes toward statistics may create a major obstacle for effective learning (Gal & Ginsburg, 1994)

Çalıkoğlu (2000) found that the students perceived the importance of statistical skills and knowledge, but they perceived themselves incompetent in such skills and knowledge. The study was conducted on the undergraduate students of the universities. However, the results could be a guide to understand the attitudes of the middle grade students towards statistics. Teachers are focusing on transmitting knowledge and skills, students may be having easy or difficult time learning or applying statistics due to the attitudes and beliefs they carry with them (Gal, Ginsburg & Schau, 1997). Gal et al. stated that students' attitudes and beliefs towards statistics deserve attention for three reasons; 1. Their role in influencing the teaching and learning process, 2. Their role in influencing students' statistical behavior after they leave the classroom and 3. Their role in influencing whether or not students will choose to enroll in a statistics course later on. Attitudes and beliefs, especially, negative ones, can have a direct impact on the classroom climate and on individual students' opportunity to learn (Gal, Ginsburg and Schau, 1997).

The variables that influence attitudes of the students towards statistics have been searched by the researchers in order to make the statistical instruction more effective. Mills (2004) explained that the important variables related to statistics achievement such as mathematics ability, statistics experience, confidence, and even gender influence student attitudes. Also Mills (2004) indicated that students are now experiencing more positive attitudes toward statistics than negative attitudes, because innovative teaching and learning strategies. Çalıkoğlu (2000) recommended the following techniques to reduce statistical anxiety: hands-on activities, using real world problems, step-by-step explanation of the statistical analysis. To make the learning of statistics less frustrating and more effective, further attention should be given by both mathematics educators and researchers to the beliefs, attitudes and expectations students bring into the statistics classrooms or develop during their educational experiences (Gal & Ginsburg, 1994).

2.3 Use of Technology in Statistics Instruction

Various new technologies offer opportunities and facilities to statistics education. Ersoy (2005) stated that technology is the most powerful force for curriculum influence today. He emphasized that the use of information and communication technologies in general and some hand-held personal technologies, namely calculators is a reform movement in the process of teaching and learning mathematics. Calculators change our view of what is a mere numerical and symbolic computation. Ersoy (2005) explained that calculators are usable in teaching and learning process of the statistics teaching. According to Moore (1997), using technology in statistics instruction helps to automate many routine operations and as a result, facilitate conceptual learning. Shaughnessy et al. (1996) stated that calculators free students and teachers from computing statistics, drawing graphs by hand and can be used to draw multiple samples quickly and easily. They stated that as technology becomes increasingly available in schools, students will have opportunities to analyze more complex and interesting data sets, as well as opportunities to choose their visual representations for data sets. At present, the use of technological support in mathematics instruction is highly recommended but it is still possible to use most curricula without the technology. As access to technology continues to grow in schools through-out the world, technology will become an inescapable part of data analysis (Shaughnessy, Garfield & Greer, 1996).

Empirical researches have been conducted by the researches to determine the effects of the calculators in the statistics instruction. According to Moore (1997), using technology in statistics instruction helps to automate many routine operations and as a result, facilitate conceptual learning. Also they indicated that graphical calculators provide a positive impact on the culture of statistical learning in a Malaysian classroom such that students who were exposed to their use seemed to be more active and keener to participate in group work. The appropriate use of calculators can actually enhance students' conceptual understanding, problem solving and attitudes towards mathematics, and the use of the calculators could have stimulated students'

enjoyment of statistics learning as well as helped in upgrading their statistical skills and conceptual understanding (Sam & Kee, 2004). Also results of a study from Holland suggested that the use of graphing calculators can stimulate both the use of realistic contexts in mathematics and more exploratory learning approaches for students, leading to students having a more integrated view of mathematics and being more flexible in their use of problem solving strategies (Drijvers & Doorman, 1996). Graham and Thomas (2000) studied with the 13-14 year old students to determine the effect of the graphing calculators on their understanding of variables in algebraic expressions. Graham and Thomas (2000) observed in their study that the graphing calculator improved their understanding of variables in algebraic expressions more than a matched control groups. Harskamp, Suhre and Struen (2000) observed in their study that students using graphing calculators tend to attempt more mathematical problems, and tend to obtain higher scores, than students not taught using graphing calculators. The above studies were about the usage of the calculators in some of the mathematic topics. However the results above should be a guide to understand the effects of the calculators in the statistics education.

Rodd and Monaghan (2000) found that the key factors which contributed to use of calculators include the expertise within mathematics departments in schools and positive regard for such calculators as learning aides. Factors which inhibited use included teachers' lack of time to learn how to use such calculators and how to teach with them, concerns over examination restrictions, and perceptions of computer being a resource priority. Katsberg and Leatham (2005) suggested that access to graphing calculators is associated with student achievement gains and that students' achievement is improved when they use curricula designed with a graphing calculator as a major tool.

Shaughnessy et al. stated that the development of new curricula and better technology for teaching data handling are not in themselves sufficient to encourage the growth of data handling in schools, it is essential to conduct continued researches about the statistics teaching supported by the technology and the researches about the

development of the statistics curriculum. Ersoy (2005) stated that in Turkey there must be research about the usage of calculators in statistics. He stated that the studies about the usage of calculators started to be searched first in METU in 1990.

This literature review underlined the importance of the statistics education and the reform movements on the content, pedagogy and technology related to the statistics instruction. It also examined the importance of the attitudes of the student towards statistics and the usage of the calculators in the statistics learning and instruction. It would be crucial to predict the impact of these variables on the statistics performance of the students.

CHAPTER III

METHOD

This chapter includes explanation of the problem and hypotheses of the present study, research design, sample of the study, variables, measuring instruments, procedures and the tools for data analysis.

3.1 Problem of the Study and Associated Hypotheses

In the previous chapters, research studies relevant to statistics instruction, attitude of the students towards statistics and use of technology in statistics instruction were presented. In this section, the problem and the hypotheses of the study were stated.

The problem of the present study was the following:

P: What are the effects of real data based and calculator supported statistics activities on 7th grade students' statistics performance and attitudes towards statistics when the statistics performance of the students prior to the instruction and the previous mathematics grades were controlled?

The following hypotheses were stated in order to test the problem:

H1: There are no significant differences among the mean scores of the students instructed by real data based statistics activities (RDBSA), those instructed by real data based and calculator supported statistics activities (RDBCSSA), and those

instructed by the traditional method (TM) with respect to statistics performance when the statistics performance test-1 (SPT1) scores and the previous mathematics grades (PMG) of the students were controlled.

H2: There are no significant differences among the mean scores of the students instructed by the real data based statistics activities (RDBSA), those instructed by the real data based and calculator supported statistics activities (RDBCSSA), and those instructed by the traditional method (TM) with respect to attitudes toward statistics.

3.2 Research Design

This study utilized quasi experimental design as outlined in table 3.1.

Table 3.1 Research design of the present study

Group	Pre-test	Treatment	Post-test
EG1	SPT1	RDBSA	SPT2, SAS
EG2	SPT1	RDBCSSA	SPT2, SAS
CG	SPT1	TM	SPT2, SAS

The abbreviations in table 3.1 have the following meanings: EG1 represents Experimental Group 1, which received instruction by the real data based statistics activities (RDBSA), EG2 represents Experimental Group 2, which received instruction by the real data based and calculator supported statistics activities (RDBCSSA); CG represents the Control Group, which received instruction by the traditional method (TM).

The measuring instruments in the table 3.1 were the following: SPT1: Statistical Performance Test 1; SPT2: Statistical Performance Test 2; SAS: Statistics Attitude Scale. SPT1 was administered as a pre-test. The SPT2 and SAS were administered as post-tests.

3.3 Sample of the Study

The subjects of the present study consisted of 84 seventh grade students from a private school in Ankara-Turkey. The study was carried out during the spring semester of 2000-2001 academic years. The targeted population was all seventh grade students in private schools of Turkey. Convenient sampling was utilized. The number of the girls and boys were respectively 36 and 48. 29 students received RDBSA instruction, 27 students received RDBCSSA instruction and 28 students received TM instruction. The students were in the age of 13 and 14. The distribution of the students is given in table 3.2.

Table 3.2 Distribution of the students in the present study

	Experimental Groups		Control Group		
	RDBSA	RDBCSSA	TM	Total	Percentage
Girls	13	11	12	36	43%
Boys	16	16	16	48	57%
Total	29	27	28	84	100%

The socioeconomic status of the students was relatively high compared to the students in public schools. The subjects were asked whether they had a calculator and computer at their home and how much they were using them at home. As seen in table 3.3 and table 3.4, nearly almost of the students had computer and calculator at

their home. They were using computer very often but they were using calculator rarely at their home.

Table3.3 Computer and calculator possesing for the students

		TM Frequency	RDBSA Frequency	RDBCSSA Frequency
Computer Possessing	Yes	19	27	20
	No	1	1	1
	Missing	8	1	6
Calculator Possessing	Yes	20	25	21
	No	0	3	0
	Missing	8	1	6

Table 3.4 Computer and calculator usage of the students

	TM Frequency	RDBSA Frequency	RDBCSSA Frequency
Computer Usage			
Never	0	1	0
Sometimes	6	8	6
Very Often	13	19	15
Missing	9	1	6
Calculator Usage			
Never	3	3	5
Sometimes	14	21	13
Very Often	3	4	3
Missing	8	1	6

3.4 Variables

In the present study the variables were categorized as dependent and independent. The dependent variables of this study were overall statistics performance scores (SPT2 scores) of the students and attitude toward statistics scores (SAS scores) of the students. The independent variable of the present study was Groups. There were three groups. One of the groups was instructed by real data based statistics activities (RDBSA). The other one was instructed by real data based and calculator supported statistics activities (RDBCSSA). The last one was instructed by traditional method (TM). The covariates of the study were previous mathematics grades (PMG) and statistics performance test scores (SPT1 scores) of the students before the treatment.

3.5 Measuring Instruments

In the present study, the following measuring instruments were used:

1.Statistics Performance Test 1 (SPT1)

2. Statistics Performance Test 2 (SPT2)

3. Statistics Attitude Scale (SAS)

The development process of each measuring instrument is explained below. The measuring instruments are presented in Appendix B.

3.5.1 Statistics Performance Test 1 (SPT1)

This test was developed by the researcher to determine the students' statistics performance. SPT1 was used as a pre-test. (See Appendix B)

The formats of the test items were as follows:

1. Restricted responce
2. Interpretive

The SPT1 was developed to determine students' statistics performance that were learned prior to the treatment. There were 8 items in the test. The objectives of the items are mentioned in table 3.6. The content related validity of the instrument was established by the mathematics teachers in the school. The suggestions were considered in the preparation of the test. They mentioned that the test was suitable for the seventh grade mathematics curriculum, and it adequately represented the topics in statistics unit.

The items 1 and 8 were prepared by the researcher. The 2nd item was the 7th question of the test, Data Handling 3 with revisions. Data Handling 3 test was used in 1995 within the Kassel projects that was executed by the Centre for Innovations in Mathematics Teaching (CIMT). The 5th item was also taken from the test, Data Handling-3 (Kassel, 1995) with revisions. The 3th item was adopted from a question of the 1989's Student Selection Examination . The subitems a and b were added by the researcher. The item 4 was adopted from a question of the 1986 Student Selection Examination. The subitems a, b, d and e were added by the researcher. The items 6 and 7 were taken from a study conducted by Mendoza and Mellor (1991). The item 7 was revised in such a way that the story of the question was changed but the objective of the question was same.

The test was out of 100. Each item had different weight. Answer key was prepared to eliminate subjectivity. The partial credits of the items in the SPT1 are shown in the table 3.5. If the answers of the students matched with the answer key they got the following scores mentioned in table 3.5.

Table 3.5 Scoring table of the Statistics Performance Test 1

Item		Objectives	Grade	Total
1	a, b, c	To read the table	6 Point (2 points each)	12
	d, e	To make percentage calculations with the data on the table	6 Point (3 points each)	
2	a, b	To make percentage and angle calculations with the data on the circle graph	15 Point	15
3	a, b	To read the bar graph	8 Point (4 points each)	12
	c	To make percenatge calculations with the data on the bar graph	4 Point	
4	a, b, c	To read the line graph	7 Points (a, b each 2 points) (c 3 points)	13
	d, e	To make predictions from the data on the linegraph	6 Point (3 points each)	
5		To convert the data into numerical values To make a table correctly to represent the data in the picture graph	5 Points 7 points	12
6	a, b	To read the bar graph	5 Points (a , 2 point) (b , 3 Points)	10
	c	To make predictions on the data on the bar graph	5 Points	
7		To draw appropriate graphs related with the article given in the question	12 points	12
8		To place the data correctly on the graph To draw the line graph correctly To name the line graph correctly To name the axes of the line graph correctly	6 Points 4 Points 2 Points 2 Points	14
TOTAL				100

3.5.2 Statistics Performance Test 2 (SPT2)

This test was developed by the researcher to determine the students' statistics performance at the end of the instruction. The content and objectives of the test were determined according to the elemantary school curriculum of the Ministry of National Education (MEB,2000). It was used as a post-test (Appendix B).

The formats of the test items were as follows:

1-Restricted responce

2-Interpretive

There were 9 items in the test. The objectives of the items are mentioned in table 3.6. The content related validity of the instrument was established by the mathematics teachers in the school. The suggestions were considered in the preparation of the test. They mentioned that the test was suitable for the seventh grade mathematics curriculum.

The items 3, 5 and 7 were prepared by the researcher. The 9th item was the 16th question of the test, Data Handling-3 (Kassel, 1995). The 1st, 2 nd and 4th items were prepared by the researcher but the data were taken form the following questions respectively, a question of the 1998' Student Selection Examination, a question of the 1999' Student Selection Examination and a question of the 1989' Student Selection Examination. The 6th question was taken from the 1985' Science High Scool Exam. The item 8 was same with the item 7 in the SPT1.

The test was scored out of 100. Each item had different weight. Answer key was prepared to eliminate subjectivity. The partial credits of the items in the SPT2 are shown in the table 3.6. If the answers of the students matched with the answer key, they got the following scores mentioned in table 3.6.

Table 3.6 Scoring table of the Statistics Performance Test 2

Item		Objectives	Grade	Total
1	a, b	To read the table	4 Point (each 2 point)	7
	C	To make percentage calculations with the data on the table	3 Point	
2	A	To read the bar graph	3 Point	9
	b, c	To make percentage and angle calculations with the data on the circle graph	6Point (each 3 point)	
3	a, b	To read the bar graph	6 Point (each 3 point)	9
	C	To make percenatge calculations with the data on the bar graph	3 Point	
4		To read the picture graph	10 Points	10
5	a, b	To read the line graph	4 Points (each 2 points)	13
	c, d, e	To make predictions from the data on the linegraph	9 Point (each 3 points)	
6		To calculate the mean of the data set	8 Point	8
7	A	To calculate the mean of the data set	4 Points	18
	B	To calculate the median of the data set	4 Points	
	C	To calculate the mod of the data set	4 Points	
	d, e	To make interpretation about the average values of the data set	6 Points (d, 4 points) (e, 2 points)	
8		To draw appropriate graphs related with the article given in the question	12 points	12
9		To place the data correctly on the graph	6 Points	14
		To draw the line graph correctly	4 Points	
		To name the line graph correctly	2 Points	
		To name the axes of the line graph correctly	2 Points	
TOTAL				100

Table 3.7 shows the objectives of SPT1 and SPT2. The objectives of the items in both tests were same except the items 6 and 7 of the SPT2. They were about the central tendencies of the data set. This topic was new to the students, which covered the seventh grade mathematics curriculum. The objectives related to the table and graphs were covered in fifth grade mathematics curriculum. Also these objectives took place in the seventh grade mathematics curriculum.

Table 3.7 The objectives of the SPT1 and SPT2 items

Type of Statistics Performance	SPT1 Item Number	SPT2 Item Number
To interpret tabular data	1	1
To interpret data in the picture graph	5	4
To interpret data in the bar graph	3, 6	3
To intrepret the data in the line graph	4	5
To interpret the data in the circle graph	2	2
To represent given data in graphs	7	8
To draw a line graph	8	9
To calculate and interpret the central tendencies of the data correctly	-	6, 7

3.5.3 Statistics Attitue Scale (SAS)

The scale was developed by the researcher in the light of the Fennema-Sherman mathematics attitude scales (Fennema & Sherman, 1976). The items of the Mathematics Attitude Scale were examined and in that manner the items of the Statistics Attitude Scale (SAS) was written. The pilot study of the SAS was conducted with 107 seventh grade students of a private school in Ankara in 2000 and

the statistics attitude scale had good reliability with a cronbach alpha coefficient of 0,90. The reliability coefficients for the subscales of SAS are given in the result chapter.

The purpose of the scale was to determine the attitudes of the students towards statistics. The SAS used a 5-point Likert scale (1=strongly disagree, 2=disagree, 3=neither disagree nor agree, 4=agree, 5=strogly agree) and contained 2 subscales: 1) Confidence in Learning Statistics (SAS1), 2) Enjoyment of Statistics (SAS2).

In the preparation of the scale it was given importance to use simple sentences and both the positive and negative meanings of the statements were included in the scale. The items numbered 1 to 10 were related to SAS1. The items numbered 11 to 20 were related to the subscale SAS2. The odd numbered items were positively stated and even numbered items were stated negatively.

All negatively worded items were reverse coded before data analysis. For the positive items, the alternatives of strongly disagree, disagree, neither disagree nor agree, agree and strogly agree were scored as 1, 2, 3, 4 and 5 respectively. For the negative items, the alternatives of strongly disagree, disagree, neither disagree nor agree, agree and strogly agree were scored as 5, 4, 3, 2 and 1 respectively. Higher scores indicate more positive attitudes toward statistics. The scale was administered as a post test (Appendix B).

To obtain evidence about the construct validity of the subscales of SAS, expert judgements were used. The researcher asked an expert mathematics educator in Faculty of Education at METU to review the subscales of the SAS.

3.6 Activity Sheets Based on Real Data

The study was about determining the effects of the real data based statistics activities and the use of statistical calculators on the seventh grade students' statistics performance and attitudes towards statistics. As mentioned in the previous chapter, all over the world many research studies were conducted about how to make the students gain statistical literacy. The students were expected to be statistically literate. To achive this goal, the media and real data sets were used in the statistics courses and these kind of studies took place. In this manner the activity sheets were prepared by the researcher. They were reviewed by mathematics teachers in the private school the study took place and also by a mathematics educator in Faculty of Education at METU. For a month, seveal newspapers were taken and examined to find the data set used in the activity sheets. The data set was determined as to be the sport news given in the newspapers. Since it was easy to collect data sets about sports in newspapers. The sports news were suitable to make statistical studies. In addition, the data would not be complex for the students to analyse.

The activity sheets were grouped in 5 categories (Appendix A). The activity sheets of the first group (1A and 1B) were about the calculation and the interpretation of the central tendency values. The activity sheet 1C was about the statistical terminology. The objectives of the activity sheets in the first group are explained below in the table 3.8.

Table 3.8 The objectives of the activity sheets of the first group

The objectives of the activity sheet 1A
1) prepare frequency table(*) 2) find the mode of a data set 3) find the median of a data set 4) calculate the mean of a a data set 5) calculate the range of a data set(*) 6) calculate the mean of a data set when any number of data are taken from the set which mean score is known 7) calculate the mean of a data set when any number of data are added or subtracted from the data set which mean and the number of data are known 8) choose the best central tendency value which represent the data set properly(*) 9) explain the effects of adding a number to a set of data, one of which is equal to mean score, the other is lower than mean score and a number upper than mean score.(*)
The objectives of the activity sheet 1B
1) estimate the mod of a data set given in a tabular form and then calculate 2) estimate the median of a data set given in a tabular form and then calculate 3) estimate the mean of a a data set given in a tabular form and then calculate 4) estimate mean of a data set when any number of data are subtracted from the set which mean score is known and then calculate 5) estimate the mean of a data set when any number of data are added or subtracted from the data set which mean and the number of data are known and then calculate 6) to calculate the percentage of the scores above the mean score, which are given in table.(*)
The objectives of the activity sheet 1C
1) explain and write the statistical data collection methods 2) summarize the data collected with statistical methods 3) explain the meanings of statistics, questionnaire, universe and sample(*) 4) explain the important points in the presentaion of the conclution of a statistical study(*) 5) find out the sample and the universe of a statistical study in any given investigation(*)

* : These objectives were not belong to the elemantary school mathematics curriculum of the Ministary of National Education (MEB,2000).

The activity sheets of the second group were related with the subject "Circle Graph". The activity sheet 2A was about reading a circle graph and making percentage calculations. The activity sheet 2B was about representing data with a circle graph and interpreting the given data. The objectives of the activity sheets in the second group are explained below in the table 3.9.

