A study of the relationship between the sex of a child and his or her mathematical abilities among some Nairobi primary schools.

A research project paper submitted to the faculty of education at the Kenyatta University in partial fulfillment of the requirement for the degree of Master of Education.

By

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1986.
DECLARATION:

"This research project paper is my original work and has not been presented for a degree in any other University."

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"This research project paper has been submitted for examination with my approval as University Supervisor."

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DEDICATION:

This project is dedicated with a lot of respect and appreciation to my parents RICHARD and TRUPHOSA whose efforts to educate me have resulted into this work.
ACKNOWLEDGEMENT:

The writer is indebted to the Education offices - Nairobi, Headteachers, teachers and pupils of the schools involved and hopes that the findings will be of value to them in one way or another in the accomplishment of their tasks.

I express my sincere appreciation to my supervisor, Prof. M.M. Patel, for his guidance during the completion of the study. His suggestions and comments were very valuable particularly during the early stages of planning the strategy for conducting this study.

Thanks also go to the Librarians in the main Kenyatta University library and those in the Bureau of Educational Research who made the relevant materials available to me throughout the study.

The writer is deeply indebted to her dear husband Andrew and their three sons Paul, George and Alvin for their patience, understanding and encouragement during the completion of the study.

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ABSTRACT:

The purpose of this study was to find out the relationship between the sex of a child and his or her mathematical abilities.

The study was specifically carried out in Nairobi area. The sample consisted of 401 standard seven children. Out of the 150 primary schools in Nairobi, only six triple-stemmed mixed primary schools were selected by stratified random selection. Out of these, twelve classes were selected at random, two from each of the six schools.

The study sought to answer the following questions:-

1. Are there any sex differences in children's arithmetic reasoning?

2. Are there any sex differences in children's abilities to solve problems?

3. Are there any sex differences in the way children apply learnt mathematical concepts?

4. Are there any sex differences in children's computation abilities?
5. Are there any sex differences in the way children use the fundamentals of numeration and number?

6. Are there any sex differences in the application abilities of boys and girls?

The study was prompted by the researcher's concern about the repetitive poor performance of girls on the CPE mathematics examination. However, the study was limited by shortage of time and as a result most variables were not considered; though they were considerably controlled.

Some literature review related to the study was done and the material reviewed mainly emphasised the last decade and part of this decade.

The instruments of study were a number of mathematical ability test batteries - adapted from those used by Wamani (1980) and Kapiyo (1982) in similar studies carried out in Nyeri and Kisumu respectively. These test batteries were organised into a number of categories, all testing different mathematical abilities among the children. These categories were:
Mathematical concepts, Arithmetic reasoning, place value, whole number comprehension, computation, application and problem solving.

The data to be analysed was obtained from the series of mathematical ability tests administered on the selected pupils.

After the test administration, the answer sheets were collected and all the scoring done by the researcher herself. The window key was used for scoring, each item carrying just one point. The marks were then represented on an analysis sheet.

To analyse the data, the services of a Casio fx-39 type of calculator were used to first compute the means and the standard deviations for the boys and girls on individual tests. Later the overall mean and standard deviation was also computed by use of the same calculator.

A t-test was then applied on all the tests to find any significant sex differences. The same was also done on the overall to find any significant differences among boys and girls in mathematical abilities.
The interpretation of the data showed no overall significant difference between boys and girls on mathematical abilities. However, there was a significant difference between boys and girls in their problem solving abilities in favour of girls. Some significant difference was also established between the application abilities of boys and girls again in favour of girls. There was also significant difference between arithmetic reasoning computational skills of boys and girls.

Since no significant sex differences were found to exist between boys and girls of Nairobi in mathematics abilities, the researcher gave some recommendations and suggestions hopefully to be adapted.

She also concluded that it was high time the myths about sexism and mathematics abilities were discarded.
CHAPTER ONE

"One of the immediate issues in Africa today concerning adopting to change is the pace at which changes are taking place ... change is inevitable."

ESHIWANI, G.S. (1980)

1.1 ----- Introduction
1.2 ----- Identification of the problem
1.3 ----- Statement of the problem
1.4 ----- Research questions
1.5 ---- Hypotheses in null form
1.6 ---- Important variables
1.7 ---- Significance of the study
1.8 ---- Limitations of study
1.9 ---- Basic assumption.
CHAPTER ONE:

1.1 Introduction.

The challenge before science and mathematics educators in Africa is to create appropriate instructional methods in the face of harsh conditions existing in the schools. In this exercise, we think of science and mathematics education that is not based on traditional laboratories.

It is the duty of the educator to establish whether families pass onto their children their own cultural beliefs and ideas and also the style of living and behaviour which they themselves use - whether schools together with the family contribute heavily towards the maintenance of a society's social relationship of production including class relationship and sexual division of labour.

They should also establish whether myths and beliefs will affect the way children perform and also their interests. During the past decade, it has become clear that the people of Kenya have chosen a modern technological life. Where they have not done so, they made great efforts and sacrifice in the hope that their children may live such a life.
Schools are looked upon as reservoirs of sacrifice and technological knowledge. It is the task of the schools, both primary and secondary to provide understanding of that part of science and mathematics which is basic to modern agriculture, industry and technology for both males and females.

But from the observations we make by critically looking at the mathematics examination results, it has become evident that there is some difference in the mathematical achievement between boys and girls.

This is an old problem and time has come when educators should try and establish the reasons behind this recurrent problem.

Furthermore, if our children have to live a modern technological life, there is need for us to understand more mathematics and science.

But then, the differential performance by pupils of different sexes may imply that boys are superior intellectually when compared to girls in the study of mathematics.
Whether such a case is true or not requires investigation.

To be able to carry out such an investigation, the researcher designed a study in which she specifically sought to find out if any sex differences exist in mathematical abilities among some Nairobi primary school children.

The reader will find details of the study from the subsequent section. It is hoped that the findings of the study will be useful to mathematics curriculum developers in the country; and also to all persons concerned with mathematics education of the children in this country.

The study, though not exhaustive may also point out areas that may require further research.

1.2 Identification of the problem:

According to Scarvia (1972); males and females differ in a variety of ways in their abilities, interests and personality. At the same time, there are also noticeable differences in privilege, reward and status that society affords the two sexes in their typical adult role functioning. Given the juxtaposition of these two points, it is tempting to seize
upon the very existence of sex differences as evidence of differences in ability of males and females. But it is important to recognise that sex differences may not necessarily entail differences in abilities.

Although research evidence documenting the nature of sex differences in abilities, interests and personality has been summarised in several recent reviews the area on sex differences and mathematical abilities as such has not been well covered. Besides, the findings by various researchers have tended to be contradictory; and to worsen the situation; the studies have been conducted mainly in the western countries.

But the area on sex differences and mathematical abilities is not a problem only in the western countries. It has also struck the researcher as a problem here; because by looking at the examination performance by boys and girls on the mathematics test, it is evident that boys score higher grades than the girls.

Many researchers have given different explanations for the difference in performance between boys and girls. This researcher feels that differences in mathematical abilities could be the main cause
of differences in performance. After all, the examination that children sit at the end of their 8 years of primary education encompasses all that the child has learnt throughout his/her eight years of primary school education; and mathematical abilities is one of the many factors being tested.

1.3: Statement of the problem:

The study sought to specifically find out if there is any relationship between the sex of a child and the child's ability in mathematical concepts.

The problem was thus specifically stated as follows:- To study the relationship between the sex of a child and his or her mathematical abilities in some Nairobi primary schools.

1.4: Research questions:

The researcher, due to time limitation, drew her attention to only a few questions. Throughout the study the researcher had the following questions in mind:-

1. Is there any difference in mathematical abilities of boys and girls?

2. If sex differences exist, in what specific content areas do they show up significantly?
1.5: **Hypotheses in null form:**

The main goal of the study was to verify or nullify the null hypotheses. The general null hypothesis that was tested in the study was as follows:

\[ H_0: \text{There is no significant difference between mathematical abilities of boys and girls.} \]

From this general hypothesis, six sub-hypotheses were developed:

- \( H_{o1}: \text{There is no significant difference between arithmetic reasoning abilities of boys and girls.} \)
- \( H_{o2}: \text{There is no significant difference between the problem solving abilities of boys and girls.} \)
- \( H_{o3}: \text{There is no significant difference between the application abilities of boys and girls.} \)
- \( H_{o4}: \text{There is no significant difference between boys and girls in the performance of some mathematics concepts.} \)
- \( H_{o5}: \text{There is no significant difference between the arithmetic computational skills of boys and girls.} \)
- \( H_{o6}: \text{There is no significant difference between number and numeration skills of boys and girls.} \)
1.6: Important variables in the study:

A study of this kind is subject to many intervening variables. Where assessment is involved it is expected that a number of factors would influence the outcome. However, in this study attempt was made to control the intervening factors as much as possible by:-

1. Selecting co-education schools so that the same teachers taught boys and girls of the one school in the study.

2. Selecting standard seven pupils so that the age factor did not come in. The average age was 14 years.

3. Schools maintained by the City Commission were selected to at least make sure that facilities like books, trained teachers, desks working space etc. were not very different.

The variables for the study were mathematical ability and sex of the pupil.

1.6.1. Significance of the choice of variables:

The two main variables namely sex and mathematical abilities were expected to provide information regarding the performance difference among pupils of
different sexes.

1.7: **Significance of the study:**

Mathematics is one of the most important subjects in the primary school syllabus, and one which has been tested on its own at both the CPE and now the KCPE examinations. It is a subject where there are specific mathematical ability factors that determine the pupil's performance in the subject. A lot of statistics has shown that there is a difference in most certificate examinations between boys and girls.