Table 3.9 The objectives of the activity sheets of the second group

The objectives of the activity sheet 2A
1) read and interpret the data given on the circle graph 2) make calculations with the values on the circle graph 3) explain how to draw a circle graph in any subject 4) make angle calculations related with the values on the circle graph(*)
The objectives of the activity sheet 2B
1) explain and write the statistical data collection methods 2) explain how to draw a circle graph in any subject 3) draw the circle graph of the data given in a tabular form 3) make calculations with the values on the circle graph-to calculate the angle of a sector of a circle 4) explain the value of circle graph in the statistics.(*)

* : These objectives were not belong to the elemantary school curriculum of the Ministary of National Education (MEB,2000).

The activity sheets of the third group were related with the subject "Picture Graph". The activity sheet 3A was about reading a picture graph and summarizing data. The activity sheet 3B was about representing data with a picture graph and interpreting the data given. The objectives of the activity sheets in the third group are explained below in the table 3.10.

Table 3.10 The objectives of the activity sheets of the third group

The objectives of the activity sheet 3A
1) read and interpret the data given on the picture graph 2) calculate the mean of a data set represented with a picture graph 3) calculate the median of a data set represented with a picture graph 4) explain the value of a picture graph in the statistics.(*) 5) make the table of the data set represented with a picture graph
The objectives of the activity sheet 3B
1) draw the picture graph of the data given in a tabular form 2) explain how to draw a picture graph in any subject 3) explain the value of a picture graph in the statistics.(*)

* : These objectives were not belong to the elemantary school curriculum of the Ministary of National Education (MEB,2000).

The activity sheets of the fourth group were related with the subject "Bar Graph" . The activity sheet 4A was about reading a bar graph and summarizing data. The activity sheet 4B was about representing data with a bar graph. The objectives of the activity sheets in the fourth group are explained below in the table 3.11.

Table 3.11 The objectives of the activity sheets in the fourth group

The objectives of the activity sheets 4A
1) read and interpret the data given on the bar graph 2) calculate the mod of a data set represented with a bar graph 3) calculate the mean of a data set represented with a bar graph 4) make calculations with the values on the bar graph 5) explain the value of a picture graph in the statistics.(*)
The objectives of the activity sheets 4B
1) explain and write the statistical data collection methods 2) summarize the data collected with statistical methods 3) explain how to draw a bar graph in any subject 4) make the table of the data set represented with a bar graph 5) draw the bar graph of the data given in a tabular form

* : These objectives were not belong to the elemantary school curriculum of the Ministary of National Education (MEB,2000).

The activity sheets of the fifth group were related with the subject “Line Graph” . The activity sheet 5A was about reading and interpting a line graph. The activity sheet 5B was about representing data with a line graph and interpreting the data given. The objectives of the activity sheets in the fifth group are explained below in the table 3.12.

Table 3.12 The objectives of the activity sheets in the fifth group

The objectives of the activity sheet 5A
1) read and interpret the data given on the line graph 2) make calculations with the values on the line graph
The objectives of the activity sheet 5B
1) explain and write the statistical data collection methods 2) summarize the data collected with statistical methods and make interpration 3) explain how to draw a line graph in any subject 4) make the table of the data set represented with a line graph 5) draw the line graph of the data given in a tabular form

The activity sheets were used in the instruction by real data based statistics activities (RDBSA) and in the instruction by real data based and calculator supported statistics activities (RDBCSSA). The same activity sheets were used in the both groups of RDBSA and RDBCSSA. The students of the RDBCSSA used calculators to make their calculations in the activity sheets but the students of the RDBSA used paper and pencil to make their calculations. So the activity sheets were designed for both use. The activity sheets were given in Appendix A.

3.7 Procedure

3.7.1 Treatment of the Groups

The present study was conducted during the spring semester of 2000-2001 academic years. Three classes were selected at a private school in Ankara. The school principal charged a mathematics teacher to study with the researcher. So that the classes of the mathematics teacher were selected in this study. These three classes were conveniently assigned to different teaching methods as respectively instruction by the real data based statistics activities (RDBSA) and instruction by real data based and calculator supported statistical activities (RDBCSSA) and instruction by the traditional method (TM). There were one control group and two experimental groups in the study. The group instructed by the TM was the control group, the teaching methods of the first and the second experimental groups were RDBSA and RDBCSSA respectively. The groups were instructed during regular course hours. One class hour was 40 minutes. The duration of the study was two weeks.

The experimental groups received instruction from the researcher but the control group received instruction from their regular teacher. However, all the groups were instructed in the light of the objectives of the Ministary of National Education's elemantary school curriculum. All the groups had the same teacher before the treatment. The experimental group 1 and the experimental group 2 were given activity sheets but the control group was instructed by the traditional method; the teacher wrote the examples taken from some mathematics textbooks on the blackboard and the students wrote the examples on their notebooks.

The activity sheets which were given to experimental groups were based on real data obtained from popular media. They were prepared by the researcher. However, the examples shown to the control group were taken from seventh grade mathematics textbooks. The data used at the traditional lectures included adjusted data.

3.7.1.1 Treatment of the Control Group

The control group was instructed by the traditional method. The students were instructed by their mathematics teacher. Also the researcher attended to the lessons. The researcher observed the control group to be aware of what they were doing in the lessons and to be aware of the differences between control group and the treatment groups. The group received 8 class hours of instruction during two weeks. One class hour was forty-minutes.

The teacher followed a plan during the lesson. Lecture method was used. In the first two lessons she explained how to find a mean value of a a data set. She wrote the formula and then asked to the students five examples about mean value. The numbers were adjusted in such a way that the students made the calculations easily. The mode and median values were instructed in the same manner. As seen in the example-1 and 2, the data set were adjusted. The students made the calculations easily.

Example-1: For the data set 35, 36, 37, 35, 34, 37, 34 and 36

a) find the mod value of the data set.
b) find the mean of the data set.
c) find the median of the data set.

Example-2: A students gets the following grades from the mathematics course; 50, 65, 75, 75 and 85. Find the mean of the data set?

The picture graph was instructed in the third lesson. The teacher drew a picture graph and explained to the students how to draw this graph and how to read. She gave a data set (see example 3) to the students and told them to draw a picture graph and then asked them questions about the graph. As seen in the example 3 the data set were adjusted, the calculation could be made easily.

Example 3: In a class, mathematics exam scores are explained. 4 students get the score 1, 1 student gets the score 2, 8 students get the score 3, 9 students get the score 4 and 6 students get the score 5. Draw the bar graph of the distribution of the mathematics scores of the students.

Then respectively circle graph, bar graph and line graph were instructed in the same manner. Mixed examples were solved about the graphs and mean, mode and median values in the last two lesson. The examples were taken from "Matematik Gezegeni" which was a seventh grade mathematics workbook.

The lessons were teacher centered. The taeacher wrote the examples to the blackboard and the students wrote on their notebook. The data was adjusted so that the students were not to make estimation and complex calculations.

3.7.1.2 Treatment of Experimental Group 1

Experimental Group 1 was instructed by real data based statistics activities (RDBSA). Through this instruction, real data based statistics activity sheets were used (See appendix A). They were developed by the researcher. Activity sheets were based on real data taken from newspapers. The data sets were about sport news. The instruction lasted 8 class hours, two weeks. The instruction was directed by the researcher. Also the mathematics teacher with whom the researcher study attended to the lessons. Since the teacher instructed the students before this study, she knew the students well. The researcher took into account the observation of the teacher about the lesson and about the students.

In the classroom, the students studied in pairs. At the beginning of the treatment, the students were informed about the study. Before the treatment, the purpose of the treatment, the procedure to be followed was explained to the students by the

researcher. Also the students were informed about the objectives of the activity sheets.

In the first two lessons, activity sheets numbered as 1A, 1B and 1C were used. They were about the calculation and the interpretation of the central tendency values. The activity sheet 1C was about the statistical terminology. The picture graph was instructed in the third lesson. The activity sheet 3A and 3B was used to instruct the picture graph. Then respectively circle graph, bar graph and line graph were instructed in the same manner. The activity sheets 2A and 2B were used to instruct circle graph. To instruct the bar graph, the activity sheets 4A and 4B were used. The activity sheets 5A and 5B were about line graph. Overhead projecter was used to show the activity sheets (Appendix A) at the blackboard. After the instructions, the activity sheets were collected by the researcher to investigate the works of the students in the class hours. In the last two lessons, the activity sheets of the students were given back to the students and the subjects were repeated in such a way that the students asked their questions about the study. The solutions of the questions in the activity sheets could be in decimal form. Also the students were forced to make estimations. At the end of the study the students wrote their thoughts about the study on a blank paper. Then these papers were collected by the researcher to be evaluated.

3.7.1.3 Treatment of Experimental Group 2

Experimental Group 2 was instructed by real data based and calculator supported statistics activities (RDBCSSA). The instruction lasted 8 class hours, two weeks. The instruction was directed by the researcher. Also the mathematics teacher with whom the researcher study attended to the lessons. Since the teacher instructed the students before this study, she knew the students well. The researcher took into account the observation of the teacher about the lesson and about the students.

Before the instruction, the researcher explained the studensts how to use the calculator (TI-30X-IIB) in twenty minutes and in the next twenty minutes the students worked in pairs of two with the calculators in the light of the directions researcher gave (See Appendix C). The calculator was presented in Appendix C. The instructor was the researcher. Real data based statistical activity sheets were used as the RDBSA group in the treatment (See appendix A). The difference between the groups was that the RDBCSSA group students made their calculations with their calculators.

In the classroom, the students studied with groups of two. At the beginning of the treatment, the students were informed about the study. Before the treatment, the purpose of the treatment, the procedure to be followed was explained to the students by the researcher. Also the students were informed about the objectives of the activity sheets.

In the first two lessons, activity sheets numbered as 1A, 1B and 1C were used. The activity sheets 1A and 1B were about calculation and the interpretation of the central tendency values,mean, mod and median. The students worked with their calculators to find the mean , mode and median values of the data sets. The activity sheet 1C was about the statistical terminology. The picture graph was instructed in the third lesson. The activity sheet 3A was about reading a picture graph and summarizing data. The activity sheet 3B was about representing data with a picture graph and interpreting the data given. Then respectively circle graph, bar graph and line graph were instructed in the same manner. The activity sheet 2A was about reading a circle graph and making percentage calculations. The activity sheet 2B was about representing data with a circle graph and interpreting the data given. The activity sheet 4A was about reading a bar graph and summarizing data. The activity sheet 4B was about representing data with a bar graph. The activity sheet 5A was about reading and interpting a line graph. The activity sheet 5B was about representing data with a line graph and interpreting the data given. Overhead projecter was used to show the activity sheets at the blackboard. After the instructions, the activity sheets

were collected by the researcher to investigate the works of the students in the class hour. In the last two lessons the activity sheets of the students were given back to the students and the subjects were repeated in such a way that the students asked their questions about the study. The solutions of the questions in the activity sheets could be in decimal form. The students had no difficulty to deal with these solutions since they used calculators. At the end of the study the students wrote their thoughts about the study on a blank paper. Then these papers were collected by the researcher to be investiagted.

3.8 Data Analysis

In order to uncover the effect of real data based and calculator supported statistical activities on 7^{th} grade students' statistics performance and attitudes towards statistics, quantitative analyses were used. Students' notes about the instruction were also examined to uncover the effects of different teaching methods on statistics instruction.

3.8.1 Quantitative Data Analyses

Quantitative data analyses were classified as descriptive and inferential statistics. All the statistical analyses were carried out by using SPSS 10.0.

3.8.1.1 Descriptive Statistics

Data were initially examined to obtain descriptive statistics (mean, median, standart deviation, skewness, kurtosis, maximum and minimum values). Data for treatment and control groups were also presented in graphs.

3.8.1.2 Inferential Statistics

To test the null hypothesis, Analysis of Covariance (ANCOVA) was used for comparing the mean scores of control and experimental groups separately on the SPT2. The study comprised one independent and one dependent variable with covariates. As seen in table 3.13, dependent variable was Statistics Performance Test 2 (SPT2) scores of the students and the covariates were mathematics previous grades (PMG) and Statistics Performance Test 1 (SPT1) scores of the students. Group membership was determined by groups.

Table 3.13 ANCOVA variable-set compositon and statistical model entry order for SPT2

Variable Set	Entry Order	Variable Name
A (Covariates)	1st	X1: PMG X2: SPT1
B (Group Membership)	2nd	X3: Groups
C (Covariates*Group Interaction)	3rd	X4: X1*X3 X5: X2*X3
D (Dependent Variables)	4rt	Y1: SPT2

To test the null hypothesis, Analysis of Variance (ANOVA) was used for comparing the mean scores of control and experimental groups separately on the SAS. The study comprised one independent and one dependent variable so the inferential statistics was based on the analysis of variance. The dependent variable was Statistics Attitude Scale (SAS) scores of the students. The independent variable was the teaching methods. The hypotheses were tested at the level of significance α=0.05.

Reliability analysis was used to find the relibility coefficients of SAS and the subscales of the SAS.

3.8.2 Analysis of Open Ended Student Coments

At the end of the study, the students were asked to write their thoughts about the instruction. They were asked to write their thoughts on a blank paper. Then the students' comments were examined by the researcher.

CHAPTER IV

RESULTS AND CONCLUSIONS

This chapter is divided into six sections. First two sections deal with the missing data analysis and outlier analysis. Descriptive statistics are presented in the third section. Fourth section presents the results of the inferential analysis. The fifth section reveals the comments of the students about treatment. Finally, the last section summarizes the findings of the study.

4.1 Missing Data Analysis

The first step in data analysis was related the missing data analysis. It was carried out before descriptive and inferential statistics. In the Statistics Performance Tests (SPT1 and SPT2), missing responses of the students for each item were replaced with 0 (wrong), since statistics performance test was similar to an achievement test, which aimed to identify best performance of students. So leaving an item without indicating an answer most closely meant being not right about the item. Any information related to students' gender, grade level, and previous mathematics grade was checked in the analysis. There was no missing data in the Statistics Attitude Scale (SAS).

4.2 Outlier Analysis

In order to reveal the possible cases with values well above or well below the majority of other cases, outlier analysis was conducted. To identify the outliers in the

mean scores of students, SPT2 and SAS scores were checked as the dependent variables through box plots. Figure 4.1 indicated that there were no outlier in the SPT2 scores for each groups. Figure 4.2 indicated that there was only one lower outlier in the SAS scores of the RDBSA group. The number of the subjects in the RDBSA group, who had taken the SAS was not too much, only 29 students had taken the SAS. Also there was only one outlier, not more than one. So that the outlier in the SAS scores of the RDBSA group was not taken out from the data set.

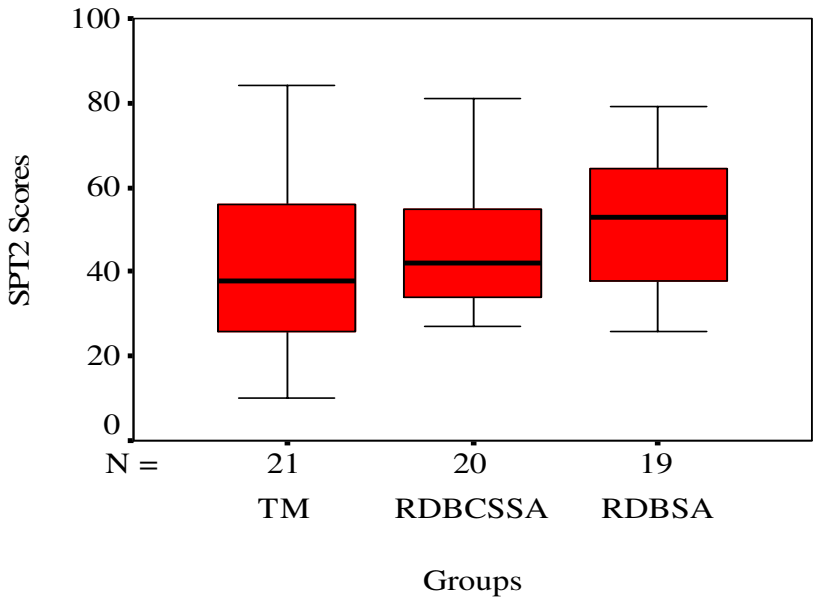

Figure 4.1 Box-Plot representing the results of the outlier analysis of SPT2 through groups

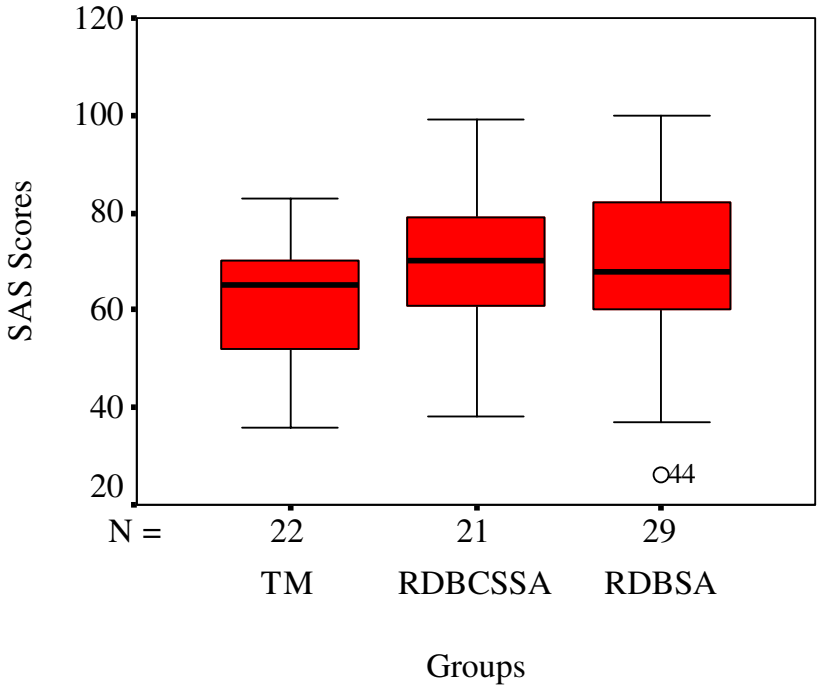

Figure 4.2 Box-Plot representing the results of the outlier analysis of SAS through groups

4.3 Descriptive Statistics

4.3.1 Descriptive Statistics of the SPT1, SPT2 and PMG

Descriptive statistics collected on the data; means, standard deviations, kurtosis, skewness, minimum and maximum scores for each groups were summarized in the following tables. Table 4.1 gives the descriptive statistics for the Statistics Performance Tests, SPT1 and SPT2.

Table 4.1 Descriptive statistics of the SPT1 and SPT2 scores for the groups

	TM		RDBSA		RDBCSSA	
	SPT1	SPT2	SPT1	SPT2	SPT1	SPT2
N	25	21	28	19	26	20
Mean	46.24	44.00	54.43	52.42	54.62	45.65
SD	22.68	22.12	16.67	17.36	15.26	14.80
Minimum	17	10	24	26	22	27
Maximum	83	84	90	79	89	81
Skew ness	0.33	0.36	0.06	-0.11	0.19	0.89
Kurtosis	-1.42	-1.08	-0.67	-1.11	-0.05	0.34

Note: The maximum possible mean score was 100, and the minimum possible score was 0.

Possible scores in both SPT1 and SPT2 were ranged from 0 to 100. As it can be seen in table 4.1, for the instrument SPT1, the highest mean score belonged to the RDBCSSA group with the value 54.62. Then the RDBSA group had the second highest mean score with the value 54.43. Lastly, the TM group came with the lowest mean score 46.24. For the instrument SPT2, the highest mean score belonged to the RDBSA group with the value 52.42. Then the RDBCSSA group had the second highest mean score with the value 45.65. Lastly, the TM group came with the lowest mean score 44.00.

The skewness values of TM, RDBSA and RDBCSSA groups were all positive for the SPT1 and lied between -1 and +1 as seen in table 4.1. The skew ness values of TM and RBCSA were both positive for the SPT2 and lied between -1 and +1. The scores of SPT2 for TM and RDBCSSA groups clustered to the left at the low values. RDBSA students' skew ness value was negative for SPT2, because most of the scores tented to be high.

As seen in table 4.1, the kurtosis values of the TM, RDBSA and RDBCSSA groups for SPT1 scores, were negative representing a flat distribution. Actually, the RDBCSSA group's kurtosis value was nearly zero indicating an average between peaked and flat distribution. For the SPT2 scores, the kurtosis values of the TM and RDBSA groups were negative representing a flat distribution. The RDBCSSA group's kurtosis value was positive.

The descriptive statistics for previous mathematics grades (PMG) of the students that had taken SPT1 and SPT2 tests were presented in table 4.2.

Table 4.2 Descriptive statistics of the PMG of the students that had taken SPT1 and SPT2

	TM	RDBSA	RDBCSSA
N	25	28	23
Mean	3.72	3.50	3.78
SD	1.21	1.40	1.28
Minimum	1	1	1
Maximum	5	5	5
Skew ness	-0.49	-0.39	-0.99
Kurtosis	-0.73	-1.10	0.10

Not: The maximum possible grade was 5 and the minimum was 1.

Possible scores in PMG were 1,2,3,4 and 5. As it can be seen in table 4.2, the highest mean score belonged to the RDBCSSA group with the value 3.78. Then the TM group had the second highest mean score with the value 3.72. Lastly, the RDBSA group came with the lowest mean score 3.50.

The skewness values of the TM, RDBSA and RDBCSSA groups were all negative for the PMG and lied between -1 and +1 as seen in table 4.2. The previous mathematics grades of the students for each groups clustered to the left at the low values.

As seen in table 4.2 the kurtosis values of the TM and RDBSA groups for PMG were negative representing a flat distribution. The RDBCSSA group kurtosis value was positive.

Figures 4.3, 4.4 and 4.5 show the histograms with normal curves related to the SPT2 scores of the TM, RDBSA and RDBCSSA students. The histograms of the TM, RDBSA and RDBCSSA groups for SPT2 were nearly looked like a normal distribution.

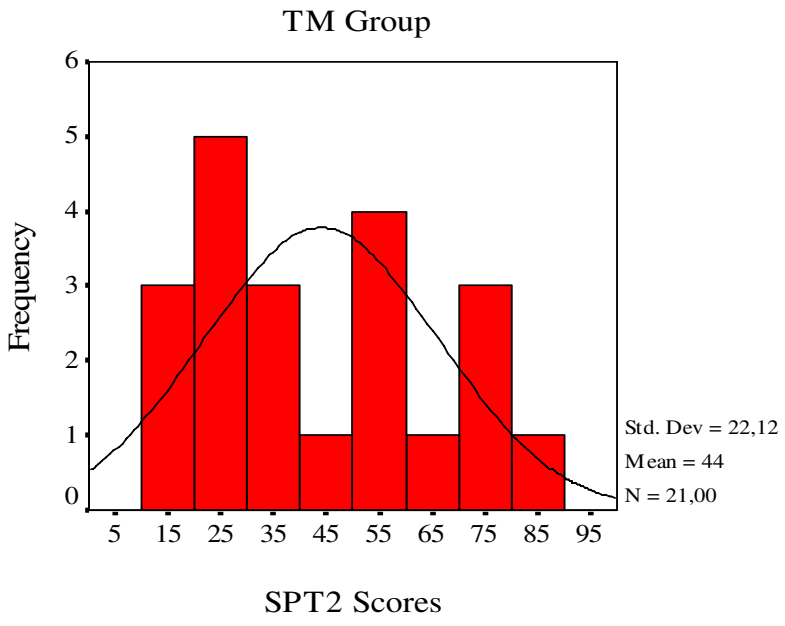

Figure 4.3 Histogram with normal curves of the TM students' Statistics Performance Test 2 scores

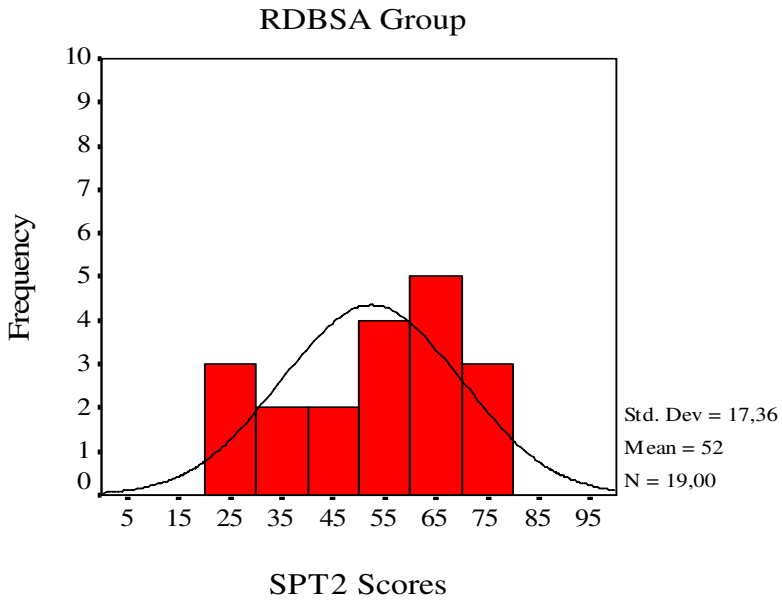

Figure 4.4 Histogram with normal curves of the RDBSA students' Statistics Performance Test 2 scores

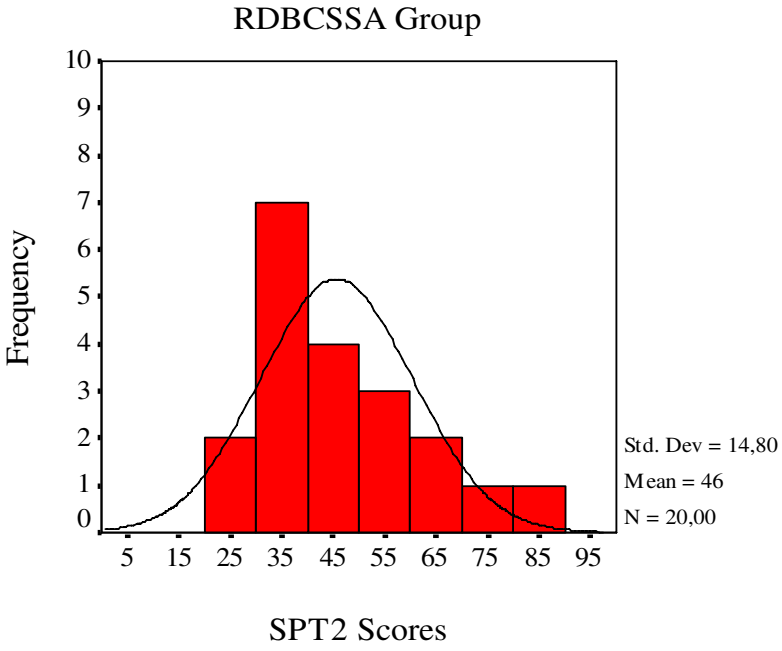

Figure 4.5 Histogram with normal curves of the RDBCSSA students' Statistics Performance Test 2 scores

4.3.2 Descriptive Statistics of the SAS

Descriptive statistics collected on the data; means, standard deviations, kurtosis, skewness, minimum and maximum scores for each groups were summarized in the table below. Table 4.3 gives the descriptive statistics of the statistics attitude scale (SAS) scores.

Table 4.3 Descriptive statistics of SAS scores for the groups

	TM	RDBSA	RDBCSSA
N	22	29	21
Mean	62.59	67.97	68.95
SD	13.49	15.52	13.45
Minimum	36	26	38
Maximum	83	100	99
Skew ness	-0.19	-0.23	-0.02
Kurtosis	-0.81	-0.17	0.86

Not: The highest possible mean score was 100, and the lowest was 20.

The possible scores of SAS were ranged from 20 to 100. As it can be seen in table 4.3, for the instrument SAS, the highest mean score belonged to the RDBCSSA group with the value 68.95. Then the RDBSA group had the second highest mean score with the value 67.97. Lastly, the TM group came with the lowest mean score 62.59. For the instrument SAS, standard deviations ranged from 13.45 to 15.52. The skew ness values of TM, RDBSA and RDBCSSA were all negative for the SAS and lied between -1 and +1. The kurtosis values of the TM group and the RDBSA group were negative representing a flat distribution for SAS scores. The RDBCSSA group's kurtosis value was positive. Positive kurtosis values indicate that the distribution is rather peaked.

Figures 4.6, 4.7 and 4.8 show the histograms with normal curves related to the SAS scores of the TM, RDBSA and RDBCSSA students. The histogram of TM group for SAS scores was nearly looked like a normal distribution. The histograms of the RDBSA and RDBCSSA groups for SAS scores were skewed to left, because their scores clustered to the right at the high levels.

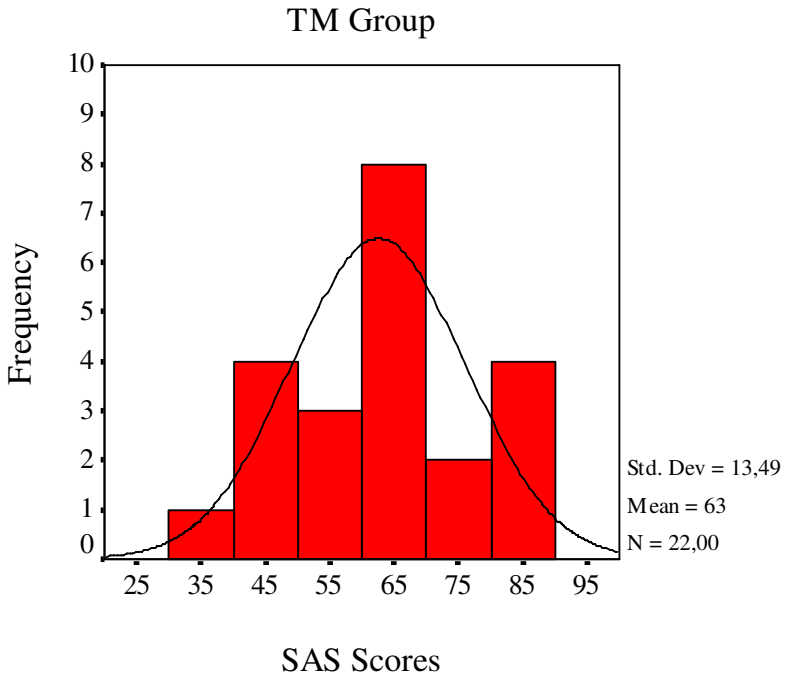

Figure 4.6 Histogram with normal curves of the TM students' Statistics Attitude Scale scores

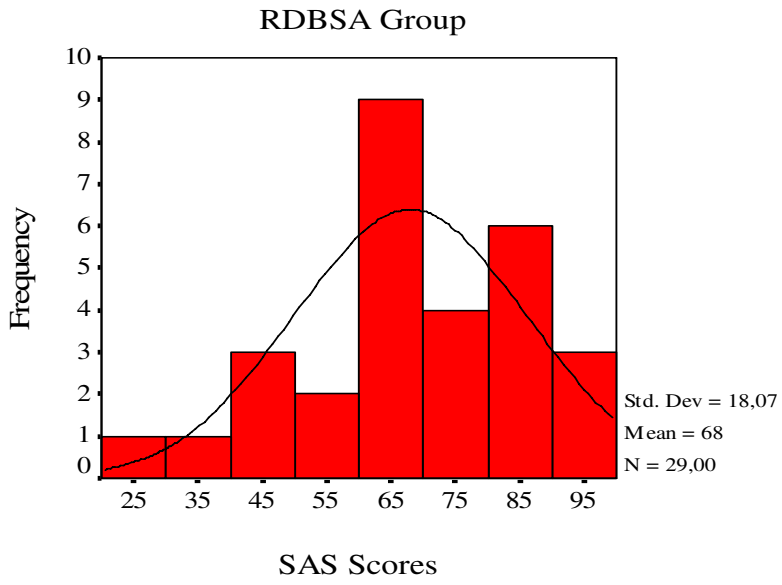

Figure 4.7 Histogram with normal curves of the RDBSA students' Statistics Attitude Scale scores

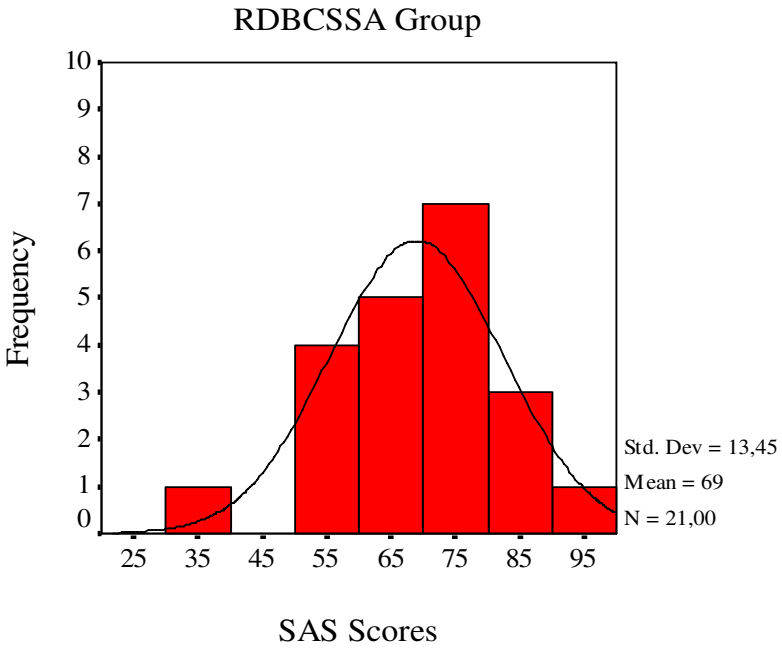

Figure 4.8 Histogram with normal curves of the RDBCSSA students' Statistics Attitude Scale scores

4.3.3 The Analysis of the Items in the Statistics Attitude Scale (SAS)

The Statistics Attitude Scale (SAS) was used to determine the attitudes of the students towards statistics. The SAS uses a 5-point Likert scale (1=strongly disagree, 2=disagree, 3=neither disagree nor agree, 4=agree, 5=strongly agree) that contains 2 subscales: 1) Confidence in Learning Statistics (SAS1), 2) Enjoyment of Statistics (SAS2). The items numbered 1 to 10 were related to SAS1. The items numbered 11 to 20 were related to the subscale SAS2. The odd numbered items were positively stated and even numbered items were stated negatively. All negatively worded items were reverse coded before data analysis. For the negative items, the alternatives of strongly disagree, disagree, neither disagree nor agree, agree and strogly agree were scored as 5, 4, 3, 2 and 1 respectively.

Gal, Ginsburg and Schau (1997) stated that instructors can examine class averages, distributions, or score profiles to determine the status of students' attitudes. If a class scores around or above neutral on each scale the instructor knows that the class as a group does not have an attitude problem. If the class falls much below neutral, the instructor may need to devote more class time to dealing with the negative attitudes (Gal et al. 1997).

For each items in the attitude scale, the mean values of the students' scores were presented in the table 4.4 and table 4.5. For the first item, the groups showed similar attitude, they tended to be agree with the 1st item as seen in table 4.4. While the TM and the RDBCSSA groups tended to be agreeing with the item 6, the RDBSA group tended to be neutral with the item 6. While the TM and the RDBCSSA groups tended to be agreeing with the item 3, the RDBSA group tended to be neutral. For the item 8, all the groups showed similar attitude, they tended to agree with the item. In general the students expressed that they could understand the graphs and tables of the newspapers and magazines easily. For the item 5, all the groups showed similar attitude such that they tended to be neutral with the item. The TM and RDBCSSA groups tended to be agreeing with the item 2, but the RDBSA group tended to be

neutral. The RDBCSSA group tended to be agreeing with the item 7 but the other two groups tended to be neutral with the item 7. The TM group tended to be neutral with the item 10 but the other two groups tended to be agree with the item. In general, the students were not sure about their success in preparing tables and drawing graphs. While the RDBSA and RDBCSSA groups tended to be neutral with the item 9, the TM group tended to be disagreeing with the item 9. For the item 4, all the groups showed similar attitude, they tended to be neutral with the item. In general, the students were not sure about working more about the graphs willingly. The items 1 to 10 were about Confidence in Learning Statistics (Statistics Attitude Subscale 1). The items 1, 3, 5, 7 and 9 were positive statements and the items 6, 8, 2, 10 and 4 were respectively the negative statements of the positive ones.

As seen in table 4.5, all the groups tended to be neutral with the items 11, 13, 16 and 20. The students were not sure about whether they enjoyed preparing tables or drawing graphs for the statistical data. Also all the groups tended to be neutral for the items 17 and 14. They were not sure about whether they were interested or not with the graphs used in media. While the RDBCSSA and the RDBSA groups were neutral with the item 15 and 18, the TM group tended to be disagree. The TM students expressed that the graphs in their textbooks were not enjoyable and they did not increase their attention. The other groups were not sure about this statement. The TM and RDBSA groups tended to agree with the item 19 but the RDBCSSA group tended to be neutral. The TM and RDBSA groups expressed that they would like to use calculators to draw graphs, however the RDBCSSA group was not sure about using the calculator to draw graphs. For the item 12, all the groups tended to be neutral. The students were not sure about being bored while drawing graphs by hand on mill metric papers with ruler The items 11 to 20 were about Enjoyment of Statistics (Statistics Attitude Subscale 2). The items 11, 13, 15, 17 and 19 were positive statements and the items 12, 14, 16, 18 and 20 were respectively the negative statemants of the positive ones.

Table 4.4 The mean values of SAS1 items

SAS Items	TM	RDBSA	RDBCSSA
Statistics Attitude Subcale 1- Confidence in Learning Statistics Items			
P: I can understand mostly what the graphs of the daily newspapers and magazines tell (Item 1)	3.64	3.90	4.24
O: I can not understand mostly what the graphs of the daily newspapers and magazines tell (Item 6)	3.95	3.38	4.10
P: I had no difficulty about understanding what the tables of the daily newspapers and magazines tell (Item 3)	4.09	3.24	4.05
O: I had difficulty about understanding what the tables of the daily newspapers and magazines tell (Item 8)	3.95	3.90	4.00
P: I am very successful about preparing the table of the statistical data (Item 5)	3.00	3.31	3.33
O: I am not successful about preparing the table of the statistical data (Item 2)	3.55	3.10	3.57
P: I am successful about drawing the bar graph or the line graph of the statistical data (Item 7)	3.32	3.38	3.76
O: I think mostly, I can not draw the bar graph or the line graph of the statistical data when I have to do (Item 10)	3.18	3.59	3.67
P: I would like to work more about the circle graph, bar graph and line graphs (Item 9)	2.45	2.93	2.81
O: I would like not to work more about the circle graph, bar graph and line graphs if I had a choice (Item 4)	3.00	3.24	3.14

Not: P means positive statement and O means opposite statement in the Statistics Attitude Scale.

Table 4.5 The mean values of the SAS2 items

SAS Items	TM	RDBSA	RDBCSSA
Enjoyment of Statistics-Statistics Attitude Subscale 2 Items			
P: I enjoy to represent the data of the research with graphs (Item 11)	2.91	3.28	3.38
O: I would not like to represent the data of the research with graphs (Item 16)	2.68	3.31	3.24
P: I enjoy to prepare table for the statistical data (Item 13)	2.77	3.31	3.10
O: Preparing the table for the statistical data is not necessary and it is boring (Item 20)	2.91	3.48	3.48
P: The bar graphs, circle graphs and line graphs in my textbooks are very enjoyable and they increase my attention to the subject (Item 15)	2.32	3.10	2.95
O: I am bored when I study on the bar graphs, circle graphs and line graphs in my textbooks (Item 18)	2.41	3.14	2.86
P: I am interested in graphs which are used in media to show the results of the studies (Item 17)	3.05	3.00	3.24
O: I am not interested in graphs which are used in media to show the results of the studies (Item 14)	3.18	3.17	3.48
P: I would like to draw the bar graphs and line graphs with calculators (Item 19)	3.59	3.97	3.48
O: I am bored when I draw the bar graphs or line graphs by hand on mill metric papers with ruler (Item 12)	2.64	3.17	3.00

Not: P means positive statement and O means opposite statement in the Statistics Attitude Scale.

The reliability of SAS was 0.92. The reliabilities, means and standard deviations of each subscale of the SAS for the groups are shown in table 4.6.

Table 4.6 Means, standard deviations and reliabilities of Statistics Attitude Subscales for the groups

Means, SD and Reliabilities of SAS Subscales for TM Group			
	Scale Mean	SD	Alpha
SAS1	34,53	7,37	0,84
SAS2	28,45	7,59	0,81
Means, SD and Reliabilities of SAS Subscales for STWSM Group			
	Scale Mean	SD	Alpha
SAS1	36,27	8,48	0,89
SAS2	33,56	8.85	0,87
Means, SD and Reliabilities of SAS Subscales for STWSMC Group			
	Scale Mean	SD	Alpha
SAS1	35,88	7,55	0,86
SAS2	31,55	8.85	0,87

4.4 Inferential Statistics

In this section, one way ANCOVA and one way ANOVA models were used. Determination of the covariates, the verifications of one way analysis of covariance (ANCOVA), the verifications of one way analysis of variance (ANOVA) and the analyses of the hypotheses were explained in this section.