The data on mathematics CPE examination results in the table 1.1 below provides evidence that girls perform much more poorly as compared to boys.

Table 1.1 shows the percentage marks for both boys and girls from the year 1979 to 1982.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>BOYS</th>
<th>GIRLS</th>
<th>GAP</th>
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<tr>
<td>1979</td>
<td>46.6%</td>
<td>39.5%</td>
<td>7.1%</td>
</tr>
<tr>
<td>1980</td>
<td>48.9%</td>
<td>40.5%</td>
<td>8.4%</td>
</tr>
<tr>
<td>1981</td>
<td>44.22%</td>
<td>36.38%</td>
<td>7.84%</td>
</tr>
<tr>
<td>1982</td>
<td>52.68%</td>
<td>42.64%</td>
<td>9.44%</td>
</tr>
</tbody>
</table>
The CPE mathematics examination tests all the aspects involved is mathematics. Therefore, poor performance also displays poor mathematical abilities of the pupil concerned.

Although researchers have done a lot of studies to compare performances in mathematics based on sex differences no great endeavour has been made to discover whether mathematical abilities could also be a cause.

It is in this study that the researcher sought to establish whether poor mathematics abilities could be the factor leading to the poor performance by girls on the mathematics test. If it is not the case, then more research should be carried out to uncover the causes.

Besides, research in this area has been carried out mainly in the Western countries and the little that has been carried out here does not directly pinpoint the area of mathematics abilities.

To crown it all, Kenya National leaders and educators are expressing concern regarding the social, cultural and professional roles of today's African women, as well as their roles to National development.
... The need of women to penetrate fields with few female students is great because Kenya urgently needs highly trained personnel in such scientific and technical areas such as chemistry, engineering and mathematics, which provide the basic foundation of the Nation's development and progress in the contemporary world (Lindsay 1976).

The researcher hopes that the findings of the study will be of significant value and also help in dismissing the pact of myths about sexism and mathematical abilities.

1.8: Limitation of the study:

In any social research there are undoubtedly errors of various kinds in the data. There are also inevitable sampling errors.

One of the limitations in this study was the generalisation of the results to other settings. This was inevitable due to limited time and funds allowed for the study - so a small number of subjects had to be used to represent the population.
The other limitation was the inability to ensure that all confounding factors to the study were controlled. The amount of relevant literature available was also a limitation to the study.

During the analysis, more complicated statistical methods were left out in order to simplify work for the researcher within the given time.

1.9: Basic assumption:

This study assumed that there existed individual differences in mathematical abilities. This meant that the distribution of mathematics ability among pupils would be normal. This would then pave way for use of statistical method for analysis and interpretation of data.

The next chapter consists of review on researches related to this study. It will involve reviewing the previous research findings and also the explanations that have been previously given by different researchers for sex differences.

In chapter three, the researcher has discussed the design of the study. That is to include the methodology, the instruments, the sample and its selection,
administration of the test and the scoring of the tests.

The analysis and results are discussed in chapter four; while the interpretations are discussed in chapter five.

In chapter six attempt will be made to draw conclusions and make relevant recommendations.
CHAPTER TWO

"Sex differences in math may be due to cultural expectations of males and females."
Deem, R. (1978)

2.1 ------ Introduction
2.2 ------ Mathematical abilities and the sex of a child.
2.3 ------ Explanations for sex differences.
CHAPTER TWO:

REVIEW OF LITERATURE:

2.1: Introduction.

In this chapter attempt is made to review literature that is related to the study. Therefore this literature review is concerned with the relationship between sex differences and mathematical abilities.

The material reviewed mainly emphasises the last decade and part of this decade.

Research on sex differences is of considerable importance for those in a position to formulate policy for it provides information if not understanding about such conditions and attempts to rectify them. However, as the review demonstrates, there are limitations to what research can tell policy makers. There are inconsistencies between some of the research findings of different studies and where this is the case we can only record them, until further research is undertaken which may help to view them out.

As with any work of this kind, there are omissions due to the limitation of time, the inaccessibility of material, the failure to locate relevant
studies and the need, when faced with a mass of materials to be selective.

Moreover, the review is limited by the constraints of the original researches, which may not have been carried with little "disadvantage" as its prime focus or which may be of a short term or descriptive nature, which makes it harder to draw inferences about long term effects or to evaluate change.

2.2: Mathematical abilities and the sex of a pupil.

In the western world, research shows that on average, girls tend to score higher than boys on tests of verbal fluency, arithmetic fundamentals, reading, and tote memory. Boys rate higher in spatial ability, arithmetic reasoning and problem solving. This has been made evident by Demo's study (1982) where she observed that females have an advantage in varying degrees in verbal skills throughout their life span, and that there is a great magnitude in sex differences with spatial and mathematical abilities.

In a study to investigate the relationship between mathematical achievement and spatial abilities among elementary school children, Guay and McDaniel (1977) found that with regard to sex differences in
spatial abilities, males had higher level spatial ability than females, and that males and females had similar low level spatial ability.

In a study by Eshiwani (1974) to establish if there were any sex differences in the learning of mathematics among Kenyan high school students, he found that boys achieved higher than girls and had a more positive attitude towards mathematics than girls .... boys scored higher on tests of mathematical reasoning, computation and comprehension of mathematical and scientific terms.

The results of the regression analysis showed that arithmetic reasoning was a valid predictive variable for boys as well as girls. However, for girls it seemed that comprehension of mathematics terms and computation ability were important factors in mathematical performance and also valid for use in prediction of future mathematical achievement.

On the other hand, Wamani (1980) in his study on mathematical ability among the primary school children in Nyeri, Kenya had contradictory finding; that there were no sex differences in mathematical ability. Wamani's study contradicted a number of
other studies which had found sex differences in mathematical abilities. For example, in the same year, (Kakonge, 1980) found that there were significant sex differences between performances of boys and girls in the three concepts; 3-D perception, spatial relationships and time.

In a later study by Kapiyo (1982), on 634 standard seven pupils in Kisumu, Kenya; It was found out that significant differences existed in mathematical ability, mathematical achievement and mathematical vocabulary in favour of male students; but not in English proficiency—showing that female pupils have a problem in mathematics.

Earlier on, Kiminyo (1973) in his study on Kenyan children found no significant difference in performance of boys and girls and the way they develop the concepts of conservation of mass, weight and volume.

In a much later study; and as part of his objective, Kyalo (1984) found out that science was not the most favourite subject for the majority of pupils (boys and girls). He did not therefore observe any difference in the sciences, mathematics being part of it. He attributed the level of performance of the pupils to the passing of the teachers' low morale to the pupils.
2.3: This subsection presents the review that is concerned with the various explanations which have been given by various researchers to explain sex differences in mathematics.

2.3.1: Sex differences - sociological viewpoint

According to Deem (1978),

"the family, schools, culture and structure of capitalistic societies support each other to a remarkable degree in the process of subordinating and differentiating women on the grounds of sex --- the notion of sex stereotyping is related to the concept of sexism and refers to the process whereby individuals are socialised into thinking that they have to act and think in a way appropriate to their sex."

Accordingly, the society leads girls into thinking that mathematics is not for them since they will not need it seriously in their future. On the same issue, Wanjala (1984) has this to say:

"the role of the parent cannot be overemphasised. It is the parents who fashion the future by the influence they exercise on their children's interests, habits, vacational choice and values. They provide the setting, the stimulus and the child's development and education. They develop the conscience, curiosiity and character."
Mwaniki (1973) whose study shows a significant difference between boys and girls in concept learning and academic achievement explained the difference by sociological factors:

"Families pass on to their children their own cultural beliefs and ideas and also the styles of living and behaviour which they themselves use."

Accordingly, parents put pressure on boys urging them to pass mathematics. Howe (1975) contends that women are trained early to avoid success and authority, lacking good role models as well, they "cool themselves out."

In support to the above point, Adams and Rae (1980) have this to say:

"Almost from the moment you are born you are taught how to be male or how to be female. Most of the behaviour you probably took to be natural for your sex is really a way of acting and behaving that you have been taught by your parents, relatives, teachers and all the other adults you meet."

Scarvia (1972) has also something to say on the issue. And according to her, members of each sex are encouraged in and become interested in and proficient at the kinds of tasks that are the most relevant to the roles they fill currently or are expected to fill in future.
--- therefore boys forge ahead in mathematics because they may become engineers or scientists; on the other hand girls know that they are unlikely to need mathematics in the occupations they will take up when they leave school. Scarvia also feels that boys are given better opportunities to learn mathematics than girls are:

"Pre-school girls are kept at home with their mothers --- boys acquire greater spatial ability because they have more opportunities to explore their environment at an early age and also to manipulate objects.

If one watches nursery school children playing, one is more likely to find boys building blocks and girls playing with dolls or pretending to cook --- which leads to lower spatial ability."

Also modelling the same-sex parent will produce differential patterns in boys and girls."

In a study by Abbot (1975) in Kenya, she found out that the young girl must learn the requirements characteristic of her future adult role and a mother/farmer/wife in a particular social organisation and in a particular cultural tradition. These requirements include skills in a number of economic tasks related to gardening, food processing and family care as well as the appropriate demeanour, attitudes and behaviour.

In her study on courses offered to undergraduate women students in various universities; Lindsay (1976) came to a conclusion that girls prefer Arts subjects
to mathematics because the society offers them arts in future.

From observations made by Delamonte (1980) boys are the dominant figures in the non-fiction section of the library because they are thought to be more able than girls in fields such as mathematics, science and statemanship.

2.3.2. Sex differences - psychological view point.

About three decades ago, some psychologists explained sex differences in mathematical performance from a psychoanalytic view point. They claimed that since a high level of controlled aggression is necessary for mathematics ability, mathematics is a primarily masculine enterprise. Therefore, since mathematics is masculine those women who like mathematics tend to identify with a strong male figure. A sprinkling of both negative and positive results have provided inconclusive evidence concerning the hypothesis.

Other psychologists explained sex differences in mathematical abilities by using age as a determining factor.
In a recent study by Fennema and Carpenter (1981) the assessment of the results indicated that there was little difference between males and females in overall mathematical achievement at ages 9 and 13. At age 17 however, females performed more poorly as compared to boys.

In an earlier study by Joffee et al (1980), it was found out that at age 11 and 15, boys rated mathematics more useful than girls and at age 15, the ratings of difficulty were the greatest source of sex differences - girls indicating that mathematics was more difficult than boys.

At age 11 pupils ratings of how difficult they found mathematics was related to how much they enjoyed the subject. Amongst younger children, the enjoyment of mathematics seemed to be more important in influencing opinions than it was in the case of 15 years olds.

On the contrary Wamani (1980) found no sex differences in mathematics abilities among Kenyan children between boys and girls of class range standard 3 to standard 5.
Paulsen et al (1983) examined gender differences in mathematics ability and age-related changes in attitude towards mathematics --- overall no significant differences by sex were found in mathematics ability.

Attitudes towards mathematics has also been used as an explanation for the sex differences in mathematics --- with the girls developing a more negative attitude towards mathematics than boys.

2.3.3. Sex differences - Educational viewpoint.

The following subsection shows that all the foregoing factors used by previous researchers to explain sex differences were not all that there is.

Eshiwani (1974) found out that girls scored higher on achievement tests when taught by use of programmed instruction method (PI) and integrated programmed instruction method (IPI), as opposed to boys who scored higher an achievement tests when the method of instruction is conventional classroom approach (CCA).
Thus accordingly, it is the method used for teaching that leads to sex differences in mathematical abilities and not the other factors that had been used as explanations before.

2.4:

Having reviewed researches related to this study, the researcher will make an attempt to explain in detail the design of the study in the next chapter.
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12. Mwaniki, M.K. The relationship between self concept and academic achievement in Kenyan pupils (UoN. 1973 102)

13. Howe Florence Women and the power to change (New York 1975 48)


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"It is tempting to seize upon the very existence of sex differences as evidence of differences in ability of males and females."

3.1 ------- Introduction
3.2 ------- The sample
3.3 ------- Variables selected for study
3.4 ------- Instruments
3.5 ------- Data collection.
3.1 Introduction:

In this chapter, attempt is made to describe the sample chosen for the study, the methodology and the instruments used in gathering data to test the hypotheses. In other words the chapter looks at the design of the study.

The study was designed to look at six basic aspects of mathematical ability concepts - i.e. arithmetic reasoning, mathematical concepts, problem solving, application, arithmetic computations and fundamentals of number and numeration.

Section 3.2 deals with the sample while section 3.3 looks at the variables that were selected for the study.

Section 3.4 gives us a detailed description of the instruments used to collect the data.

While section 3.5 talks about the data collection.
3.2 The sample:

The number of primary schools in Kenya is very large. This means that to get a representative and meaningful sample for the study was quite difficult and beyond the scope of this study; considering the amount of time given.

Though the study was limited to schools in Nairobi area, the number of primary schools in Nairobi is about 150, and therefore sample selection to represent the population was again very difficult.

In this study, the sample of schools was drawn specifically from Nairobi area. All the schools in the sample were situated within Nairobi city and its periphery within a radius of 10 kilometers. This region consisted of quite a large number of primary schools; and incidentally all were maintained by the City Commission.

The schools that were included in the sample were to fulfill the following conditions:–

i) Be mixed primary schools

ii) Be triple-streamed at least in standard seven.

iii) Have almost a fifty-fifty ratio of boys and girls.
In all, the study involved 401 pupils. All of them were standard seven pupils drawn from six primary schools.

Out of the 401 pupils, 199 were boys and 202 were girls.

Table III.1 represents the distribution of boys and girls as per school.

<table>
<thead>
<tr>
<th>SCHOOL</th>
<th>BOYS</th>
<th>GIRLS</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>36</td>
<td>34</td>
<td>70</td>
</tr>
<tr>
<td>B</td>
<td>22</td>
<td>24</td>
<td>46</td>
</tr>
<tr>
<td>C</td>
<td>34</td>
<td>30</td>
<td>64</td>
</tr>
<tr>
<td>D</td>
<td>34</td>
<td>47</td>
<td>81</td>
</tr>
<tr>
<td>E</td>
<td>29</td>
<td>35</td>
<td>64</td>
</tr>
<tr>
<td>F</td>
<td>44</td>
<td>32</td>
<td>76</td>
</tr>
<tr>
<td>TOTAL</td>
<td>199</td>
<td>202</td>
<td>401</td>
</tr>
</tbody>
</table>

Notice that the number of boys and girls in the sample as per school was almost equal except in some instances where there was a wide range due to absenteeism.
The analysis of the pupils' ages showed that the age range was between 11 and 15 years; 14 years being the average age.

3.2.1: Selection and testing of subjects.

There are two main methods of doing random selection. These are the simple random selection and the stratified random selection.

In this particular study the latter method was used so that each zone in Nairobi was represented.

Before the sample was selected, permission to carry out research was granted by the Kenyan office of the President in June, 1986. The decision to obtain a sample from schools in Nairobi district was promoted by the researcher's considerable familiarity with many areas in the district. This was a useful decision due to the limited availability of funds and time for data collection.

Primary schools in Kenya are operated on termly basis. There are three terms in a year, each term lasting about three months with approximately one month's break in between the terms. Since permission to carry out the research had just been
granted in June, testing of the subjects was carried out during the second term of the school year between June and July.

This testing took one day per school. Though the number of pupils in each standard seven varied in different schools, the average number of pupils per class was about 35, except for school B where many pupils were absent.

3.3: Variables selected for the study:

The dependent variable for this study was mathematical ability. The main independent variable was the sex of the child. The independent variable was chosen on the assumption that it influences mathematical ability.

The other independent variables like age, environment, facilities and teachers were somehow controlled by the fact that the boys and girls in the sample were all selected from standard seven pupils of average age 14 years. They also came from mixed schools which meant that there would be no advantage
of either boys or girls due to environment or facilities and teachers. One may be tempted to think that there would be differences in performance between schools; but since that was not our major concern we somehow ignored it but it remains open for future research.

As it had been mentioned earlier, the schools selected in the sample were all run by the Nairobi City Commission and they therefore had similar facilities. The teachers that taught them were employed by the Teacher's Service Commission (TSC). It was therefore, assumed that the method of teaching at least per school was the same for both boys and girls. There was therefore no need to study those confounding variables as they had been indirectly controlled. The researcher was however aware that that kind of control was not enough and that the variables could have had some confounding influence on the performance of the children; but there wasn't just enough time for them to be considered.

The two main variables considered in the study are discussed in more detail in the following section.
3.3.1 Mathematical ability:

What one achieves in a given discipline is viewed to be a reflection of his or her potential capacity in the area.

For mathematics, we consider the mathematical ability which is composed of the following factors:

a) Mathematical reasoning ability
b) Visualisation ability
c) Computation ability
d) Problem solving ability.

3.4: **Instruments:**

Mathematical ability cannot be measured directly. A way had to be devised to test each of the factors mentioned in the previous sub-section.

The following test batteries were employed in order to test each of the factors mentioned in the preceding section:-

i) Arithmetic reasoning test.

ii) Problem solving test.

iii) Mathematical concepts test.

iv) Arithmetic computation test.

v) Mathematical application test.
vi) Whole number comprehension test.

vii) Interpreting and understanding number and numeration - mainly place value.

These tests were adapted from those used by Wamani (1980) and Kapiyo (1982) in similar studies conducted in primary schools in Nyeri, Kenya and Kisumu, Kenya respectively. (see Appendix B).

Below is a detailed description of each test:

i) **Arithmetic reasoning:**
This test consisted of fifteen multiple choice items structured in such a way that the child did not have to find the answers, but to tell the process of arriving at the correct answer. The test was allowed only fifteen minutes.

ii) **Problem solving:**
The test on problem solving consisted of ten multiple choice questions all structured to test the problem solving abilities of the child. Only twenty minutes were allowed for the test.

iii) **Arithmetic computation:**
This test consisted of twenty simple arithmetic questions ranging from simple addition
subtraction, multiplication and on through division.

This test was also multiple choice type and only fifteen minutes were allowed for the test.

iv) Mathematical concepts:

This test consisted of nine multiple choice items all structured in such a way that most of the mathematical concepts expected of a primary school child were included. Only twenty minutes were allowed for the test.

v) The Application test:

This test consisted of eight theory problems designed for the pupils to perform the relevant mathematical operations. All the problems involved either addition or subtraction operations; and only fifteen minutes were allowed for the test.

vi) Number and numeration:

This test consisted of multiple choice items designed to test number and numeration. The test was subdivided into three sections A, B and C.
Section A was allowed only ten minutes and consisted of eight problems mainly testing the child's knowledge on place value.

Section B consisted of three questions lasting five minutes; all designed to test knowledge on number. Finally, section C consisted of eleven questions lasting twenty minutes all designed to test the general computational skills of the child.