4.4.1 Determination of the Covariates for Statistics Performance Test 2

Before clarifying the assumptions of ANCOVA, two independent variables, namely; previous mathematics grades (PMG), pretest (SPT1) scores of the students were set as possible confounding variables of this study. Hence these two independent variables were taken as covariates in order to statistically equalize the differences between the TM, the RDBSA and the RDBCSSA. The correlation between the predetermined independent variables and the dependent variable were calculated and tested for their statistical significance to decide which independent variables should be selected as covariates in ANCOVA.

As presented in table 4.7, previous mathematics grades (PMG), pretest (SPT1) scores have significant correlation with the dependent variable. So these two independent variables were determined in the covariate set for the inferential analyses.

Table 4.7 Pearson correlation coefficients between possible covariates and dependent variable (SPT2)

	Dependent Variable (SPT2)
PMG	0.597**
SPT1	0.726**

** $P< 0.01$

4.4.2 Assumptions of ANOVA and ANCOVA

4.4.2.1 Assumptions of ANCOVA for the Statistics Performance Test 2

In the analysis of ANCOVA there are six underlying assumptions that need to be verified

1. Normality
2. Linearity
3. Correlation among the covariates
4. Homogeneity of regression
5. Equality of variances
6. Independency of observations

For normality assumption, skewness and kurtosis values were examined. These values were in almost acceptable range (for skew ness 0.11-0.89, and for kurtosis 0.34-1.11) for a normal distribution as indicated in table 4.1.

To test for linearity, the scatter plots were generated between the dependent variable (SPT2) and each of the covariates. The relationships were clearly linear, so we assumed that we have not violated the assumption of a linear relationship.

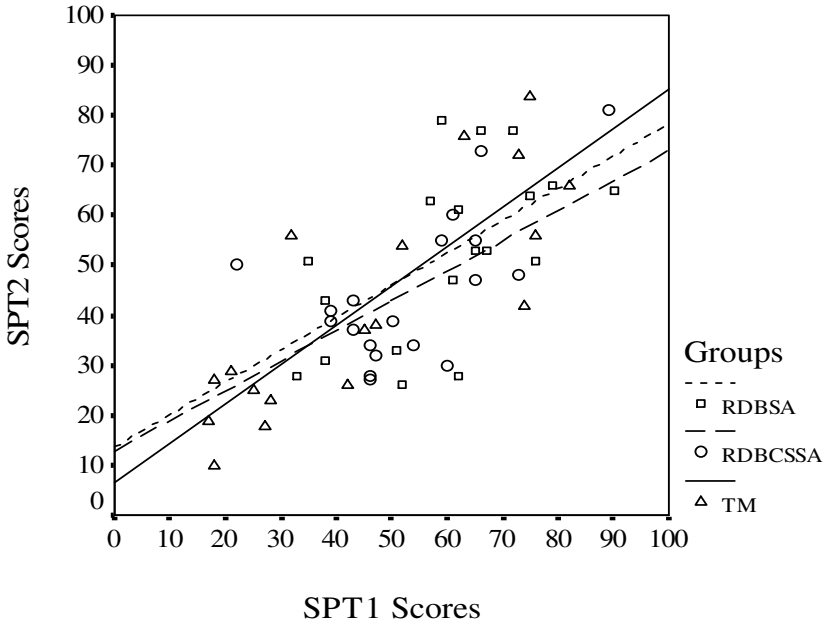

Figure 4.9 The scatter plot of the linear relationship between SPT2 and SPT1 scores

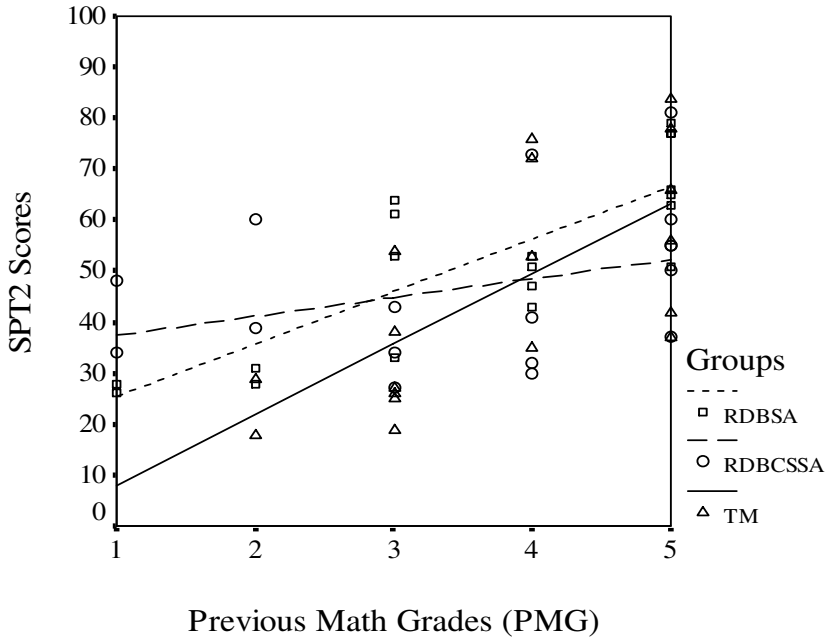

Figure 4.10 The scatter plot of the linear relationship between SPT2 and PMG scores

To test the assumption of the correlation among the covariates, Pearson correlation coefficients between the covariates were calculated. Since two covariates were used for the SPT2, the correlation between the covariates was calculated for all groups. The Pearson correlation between covariates namely between PMG and SPT1 were found to be -0.39 for the RDBCSSA group and 0.48 for the RDBSA group. These values are less than 0.80. Therefore, it can be said that there was not a strong correlation among the two covariates for the groups RDBSA and RDBCCSA. However the Pearson correlation between the covariates was found to be 0.80 for the TM group. There was a strong relationship between two covariates so that PMG covariate was removed from analysis. Therefore the null hypothesis was revised as following:

H1: There are no significant differences among the mean scores of the students instructed by real data based statistics activities (RDBSA), those instructed by the

real data based and calculator supported statistical activities (RDBCSSA) and those instructed by the traditional method (TM) with respect to statistics performance when the Statistics Performance Test 1 (SPT1) scores of the students were controlled.

Homogeneity of regression slopes assumption concerns the relationship between the covariate and the dependent variable for the groups. As seen in table 4.8, the significance level for the interaction between the groups and SPT1 was 0.70. It was greater than 0.05 so the assumption of homogeneity of regression slopes was not violated.

Table 4.8 Results of the analysis for homogeneity of regression assumption with respect to the SPT2

	Type III Sum of Squares	df	Mean Square	F	Sig.
Groups * SPT1	124.373	2	62.186	0.358	.701

a R Squared = 0.539 (Adjusted R Squared = 0.493)

The fifth assumption of satisfying the equality of variances was controlled by Levene's Test of Equality. As seen in table 4.9, F value was found non-significant. This indicates the error variance of the dependent variable across groups was equal.

Table 4.9 Levene's test for equality of error variances for SPT2 scores

F	df1	df2	Sig.
0.249	2	53	.78

Lastly, independency of the observations assumption was checked. To validate this assumption the course teachers of the students observed the groups during the

administration of all pre and post tests. From their observations it was concluded that the students did all the tests by them.

4.4.2.2 Assumptions of ANOVA for Statistics Attitude Scale

In the analysis of ANOVA there were three underlying assumptions that need to be verified

1. Independency of observations
2. Normality
3. Homogeneity of variances

The independency of the observations assumption was checked. To validate this assumption the course teachers observed the groups during the administration of the statistics attitude scale. From the observations it can be mentioned that the students did all the scale by themselves.

For normality assumption, skewness and kurtosis values were examined. The values were in almost acceptable range (for skewness 0.02-0.23, and for kurtosis 0.17-0.86) for a normal distribution as indicated in table 4.3.

The third assumption of homogeneity of variance was controlled by Levene's Test of Equality. As seen in table 4.10, F value was greater than .05 so the assumption of homogeneity of variance was not violated. This indicates the variance in SAS scores was same for each of the three groups.

Table 4.10 Levene's test for homogeneity of variances for SAS

F	df1	df2	Sig.
1.551	2	69	.219

4.4.3 Findings Related to Hypotheses Testing

Findings of the study related to the hypotheses were presented in this section. Hypotheses related to the study were:

H1: There are no significant differences among the mean scores of the students instructed by real data based statistics activities (RDBSA), those instructed by real data based and calculator supported statistics activities (RDBCSSA) and those instructed by the traditional method (TM) with respect to statistics performance when the Statistics Performance Test 1 (SPT1) scores of the students were controlled.

To test the first hypothesis, the statistical technique of ANCOVA was used. The covariate of this study was SPT1 scores, and the dependent variable was SPT2 scores. Group was taken as a fixed factor of this study. The results of ANCOVA were presented in table 4.11. There was no significant difference in the Statistics Performance Test-2 (SPT2) scores for subjects in the study groups, after controlling SPT1 scores, ($F(2,52)=0.31$, $p=.74$, eta square=0.01). The eta squared value is only 0.012, a small effect size. Only 1.2% of the total variance of model for the dependent variable of SPT2 was explained by the independent variable of groups.

Table 4.11 Analysis of covariance test results for the Statistics Performance Test 2

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
Groups	104.769	2	52.385	0.309	.735	0.012
SPT1	8973.632	1	8973.632	53.011	.000	0.505
Error	8802.567	52	169.280			
Total	140203.000	56				
Corrected Total	18837.839	55				

The second hypothesis was as following.

H2: There are no significant differences among the mean scores of the students instructed by real data based statistics activities (RDBSA), those instructed by real data based and calculator supported statistics activities (RDBCSSA) and those instructed by the traditional method (TM) with respect to attitudes toward statistics.

ANOVA was used to test the hypothesis. The dependent variable was Statistics Attitude Scale (SAS) scores of the students. Group was taken as a fixed factor of this study. The results of ANOVA were given in table 4.12. According to the results, there is no significant difference in the Statistics Attitude Scale scores for subjects in the study groups ($F(2, 69) = 1.09$, $p = .34$).

Table 4.12 Analysis of variance test results of the Statistics Attitude Scale

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	523.875	2	261.938	1.090	.342
Within Groups	16583.236	69	240.337		
Total	17107.111	71			

4.5 Analysis of the Students Comments about Treatment

Students were asked to reflect on their experiences about the statistics instruction they had taken. At the end of the instruction they were asked to write their thoughts about the teaching methods. Students' comments were examined with the mathematics teacher. General thoughts of the students were detected.

There were 15 students in the TM group. The expressions of the students about the traditional method was shown in the table 4.13.

Table 4.13 The expressions of the TM students about the teaching method

	Number of the students
Statistics is a very important and attractive subject.	7
Statistics is not an attractive subject.	1
The learning style was boring, it should be made enjoyable	1
Cooperative learning could be better to use in the lessons.	7
The examples should be more attractive. They could contain real data examples.	7
Traditional method was good. The subject was understood very well.	5
Calculators should be used to make the lessons more attractive	3
Calculators should not be used since the people do not use their brain for calculations.	2
Computers should be used in the lesson by the way the topics should be understood better.	2
The time of the treatment should be longer.	1

There were 13 students in the RDBSA group. The expressions of the students about the instruction by real data based statistics activities were shown in the table 4.14

Table 4.14 The expressions of the RDBSA students about the teaching method

	Number of the students
The teaching method was enjoyable.	7
It was good to learn cooperatively.	2
It would be better to work individually	1
The teaching method was boring.	3
It would be better to learn the subjects from the teacher.	3
The content of the worksheets were good and enjoyable.	1

There were 17 students in the RDBCSSA group. The expressions of the students about the instruction by real data based and calculator supported statistics activities was shown in the table 4.15

Table 4.15 The expressions of the RDBCSSA students about the teaching method

	Number of the students
The teaching method was enjoyable.	5
The lesson was boring.	1
The calculators made the lessons enjoyable and made the study easy.	12
The usage of the calculators was very complex.	7
The worksheets were enjoyable and it was good to use articles from newspapers.	1
The worksheets were not attractive.	1

4.6 Summary of the Results

In the light of above findings, the following conclusions were deduced:

1. There was no significant mean difference among the treatment groups with respect to statistics performance when the Statistics Performance Test 1 (SPT1) scores of the students were controlled. The mean scores were ordered as the RDBSA, RDBCSSA and the TM.

2. There was no significant mean difference among treatment groups with respect to attitude towards statistics. These mean scores were ordered as: the RDBSA, the RDBCSSA and the TM.

3. From the mean values of the Statistics Attitude Scale items, the followings were inferences. The students expressed that they could understand the graphs and tables of the newspapers and magazines easily but they were not sure about their success in preparing tables and drawing graphs. Also they were not sure about being wily to work more about the graphs. The mean scores of the students were around 3 or above which meant that the students had positive attitudes to the statements of Statistics Attitude Subscale 1 (Confidence in Learning Statistics). The students tended to be neutral about whether they enjoyed preparing tables or drawing graphs for the statistical data. Also they were not sure about whether they were interested with the graphs used in media. The TM students expressed that the graphs in their textbooks were not enjoyable and they did not increased their attention. The other groups were not sure about this statement. The TM and RDBSA groups expressed that they would like to use calculators to draw graphs, however the RDBCSSA group was not sure about using the calculator to draw graphs. The students were not sure about they were bored while drawing graphs by hand on mill metric papers with ruler. The mean scores of the students were around 3 which meant that the students were neutral to the statements of the Statistics Attitude Subscale 2 (Enjoyment of Statistics).

4. From the students' comments about the teaching methods the following inferences were obtained. Most of the TM students mentioned that statistics was a very important and attractive subject. They preferred to learn cooperatively. Also they expressed that the examples should be more attractive such that the activity sheets could contain real data examples. However some of the students wrote that traditional method was good and the subject was understood very well. Most of the RDBSA students mentioned that the teaching method was enjoyable. Most of the RDBCSSA students expressed that the calculators made the lessons enjoyable and made the study easy.

CHAPTER V

DISCUSSIONS AND RECOMMENDATIONS

In this chapter, first the purpose of the present study is restated. Second, the results of this study are discussed. Third, limitations of the study, internal and external validity of the study are explained. Finally, the recommendations are stated.

5.1 Restatement of the Purpose of the Present Study

The purpose of the present study was to investigate the effects of three different teaching methods: (i) instruction by real data based statistics activities (RDBSA) (ii) instruction by real data based and calculator supported statistics activities (RDBCSSA) and (iii) instruction by the traditional method (TM) on seventh grade students' statistics performance and attitude toward statistics.

To accomplish this purpose, a quasi-experimental research design was utilized. The research was conducted during the spring semester of 2000-2001 academic years. There were one control and two experimental groups. Subjects of the present study consisted of seventh grade students of a private school in Ankara. In the present study convenient sampling was used. While the control group was instructed by the TM, the experimental groups were instructed by the RDBSA and the RDBCSSA. The SPT1 was administered to all groups before the instructions. Students' previous mathematics grades belonged to the fall semester of the 2000-2001 academic years were obtained. The activity sheets given to the experimental groups were prepared by the researcher. The activity sheets were based on real data. The examples which were

taught to the control group, were taken from seventh grade mathematics textbooks, they were not based on real data. The data in the examples were adjusted. So the students were not to make estimation and complex calculations. The RDBCSSA group was given calculators besides the activity sheets. The calculators had the statistical functions. After a two-week treatment, the SPT2 was given as a post test. Also SAS was given after the treatment to determine the attitutes of the students towards statistics.

5.2 Discussion of the Study

The importance of statistics in our lives makes the case for statistics to become a key part of education for responsible citizenship. Moore (1997) stated that a movement to reform the teaching of statistics calls for researchers and teachers to focus on the synergy between content, pedagogy and technology. What could be done to make the students statistically literate with a technology support in mathematics curriculum, were studied in this research.

The purpose of the present study was to investigate the effects of real data based statistics activities and the use statistical functioned calculators, on the statistics performance of the students. SPT2 was adminestered as a post test to determine students' statistics performance after the treatment. The adjusted mean scores of the RBSA, RBCSA and TM groups on post-test (SPT2) were found as 52.42, 45.65 and 44.00, respectively. RBSA group had the highest mean score. However, the results of ANCOVA revealed no significant mean difference among the RDBSA, the RDBCSSA and the TM groups with respect to statistical performance ($p>.05$). The effects of the real data based statistics activities and statistical functioned calculators on the statistics performance of the students were not significant. On the contrary, Harskamp, Suhre and Struen (2000) found that students using graphing calculators tended to obtain higher scores, than students not taught using graphing calculators. In the same way Katsberg and Leatham (2005) mentioned that students' achievement is

improved when curricula designed with a graphing calculator is used. Çalıkoğlu (2000) stated that the students do not forget the statistical methods which are based on real world problems so it is necessary to use real world problems in understanding statistical methods and the value of statistics in daily life. In the same way, Singer and Willett (1990) proposed that artificial data sets should be eliminated from the curriculum and that they should be replaced with real data sets.

Experimental groups of the present study had low mean scores. The reason could be that the duration of the treatment was short to improve the statistics skills (i.e. duration was two weeks), since statistical literacy could be developed over a long period of time. Besides, the problems in SPT2 were new for the students because most of the students were generally used to solve usual textbook questions. They had difficulties in the estimation problems in the questions of SPT2. The students in experimental groups worked cooperatively but they were accustomed to learn the subject from the teacher in other words they were accustomed to teacher centered instruction. Garfield (1995) stated that the use of small group learning activities leads to better group productivity, improved attitudes and sometimes increased achievement. However in this study there were not significant mean differences among the groups that worked in pairs of two and the group that worked individually with respect to statistics performance and attitudes towards statistics.

Students' attitudes about statistics are important because they may influence the learning process. Mills (2004) stated that important variables related to statistics achievement such as mathematics ability, statistics experience, confidence, and even gender continue to influence student attitudes. Besides the statistics performance of the students, the present study investigated the effects of real data based statistics activities and the use statistical functioned calculators, on the attitudes of the students towards statistics. SAS was administered as a post test to determine students' attitudes towards statistics. The adjusted mean scores of the RDBSA, RDBCSSA and TM groups on SAS were found as 47.97- 48.95 and 42.59, respectively. RDBCSSA group had the highest mean score. However when the results were analyzed with

ANOVA, it was found that there was not significant mean difference among the RDBSA, the RDBCSSA and the TM groups with respect to attitudes toward statistics ($p>.05$). Despite these findings researchers argue that dealing with real data sets helps developing positive attitudes towards statistics. For example, Mills (2004) indicated that students are now experiencing more positive attitudes toward statistics than negative attitudes, because innovative teaching and learning strategies. In addition Çalıkoğlu (2000) recommended the following techniques to reduce statistical anxiety: hands-on activities, using real world problems, step-by-step explanation of the statistical analysis.

From the mean values of the Statistics Attitude Scale items, the followings were concluded. The students expressed that they could understand the graphs and tables of the newspapers and magazines easily but they were not sure about their success in preparing tables and drawing graphs. Also they were not sure about being eager to work more about the graphs. The mean scores of the students were around 3 or above. The students had positive attitudes to the statements in Statistics Attitude Subscale 1 (Confidence in Learning Statistics). Gal, Ginsburg and Schau (1997) stated that if a class scores around or above neutral on each scale the instructor knows that the class as a group does not have an attitude problem.

The students tended to be neutral about whether they enjoyed preparing tables or drawing graphs for the statistical data. Also they were not sure about whether they were interested in the graphs used in media. The TM students expressed that the graphs in their textbooks were not enjoyable and they did not increased their attention. The others were not sure about the statement. The TM and RDBSA groups expressed that they would like to use calculators to draw graphs, however the RDBCSSA group was not sure about using the calculator to draw graphs. On the contrary Sam and Kee (2004) stated that the use of the calculators could have stimulated students' enjoyment of statistics learning as well as helped in upgrading their statistical skills and conceptual understanding.

However, the students were not sure about they were bored while drawing graphs on millimetric papers with ruler. Results of a study from Holland suggested that the use of graphing calculators can stimulate both the use of realistic contexts in mathematics and more exploratory learning approaches for students, leading to students having a more integrated view of mathematics and being more flexible in their use of problem solving strategies (Drijvers & Doorman, 1996). The mean scores of the students were around 3 which meant that the students were neutral to the statements of the Statistics Attitude Subscale 2 (Enjoyment of Statistics).

15 students from the TM group, 17 students from the RDBCSSA group and 13 students from the RDBSA group reflected their thoughts about the teaching methods they had taken by writing their thoughts on a blank paper. Most of the TM students mentioned that statistics was a very important and attractive subject. They wanted the examples to be more attractive and they preferred to work cooperatively. However some of the students wrote that traditional method was good and the subject was understood very well. Most of the RDBSA students mentioned that the teaching method was enjoyable. Most of the RDBCSSA students expressed that the calculators made the lessons enjoyable and made the study easy.