3.5: Data collection:

The data for this study were obtained through administration of a series of mathematical ability tests on some selected standard seven pupils; chosen at random from six tripple - streamed mixed schools in Nairobi.

3.5.1: Test administration:

Before the researcher went to the field to administer the tests, she sent a testing programme and a letter from the City Education Office to the head-teacher of the selected schools well in advance, showing the tests timetable and requirements (see Appendix A).
To take the test, the pupils required to have a pencil, rubber and scrap paper.

Below is the list of tests taken by pupils in that order:-

i) Arithmetic reasoning test -------- 15 minutes
ii) Problem solving test ------------ 20 minutes
iii) Mathematical concepts test ---- 20 minutes
iv) Arithmetic computation test --- 15 minutes
v) Application test --------------- 15 minutes
vi) Fundamentals of number and numeration -------- 35 minutes

An answer sheet was provided for each test and pupils were instructed not to write anything on the question booklet but to indicate with a cross (x) the choice that they thought was correct. All the items were multiple choice - type questions. A detailed pupils identification questionnaire was included on the answer sheet. This questionnaire required information mainly on pupils' age, sex, name, school and the date. (see Appendix B).

Since the pupils had been informed well in advance about the test by their heads, it was assumed that the experience was not a surprise to them.
Moreover, the researcher, together with her aid made the pupils quite comfortable before the beginning of the tests by telling them that they were going to take a series of six simple tests for research purposes. She told the pupils to feel free and do the test without fear or cheating and to guess only where they were completely unable. They were also told not to leave any question answered and to be as honest as possible though the tests would not reflect on their examination results.

Before each test, the researcher worked out examples with the children and then asked them to proceed in a similar manner. This was done after the researcher, with the help of her aid and the teacher had supplied the question booklets and the answer sheets to each child. After starting on test one the children were then told not to proceed to the next test until they were asked to; even if they finished before time. They were also told how to indicate the correct answer on the answer sheet.
3.5.2: Scoring the test.

After the administration of the tests in school, the researcher with the help of her aid collected all the answer sheets and also the question booklets.

Since all the tests were multiple-choice type, each correct response was awarded one point and every wrong response zero points.

The number of points as per six tests were as follows:

Test 1 - Maximum of 15 points and minimum of zero points.

Test 2 - Maximum of 10 points and a minimum of zero points.

Test 3 - Maximum of 9 points and a minimum of zero points.

Test 4 - Maximum of 20 points and a maximum of zero points.

Test 5 - Maximum of 8 points and a minimum of zero points.

Test 6 - Maximum of 22 points and a minimum of zero points.

There are many ways of scoring a multiple choice type of test. For this particular study, the researcher used the window key and recorded all the correct
and incorrect responses on analysis sheets

With all that done, the researcher was then ready to analyse her data.

In the next chapter the researcher has presented the results and method of analysis.
CHAPTER FOUR

"--- changes in technology, communication, medicine, political and socio-economic development are taking place so fast that people's way of life are affected without the people themselves realising it --- ."

ESHIWANI (1980)

4.1 ----- Introduction

4.2 ----- Analysis of data.

4.3 ----- Results.
4.1: Introduction.

In the last chapter, the researcher outlined the design of the study. In this chapter, attempt will be made to present the results of the tests described in the previous chapter. Since the main purpose of the study was to investigate the effect of the sex of a child on his or her mathematical abilities, various statistical methods were used. In this chapter the researcher will however, just talk about the mean and standard deviation; where mean describes the average score and the standard deviation is the measure of spread of the scores.

4.2: Analysis of data.

To analyse the data, the services of a Casio fx - 39 type of calculator were employed. This calculator was used to obtain the means and standard deviation for each test and also to obtain the grand mean and grand standard deviation for both boys and girls.
4.3: Results.

In this section mention of the tests described in chapter three will be made and then followed by the results obtained by computing the means and the standard deviations.

4.3.1:

This sub-section consists of results obtained from the administration of the arithmetic reasoning test (Test 1).

As mentioned earlier in chapter three, this test consisted of fifteen multiple choice items structured in such a way that the child did not have to find the answers, but to tell the process of arriving at the correct answers.

Table IV.1 below shows the means and standard deviations for both boys and girls as obtained in test 1.

<table>
<thead>
<tr>
<th>SEX</th>
<th>NO. of CHILDREN</th>
<th>MAX SCORE</th>
<th>MEAN</th>
<th>STANDARD DEVIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>199</td>
<td>15</td>
<td>5.19</td>
<td>3.25</td>
</tr>
<tr>
<td>Girls</td>
<td>202</td>
<td>15</td>
<td>5.41</td>
<td>2.21</td>
</tr>
</tbody>
</table>
From the above table, we notice that the mean score for girls on this test is slightly higher than that for boys. The standard deviation or the spread of scores is a bit higher for boys in this test than it is for girls.

4.3.2:

In the following sub-section the researcher will present results as obtained from the administration of test 2. Test 2 was the problem solving test and it consisted of ten multiple choice items all structured to test the problem solving abilities of a child.

Table IV.2 below shows the means and standard deviations for both boys and girls as obtained in test 2.

<table>
<thead>
<tr>
<th>SEX</th>
<th>NO OF CHILDREN</th>
<th>MAX SCORE</th>
<th>MEAN</th>
<th>STANDARD DEVIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>199</td>
<td>10</td>
<td>4.13</td>
<td>1.63</td>
</tr>
<tr>
<td>Girls</td>
<td>202</td>
<td>10</td>
<td>4.41</td>
<td>1.62</td>
</tr>
</tbody>
</table>

Like for test 1, the mean score for the girls in the test is slightly higher than that for boys.
However, the measure of spread for both the boys and the girls is almost the same with a difference of 0.01.

4.3.3:

As it will be seen in this sub-section, results obtained from the computation of both the means and standard deviations for boys and girls after the administration of test 3 are tabulated.

Test 3 was a mathematical concepts test. The test consisted of nine multiple choice theory problems. The questions were structured in such a way that most of the mathematical concepts expected of a primary school child were included.

Table IV.3 below illustrates the means and the standard deviations as were obtained after the administration of the test 3.

<table>
<thead>
<tr>
<th>SEX</th>
<th>NO OF CHILDREN</th>
<th>MAX SCORE</th>
<th>MEAN</th>
<th>STANDARD DEVIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>199</td>
<td>9</td>
<td>4.10</td>
<td>1.59</td>
</tr>
<tr>
<td>Girls</td>
<td>202</td>
<td>9</td>
<td>4.13</td>
<td>1.84</td>
</tr>
</tbody>
</table>

In this test the means for both boys and girls are
almost the same with that of girls 0.03 marks higher than that of boys. The standard deviation for girls is however, greater than that for boys.

4.3.4

In the following sub-section, results as obtained from computing the means and the standard deviations for both boys and girls after the administration of test 4 are illustrated. Test 4 was the arithmetic computation test which consisted of twenty simple arithmetic questions ranging from simple addition, subtraction, multiplication through division. All the items were multiple choice type.

Table IV.4 below illustrates the means and standard deviations for both the boys and girls after the administration of test 4.

<table>
<thead>
<tr>
<th>SEX</th>
<th>NO OF CHILDREN</th>
<th>MAX SCORE</th>
<th>MEAN</th>
<th>STANDARD DEVIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>199</td>
<td>20</td>
<td>16.8</td>
<td>2.56</td>
</tr>
<tr>
<td>Girls</td>
<td>202</td>
<td>20</td>
<td>17.1</td>
<td>2.25</td>
</tr>
</tbody>
</table>

The results show the mean for girls on this test
to be slightly higher than that for boys on the same test.
The spread or the standard deviation for boys is seen to be a bit higher than that for girls.

4.3.5:

In this sub-section, the results as obtained from the administration of test 5 have been presented. Test 5 was the application test. This test consisted of eight theory problems designed for the pupils to perform the relevant mathematical operation. All the problems were multiple choice type and involved either addition or subtraction abilities.

Table IV.5 below illustrates the results of the means and the standard deviations for boys and girls as obtained in test 5.

<table>
<thead>
<tr>
<th>SEX</th>
<th>NO. OF CHILDREN</th>
<th>MAX SCORE</th>
<th>MEAN</th>
<th>STANDARD DEVIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>199</td>
<td>8</td>
<td>6.61</td>
<td>1.58</td>
</tr>
<tr>
<td>Girls</td>
<td>202</td>
<td>8</td>
<td>6.85</td>
<td>1.34</td>
</tr>
</tbody>
</table>

The table shows that the mean for girls on this
test is slightly more than that for the boys.

The measure of spread (s.d) for boys is however slightly higher for boys than for girls on the same table.

4.3.6:

This sub-section shows the results obtained after the administration of test 6.

This test was subdivided into three sections A, B and C.

Section A consisted mainly of problems on place value. This sub-section consisted of eight questions designed to test whether the child had understood the concept of place value in the whole number system.

Section B consisted of three questions designed to test knowledge on number.

The last section, C consisted of eleven questions designed to test the general computation skills of the child. All the items in the three sections were multiple choice types.
Table IV.6 illustrates the summary of the results - mean and standard deviation after the administration of the test.

<table>
<thead>
<tr>
<th>SEX</th>
<th>NO. OF CHILDREN</th>
<th>MAX SCORE</th>
<th>MEAN</th>
<th>STANDARD DEVIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>199</td>
<td>22</td>
<td>10.80</td>
<td>3.67</td>
</tr>
<tr>
<td>Girls</td>
<td>202</td>
<td>22</td>
<td>10.53</td>
<td>3.17</td>
</tr>
</tbody>
</table>

The table shows the mean for boys on this test to be higher than that for girls. The spread (standard deviation) for boys is also higher than that for girls here.

4.3.7: In this sub-section the researcher has summarised the consolidated mean and standard deviation for both the boys and the girls. This is attempt to give the reader a rough idea about mathematical abilities.
Table IV.7 shows the consolidated table.

<table>
<thead>
<tr>
<th>SEX</th>
<th>NO. OF CHILDREN</th>
<th>MAX SCORE</th>
<th>MEAN</th>
<th>STANDARD DEVIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>199</td>
<td>74</td>
<td>48.0</td>
<td>9.65</td>
</tr>
<tr>
<td>Girls</td>
<td>202</td>
<td>74</td>
<td>48.37</td>
<td>9.47</td>
</tr>
<tr>
<td>TOTAL</td>
<td>401</td>
<td>74</td>
<td>48.18</td>
<td>9.52</td>
</tr>
</tbody>
</table>

Notice that there is not much difference between the means and the standard deviations for boys and girls on the overall.
"It seems clear that what is crucial in the achievement and the retention of Kenyan boys and girls in math is not their attitudes towards math, or expectations of their sex roles, but the method used in instruction."

ESHIWANI G.S. (1974)

5.1 Introduction
5.2 Interpretation of data
CHAPTER FIVE:

INTERPRETATION OF RESULTS:

5.1: Introduction:

In the previous chapter, the researcher outlined the findings of the tests described in chapter three.

In this chapter, attempt will be made to interpret the results based on the findings of the previous chapters. The purpose of the study as mentioned earlier was to find out if there exists any significant relationship between the sex of a child and his or her mathematical abilities. The researcher came up with six hypotheses in null form.

For each of these null hypotheses a t-technique was used at the level $p = 0.05$ or at the 95 percentile level and degree of freedom ($df = 400$). Wherever the computed $t$ value was greater than the critical $t$ value, the hypothesis was rejected at that percentile level. And wherever the computed $t$ value was lesser than the critical $t$ value, the hypothesis was accepted at that percentile level.
The t-value was computed as shown.

\[ \overline{\sigma_D} = \overline{\sigma_{M_B}} - \overline{\sigma_{M_G}} = \sqrt{\frac{\sigma_{B}^2}{N_B} + \frac{\sigma_{G}^2}{N_G}} \]

Where \( \overline{\sigma_D} \) is the error of estimate.

\( \overline{\sigma_{M_B}} \) is the mean for boys.
\( \overline{\sigma_{M_G}} \) is the mean for girls.
\( \sigma_{B}^2 \) is the square of standard deviations for boys.
\( N_B \) = Number of boys in the sample.
\( N_G \) = Number of girls in the sample.
\( \sigma_{G}^2 \) = Square of std. deviation for girls.

After \( \overline{\sigma_{B}} \) was obtained, the t-value was computed by obtaining the critical ratio (CR) as follows:

\[ CR = \frac{D}{\overline{\sigma_D}} \]

Where D is the difference in means.

5.2: Interpretation of data:

In this section statements of the hypotheses in null form as were stated earlier in chapter one will be presented and this will be followed by interpretations based on the results of the t-technique.
5.2.1: Hypothesis 1.

H01. There is no significant difference between the arithmetic reasoning of boys and girls.

The above hypothesis was tested for significance by using the t-technique and the results tabulated as shown below in Table V.1.

Table V.1 shows t-value obtained after the administration of test 1.

<table>
<thead>
<tr>
<th>SEX</th>
<th>NO. OF CHILDREN</th>
<th>MEAN</th>
<th>S.D.</th>
<th>D</th>
<th>SD</th>
<th>CR(t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>199</td>
<td>5.19</td>
<td>3.25</td>
<td>0.22</td>
<td>0.27</td>
<td>0.81</td>
</tr>
<tr>
<td>Girls</td>
<td>202</td>
<td>5.41</td>
<td>2.21</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From the table it will be seen that the computed t-value is 0.81. This value is very much less than the critical t-value of 1.65 at the level $P = 0.05$ and degree of freedom ($df = 400$).

This indicates that the above hypothesis was accepted at $P = 0.05$. This implies that there are no sex differences between the reasoning abilities of boys and girls at $P = 0.05$ level.
5.2.2: Hypothesis 2:

Ho2. There is no significant difference between the problem solving abilities of boys and girls.

The significance of the above hypothesis was also tested by use of the t-technique and the results tabulated as shown in table V.2 below.

Table V.2 shows the t-value obtained after the administration of test 2.

<table>
<thead>
<tr>
<th>SEX</th>
<th>NO. OF CHILDREN</th>
<th>MEAN</th>
<th>S.D.</th>
<th>D</th>
<th>( \sqrt{D} )</th>
<th>C R(t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>199</td>
<td>4.13</td>
<td>1.63</td>
<td>0.28</td>
<td>0.16</td>
<td>1.75</td>
</tr>
<tr>
<td>Girls</td>
<td>202</td>
<td>4.41</td>
<td>1.62</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The table shows that the computed t-value of 1.75 is greater than the critical t-value of 1.65 at the level \( P = 0.05 \) and degree of freedom \( (df = 400) \).

This indicates that the above hypothesis is rejected at the \( P = 0.05 \) level.
This implies that there is a significant difference between the problem solving abilities of boys and girls in favour of girls over boys as indicated by the higher mean score for girls as compared to that of boys.

5.2.3: Hypothesis 3.

H03: There is no significant difference between the application abilities of boys and girls.

The above hypothesis was also tested by use of the t-technique at $P = 0.05$ level and $df = 400$. The results are shown in Table V.3 below.

Table V.3 shows the $t$-value as obtained from administration of test 5:

<table>
<thead>
<tr>
<th>SEX</th>
<th>NO. OF CHILDREN</th>
<th>MEAN</th>
<th>S.D</th>
<th>$t_0$</th>
<th>D</th>
<th>CR ($t$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>199</td>
<td>6.61</td>
<td>1.58</td>
<td></td>
<td>0.15</td>
<td>0.24</td>
</tr>
<tr>
<td>Girls</td>
<td>202</td>
<td>6.85</td>
<td>1.34</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The table shows the computed $t$-value to be 1.8. This value is greater than the critical value of 1.65 at $P = 0.05$. 
As a result, the above hypothesis was rejected. Thus, there is a significant difference between the application abilities of boys and girls in favour of girls over boys as implied by the higher mean score for girls on this test as compared to that of boys.

5.2.4: Hypothesis 4.

Ho4. There is no significant difference between boys and girls in the performance of some mathematical concepts.

On testing the above hypothesis by use of the t-technique, the results as shown in table V.4 below were obtained.

Table V.4 shows the t-value after the administration of test 3.

<table>
<thead>
<tr>
<th>SEX</th>
<th>NO. OF CHILDREN</th>
<th>MEAN</th>
<th>S.D.</th>
<th>t</th>
<th>D</th>
<th>C.R.(t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>199</td>
<td>4.10</td>
<td>1.59</td>
<td>0.17</td>
<td>0.03</td>
<td>0.18</td>
</tr>
<tr>
<td>Girls</td>
<td>202</td>
<td>4.13</td>
<td>1.84</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the table, the computed t-value is 0.18
This value is much less than the critical t-value at $P = 0.05$ and $df = 400$.

This implies that the above hypothesis was accepted at the $P = 0.05$ level.

Thus, there is no significant difference between boys and girls in the performance of some mathematical concepts at $P = 0.05$ level.

5.2.5: Hypothesis 5:

$H_0$: There is no significant difference between arithmetic computational skills of boys and girls.

On testing the above hypothesis by use of $t$-technique at $P = 0.05$ and $df = 400$, the results as shown in Table V.5 below were obtained.

Table V.5 showing the $t$-value after administration of test 4:

<table>
<thead>
<tr>
<th>SEX</th>
<th>NO. OF CHILDREN</th>
<th>MEAN</th>
<th>S.D.</th>
<th>$\bar{D}$</th>
<th>D</th>
<th>CR (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>199</td>
<td>16.8</td>
<td>2.56</td>
<td>0.23</td>
<td>0.88</td>
<td>3.83</td>
</tr>
<tr>
<td>Girls</td>
<td>202</td>
<td>17.1</td>
<td>2.25</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The computed $t$-value as shown in Table V.5 is
very much greater than the critical t-value of 1.65 at $P = 0.05$ level.

On this basis, the above hypothesis was rejected. This implies that there is a significant difference between arithmetic computational skills of boys and girls in favour of girls at $P = 0.05$ level, as evidenced by the higher mean score for girls over that for boys.

5.2.6: Hypothesis 6.

$H_06$: There is no significant difference between number and numeration skills of boys and girls.

Table V.6 shows the results obtained after applying the t-technique to test the significance of the null hypothesis related to test 6.

<table>
<thead>
<tr>
<th>SEX</th>
<th>NO OF CHILDREN</th>
<th>MEAN</th>
<th>S.D.</th>
<th>$D_D$</th>
<th>$D$</th>
<th>$C_R(t)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>199</td>
<td>10.80</td>
<td>3.67</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>202</td>
<td>10.53</td>
<td>3.17</td>
<td>0.34</td>
<td>0.27</td>
<td>0.80</td>
</tr>
</tbody>
</table>

As the table shows, the computed t-value of 0.80 is much less than the critical t-value of 1.65.
As a result of this, the null hypothesis was accepted; implying that there is no significant difference between number and numeration skills of boys and girls at $P = 0.05$ level.

5.3:

In this section, attempt is made to test the main null hypothesis; $H_0$. There is no significant difference between mathematical abilities of boys and girls.