5.3 Limitations

The experimental groups were instructed by the researcher but the control group was instructed by their regular mathematics teacher. This might have a potential influence on the results of this study. The researcher attended to the control group courses to observe the instruction.

Another limitation of the study was that the experimental groups worked in small groups. In the control group the students worked individually.

The number of the students was limited to get significant differences between the treatment groups on the performance and attitudes of the students. Besides there was the problem of irregular attendance of the students since the study was conducted at the last two weeks of the semester.

The duration of the treatment was another limitation. The duration was limited to make significant differences between the treatment groups on the performance and attitudes of the students. The treatment lasted two weeks.

5.3.1 Internal Validity

Internal validity means that observed differences on the variable are directly related to the independened variable, and not due to the some unintended variables.

In the present study, the possible threats to internal validity were students' characteristics, location, history, instrument decay, maturation, regression, data collector characteristics, data collector bias, confidentiality, implementation of the treatment and Hawthorne effect. The way of controlling these threats were discussed.

In the present study, students' characteristics could not be a problem for the internal validity. Students were at the same age; and the number of boys and girls were almost equal. Hence, those characteristics did not affect research results unintentionally. Since students' socioeconomic backgrounds were almost the same, they could understand and speak Turkish at the same level. Students were seventh grade so that they were given the same courses through their entire education. There were not differences on pre-treatment measures. Therefore, their educational backgrounds could not be a threat.

Location and history threats were controlled by administering the pre and post-tests to all groups almost at the same time. The testing location was not different in terms

of physical conditions since they were at the same school even at the same floor. Although maturation was threat in many studies, it was not in the present study. Since all the students were at the same age, maturation was controlled.

Data collector characteristics and data collector bias should not be threats in this study because data collectors (the researcher and the mathematics teacher) followed the same procedure. While scoring the instruments, the researcher scored an item for all students then passed to the next item in order to prevent decay threat to internal validity. The numbers and the names in the pre-test were changed in the administration as a post-test in order to prevent recalling.

Confidentiality was satisfied without taking account the names of the students. Regression should not be a treat for this study because the subjects were not from the gifted or remedial classrooms. On the other hand, implementation might be a threat to internal validity. The RBSA and the RBCSA groups were instructed by the researcher, but the TM group had a different teacher. To control this threat, the lesson plan of the control group was prepared by the mathematics teacher before the treatments began and they were examined by the researcher. By this way the teacher should not be affected from the other teaching methods. Also the researcher attended to the control group courses to observe how the instruction went on. Any of the methods were not favored and the problems out of the research were solved during the instruction. Since the study took place in regular setting, Hawthorne effect could be reduced.

5.3.2 External Validity

5.3.2.1 Population Validity

In the present study, convenience sampling was utilized. Therefore, generalizations of the findings of the study were limited. However, generalizations could be done on

subjects having the same characteristics. The subjects of the present study consisted of 84 seventh grade students from a private school in Ankara-Turkey. The targeted population was the all seventh grade students in private schools of Turkey.

5.3.2.2 Ecological Validity

The ecological validity refers to the degree to which results of a study can be extended to other settings or conditions. The treatment and the instruments were utilized in regular classroom conditions. The results of the present study could be generalized to classroom settings similar to this study.

5.4 Recommendations for Further Research

Followings are some recommendations for further researches on the effects of the RDBSA, the RDBCSSA and the TM on students' statistical performance and attitudes towards statistics.

- The sample size can be increased in further studies.
- The duration of application of the treatment can be increased in further studies.

Taking into account the following research topics, new materials and measuring instruments can be designed and tested in the class. A similar study could be conducted:

- To investigate the effect of the RDBSA, the RDBCSSA and the TM on students' retained statistical performance.

- To compare the effect of different teaching methods on statistics performance and attitude toward statistics.

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APPENDIX-A

THE ACTIVITY SHEETS BASED ON REAL DATA

Ad Soyad:..... , ... /Sınıf: 7-..... /No: ..... , ...

Merkezi Eğilim Değerleri

Etkinlik-1A

Aşağıdaki tabloda, 1. lig takımlarından iki tanesinin oynadıkları maçlarda attıkları gollerin sayıları sırası ile verilmiştir. Veriler, 2000 yılında aittir ve takımların 23. hafta sonundaki maç sonuçlarının verildiği bir gazete haberinden alınmıştır.

A Takımı	1 ,2, 2, 1, 3, 5, 3, 4, 4, 2, 2
B Takımı	1, 1, 3, 4, 4, 3, 4, 2, 0, 2, 2, 1

Gollerin atılma sıklığını (frekansını) bulmak için, aşağıda verilen çeteleyi doldurunuz.

Gol sayısı / Takım	0	1	2	3	4	5
A TAKIMI		//	////			
B TAKIMI						

Aşağıdaki soruları, hazırlamış olduğunu sıklık tablosuna (çeteleye) göre yanıtlayınız.

1) Her bir takım için, en fazla atılan (sıklığı en fazla olan) gol sayısını bulunuz.

Bu değere veri setinin **modu** denir.

(Eğer, en büyük sıklık değerine sahip birden çok veri var ise, tüm bu değerler veri setinin modu olarak kabul edilir. Ama veri setinde tüm veriler aynı sıklıkta yer alıyor ise bu veri setinin modu yoktur.)

A takımının attığı gollerin **modu:** | B takımının attığı gollerin **modu:**

---

2)

Veriler bir sıraya göre dizildiğinde (küçükten büyüğe veya büyükten küçüğe doğru), bu sıralamanın tam ortasında yer alan değere veri setinin **medyanı** denir.

Veri sayısı çift ise, medyanı bulmak için tam ortada yer alan iki değer toplanıp ikiye bölünür.

a) A takımının attığı golleri büyükten küçüğe veya küçükte büyüğe doğru sıralayınız.

A takımının goller:

A takımının attığı gollerin medyanı:

b) B takımının attığı golleri de yukarıdaki gibi sıralayınız.

B takımının goller:

B takımının attığı gollerin medyanı:

3) Veri setinde yer alan en düşük değer ile en büyük değerin farkına veri setinin **değişim aralığı** denir.

A takımının attığı gollerin değişim aralığı:	B takımının attığı gollerin değişim aralığı:

4) Veri setinde yer alan tüm veri değerlerin toplanıp, veri sayısına bölünmesi ile elde edilen değere veri setinin **aritmetik ortalaması** denir.

A takımının attığı gollerin toplamı=	B takımının attığı gollerin toplamı=
A takımının oynadığı maç sayısı=	B takımının oynadığı maç sayısı=
A takımının attığı gollerin ortalaması=	B takımının attığı gollerin ortalaması=

5) 12 maç sonucunda attığı gollerin aritmetik ortalaması 2 olan C takımının,veri setinden 2 maçta attığı gol sayıları yani 2 ve 6 çıkarılırsa, geriye kalanların aritmetik ortalaması kaç olur?	6) 10 maç sonucunda attığı gollerin aritmetik ortalaması 2 olan D takımının, bundan sonra oynayacağı iki maçta toplam kaç gol atmalıdır ki, attığı gollerin aritmetik ortalamasını 2.5 'a yükseltsin?

8) Aritmetik ortalama, medyan ve mod değerlerine, veri setinin merkezi eğilim değerleri denir.

A takımına ait merkezi eğilim değerlerini önceki sorularda bulmuştunuz. Bu değerleri aşağıdaki boşluklara yazarak inceleyiniz.

Aritmetik Ortalama	Medyan	Mod
.....	.....	.....

Bu değerlerden hangisi veri dizisinin merkezi eğilimini en iyi şekilde ifade etmektedir. Kısaca düşüncelerinizi yazınız.

7) a) B takımına ait veri setine **ortalamanın üzerinde** bir değer(gol sayısı) eklerseniz ortalama nasıl değişir? (Önce tahmin ediniz, sonra hesap yapınız)

Tahminiz nedir? Artar( ) Azalır( ) Değişmez( )

* B takımının önceki aritmetik ortalaması= ☐

* Ortalamanın üzerinde seçtiğiniz veri(değer)= ☐

* B takımının, eklediğiniz değere göre çıkan aritmetik ortalaması= ☐

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b) B takımına ait veri setine **ortalamanın altında** bir değer(gol sayısı) eklerseniz ortalama nasıl değişir? (Önce tahmin ediniz, sonra hesap yapınız)

Tahminiz nedir? Artar( ) Azalır( ) Değişmez( )

* B takımının önceki aritmetik ortalaması= ☐

* Ortalamanın altında seçtiğiniz veri(değer)= ☐

* B takımının, eklediğiniz değere göre çıkan aritmetik ortalaması= ☐

---

c) B takımına ait veri setine **ortalamaya eşit** bir değer (gol sayısı) eklerseniz ortalama nasıl değişir? (Önce tahmin ediniz, sonra hesap yapınız)

Tahminiz nedir? Artar( ) Azalır( ) Değişmez( )

* B takımının önceki aritmetik ortalaması= ☐

* Ortalamanın eşit olarak seçtiğiniz veri(değer)= ☐

* B takımının, eklediğiniz değere göre çıkan aritmetik ortalaması= ☐

---

7. soruda bulduğunuz sonuçlar ile ilgili olarak ne söyleyebilirsiniz? Kısaca açıklayınız.

Ad Soyad:..... , ... /Sınıf: 7-..... /No: ..... , ...

Basketbol Seçmeleri

Etkinlik 1B

Bir okulun basketbol takımının seçmelerine katılan 14 çocuğun boy uzunluklarının dağılımı aşağıda tablo ile gösterilmektedir. Bu tabloya bakarak aşağıdaki soruları yanıtlayınız.

Boy uzunluğu(cm)	167	172	180	183	187
Öğrenci sayısı	1	3	3	3	4

1) Seçmelere katılan bu öğrencilerin boy uzunluklarının **modu** kaçtır?

Sonuç= ☐

2) Seçmelere katılan bu öğrencilerin boy uzunluklarının **medyanı** kaçtır?

Sonuç= ☐

3) Bu öğrencilerin, boy uzunluklarının **aritmetik ortalaması** kaçtır?

Tahmini değeriniz= ☐

Hesap yaparak bulduğunuz değer= ☐

4) Öğrencilerin yüzde kaçının boy uzunluğu, ortalama boy uzunluğunun(seçmelere katılan bu öğrencilerin aritmetik boy ortalamasının) üzerindedir?

Sonuç= ☐

5) Boyları sırası ile 180cm ve 187cm olan iki kişi bu seçmelerden çıkarsa geriye kalan öğrencilerin boy uzunluklarının aritmetik ortalaması kaç olur?

Tahmini değeriniz = ☐

Hesap yaparak bulduğunuz değer = ☐

6) Takımdan ayrılan öğrencilerin yerine başka iki öğrenci geliyor. Yeni oluşan grubun aritmetik boy ortalaması 179 dur. Bu durumda takıma yeni katılan bu iki öğrencinin boy uzunluklarının toplamı kaçtır? Bu toplama göre bu iki öğrencinin boy uzunluklarını tahmin ediniz.

Boy uzunlukları toplamı= ☐

1. öğrencinin boy uzunluğu= ☐

2. öğrencinin boy uzunluğu= ☐

Ad Soyad:..... , ... /Sınıf: /-..... /No: ..... , ...

Basketbol Seçmeleri

Etkinlik 1B

Bir okulun basketbol takımının seçmelerine katılan 14 çocuğun boy uzunluklarının dağılımı aşağıda tablo ile gösterilmektedir. Bu tabloya bakarak aşağıdaki soruları yanıtlayınız.

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Sonuç= ☐

2) Seçmelere katılan bu öğrencilerin boy uzunluklarının **medyanı** kaçtır?

Sonuç= ☐

3) Bu öğrencilerin, boy uzunluklarının **aritmetik ortalaması** kaçtır?
(Önce tahmin ediniz, sonra hesap makineniz ile ortalama değerini hesaplayınız)

Tahmini değeriniz= ☐

Hesap makinesi ile bulduğunuz değer = ☐

4) Öğrencilerin yüzde kaçının boy uzunluğu, ortalama boy uzunluğunun(seçmelere katılan bu öğrencilerin aritmetik boy ortalamasının) üzerindedir?

Sonuç= ☐

5) Boyları sırası ile 180cm ve 187cm olan iki kişi bu seçmelerden çıkarsa geriye kalan öğrencilerin boy uzunluklarının aritmetik ortalaması kaç olur?
(Önce tahmin ediniz, sonra hesap makineniz ile ortalama değerini hesaplayınız.)

Tahmini değeriniz = ☐

Hesap makinesi ile bulduğunuz değer = ☐

6) Takımdan ayrılan öğrencilerin yerine başka iki öğrenci geliyor. Yeni oluşan grubun aritmetik boy ortalaması 179 dur. Bu durumda takıma yeni katılan bu iki öğrencinin boy uzunluklarının toplamı kaçtır? Bu toplama göre bu iki öğrencinin boy uzunluklarını tahmin ediniz.

Boy uzunlukları toplamı= ☐

1. öğrencinin boy uzunluğu= ☐

2. öğrencinin boy uzunluğu= ☐

Ad Soyad:
Sınıf:
No:

Anketler Ne Diyor?

Etkinlik-1C

Erkekler FENER kadınlar CİMBOM

17 ilde yapılan anket sonucunda G.Saray'ın şampiyon olacağını tahmin edenlerin oranı yüzde 52.7 oldu. Kadınların yüzde 52'si G.Saray'ı, erkeklerin yüzde 60'ı F.Bahçe'yi favori gösterdi.

F.Bahçe-G.Saray derbisi için geri sayım başlarken, A&G adlı bir araştırma şirketi tarafından yapılan anket, futbolseverlerin şampiyonluk için sarı kırmızılı takımı favori gösterdiğini ortaya koydu. 28-29 Nisan günlerinde, 17 ilde, 18 yaş üstü 1580 denekle yapılan anket sonucunda 'G.Saray şampiyon olacak' diyenlerin oranı yüzde 52.7 olarak gerçekleşti.

F.Bahçe'nin şampiyon olacağını tahmin edenlerin oranı yüzde 29.1 olurken, deneklerin yüzde 3.8'i Beşiktaş, yüzde 1.2'si de Gaziantepspor'un mutlu sona ulaşacağını tahmin etti. Ankete katılanların yüzde 0.7'si bu dört takım dışındaki diğer kulüpleri favori gösterirken, 'fikrim yok' diyenlerin oranı ise yüzde 12.5. Anketin en ilginç tespiti, kadınların yüzde 52'sinin G.Saray'ı, erkeklerin ise yüzde 60'ının F.Bahçe'yi favori göstermeleri oldu.

KİM ŞAMPİYON OLACAK

Galatasaray	% 52.7
Fenerbahçe	% 29.1
Beşiktaş	% 3.8
Gaziantepspor	% 1.2
Diğer	% 0.7
Cevap yok/Fikri yok	% 12.5
TOPLAM	% 100

Yanda, "Kim şampiyon olacak?" adı altında yapılan bir anket çalışmasının sonuçlarını görmektesiniz.

***İstatistik**, gözlemlerden elde edilen verilerin incelenmesinde matematiksel yöntemlerle bazı sonuçlar çıkaran bir bilim dalıdır.*

***Anket** de, istatistik için bilgi toplama yöntemlerinden bir tanesidir.*

*Araştırmalarda bazen, araştırmaya konu olan tüm objelerin dikkate alınan özelliklerine ait ölçme sonuçlarının oluşturduğu kümeye **evren** denir.*

*Araştırmalarda bazen, hatta çoğu zaman, evren yerine ondan uygun şekilde bazı elemanlar seçilerek daha az sayıda elemandan oluşturulan kümeye **örneklem** denir.*

(Örneğin Ankara'daki tüm öğrencileri kapsayan bir araştırma için, Ankara'daki tüm öğrenciler çalışmanın evrenini oluşturur. Fakat Ankara'daki tüm öğrencilere ulaşmak güç olacağı için, çalışma Ankara'daki bir grup öğrenci üzerinde yapılır ve sonuçlar tüm öğrencilere genellenir.)

Yukarıdaki tanımları göz önünde bulundurarak aşağıdaki soruları yanıtlayınız.

1-) Yandaki çalışma kimin tarafından ve ne zaman gerçekleştirilmiştir?

2-) Bu çalışmada seçilen örneklem nedir?(Çalışmaya katılanlar kimlerdir?)

3-) Bu çalışmanın evreni nedir? (Çalışmanın asıl hedef kitlesi kimlerden oluşmaktadır?) **Tahmin ediniz.**

4-) Araştırma sonuçları etkili bir şekilde sunulmuş mudur? Kısaca açıklayınız.

NOT: Gazetede bir araştırma sonucu ile karşılaştığınızda bu soruların cevaplarını arayın. Eğer araştırma sonuçlarının verildiği yazıda bu sorulara cevaplar bulamıyorsanız, yapılan araştırmanın sonuçlarının güvenilirliği sorgulanmalıdır.)

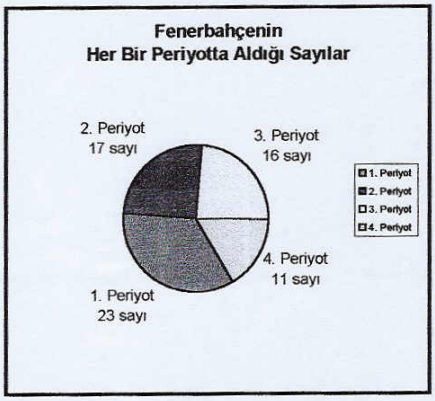
Ad Soyad: ..... , ... /Sınıf: 7- ..... /No: ..... , ...

Bayanlar Basketbol Karşılaşması
Daire Grafiği

Etkinlik-2A

Bayanlar Birinci Basketbol Ligi play-off yarı finali 2. maçında Galatasaray ile Fenerbahçe karşı karşıya geldiler. Aşağıdaki daire grafiği, Fenerbahçe'nin bu maçın her bir periyodunda aldığı sayıları göstermektedir.

Grafiği dikkatli bir şekilde inceleyerek aşağıdaki soruları yanıtlayınız.



1-) İlk periyotta alınan sayı ile son periyotta alınan sayı arasındaki fark kaçtır?
2-) Bu maçta Fenerbahçe kaç sayı toplamıştır?
3-) 1 sayıya karşılık gelen açının ölçüsü kaç derecedir?

Yukarıda verilen verileri kullanarak tabloda boş bırakılan yerleri doldurunuz. 1. periyot için verilen yapılan işlemleri inceleyiniz. İşlemlerinizi hesap makineleriniz ile yapınız.

	Alınan Sayı	Alınan Sayının Toplamdaki (toplam sayıdaki) Yüzdesi	Bulunduğu Daire Diliminin Açısı
1.Periyot			
2.Periyot			
3.Periyot			
4. Periyot			

Adı Soyad:..... , ... /Sınıf: 7-..... /No: ..... , ...

Kim Şampiyon Olacak?

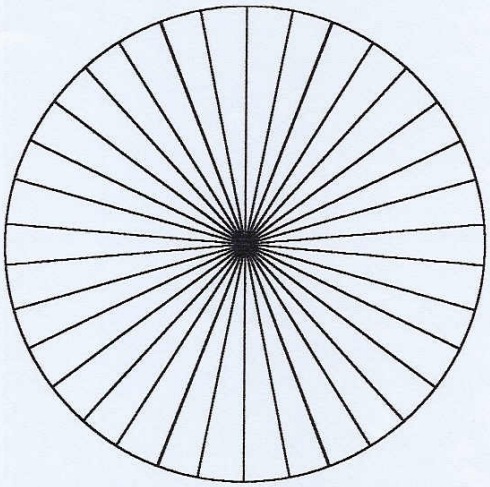
Etkinlik-2B

Daire Grafiği Oluşturuyorum!

Aşağıda verilen tabloda, A&G adlı bir araştırma şirketinin "Kim şampiyon olacak?" adı altında yaptığı bir anketin sonuçları, görülmektedir.

Tablodaki bilgileri kullanarak daire grafiği oluşturunuz. Bunun için aşağıda verilen **50 eşit parçaya bölünmüş** daireyi kullanınız. Tabloda yer alan her bir takım için farklı renklerde kalemler kullanarak yukarıdaki daireyi boyayınız. Tablodaki bilgileri hazırlamış olduğunuz bu daire üzerinde gösteriniz ve daire grafiğinize bir isim veriniz.