The testing of this hypothesis will enable us to know whether generally there exists any sex differences between the mathematical abilities of boys and girls.

Table V.7 below is a consolidated table showing the results of the mean, s.d and t-value at $P = 0.05$ level and df = 400.
As shown by the computed t-value of 0.29, it is very much less than the critical t-value of 1.65 at $P = 0.05$.

As a result the hypothesis was accepted that there is no significant difference between mathematical abilities of boys and girls at the level $P = 0.05$. 

<table>
<thead>
<tr>
<th>SEX</th>
<th>NO. OF CHILDREN</th>
<th>MEAN</th>
<th>S.D</th>
<th>D</th>
<th>C.R(t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>199</td>
<td>48.10</td>
<td>9.65</td>
<td>0.96</td>
<td>0.28</td>
</tr>
<tr>
<td>Girls</td>
<td>202</td>
<td>48.37</td>
<td>9.47</td>
<td></td>
<td>0.29</td>
</tr>
</tbody>
</table>

As shown by the computed t-value of 0.29, it is very much less than the critical t-value of 1.65 at $P = 0.05$.

As a result the hypothesis was accepted that there is no significant difference between mathematical abilities of boys and girls at the level $P = 0.05$. 
CHAPTER SIX

"Classrooms are becoming more and more like good homes and good homes like classrooms"

NICHOLAS GILLET (1979)

6.1 ------- Introduction
6.2 ------- Summary
6.3 ------- Implications of the study
6.4 ------- Suggestions and recommendations
6.5 ------- Conclusion.
The t-test was used to statistically establish the significance of the sex differences.

6.3: Implications of the study:

The null hypothesis that there is no significant differences between boys and girls was accepted. The results showed that in general there were no significant sex differences in mathematical abilities.

This is in line with Wamani's findings (1980).

Although girls on the average don't do as well as boys in mathematics, it is possible that the problem is psychological, social and cultural one and is not of lack of ability or potential in mathematics as this study has shown.

And as Rae (1980) puts it

"--- almost from the moment you are born, you are taught how to be male and how to be female. Most of the behaviour you probably took to be natural for your sex is really a way of acting and behaving that you have been taught by your parents, relatives, teachers and all other adults you meet."
6.4: Suggestions and recommendations:

Sex differences in almost every aspect of human behaviour have been observed consistently and the most widely accepted explanation for this is that families pass on to their children their own cultural beliefs and behaviour which they themselves use (Mwaniki 1973).

Members of each sex are encouraged in and become interested and proficient in the kinds of tasks that are the most relevant to the roles they fill currently or are expected to fill in the future --- boys are given better opportunities to learn mathematics than girls are (Scarvi, 1972).

It has thus been demonstrated that boys and girls tend to achieve higher scores on tasks that are stereotypically and culturally perceived as appropriate to their sex differences in performance and that the sex-typed socialisation practices constrain the child's development of sense of competency in specific areas of study he or she perceives as not appropriate to his/her sex.
However, this study has revealed no sex differences in mathematical abilities. More research is therefore needed to reveal more reasons for sex differences in mathematics performance.

It would be important to determine at what age and stage such sex differences in mathematics appear.

Some researchers have used attitude towards mathematics as a reason for sex differences. It would be also wise to determine at what stage these attitudes crop in.

Since this study did not establish whether the type of school and the environment in which the school was situated had any impact on mathematical abilities, it is important that more research should be carried out in this area.

From the findings of the study it is evident that most of the above factors do not hold as explanations for sex differences in mathematical abilities among children in Nairobi. It seems the attitude of parents and the society as a whole in Nairobi towards the child's sex is changing; and
all the children are being given equal opportunity in the mathematics class. This attitude should be adapted.

Even in the teaching process, the teacher-pupil interaction especially between male teachers and female pupils, and female teachers and male pupils should be investigated. Sex differences in mathematics and other courses need to be identified at their earliest.

6.5: Conclusion:

In Nairobi, gone are the days when schools were depithing institutions more remote and forbidding than factories. The parents, now much better educated than the illiterate parents of the past are anxious to do all they can to support the schools and also to encourage their children equally irrespective of the sex.

No wonder this study in Nairobi has not found any sex differences in math abilities between boys and girls. Though there are small differences in problem solving, application abilities and arithmetic computational skills, on the overall there are no significant sex differences.
It is therefore high time we discarded the myths about sexism and math abilities and adapt a different strategy to teaching in our Kenyan schools to-day to benefit both boys and girls.
B I B L I O G R A P H Y:


17. Jack and Jones Bridging the gap (London 1979 p.8).


21. KNEC CPE Newsletter (1981 p.10)

22. KNEC CPE Newsletter (1983 p.11)


"To consider the Beecher report in relation to the education of African girls." (Kenya 1980 p. 8-10).

24. Kyalo, F.K. A study of the factors that affect science teaching and learning in some primary schools in Chiangwithia location, Kitui district (KUC 1984 54).


The relationship between self-concept and academic achievement in Kenyan pupils (UoN. 1973 102).

Mathematics and school (vol.13 No.4 Sept. 1984)
"Assessing math.: Attitudes and sex differences: Some APU findings."


Problems faced by teachers in teaching math in different categories of secondary schools in form four (KUC 1984).
APPENDIX "A"

Letter to Schools.

Letter from City Education Office.

Permit from Office of the President.

Letter from the Science Bureau.
To the Headmaster,

I am writing to inform you that I have been granted permission to carry out a research study in Kenya by the Office of the President. Your school is among the six that have been randomly selected to be included in the sample of the study.

The study is an educational research to be carried out in my personal capacity as a student with the support of Kenyatta University Department of Communications and Technology, Nairobi. The study is designed to study the relationship between the sex of a child and his or her mathematical abilities.

The main purpose for writing this letter is to inform you that I will visit your school in the morning of ......... During this visit which is expected to take at least 3 hours, six tests will be administered to standard seven pupils. Out of the three streams of your standard seven classes; two will be randomly selected to be included in the study sample. Your co-operation will be of utmost importance. I may need one mathematics teacher to help me administer the tests.

Also each pupil in the sample will require at least a pencil, a rubber and scrap paper. Enclosed is a programme for the administration of the test.

Yours faithfully,

HELEN A.O.M.MONDOH
It is expected that if all goes well, the testing will take a maximum of two hours.

It will be better if the chosen classes sit the tests at the same time to save time. Important instructions for the test will be read aloud and important ones written on the board. Below is how the tests will follow each other.

<table>
<thead>
<tr>
<th>Time</th>
<th>Kind of Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st 15min</td>
<td>Test 1. Arithmetic reasoning</td>
</tr>
<tr>
<td>Next 20 min</td>
<td>Test 2. Problem solving</td>
</tr>
<tr>
<td>Next 20 min</td>
<td>Test 3. Mathematical</td>
</tr>
<tr>
<td>Next 15 min</td>
<td>Test 4. Arithmetic Competence</td>
</tr>
<tr>
<td>Next 15 min</td>
<td>Test 5. Application Test</td>
</tr>
<tr>
<td>Next 35 min</td>
<td>Test 6. Fundamentals of number and numeration</td>
</tr>
</tbody>
</table>
The Headteacher,

Unity Primary School
Muthaiga Primary School
Thika Road Primary School
Moi Avenue
Moi Forces Academy
Dr. Aggrey Primary School

Dear Sir/Madam,

MRS. MONDOH HELEN A.M.O.

STUDY ON RELATIONSHIP BETWEEN THE SEX OF A CHILD AND HIS OR HER MATHEMATICAL ABILITIES

The above named from Kenyatta University has permission to carry out a survey in your school as indicated above.

Please assist in this matter.

Yours faithfully,

S.W. Njogu
Ag. Deputy City Education Officer
for: CITY EDUCATION OFFICER, NAIROBI.

c.c.: Professor M.M. Patel,
Kenyatta University,
P.O. Box 43844,
NAIROBI.
THIS IS TO CERTIFY THAT:

Prof./Dr./Mr./Mrs./Miss Helen A. Mondoh

c/o Kenyatta University
P.O. Box 43844, NAIROBI

has been permitted to conduct research in NAIROBI

NAIROBI

NAIROBI

NAIROBI

Location

Location

District

District

Province

Province

on the topic "To study the relationship between the sex of a child and his or her mathematical ability."

for a period ending 30th August 1986

Research permit No. OP.13/001/16C 93

Date of issue 26th May 1986

Fee receipt Ksh.25/=
NOTES

1. Government Officers will not be interviewed without prior appointment.

2. No questionnaire will be used unless it has been approved.

3. You must report to the District Commissioner of the area before embarking on your research.

4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.

5. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice.
REF: OP/13/001/16C 93/3

THE SECRETARY,
NATIONAL COUNCIL FOR
SCIENCE & TECHNOLOGY,
P.O. BOX 30623,
NAIROBI.

RE: RESEARCH AUTHORIZATION

APPLICANT: HELEN LONDON

The above named has been authorized to conduct research on "...... Relationship between the sex of a child and his or her mathematical abilities." under the Standing Research Clearance accorded to Kenyan Universities/Public Institutions.

I herewith enclose copies of his/her application for record purposes. He/She has also been notified that we will need a minimum of two copies of her/his research findings at the expiry of the project.

for: PERMANENT SECRETARY ADMINISTRATION

cc.
The Chairman
The Applicant

Department of Educational

Communication & Technology

Kenyatta University

NAIROBI

Enc.
APPENDIX "B"

Test batteries.

Answer sheet.
INSTRUMENTS

TEST 1

Arithmetic reasoning  Time: 15 minutes

Instructions: Do not start before you are told.