KİM ŞAMPİYON OLACAK	
Galatasaray	% 52.7
Fenerbahçe	% 29.1
Beşiktaş	% 3.8
Gaziantepspor	% 1.2
Diğer	% 0.7
Cevap yok/Fikri yok	% 12.5
TOPLAM	% 100



Grafiği tamamladıktan sonra aşağıdaki soruları yanıtlayınız. Yanıtlarınızda sadece işlemleri göstermeniz yeterlidir. İşlemlerin sonuçlarını bulmanıza gerek yoktur.

1- a) Bu anket 1580 kişiye uygulandığına göre, kaç kişi anketteki soru için fikir belirtmemiştir?	1-b) Daire grafiğinde fikir belirtmeyenleri gösteren daire diliminin açısı kaç derecedir?
2) Gazetelerde yer alan araştırma sonuçlarının, tabloların yanı sıra bu tür grafiklerle gösterilmesini istermiydiniz? Evet ( ) Hayır ( ) Nedenini kısaca açıklayınız.	

Ad Soyad:
Sınıf:
No:

Bayanlar Basketbol Karşılaşması
Şekil Grafiği

Etkinlik-3A

Derya	
Dixon	
Çelen	
Routkovskaya	
Lelas	
Gülizar	
Betül	

Bayanlar Birinci Basketbol Ligi play-off yarı finali 2. maçında Galatasaray ile Fenerbahçe karşı karşıya geldiler.

Yandaki şekil grafiği Galatasaray oyuncularının bu maçta aldıkları sayıları göstermektedir.

Her şekil 4 puanı göstermektedir.

( = 4 puan)

Grafiği dikkatli bir şekilde inceleyerek aşağıdaki soruları yanıtlayınız. İşlemlerinizi cevap için ayrılan boşluklara yapınız.

1-) Routkovskaya kaç sayı almıştır?	2-) 9 sayı alan oyuncu kimdir?
3-) Lelas'ın takımına kazandırdığı sayının toplamdaki yüzdesi kaçtır?	4-) Oyuncuların aldıkları sayıların medyanı kaçtır?
5-) Oyuncuların aldıkları sayıların aritmetik ortalaması kaçtır?	7-) Şekil grafiğinde verilen bilgileri, tablo ile gösteriniz.
6-) Sizce, bu bilgiler şekil grafiği ile etkili bir şekilde gösterilmiş midir? Siz hangi tür grafiği kullanmayı tercih ederdiniz? Kısaca yazınız.	

Ad Soyad:
Sınıf:
No:

Serkan Krallığa Koşuyor

Etkinlik-3B

Şekil Grafiği Oluşturuyorum!

SERKAN KRALLIĞA KOŞUYOR

	TOPLAM	SAĞ AYAK	SOL AYAK	KAFA	PENALTI
Serkan (Samsun)	21	16	1	1	3
Ahmet (Beşiktaş)	16	13	0	2	1
Cafer (Ank.Gücü)	13	6	6	0	1
Moldovan (F.Bahçe)	13	7	2	2	2
Ümit Karan (G.Birliği)	12	6	3	3	0
B.Hakan (G.Saray)	12	1	1	8	2
Boliç (F.Bahçe)	11	4	0	3	4
Oktay (G.Antep)	11	5	2	2	2
Dobrowski (Kocaeli)	11	7	0	1	3

Yanda, bir gazetenin spor sayfasından alınmış, bazı futbolcuların attıkları gol sayılarını gösteren verilerin yer aldığı bir tablo görmektesiniz.

Yandaki tabloyu dikkatlice inceleyiniz. Tabloda kaç çeşit veri seti yer almaktadır?

Tabloda yer alan çeşitli türdeki veri setlerinden istediğiniz birini seçeniz. Örn futbolcuların penaltı ile kazandıkları gol sayıları.....vb

Seçtiğiniz veri setindeki verileri şekil grafiği ile gösteriniz. Grafiğinizi aşağıda yer alan boş alan çiziniz.

Not:Oluşturacağınız şekil grafiğinde 4 puana karşılık bir daire (top resmi) çizebilirsiniz.

Oluşturduğunuz şekil grafiğini inceleyiniz. Tablodaki bilgileri bu yol ile sunmanın ne gibi faydaları olabilir? Gazetelerde böyle grafikler görmek hoşunuza gider miydi? Kısaca yazınız.

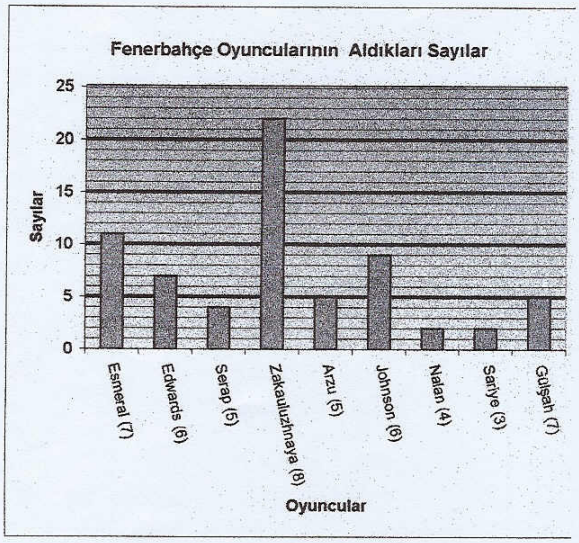
Ad Soyad:
Sınıf:
No:

Bayanlar Basketbol Karşılaşması
Sütun Grafiği

Etkinlik-4A

Bayanlar Birinci Basketbol Ligi play-off yarı finali 2. maçında Galatasaray ile Fenerbahçe karşı karşıya geldiler.

Aşağıdaki sütun grafiği, Fenerbahçe oyuncularının bu maçta aldıkları sayıları göstermektedir Grafiği dikkatli bir şekilde inceleyerek Aşağıdaki soruları yanıtlayınız.



1-) Serap kaç sayı almıştır?

2-) 6 sayı toplayan oyuncu kimdir?

3-) Hangi oyuncular aynı sayıyı almışlardır?

4-) En fazla sayı alan oyuncu ile en az sayı alan oyuncu arasındaki fark kaçtır?

5-) Oyuncuların aldıkları sayıların modu kaçtır?

6-) Oyuncuların aldıkları sayıların toplamı kaçtır?

7-) Fenerbahçe'nin bu maçta oynayan kaç oyuncusu vardır?

7-) Oyuncuların aldıkları sayıların ortalaması kaçtır?

7-) Oyuncuların yüzde kaçı ortalamanın altında sayı almıştır?

8-) Sizce bu grafik verilen bilgileri yansıtmada etkili mi? Siz olsaydınız, bu bilgiler için ne tür bir grafik hazırlardınız?

Ad Soyad:
Sınıf:
No:

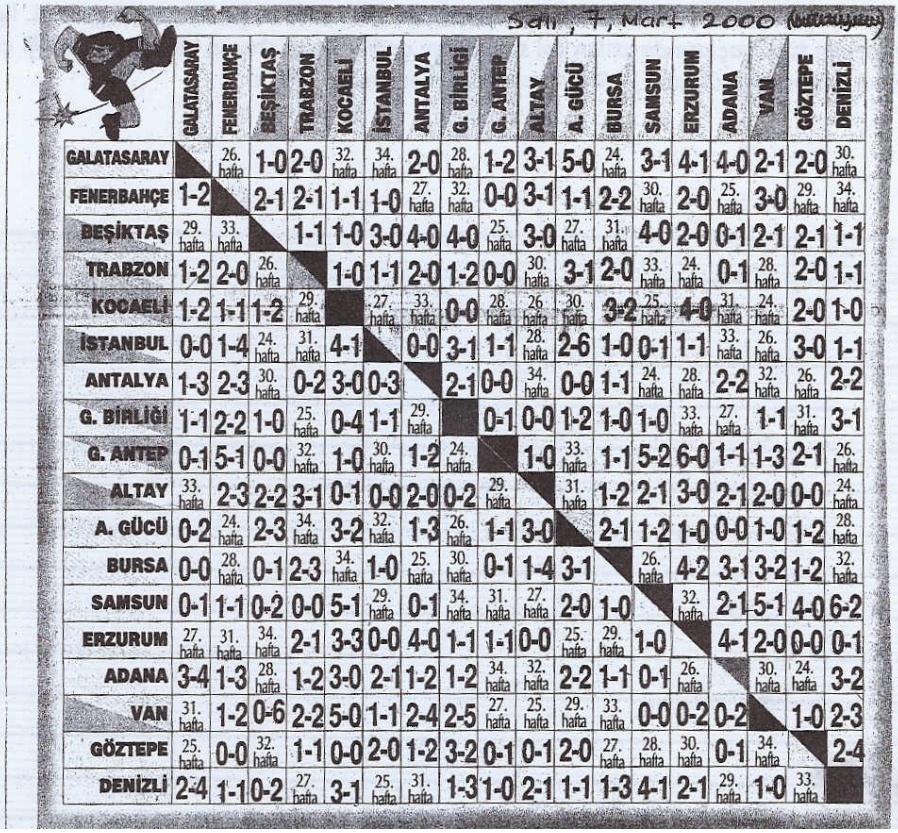
1. Lig Takımları Maç Sonuçları

Sütun Grafiği Oluşturuyorum!

Etkinlik-4

Aşağıda, bir gazeteden alınmış, 1. lig takımlarının, 23. hafta sonu, maç sonuçlarının verildiği bir tablo görmektesiniz. Tabloda 18 takımın aralarında yapmış oldukları 207 maçta attıkları gol sayıları verilmektedir.

Arka sayfada yer alan çetele tablosu, oynanan 207 maçta atılan gol sayılarının dağılımını göstermektedir (İstatistikte verileri düzenlerken (özellikle fazla sayıdaki veriler) çetele tutm çok kolaylık sağlar). Her çubuk bir adete karşılık gelmektedir, buna göre arka sayfada yer alar çetele tablosundaki toplam sütununu doldurunuz.



Salı, 7, Mart 2000

	GALATASARAY	FENERBAHÇE	BEŞİKTAŞ	TRABZON	KOCAELİ	İSTANBUL	ANTALYA	G. BİRLİĞİ	G. ANTEP	ALTAY	A. GÜCÜ	BURSA	SAMSUN	ERZURUM	ADANA	VAN	GÖZTEPE	DENİZLİ
GALATASARAY		26. hafta	1-0	2-0	32. hafta	34. hafta	2-0	28. hafta	1-2	3-1	5-0	24. hafta	3-1	4-1	4-0	2-1	2-0	30. hafta
FENERBAHÇE	1-2		2-1	2-1	1-1	1-0	27. hafta	32. hafta	0-0	3-1	1-1	2-2	30. hafta	2-0	25. hafta	3-0	29. hafta	34. hafta
BEŞİKTAŞ	29. hafta	33. hafta		1-1	1-0	3-0	4-0	4-0	25. hafta	3-0	27. hafta	31. hafta	4-0	2-0	0-1	2-1	2-1	1-1
TRABZON	1-2	2-0	26. hafta		1-0	1-1	2-0	1-2	0-0	30. hafta	3-1	2-0	33. hafta	24. hafta	0-1	28. hafta	2-0	1-1
KOCAELİ	1-2	1-1	1-2	29. hafta		27. hafta	33. hafta	0-0	28. hafta	26. hafta	30. hafta	3-2	25. hafta	4-0	31. hafta	24. hafta	2-0	1-0
İSTANBUL	0-0	1-4	24. hafta	31. hafta	4-1		0-0	3-1	1-1	28. hafta	2-6	1-0	0-1	1-1	33. hafta	26. hafta	3-0	1-1
ANTALYA	1-3	2-3	30. hafta	0-2	3-0	0-3		2-1	0-0	34. hafta	0-0	1-1	24. hafta	28. hafta	2-2	32. hafta	26. hafta	2-2
G. BİRLİĞİ	1-1	2-2	1-0	25. hafta	0-4	1-1	29. hafta		0-1	0-0	1-2	1-0	1-0	33. hafta	27. hafta	1-1	31. hafta	3-1
G. ANTEP	0-1	5-1	0-0	32. hafta	1-0	30. hafta	1-2	24. hafta		1-0	33. hafta	1-1	5-2	6-0	1-1	1-3	2-1	26. hafta
ALTAY	33. hafta	2-3	2-2	3-1	0-1	0-0	2-0	0-2	29. hafta		31. hafta	1-2	2-1	3-0	2-1	2-0	0-0	24. hafta
A. GÜCÜ	0-2	24. hafta	2-3	34. hafta	3-2	32. hafta	1-3	26. hafta	1-1	3-0		2-1	1-2	1-0	0-0	1-0	1-2	28. hafta
BURSA	0-0	28. hafta	0-1	2-3	34. hafta	1-0	25. hafta	30. hafta	0-1	1-4	3-1		26. hafta	4-2	3-1	3-2	1-2	32. hafta
SAMSUN	0-1	1-1	0-2	0-0	5-1	29. hafta	0-1	34. hafta	31. hafta	27. hafta	2-0	1-0		32. hafta	2-1	5-1	4-0	6-2
ERZURUM	27. hafta	31. hafta	34. hafta	2-1	3-3	0-0	4-0	1-1	1-1	0-0	25. hafta	29. hafta	1-0		4-1	2-0	0-0	0-1
ADANA	3-4	1-3	28. hafta	1-2	3-0	2-1	1-2	1-2	34. hafta	32. hafta	2-2	1-1	0-1	26. hafta		30. hafta	24. hafta	3-2
VAN	31. hafta	1-2	0-6	2-2	5-0	1-1	2-4	2-5	27. hafta	25. hafta	29. hafta	33. hafta	0-0	0-2	0-2		1-0	2-3
GÖZTEPE	25. hafta	0-0	32. hafta	1-1	0-0	2-0	1-2	3-2	0-1	0-1	2-0	27. hafta	28. hafta	30. hafta	0-1	34. hafta		2-4
DENİZLİ	2-4	1-1	0-2	27. hafta	3-1	25. hafta	31. hafta	1-3	1-0	2-1	1-1	1-3	4-1	2-1	29. hafta	1-0	33. hafta	

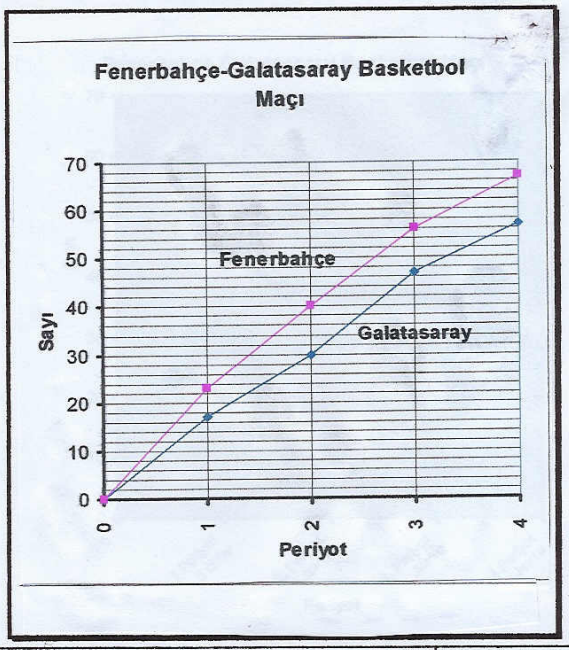
		Toplam
0 gol	卌 ///	
1 gol	卌 /	
2 gol	卌 卌 卌 卌 卌 卌 卌 卌 卌 卌 卌 卌 卌 //	
3 gol	卌 卌 卌 卌 卌 卌 卌 ///	
4 gol	卌 卌 卌 ////	
5 gol	卌 //	
6 gol	////	

Hazır olarak verilen çetele tablosunu kullanarak, 23. hafta sonuna kadar yapılan, 1. lig takımlarının tüm maçlarında atılan gol sayılarının dağılımını gösteren bir sütun grafiği çizi (Verilen eksenleri kullanınız). *Grafiğe ve eksenlere isim veriniz.*

Ad Soyad:
Sınıf:
No:

Bayanlar Basketbol Karşılaşması
Çizgi Grafiği

Etkinlik-5A



Bayanlar Birinci Basketbol Ligi play-off yarı finali 2. maçında Fenerbahçe ile Galatasaray karşı karşıya geldi.

Yandaki çizgi grafiği bu iki takımın, her bir periyot sonunda, toplamda kaç sayıda olduklarının göstermektedir. (Not: 1. Periyot sonu ile 2. periyot sonu arasında geçen süre 2. periyottur. Buna göre her bir periyotta aldıkları puanları bu grafikten sizler çıkarın.)

Verilen grafiği dikkatli bir şekilde inceleyerek aşağıdaki soruları yanıtlayınız.

1-) Bu basketbol maçı kaç kaç bitmiştir? Aralarındaki sayı farkı kaçtır?	2-) Her bir takımın sadece 3. periyot içinde aldıkları sayıları yazınız.
3-) 4. periyodun ilk yarısında, takımların **yaklaşık olarak**, toplamda kaç sayıda olduklarını, grafiğe bakarak söyleyiniz.	
4-a) Takımlar 34 sayıya hangi periyotlar arasında ulaşmışlardır? (Grafiğe bakarak cevaplayınız.)	4-b) 1 periyot 10dk sürmektedir. Buna göre takımlar 34 sayıya, maçın başlamasından yaklaşık kaç dakika sonra ulaşmış olabilirler? (**Grafiğe bakarak, yaklaşık bir değer söyleyiniz.**)

Ad soyad:
Sınıf:
No:

NBA'DE TOPLU SONUÇLAR

Etkinlik-5B

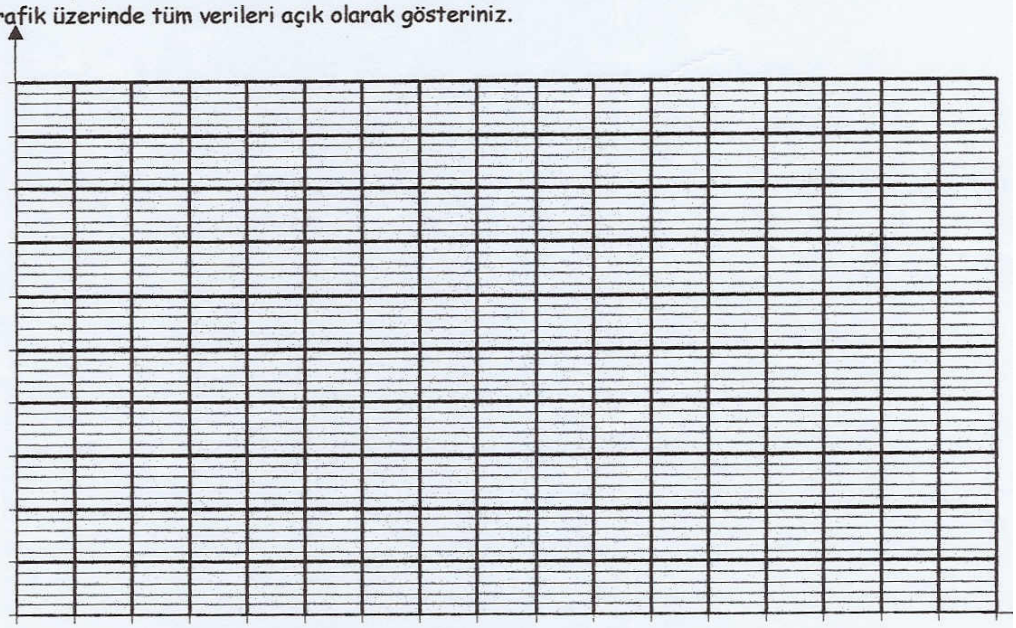
ÇİZGİ GRAFİĞİ OLUŞTURUYORUM!

NBA maçlarını takip eder misiniz? Sizlere 29 tane NBA toplu sonuç tabloları verilmektedir. Tabloda ismi bulunan takımlar içinden kendinize bir takım seçiniz. Seçmiş olduğunuz bu takımın almış olduğu puanları, verilen tabloları inceleyerek bulunuz.

- Tabloların veriliş sırasına göre takımınızın aldığı puanları tablo yaparak gösteriniz.

- Oluşturmuş olduğunuz tablodaki bilgileri kullanarak, takımınızın başarı grafiğini çizmeye ne dersiniz?

Aşağıda verilen eksenleri kullanınız. Grafiğinizi ve eksenleri isimlendirmeyi unutmayınız. Grafik üzerinde tüm verileri açık olarak gösteriniz.



- Yukarıda oluşturduğunuz çizgi grafiğine göre ne tür yorumlar yapabilirsiniz?

NBA'DE SONUÇLAR

Indiana: 111- Houston: 102
Philadelphia: 99- Utah: 97
Toronto: 95- Orlando: 91
Atlanta: 90- Boston: 114
Charlotte: 99- New York: 118
Detroit: 82- LA Lakers: 110
Denver: 114- LA Clippers: 87
Chicago: 92- Golden State: 95 (2.Uzt)
Vancouver: 86- Phoenix: 101

NBA'DE SONUÇLAR

New Jersey: 88- Utah: 92
Toronto: 100- Houston: 88
New York: 85- LA Lakers: 92
Vancouver: 99- Detroit: 101
Atlanta: 85- Dallas: 89
Philadelphia: 89- Orlando: 85
Minnesota: 109- Milwaukee: 82
Golden State: 82- Phoenix: 99

(3)

Play-off'a iki bilet daha

NBA'de dün oynanan maçlar sonunda Orta-batı Grubu lideri Utah Jazz ve Pasifik Grubu üçüncüsü Phoenix Suns da play-off'a kal-mayı garantilediler. So-nuçlar şöyle: Phila-delphia-Boston: 117-115 (2.uzatmada), Toronto-Charlotte: 84-102, New Jersey-Minnesota: 115-116 (uzatmada), New York-Atlanta: 95-83, Or-lando-Houston: 112-96, Milwaukee-Miami: 87-99, Chicago-Denver: 70-68, Seattle-Utah: 95-98, Golden State-Portland: 83-96, LA Lakers-Pho-enix: 109-101, Sacra-mento-Detroit: 113

(4)

NBA'DE TOPLU SONUÇLAR

Atlanta Hawks-Denver Nuggets	: 116-111
Cleveland Cavaliers-Toronto Raptors	: 96-99
Miami Heat-Phoenix Suns	: 81-78
New Jersey Nets-Indiana Pacers	: 111-106
Orlando Magic-Boston Celtics	: 122-87
M.Timberwolves-Philadelphia 76ers	: 100-102
Sacramento Kings-New York Knicks	: 103-95
Houston Rockets-Golden State Warriors	: 121-86
Los Angeles Clippers-Dallas Mavericks	: 102-112
Portland Trail Blazers-San Antonio Spurs	: 85-89

(5)

NBA'DE SONUÇLAR

Toronto: 93- New Jersey: 100
Atlanta: 82- Miami: 77
Indiana: 95- New York: 91
Minnesota: 111- Cleveland: 107 (Uz)
Dallas: 97- San Antonio: 96
Utah: 96- Denver: 83
Vancouver: 98- Golden State: 82
Sacramento: 98- Washington: 86
Seattle: 90- Detroit: 100

(6)

NBA sonuçları

Boston: 106
Minnesota: 109
Philadelphia: 106
Toronto: 93
Charlotte: 119
New Jersey: 103
New York: 78
Chicago: 67
Orlando: 103
Atlanta: 90
San Antonio: 103
LA Clippers: 78
Phoenix: 114
Sacramento: 93
Portland: 95
Detroit: 104
LA Lakers: 119
Golden State: 96

(7)

NBA'DE SONUÇLAR

Atlanta: 70- Charlotte: 86
Dallas: 86- Washington: 93
San Antonio: 96- Cleveland: 76
Vancouver: 75- Utah: 84
LA Clippers: 107- Detroit: 126

(8)

NBA'DE SONUÇLAR

New Jersey	: 110
Denver	: 112
Houston	: 123
Chicago	: 78
Milwaukee	: 99
Boston	: 84
Minnesota	: 106
Toronto (Uzatma)	: 101
Sacramento	: 89
LA Lakers	: 90
Phoenix	: 90
Golden State	: 82
Portland	: 89
New York	: 93
Indiana	: 101
Philadelphia	: 111
Orlando	: 94
Miami	: 69

(9)

NBA sonuçları

Washington: 93
Denver: 101
Detroit: 91
Charlotte: 98
Chicago: 81
Cleveland: 86
Utah: 98
Philadelphia: 84
Vancouver: 99
LA Lakers: 108
Seattle: 95
New York: 110

(10)

NBA'de sonuçlar

Charlotte: 96 Philadelphia: 102
Cleveland: 98 Houston: 85
Miami: 89- LA Lakers: 100
Chicago: 86 Orlando: 88 (uz)
LA Clippers: 93 Washington: 105
Phoenix: 110 Boston: 106

(11)

NBA LİGİ SONUÇLARI

New Jersey: 92 - Milwaukee: 90 (uzatmada)
Indiana: 113 - Charlotte: 99
Washington: 101 - Chicago: 88
Cleveland: 90 - Miami: 92 (uzatmada)
Dallas: 99 - Boston: 104
San Antonio: 102 - Denver: 82
Seattle: 96 - Portland: 97
LA Clippers: 83 - Sacramento: 104

(12)

NBA'DE SONUÇLAR

Indiana: 84
Milwaukee: 105
Dallas: 98-
Cleveland: 104
Houston: 110
LA Clippers: 95
Denver: 86
Washington: 100

NBA DE SONUÇLAR

Boston: 100
Dallas: 108
Charlotte: 81
Seattle: 84
Miami: 85
New York: 76
Utah: 106
New Jersey: 101
Golden State: 80
Atlanta: 75
LA Clippers: 77
Houston: 96

NBA'DE SONUÇLAR

Indiana: 115- Detroit: 105
Philadelphia: 106- Dallas: 87
Toronto: 87- Chicago: 80
Cleveland: 93- Phoenix: 100
Orlando: 103- Seattle: 94
Minnesota: 87- Charlotte: 92
San Antonio: 93- Miami: 69
Portland: 87- LA Lakers: 90
Sacramento: 112- Vancouver: 87

NBA'de sonuçlar

Washington	: 84
Philadelphia	: 87
Miami	: 101
Seattle	: 83
New York	: 109
Milwaukee	: 94
Orlando	: 104
Charlotte	: 96
Chicago	: 110
Cleveland	: 114 (Uzt)
Dallas	: 102
New Jersey	: 103
Houston	: 102
Sacramento	: 99
San Antonio	: 102
Minnesota	: 108
Phoenix	: 118
Indiana	: 87

SONUÇLAR

Toronto: 114
Boston: 104
Atlanta: 83
New York: 70
Utah: 89
Charlotte: 87
Denver: 122
Golden State: 88
Portland: 101
Vancouver: 91
LA Lakers: 107
Indiana: 92

(17)

NBA'de sonuçlar

Houston: 99- New Jersey: 92 (Uz)
LA Clippers: 99- Cleveland: 109
Chicago: 84- Philadelphia: 95
San Antonio: 103- Sacramento: 108
Washington: 100- Detroit: 94
Atlanta: 81- Seattle: 93
Milwaukee: 84- Minnesota: 91
Phoenix: 110- Dallas: 96

(18)

NBA'DE SONUÇLAR

Washington: 85
Orlando: 87
Milwaukee: 111
Atlanta: 78
Phoenix: 100
Miami: 92
Portland: 90
Toronto: 109
San Antonio: 106
New Jersey: 104
LA Clippers: 103
LA Lakers: 123
Sacramento: 130
Dallas: 109

(19)

NBA'DE SONUÇLAR

Toronto: 85- Golden State: 78
Cleveland: 97- Philadelphia: 98 (Uz)
Miami: 108- Milwaukee: 104
Orlando: 107- Washington: 98
New York: 91- Houston: 85
Dallas: 111- Indiana: 90
San Antonio: 94- Atlanta: 79
Phoenix: 107- Minnesota: 100
LA Clippers: 110-Denver: 106
Portland: 96- Sacramento: 91

(20)

NBA'de sonuçlar

ndiana - Miami	: 96-105
oston - Philadelphia	: 93-77
Milwaukee - Cleveland	: 103-72
lew Jersey - Orlando	: 129-91
lew York - San Antonio	: 93-80
eattle - Toronto	: 97-99
Washington - Portland	: 86-102
olden State - LA Clippers	: 103-112
A Lakers - Sacramento	: 109-105

(24)

NBA'de sonuçlar

- Indiana: 127- Portland: 119 (Uz)
- Atlanta: 79- San Antonio: 105
- Dallas: 79- Minnesota: 100
- Utah: 101- Houston: 82

Golden State: 92- LA Lakers: 109

(21)

ONUÇLARI

reland	: 86
h	: 107
mi	: 92
adelphia	: 77
vaukee	: 106
ston	: 96
Antonio	: 88
as	: 110
land	: 92
nesota	: 96
ttle	: 117
couver	: 103

(22)

Sounuçlar

Boston	: 121
G.State	: 104
Atlanta	: 107
Indiana	: 113
Charlotte	: 77
Chicago	: 74
Detroit	: 113
Orlando	: 91
Sacramento	: 98
LA Clippers	: 78

(23)

NBA'de sonuçlar

Boston: 97- Orlando: 91
Vancouver: 92- Toronto: 94
LA Lakers: 93- Miami: 80
Charlotte: 100- Chicago: 94
New York: 79- Utah: 88
Minnesota: 105- Seattle: 100
Denver: 92- Cleveland: 100
G.State: 95- Indiana: 114

(25)

NBA'de sonuçlar

Boston: 104
Chicago: 74
Philadelphia: 77
New York: 82
Washington: 99
San Antonio: 106 (Uz)
Cleveland: 92
Indiana: 95
Miami: 96
Denver: 88
Detroit: 111
Vancouver: 97
Milwaukee: 80
New Jersey: 108
Phoenix: 96
Utah: 99
Seattle: 99
Golden State: 85
LA Clippers: 101
Charlotte: 118
Sacramento: 103
Toronto: 88

(26)

NBA'de sonuçlar

Indiana: 90
Denver: 89
New York: 111
Vancouver: 86
Houston: 101
Phoenix: 108
Minnesota: 86
Washington: 90
Chicago: 89
Atlanta: 82
Utah: 113
Cleveland: 95
Seattle: 101
Dallas: 86
Golden State: 99
Charlotte: 102

(27)

A' DE TOPLU SONUÇLAR

hington: 118 - New York: 113 (Uzatmada)
on: 112 - Milwaukee: 101
delphia: 107 - Vancouver: 90
oit: 130 - Denver: 116
Jersey: 115 - Portland: 103
ndo: 103 - Chicago: 67
lippers: 94 - Toronto: 95
mento: 105 - Charlotte: 92

(28)

SONUÇLAR

Atlanta	: 91
Vancouver	: 86
Detroit	: 94
Portland	: 99
Orlando	: 110
Denver	: 107
Dallas	: 104
Phoenix	: 99
Houston	: 86
Minnesota	: 100

(29)

NBA'de sonuçlar

Detroit: 124 - Boston: 115
Chicago: 79 - Utah: 87
Denver: 108 - LA Lakers: 118

APPENDIX-B

MEASURING INSTRUMENTS

İLKÖĞRETİM MATEMATİK/İSTATİSTİK SINAVI-1 **Süre: 40 dakika**

Ad-Soyad: ..... **Cinsiyet:** ( )E ( )K **Doğum Tarihi:** ...../...../.....

Okul: ODTÜ Gel. Vakfı Özel İlköğretim Okulu **Sınıf/ Şube:** 7 / ..... **Okul No:**.....

Önceki Dönem Matematik Karne Notu: .....

Yönerge:

- Hazırlanan sorular, önceki yıllarda öğrendiğiniz İstatistik konuları (Grafik okuma ve oluşturma) ile ilgili bilgilerinizi ölçmek için hazırlanmıştır.
- Bu sınavda 8 soru vardır. Soruların içeriğini, tablo okuma, verilen çeşitli türdeki grafikleri okuma, yorumlar yapma ve grafik çizme oluşturmaktadır.
- Soruları dikkatlice okuyunuz, düşünerek ne yapacağınıza karar veriniz.
- Soruların yanıtını (cevabını) nasıl bulduğunuzu (işlemleri) boş bırakılan yerde açıkça gösteriniz/açıklayınız.
- Yanıtlarınızı cevap için ayrılan uygun boşluklara yazınız.
- Test süresi 40 dakikadır.
- Başarılar diler, ayrıca teşekkür ederiz.

SORULAR

1-) Aşağıdaki tablo tenis ve basketbol kursundaki öğrencilerin yaşlarına göre dağılımını vermektedir. Tablodaki bilgileri inceleyerek soruları cevaplayınız.

	Yaş 11	Yaş 12	Yaş 13	Yaş 14	TOPLAM
Tenis	8	10	-	7	25
Basketbol	12	3	10	10	35
TOPLAM	20	13	10	17	60

a) Kaç kişi basketbol oynuyor? **Yanıt (a):**

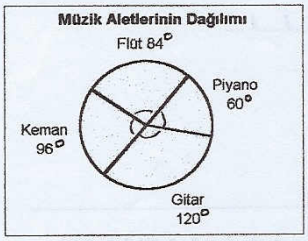
b) 11 yaşında olan kaç öğrenci var? **Yanıt (b):**

c) 14 yaşında olup tenis oynayan kaç öğrenci vardır? **Yanıt (c):**

d) 11 yaşındaki öğrencilerin yüzde kaçı tenis oynuyor? **Yanıt (d):**

e) Basketbol oynayan 12 yaşındaki öğrenciler, tüm öğrencilerin yüzde kaçıdır? **Yanıt (e):**

2-) Aşağıda verilen daire (pasta) grafiği, 60 çocuğun çalabildikleri müzik aletlerine göre dağılımını göstermektedir. Buna göre aşağıdaki soruları cevaplandırınız.



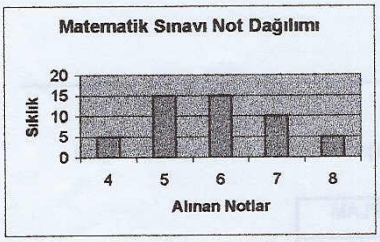
a) Bir öğrenciyi gösteren açı kaç derecedir? **Yanıt (a):**

b) Aşağıdaki tabloyu doldurunuz.

Müzik aleti	Öğrenci sayısı
Piyano	
Gitar	
Keman	
Flüt	

---

3) Aşağıdaki grafik, bir sınıftaki öğrencilerin matematik sınavından aldıkları notların dağılımını göstermektedir. Bu bilgilere göre aşağıdaki soruları cevaplandırınız.

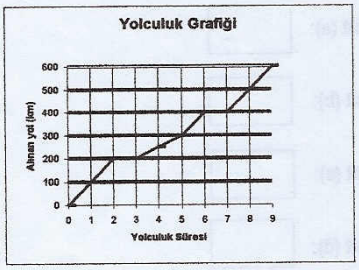


a) Kaç kişi bu sınava girmiştir? **Yanıt (a):**

b) Alınan tüm notların toplamı kaçtır? **Yanıt (b):**

c) 5 ve 5'in üzerinde not alanlar başarılı olduğuna göre, bu sınıfta başarısız olanların yüzdesi kaçtır? **Yanıt (c):**

4-) Aşağıdaki grafik, yolculuk sırasında 2 defa mola veren bir aracın aldığı yolun süreye göre değişimini göstermektedir.



a) Yolculuktan 5 saat sonra kaç km yol gitmiştir? **Yanıt (a):**

b) Hareket noktasından 500 km uzaklığa ulaşmak için kaç saat geçmiştir? **Yanıt (b):**

c) 1. molanın başlangıcı ile 2. molanın bitimi arasında geçen süre kaç saattir? **Yanıt (c):**

d) 380 km lik yol **yaklaşık olarak** kaç saatte gidilmiştir? (Tahmini olarak söyleyiniz.) **Yanıt (d):**

e) 1 saat 20 dk sonra **yaklaşık olarak** kaç km yol gidilmiştir? (Tahmini olarak söyleyiniz.) **Yanıt (e):**

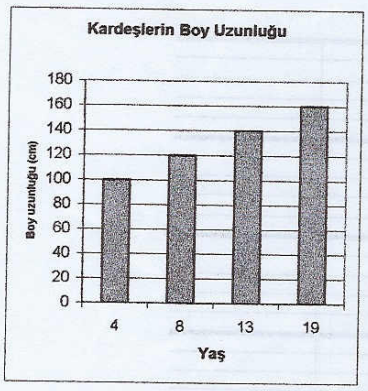
5) 1990 yılına ait ilk beş ayın, aylık araba satışları aşağıda gösterilmiştir.
(Her bir araba 50 000 arabayı göstermektedir.)

Ocak	
Şubat	
Mart	
Nisan	
Mayıs	

Yandaki şekil grafiğinde verilen bilgileri tablo ile gösteriniz.

---

6) Aşağıdaki grafik, 4, 8, 13 ve 19 yaşlarındaki dört kardeşin boy uzunluklarını göstermektedir. Buna göre aşağıdaki soruları cevaplandırınız.



a) 4 yaşındaki çocuğun boyu kaç cm dir? **Yanıt (a):**

b) 4 yaşındaki bu çocuk 19 yaşındaki kardeşinden kaç cm daha kısadır? **Yanıt (b):**

c) 5. kardeş 10 yaşında ise, 10 yaşındaki bu çocuğun boy uzunluğunu söyleyebilir misiniz? Evet / Hayır (Seçeneğinizi yuvarlak içine alınız.)

(**Evet:** Cevabınız evet ise, grafik üzerinde,10 yaşındaki bu çocuğun boyunu gösteren bir sütun çiziniz.)

(**Hayır:** Cevabınız hayır ise kısaca nedenini açıklayınız.)

7-) Ülkemizde kitap okuyanların durumunu göstermek amaçlı yapılan araştırma sonuçları, bir dergide **çeşitli grafikler** ile yayınlanmıştır. Bu grafikler, yıllara bağlı olarak kitap okuyan insanların sayısında bir düşüş olduğunu göstermektedir. Kitap okuyanların sayıları cinsiyete ve bölgelere göre de değişmektedir. Bunlara ek olarak kitap fiyatlarının da kitap okuyucularının sayısını etkilediği görülmektedir.

Bu dergide yer alan grafiklerden birine benzer bir grafik çizin ve isimlendirin.

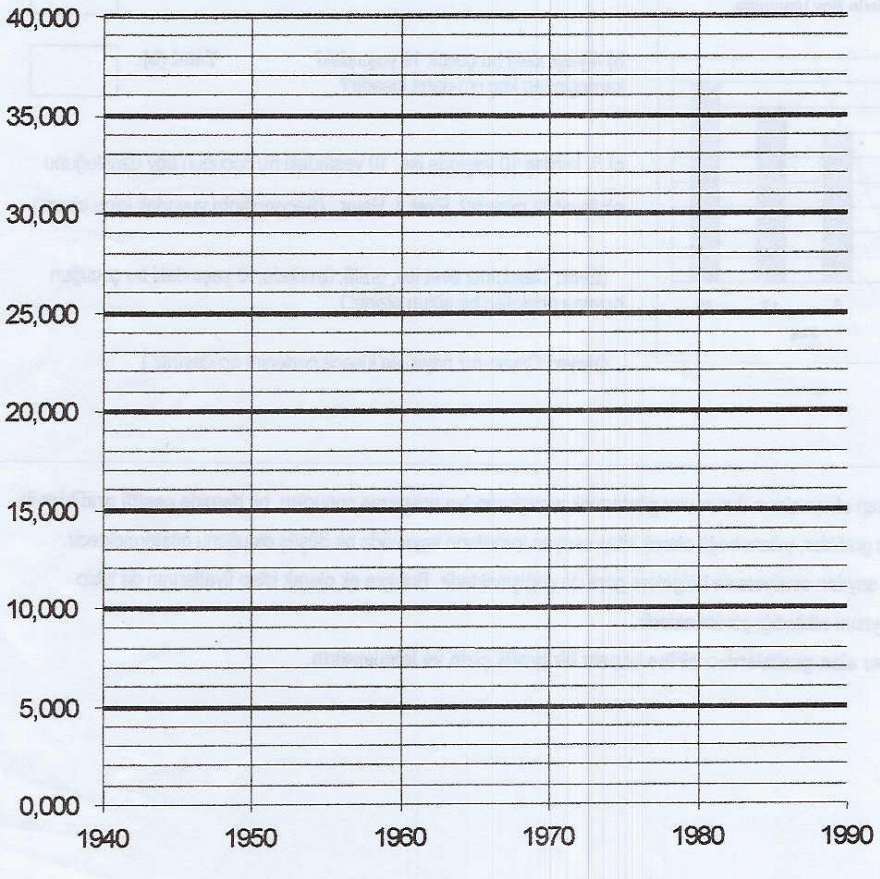
8-)

Yıl	Satılan Otomobil Sayısı
1940	4 000
1950	6 000
1960	9 000
1970	16 000
1980	25 000
1990	39 000

Yandaki tablo, 1940-1990 yılları arasındaki otomobil satışları ile ilgili bilgi vermektedir.

Bu tabloda verilen verilerin çizgi grafiğini, aşağıda hazır olarak verilen eksenler üzerinde çiziniz.

(Grafiğe ve eksenlere isim vermeyi unutmayınız.)



İLKÖĞRETİM MATEMATİK/İSTATİSTİK SINAVI-2

Süre: 40 dakika

Ad-Soyad: ..... **Cinsiyet:** ( )E ( )K **Doğum Tarihi:** ..../...../.....