This section consists of 15 problems in arithmetic. However, you do not have to find the answer to each problem. You only have to TELL HOW the answer can be found.

DO NOT mark the answer on this question paper. An answer sheet will be provided. Mark on the answer sheet with an (x) to show the correct answer.

Example 1

Jane's father was 26 years old when she was born. Jane is 8 years old now. How old is his father now?

(a) Subtract
(b) Divide
(c) Add
(d) Multiply

Jane's father is now 34 years old. But you are not asked to find this. You are asked HOW to find this. Since this age is found by adding 26 to 8, choice (c) should be the answer.

Example 2

Desks cost Sh. 40 each. If bought in lots of 4, the total price is reduced by Sh. 20. How much would 4 desks cost?

(a) Divide and add
(b) Multiply and multiply
(c) Subtract and divide
(d) Multiply and subtract

One way to solve the problem would be to multiply Sh. 40 by 4 and then subtract Sh. 20 from the product. So you should choose choice (d). Although some problems may be worked in more than one way, only one of the ways will be given among the answered choices.

You should only guess if you can rule out some of the choices. DO NOT guess wildly.
1. There are 4 quarts in a gallon and 4 cups in a quart. How many cups are there in a gallon?

(a) Add
(b) Subtract
(c) Multiply
(d) Divide

2. A hand planer removes 0.02 centimetres of wood each time a piece of wood is passed through it. If a board is put through 7 times, how much wood will have been removed?

(a) Multiply
(b) Subtract
(c) Divide
(d) Add

3. There are 54 children at a small holiday camp. If there are 33 boys attending the camp, how many campers are girls?

(a) Add
(b) Multiply
(c) Subtract
(d) Divide

4. A man wants to seed a lawn around his new home. His lot is 120 metres by 90 metres (10,800 sq.metres). His house is centered on the lot and occupies 2,785 square metres. How many square metres of ground may be put into lawn.

(a) Add
(b) Multiply
(c) Divide
(d) Subtract

5. A wholesale fruit dealer sells oranges at Sh. 7 per kilo and lemons at Sh. 3 per kilo. One day he sold 79 kilos of each type of fruit. How much money was taken in.

(a) Add and divide
(b) Multiply and add
(c) Multiply and subtract
(d) Divide and divide
6. A cyclist in an international bicycle race covers an average of 9 kilometres every 20 minutes. If he can maintain the same average speed, how long will it take him to cycle the remaining 84 kilometres of the race?

   (a) Divide and multiply
   (b) Subtract and divide
   (c) Add and subtract
   (d) Divide and add

7. A grocer sells oranges for 60 cents a dozen. The oranges cost him 30 cents a dozen. How much profit is there on each orange?

   (a) Subtract and multiply
   (b) Divide and subtract
   (c) Add and divide
   (d) Subtract and divide

8. A boy works in a shop after school for a total of 10 hours a week. He also works 8 hours on Saturdays. How much is he being paid per hour, if he makes Sh. 20.70 per week?

   (a) Multiply and subtract
   (b) Subtract and divide
   (c) Add and divide
   (d) Multiply and divide

9. A housewife took a job which pays Sh. 65 per week. After paying taxes she is left with 76% of her salary, and each week she spends a total of Sh 56 on lunches and bus fare. How much does her job increase the family income?

   (a) Divide and subtract
   (b) Subtract and multiply
   (c) Add and divide
   (d) Multiply and subtract
10. A rectangular underground reservoir is 15 metres deep and contains 2,000,000 litres of water when it is full. The short rains filled the reservoir but the January drought caused the water level to drop by 8 metres. Approximately how many litres of water were consumed during the drought?

(a) Subtract and divide
(b) Add and subtract
(c) Divide and multiply
(d) Subtract and multiply

11. A certain part of beef costs Sh.7.50 per kilogram. How much beef could a mother serve to each of 5 children if she could only afford to spend Sh.20 for the beef?

(a) Divide and divide
(b) Multiply and add
(c) Subtract and multiply
(d) Divide and multiply

12. A coat marked Sh.40 was sold for 29.95 during a sale. What was the per cent reduction?

(a) Divide and add
(b) Subtract and divide
(c) Multiply and subtract
(d) Add and divide

13. At the beginning of a month, a car rental organisation rented 37 cars. During the month 32 of the cars were returned. If at the end of the month, 43 of their cars were being rented, how many rentals were made?

(a) Subtract and divide
(b) Subtract and subtract
(c) Add and subtract
(d) Multiply and add

14. A corporation doubled its assets by selling 1,000 shares of stock at Sh.75 per share. What were the corporation's total assets after the stock had been sold?

(a) Multiply and divide
(b) Add and multiply
(c) Add and subtract
(d) Multiply and multiply
15. A certain mother generally squeezes $1\frac{1}{2}$ oranges for a glass of orange juice. The average cost of the oranges she bought during one year was 40 cents per orange. Approximately how much did it cost the family for the 827 glasses of juice that were drank during the year?

(a) Multiply and subtract
(b) Add and divide
(c) Multiply and multiply
(d) Divide and multiply
INSTRUCTIONS: Do not start before you are told.

In this section there are 10 problems. For each question, choose the correct answer from those and mark the correct letter on the answer sheet with an "x". Do not write on this question paper.

1. Tom's mother cooked 48 potatoes. She also cooked 64 bananas. How many fewer potatoes than bananas did she cook?
   
   (a) 112 (c) 26
   (b) 48 (d) 16

2. Ann has Sh. 30 to spend on books. Each book costs Sh. 5. How many books can Ann buy?
   
   (a) \( n=30-5 \) (c) \( n=5\times30 \)
   (b) \( n=30\div5 \) (d) \( n=30+5 \)

3. David bought a bag of 20 new marbles. He now has 75 marbles. How many marbles did David have before he bought new ones?
   
   (a) \( 20+75=n \) (c) \( n+20=75 \)
   (b) \( 75=20+n \) (d) \( n=75+20 \)

4. Suppose you have a marble game. You drop a marble at A. It goes to B. In how many ways can it go?

   (a) 2
   (b) 4
   (c) 5
   (d) 6
5. Look at the chart below. Some numbers are needed to complete it. What number would you write instead of the question mark in the ring?

<table>
<thead>
<tr>
<th></th>
<th>MON</th>
<th>TUE</th>
<th>WED</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>BILL</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>JOE</td>
<td>4</td>
<td>8</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>TOM</td>
<td>1</td>
<td>7</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>TOTAL</td>
<td>10</td>
<td>18</td>
<td>?</td>
<td>37</td>
</tr>
</tbody>
</table>

(a) 3 (c) 10
(b) 4 (d) 13

6. If R-S=T, then which of the following is (are) true?

I. R+T=S  II. R-T=S  III. S+T=R

(a) 1 only   (b) 1 and II
(c) I and III (d) II and III

7. The following diagrams are pictures of loops of cord. Which one cannot be pulled out or twisted (without cutting) to form a circular loop without a knot?

(a)  
(b)
The picture to the left shows the number 3425. What number is shown by the picture on the right?

(a) 9730  (b) 9269  (c) 973  (d) 269.

9. The picture below shows that something happened to a large group. How was the group at the left changed to become the group at the right?

(a) 4 was added to it  (c) 4 was subtracted from it.
(b) It was multiplied by \( \frac{1}{4} \)  (d) It was divided by \( \frac{1}{4} \).
In the figure above, the line ST is drawn to the scale 1 cm to 100 metres. What is the distance represented by ST?

(a) 175 metres  (c) 125 metres

(b) 150 metres  (d) 100 metres
TEST 3

Mathematical concepts Time: 20 minutes

Instructions: Do not start before you are told.

This is not a test. It is a list of what you may have been taught in mathematics up to now. There are examples and problems to work. There are nine question to answer.

This test is concerned with mathematical concepts. There may be questions that you may not be questions that you may not be able to answer.

Do not worry. First do those that you can and then those you cannot do later.

DO NOT write on the question paper. Mark the correct answer with an (x) on the corresponding part of the underlined sheet.

---

1. This picture suggests, or helps you think of number 3.

Look at the picture at the right. It suggests another number. How many of the pictures below suggest the same number as the one at the right.

(a) one of them
(b) three of them
(c) four of them
(d) My answer is not given.

2. Look at the drawing at the right. The shaded part suggests a fraction. How many drawings below suggest the same number?
(a) four of them  (c) two of them
(b) three of them  (d) my answer is not given

3. Which one of these is read, "eight is greater than five"
   (a) 8≠5  (c) 8<5
   (b) 8>5  (d) 8≥5

4. Which one of these is greater than 394 and less than 439?
   (a) 45  (c) 400
   (b) 349  (d) 943

5. These are names for four numbers. Which names the greatest of these numbers?
   (a) 23 tens and 10 ones  (c) 2 hundreds and 47 ones
   (b) 3 hundreds and 12 tens  (d) 4 hundred and 12 ones

6. Look at this number number sentence 3xn=63. Mark below how you can find the number that would make it a true sentence:
   (a) Multiply 63 by 3  (c) Add 3 to 63
   (b) Divide 63 by 3  (d) Subtract 3 from 63

7. Look at this number sentence: n-73*58. Mark below how you can find the number that would make it a true sentence.
   (a) Change 73 to 6 tens and 13 ones  (c) Subtract 58 from
   (b) Subtract 73 from 58  (d) Add 73 and 58
8. How many of these drawings are pictures of squares?

(a) Seven of them
(b) Five of them
(c) Three of them
(d) Two of them
(e) None of them is given

9. Here is a drawing of a circle and some points.

which letters name points of the circle?