Okul: ODTÜ Gel. Vakfı Özel İlköğretim Okulu **Sınıf/ Şube:** 7 / ..... **Okul No:**.....

Önceki Dönem Matematik Karne Notu: .....

Yönerge:

- Aşağıdaki sorular, İstatistik konuları (Grafik okuma, oluşturma ve verilerin genel eğilim hesaplamaları) ile ilgili bilgilerinizi ölçmek için hazırlanmıştır.
- Bu sınavda 9 soru vardır. Soruların içeriğini, tablo okuma, verilen çeşitli türdeki grafikleri okuma, yorumlar yapma ve grafik çizme oluşturmaktadır.
- Soruları dikkatlice okuyunuz, düşünerek ne yapacağınıza karar veriniz.
- Soruların yanıtını (cevabını) nasıl bulduğunuzu (işlemleri) boş bırakılan yerde açıkça gösteriniz/açıklayınız.
- Yanıtlarınızı cevap için ayrılan uygun boşluklara yazınız.
- Test süresi 40 dakikadır.
- Başarılar diler, ayrıca teşekkür ederiz.

1-) Aşağıdaki tabloda Türkiye'nin 1989-1995 yıllarındaki hayvancılığa ait dış ticaret tutarları verilmiştir.

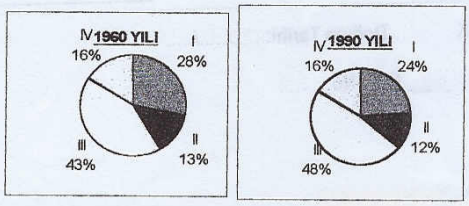
	1989	1990	1991	1992	1993	1994	1995
Dışalım (Milyar)	44	237	388	662	1 018	591	14 716
Dışsatım (Milyar)	324	319	513	525	1 886	4 206	3 321

a) Dışsatımda en yüksek değere hangi yılda ulaşılmıştır? **Yanıt (a):**

b) Hangi yıllarda dış ticaret açığı olmuştur? **Yanıt (b):**
(Dış alım tutarı, dış satım tutarından fazla olduğu zaman dış ticaret açığı oluşur.)

c) Dışalımda 1989-1990 yılları arasında **yaklaşık olarak** yüzde kaçlık bir artış yaşanmıştır? **Yanıt (c):**

2-) Dört bölgenin, bir tarım ürününün 1960 ve 1990 yılları üretimindeki payları aşağıdaki grafiklerle gösterilmiştir. Buna göre aşağıdaki soruları cevaplayınız.



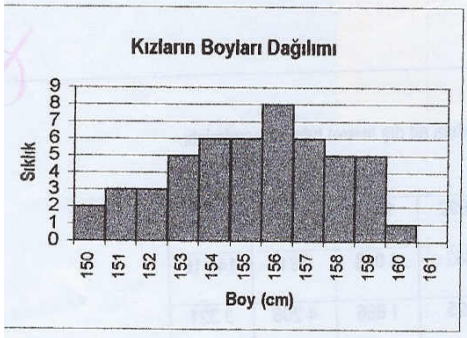
a) 1960-1990 yılları arasında hangi bölgenin üretiminde artış olmuştur? Yüzde kaçlık bir artış olmuştur?

Yanıt (a):

b) 1990 yılına ait grafikte II. Bölgenin üretimini gösteren daire diliminin açısı kaç derecedir? **Yanıt (b):**

c) 1990 yılındaki üretime göre 640 tonluk üretimin kaç tonu IV. Bölge tarafından sağlanmıştır? **Yanıt (c):**

3-) Aşağıdaki grafik 14 yaşındaki bir grup kız öğrencinin boylarının dağılımını göstermektedir. Grafiği inceleyiniz ve aşağıdaki soruları cevaplandırınız.

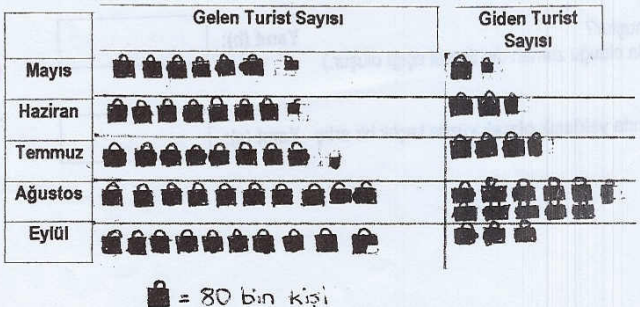


a)Bu grupta kaç tane öğrenci vardır? **Yanıt (a):**

b) Boyu 156 cm olan öğrenciler tüm öğrencilerin kaçta kaçıdır? **Yanıt (b):**

c) Boyu 156 cm ve üzerinde olanlar okul takıma seçileceğine göre bu gruptaki kızların yüzde kaçı takıma alınacaktır? **Yanıt (c):**

-)Aşağıdaki grafik belirli bir yılda, bir ülkeye gelen ve bu ülkeden dışarı giden turist sayısını göstermektedir. Buna göre şağıdaki soruları cevaplayınız.

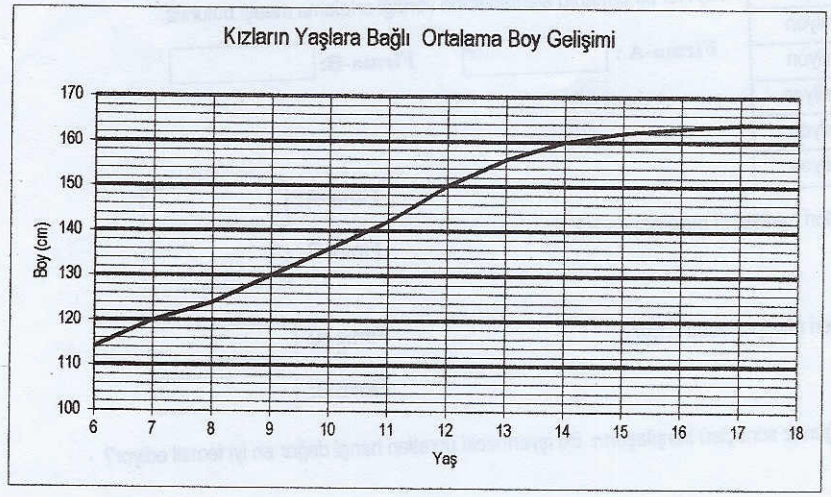


a) Mayıs ayında bu ülkeye gelen ve giden turist sayıları nedir?

b)Giden turist sayısında hangi ay(lar)da düşüş yaşanmıştır?

c) Turizm açısından en iyi geçen ay hangisidir? Neden bu ayı seçtiğinizi kısaca yazınız.

5-) Aşağıdaki grafik kızların yaşlara bağlı olarak ortalama boy gelişimlerini göstermektedir. Grafiği inceleyerek soruları cevaplandırınız.



a) 12 yaşındaki bir kızın boyu grafiğe göre kaç cm dir? **Yanıt (a):**

b) 114 cm boyundaki bir kız grafiğe göre kaç yaşındadır? **Yanıt (b):**

c) 13 yaşını 4 ay geçmiş birinin boyunun kaç olmasını beklersiniz? **Yanıt (c):**
(Grafiğe göre bir tahminde bulununuz.)

d) 140 cm boyundaki bir kızın kaç yaşında olabileceğini grafiğe bakarak tahmin ediniz. **Yanıt (d):**

e) 20 yaşındaki bir kızın boyunu grafiğe göre tahmin edebilir misiniz? Evet / Hayır

Evet, diyorsanız tahminiz nedir?

Hayır, diyorsanız nedenini açıklayınız.

6-) 10 tane sayının aritmetik ortalaması 18 'dir. Bu sayılardan 5 ve 7 olan ikisi çıkarılırsa, geriye kalanların aritmetik ortalaması kaç olur?

7-) İki firmanın 5 tane elemanına verdiği maaşlar aşağıdaki tabloda verilmektedir. Buna göre aşağıdaki soruları cevaplayınız.

Firma-A	Firma-B
10 milyon	4 milyon
10 milyon	8 milyon
12 milyon	40 milyon
14 milyon	2 milyon
14 milyon	6 milyon

a) Her bir firmanın elemanlarına verdiği ortalama maaşı bulunuz.

Firma-A : ☐ **Firma-B:** ☐

b) Her bir firmanın verdikleri maaşların medyanı nedir?

Firma-A: ☐

Firma-B: ☐

c) Her bir firmanın verdikleri maaşın modu kaçtır?

Firma-A: ☐

Firma-B: ☐

d) a, b ve c şıkların bulduğunuz sonuçları karşılaştırın. Bu işyerindeki ücretleri hangi değer en iyi temsil ediyor?

e) İşe girmek için hangi firmayı tercih ederdiniz? Neden?

8-) Ülkemizde kitap okuyanların durumunu göstermek amaçlı yapılan araştırma sonuçları, bir dergide **çeşitli grafikler** ile yayınlanmıştır. Bu grafikler, yıllara bağlı olarak kitap okuyan insanların sayısında bir düşüş olduğunu göstermektedir. Kitap okuyanların sayıları cinsiyete ve bölgelere göre de değişmektedir. Bunlara ek olarak kitap fiyatlarının da kitap okuyucularının sayısını etkilediği görülmektedir.

Bu dergide yer alan grafiklerden birine benzer bir grafik çizin ve isimlendirin.

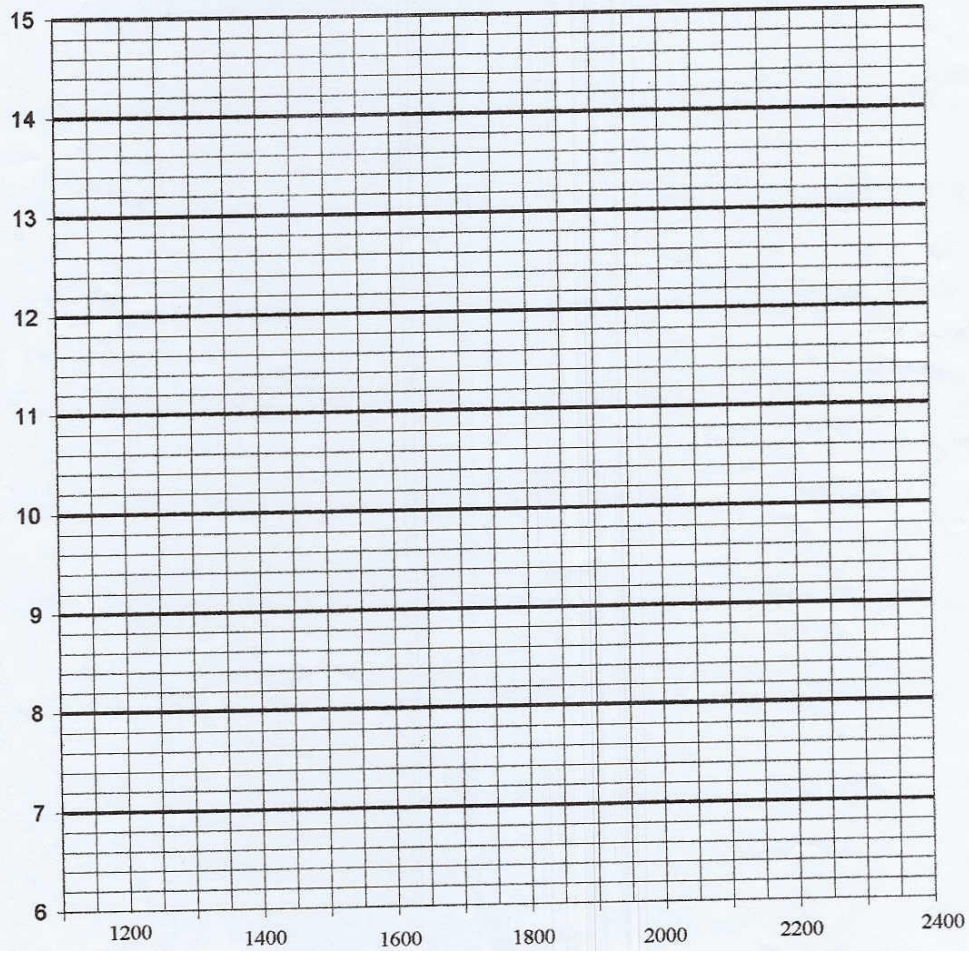
9-)

Motor Gücü (cc)	Benzin Tüketimi (litre/km)
1200	14.9
1400	12.7
1500	11.1
1600	9.9
1800	8.1

Yandaki tabloda 5 tane arabanın kilometre başına düşen benzin tüketimi (litre olarak) ve motor güçleri verilmiştir.

Tablo halinde verilen bu bilgilerin çizgi grafiğini aşağıdaki eksenler üzerinde çiziniz.

Grafiğe ve eksenlere isim veriniz.



İstatistiğe Yönelik Tutum Ölçeği

Bu anket, istatistiğe bakış açınız hakkında bilgi edinilmesi amacıyla hazırlanmıştır. Tamamen Katılıyorum (SA), Katılıyorum (A), Kararsızım (U), Katılmıyorum (D), Tamamen Katılmıyorum (SD) olmak üzere beş seçenek verilmiştir. Lütfen, cümleleri dikkatli okuduktan sonra her cümle için size uygun olan seçeneklerden yalnızca birini işaretleyiniz.

--------	SA	A	U	DA	SD
1. Günlük gazete ve dergilerde (seçim sonuçları, ekonomi haberleri vb alanlarda) çıkan pasta ve sütun grafiklerinin çoğunda anlatılmak istenenleri anlıyorum.	☐	☐	☐	☐	☐
2. Sayısal verilerin çizelgesini hazırlamakta hiç başarılı değilim.	☐	☐	☐	☐	☐
3. Günlük gazete ve dergilerde (spor haberleri, hava durumu vb alanlarda yer alan) çizelgelerde (tablolarda) anlatılmak istenenleri anlamakta pek sorunum yok.	☐	☐	☐	☐	☐
4. Seçme şansım olsaydı pasta, sütun ve çizgi grafiklerini öğrenmek istemezdim.	☐	☐	☐	☐	☐
5. Sayısal verilerin çizelgesini (tablosunu) hazırlamakta oldukça başarılıyım.	☐	☐	☐	☐	☐
6. Günlük gazete ve dergilerde (seçim sonuçları, ekonomi haberleri vb alanlarda) çıkan pasta ve sütun grafiklerinde anlatılmak istenenleri anlayamıyorum.	☐	☐	☐	☐	☐
7. Verilen verilerle ilgili sütun veya çizgi grafiği (örn. sıcaklık, boy ve ağırlık grafikleri) çizmekte başarılıyım.	☐	☐	☐	☐	☐
8. Günlük gazete ve dergilerde (spor haberleri, hava durumu vb alanlarda yer alan) çizelgelerde (tablolarda) anlatılmak istenenleri anlamakta zorlanıyorum.	☐	☐	☐	☐	☐
9. Pasta, sütun ve çizgi grafikleri ile daha fazla çalışma yapmak isterdim.	☐	☐	☐	☐	☐
10. Verilen veriler ile ilgili sütun veya çizgi grafiği (örn. sıcaklık,boy ve ağırlık grafikleri) çizmem gerektiğinde çoğu zaman yapamayacağımı düşünüyorum.	☐	☐	☐	☐	☐
11. Yaptığım bir araştırmada geçen sayısal verileri sütun, çizgi vb grafikler ile göstermek hoşuma giderdi.	☐	☐	☐	☐	☐
12. Milimetrik kağıt ve cetvel ile elde sütun veya çizgi grafiği çizerken sıkılıyorum.	☐	☐	☐	☐	☐
13. Sayısal veriler ile ilgili çizelge (tablo) hazırlamaktan zevk alıyorum.	☐	☐	☐	☐	☐
14. Medyada çıkan çeşitli araştırma sonuçlarının anlatıldığı sütun,çizgi vb grafikler hiç ilgimi çekmiyor.	☐	☐	☐	☐	☐
15. Ders kitaplarımda yer alan pasta, sütun ve çizgi grafikleri çok zevkli ve bu konuya olan ilgimi arttırıyor.	☐	☐	☐	☐	☐
16. Yaptığım bir araştırmada geçen sayısal verileri sütun, çizgi vb grafikler ile göstermek istemezdim.	☐	☐	☐	☐	☐
17. Medyada çıkan çeşitli araştırma sonuçlarının anlatıldığı sütun, çizgi vb grafikler çok ilgimi çekiyor.	☐	☐	☐	☐	☐
18. Ders kitaplarımda yer alan pasta, sütun ve çizgi grafiklerine çalışırken sıkılıyorum.	☐	☐	☐	☐	☐
19. Sütun veya çizgi grafiklerini, bilgisayar veya grafik tabanlı hesap makineleri ile çizmek isterdim.	☐	☐	☐	☐	☐
20. Sayısal veriler ile ilgili çizelge (tablo) hazırlamak çok gereksiz ve sıkıcı.	☐	☐	☐	☐	☐

APPENDIX-C

INSTRUCTIONS ABOUT USING THE CALCULATOR

The functions given below are used to make statistical calculations.

2nd	STAT	DATA	STAT VAR	EXIT STAT

To enter the data set (45, 55, 55, and 55) follow the steps explained below.

1) Press [2nd] and [STAT]

2) [1-VAR 2-VAR] will be seen in the screen. Press [Enter] [DATA] 45 [Enter] [⇩]

3) FRQ=1 will be seen in the screen. Press [Enter]

4) X2= ….. is seen in the screen. Press 55 [Enter] [⇩]

5) FRQ= 3 will be written then press [Enter]

To make statistical calculations for the data set (45, 55, 55, and 55) follow the step below

1) Press [STAT]. Press [⇨] to see the statistical calculations of the data set.

2) To clear the data set press [2nd] [STAT] [⇦] [Enter]

3) To exit from the statistics function press [2nd] [EXIT STAT] [Enter]

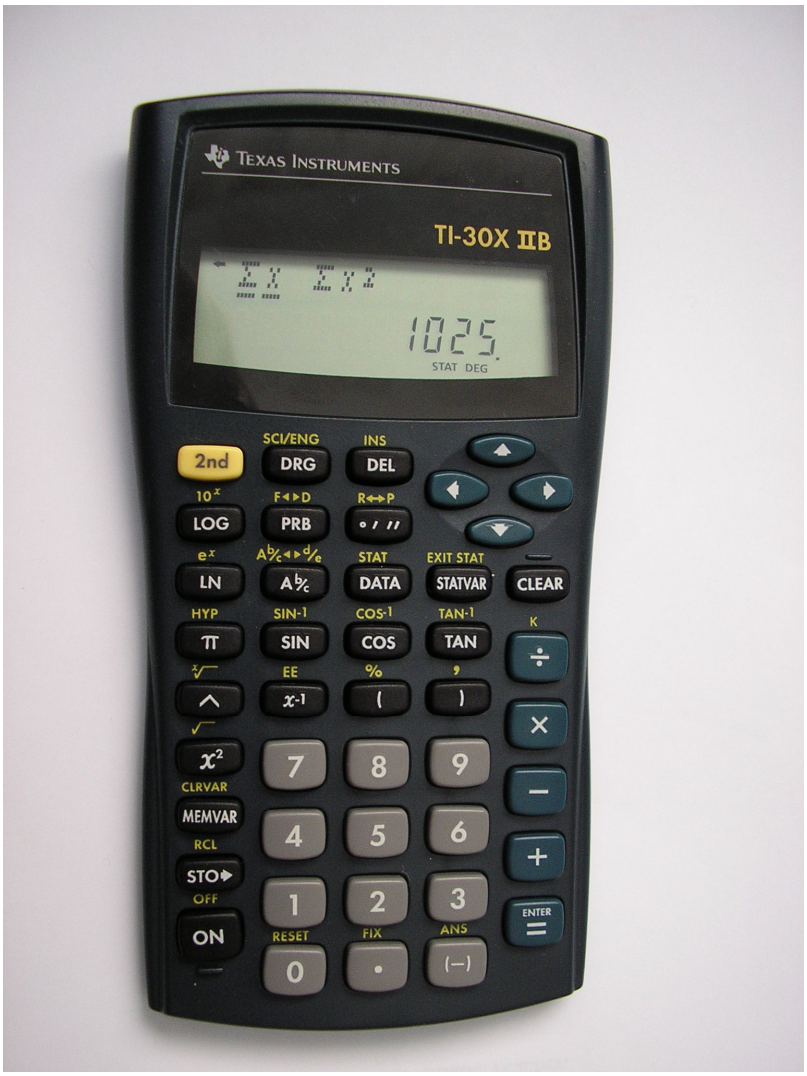


Figure C.1 30XII/RC/A Texas Instrument Calculator