(a) B and E
(b) A and C and D
(c) F
(d) A, B, C, D and E
Arithmetic Computation. Time: 15 minutes

Instructions:

Do not begin before you are told.

Do not mark anything on this question paper.

Mark the correct answer with an "x" on the answer sheet provided.

1. \( \frac{4}{3} + 3 \)  (a) 1  (b) 7  (c) 12  (d) 8

2. 6  (a) 7  (b) 6  (c) 5  (d) 4

3. \( \frac{1}{9} \times 9 \)  (a) 9  (b) 10  (c) 8  (d) 1/9

4. \( 27 \div 9 \)  (a) 56  (b) 3  (c) 18  (d) 243

5. 23  (a) 58  (b) 68  (c) 473  (d) 275

6. 60  (a) 47  (b) 33  (c) 43  (d) 290

7. 100 + 1 + 10 \( \times \)  (a) 100110  (b) 111  (c) 1011  (d) 201

8. 12 + 54 + 38 \( \times \)  (a) 104  (b) 554  (c) 590  (d) 932

9. \( 4 \div 40 \)  (a) 0.1  (b) 10  (c) 0.01  (d) 100
<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>402</td>
<td></td>
<td>8244</td>
<td></td>
</tr>
<tr>
<td></td>
<td>x201</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>4</td>
<td>(a)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>x 0</td>
<td>(b)</td>
<td>0</td>
<td>(c) 0.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(d)</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>1111</td>
<td>(a)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(b)</td>
<td>1/101</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(c)</td>
<td>1/100</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(d)</td>
<td>11/101</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>7000</td>
<td>(a)</td>
<td>6001</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(b)</td>
<td>6111</td>
<td>(c) 7001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(d)</td>
<td>7111</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>345</td>
<td>(a)</td>
<td>1035</td>
<td></td>
</tr>
<tr>
<td></td>
<td>x111</td>
<td>(b)</td>
<td>38295</td>
<td>(c) 60273</td>
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This scale is composed of eight story problems which are designed to measure the pupil's ability to select and perform the relevant arithmetic operations, six of them involve either addition or subtraction while the seventh deals with partitioning a set into equivalent groups.

Instructions: Do not start before you are told.

There are eight questions in this section. Read each question carefully and choose the correct answer from those given and mark the correct letter on the answer sheet with a cross (x).

1. Tom and Jim share a bag of oranges. One day Tom takes twenty-five of the oranges to school, and Jim takes the other seventeen. The next day Tom takes seventeen oranges. How many oranges are there for Jim to take?

   (a) 17
   (b) 42
   (c) 25
   (d) 8

2. Sue had one pencil, Mary gave her two more pencils. How many pencils does she have now?

   (a) 1
   (b) 2
   (c) 3
   (d) 4
3. Mary had some money. She spent Sh.3 for pen and Sh. 1 for a ball. Then her money was all gone, How much money did Mary have before she spent any?

(a) 1
(b) 2
(c) 3
(d) 4

4. Rosa has three bananas. If she eats one of them, how many bananas will she have left?

(a) 1
(b) 2
(c) 3
(d) 4

5. Tom had some blocks. David gave him four more blocks. Now Tom has seven blocks. How many blocks did Tom have before David gave him more?

(a) 3
(b) 4
(c) 5
(d) 6
6. John had some pennies. He lost three of them. Now he has four pennies did he have before he lost any?

(a) 3
(b) 5
(c) 7
(d) 4

7. Bill has five pencils. John has three pencils. How many more pencils does Bill have than John?

(a) 1
(b) 3
(c) 5
(d) 2

8. Mrs. James bought six eggs. She used one half the eggs to make a cake. How many eggs did she use.

(a) 2
(b) 3
(c) 4
(d) 5
Instructions: Do not start before you are told.

This test is divided into three sections. Section A is designed to measure the pupils ability to interpret the meaning of symbols in the numeration system.

Section B is designed to assess the pupils understanding of numerical order in terms of both cardinality and ordinality.

Section C is designed to assess the pupils ability in whole number comprehension.

SECTION A Time 10 minutes

Instructions:

In this section there are seven questions. For each question choose the correct answer from those given and indicate the correct answer on the ANSWER sheet with an "x".

1. Which number has a five in the tens place?

(a) 15
(b) 5
(c) 51
(d) 501

2. Which number shows the number of tens?

(a) 8
(b) 2
(c) 28
(d) 208
3. Look at the picture. How many tens are there?
   (a) 3
   (b) 2
   (c) 1
   (d) 21

4. Which number has three tens and seven ones?
   (a) 37
   (b) 3
   (c) 7
   (d) 73

5. Which number is three hundred and three?
   (a) 300.3
   (b) 330
   (c) 30.3
   (d) 0.33
6. Write a number in the box to make the sentence true.

\[ 125 = 100 + \_ \_ \_ + 5 \]

(a) 20
(b) 10
(c) 5
(d) 15

7. Which of these is the name of ten tens?

(a) 100
(b) 110
(c) 1010
(d) 101

8. Which of these is a name of six tens and thirteen ones?

(a) 613
(b) 73
(c) 19
(d) 63
SECTION B

Time: 5 minutes

Instructions:
Select the correct answer and indicate it with an 'x' on the answer sheet. Do not write on the question paper.

1. 4 17 9 84 21

Suppose these numbers were put in order, which number would be in the middle.

(a) 84
(b) 21
(c) 17
(d) 4

2.

Which of these children is next to the last in line?

(a) 6
(b) 1
(c) 5
(d) 2
3. If the two middle digits of 6348 are interchanged, the number would be.

(a) 100 less
(b) 90 less
(c) 90 more
(d) 100 more

SECTION C:

Time: 20 minutes

Instructions

All the questions in this section must be answered on the answer sheet provided. Indicate with an 'x' the correct answer. Do not write anything on the question paper.

1. The closest the earth comes to the sun is 91,000,000 miles. How should this number be read?

(a) ninety-one million
(b) nine million one hundred thousand
(c) ninety-one billion
(d) ninety-one hundred thousands

2. Which of the following shows the correct meaning of 40

(a) (4xten) + (7xone)
(b) (4xone) + (7xten)
(c) (4+0+7)x(one hundred)
(d) (4xtenxten)+(0xten)+(7xone)
3. \[ \begin{array}{c}
400 \\
-199 \\
\hline
201
\end{array} \]

In this subtraction, we must borrow or ungroup. Which statement below shows how to do it for this problem?

(a) \[ 400 = (3 \text{ hundreds}) + (9 \text{ tens}) + (9 \text{ ones}) \]
(b) \[ 400 = (3 \text{ hundreds}) + (9 \text{ tens}) + (10 \text{ ones}) \]
(c) \[ 400 = (3 \text{ hundreds}) + (10 \text{ tens}) + (9 \text{ ones}) \]
(d) \[ 400 = (5 \text{ hundreds}) - (9 \text{ tens}) - (10 \text{ ones}) \]

4. On the blackboard Joe read the warning:

A MISPLACED DECIMAL POINT MEANS A LARGE MISTAKE. How does a misplaced decimal point change a number?

(a) One place too far to the right makes the numeral 10 times too large.
(b) One place too far to the right subtracts 1 from the number.
(c) One place too far to the left subtracts 1 from the number.
(d) One place too far to the left makes the number 10 times too large.

5. A Bank Clerk reports that he has 10,000 one hundred shillings notes. How much money does he have?

(a) Sh. 10,000
(b) Sh. 100,000
(c) Sh. 1,000,000
(d) Sh. 10,000,000
6. In circle land, people write:

When they mean 58 and they write.

When they mean 834

What number do they mean when they write the following?

(a) 2359
(b) 3529
(c) 5239
(d) 5329

7. What is the answer to this addition problem?
8. On planet x-200 the following symbols were used for numbers:

\[ \Delta = 1 \quad \nabla = 10 \quad \Box = 100 \]

For example:

\[ 6 = \Delta \Delta \Delta \quad \text{and} \quad 15 = \nabla \Delta \Delta \quad \text{and} \quad 123 = \Box \nabla \nabla \Delta \]

How would 324 be written?

(a) \[ \begin{array}{c}
\Delta \Delta \\
\Delta \\
\end{array} \]

(b) \[ \begin{array}{c}
\nabla \\
\nabla \\
\Delta \\
\end{array} \]

(c) \[ \begin{array}{c}
\nabla \\
\nabla \\
\Delta \Delta \\
\end{array} \]

(d) \[ \begin{array}{c}
\Box \\
\Box \\
\Box \\
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\Box \\
\Delta \\
\end{array} \]

9. Which of the following is equal to 37 tens?

(a) \[ \frac{37}{100} \quad (b) \quad 37 \quad (c) \quad 370 \quad (d) \quad 3700 \]
10. Which arrow points to the tenths place?

(a) G  (b) H  (c) J  (d) K

11. If a new system of number notation used the following symbols.

\[ \triangle \] stands for zero
\[ \diamond \] stands for eight
\[ \Box \] stands for five
\[ \bigcirc \] stands for two

Which is the correct answer to the example?

\[ \bigcirc \bigcirc \bigcirc \bigcirc \]

(a) \[ \bigcirc \bigcirc \bigcirc \bigcirc \]  
(b) \[ \bigcirc \bigcirc \bigcirc \bigcirc \]  
(c) \[ \bigcirc \bigcirc \bigcirc \bigcirc \]  
(d) \[ \bigcirc \bigcirc \bigcirc \bigcirc \]
Mark the correct answer as shown A B C D in this case C is the correct answer.

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