COMPARATIVE PERFORMANCE BY GENDER IN SUBTOPICS

OF JUNIOR SECONDARY SCHOOL ALGEBRA

IN SOKOTO STATE

BY

IBRAHIM GALADIMA

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DECLARATION

I hereby declared that, this thesis has been written by me and that it is a record of my own research work. It has not been presented in any previous application for a high degree. All quotations are indicated by quotation marks or indentation and the sources of information are specifically acknowledge by means of references.

CERTIFICATION

This thesis report entitled "Comparative Performance by Gender in Subtopics of Junior Secondary School Algebra in Sokoto State" by Ibrahim Galadima meets the regulations governing the award of the degree of Master of Education (M.Ed. Mathematics Education) of Ahmadu Bello University and is approved for its contribution to knowledge and literary presentation.

DR L. SHIRLEY
CHAIRMAN, SUPERVISORY COMMITTEE _____ DATE

MEMBER, SUPERVISORY COMMITTEE _____ DATE

HEAD OF DEPARTMENT _____ DATE

PROFESSOR D.I. SAROR
DEAN, POSTGRADUATE SCHOOL 31-1-89

DEDICATION

This work is dedicated to my brother, Alhaji Mamman Barade Rijiyar-Zaure, Sokoto, who enrolled me into the Western type of education.

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ABSTRACT

This study investigated and compared the performances of Junior Secondary School three students in the subtopic-categories of algebraic content. It also investigated their areas of difficulties in the said content. The study covered all the Junior Secondary School three students who were found to have had continuous Mathematics teaching from forms one to three in Sokoto State.

A A sample of fifteen out of seventy qualified schools were randomly selected and used. In each school one stream of the Junior Secondary School three classes was randomly selected. On the whole, a total of 516 students were involved comprising 314 boys and 175 girls. The instrument used was a standardized test constructed and validated in Kano State by Jahun (1986). Difference of means-tests (Z-test) were employed to compare performance pairwise, between boys and girls and over performance. The level of significance was put at 0.05.

Some of the findings of the study show that, there were statistically significant differences in the subtopic categories of algebraic content, both pairwise and between boys and girls. It was only in the pairs, equation and variation among boys, and factorization and graph among girls that, significance difference was not established, in the comparison between boys and girls (in each of the subtopic

categories), a significant difference was found in the subtopic, variation, where the Z-value was found to be 3.850. While in the remaining categories; factorization, equation and graph, no differences were observed. However, boys were found to score higher in the categories graph and variation, with the mean rcores 18.3 and 10.7 respectively, and girls in factorization and equation with mean scores of 16.2 and 12.3 respectively. In the overall performance, no significant difference was found. This implies that, both boys and girls performed the same in the algebraic content.

In the areas of difficulties, both boys and girls were found to have difficulties in solving equations involving difference of two-square, cross-multiplication and solving equation, using the methods of elimination and substitution. Graph and variation were also found to have posed some difficulties to Junior Secondary School three students. In particular, the later was found to be the most difficult category, because, majority of the students did not understand the terms- and symbols involved in the category.

Based on the findings, some recommendations were made to ameliorate the situation. These include;

i) That remedial classes in the identified areas of difficulties should be designed at Senior Secondary School I level to remedy the situation.

ii) Teachers should always put more emphasis on the identified areas of difficulties while teaching and also make sure that concepts, terms and symbols are fully comprehended by the students.

iii) Further research of this kind should be entended to other topics in Mathematics, such as geometry, trigonometry, etc. This will provide a clear juncture of the areas of difficulties among students in Mathematics as a whole.

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DEFINITION OF TERMS

The terms below have the following operational definitions in this study:-

STANDARDIZED TEST - A test which contains a set of items that are carefully prepared, with uniform directions for administration and scoring based on norms that are clearly defined.

AREAS OF DIFFICULTY - An area found from the student's work in the four subtopic-categories where performance is relatively low.

Chapter 1

INTRODUCTION

There is a great demand for scientific and technological manpower in all walks of life all over the world. Nigeria in particular has this problem and a great emphasis has been laid in the National Policy on Education (1977) for developing scientific attitudes at all levels of education.

However, to develop scientific and technological knowledge, as well as to cope with the increasing demands of the science and technology, students should be encouraged to offer science subjects and mathematics.

Mathematics and algebra in particular, is ~~indis~~pensable to science and engineering fields because students must know how to handle algebraic relations and equations.

Grove (1960) said that, the equation and hence, algebra is the basic concept of Mathematics. Algebra has practical values in many aspects of life. For instance, in Physics, such formulae as $E = mc^2$ for the study of atomic energy, $S = ut + \frac{1}{2}ft^2$ for laws of motion, $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$ for optics are fundamental. In mathematics, formulae such as $a^2 = b^2 + c^2 - 2bc \cos A$ for cousine, statistical formulae for arithmetic mean, median, standard deviation, correlation coefficient, and regress lines are used. In business and insurance, algebraic

formulae guide payment, interest, and value calculations, and graphs show visual relationships. Medical uses include the simple formula for conversion of centigrade to farenheit ($F = \frac{9}{5}c + 32$), the formula used to determine the amount of iron a body requires in terms of its weight (Fe = 4.5 WD + 500mg, where Fe = iron, W = weight in K and D haemoglobin concentration) and many others. However, the teaching and laerning of this section of mathematics have met so many problems which have now caused it to be a matter of public concern. Every year, it seems that students' performance in algebra are generally low and probably declining. For instance, Jahun (1986), in constructing a standardized test for JSS - 3 in algebra, found that a majority of the students scored below 15%. This is a clear indication of poor performance in algebra by the students.

Thus, it is the researcher's belief that there is the need to conduct research in all the various subtopics of algebra to find out areas of students' difficulties. This may help reduce some of the problems encountered by the students in mathematics generally and algebra in particular.

1.1 Statement of the Problem

Gender differences in mathematics is an area which has attracted a considerable amount of attention among mathematicians, mathematics educators and teachers of

mathematics. Much research has been conducted on mathematics achievement, attitude, anxiety, fear of success. Others focussed attention on mathematical learning problems, analysis of errors in mathematics,etc. However, not much has been done in specific areas of mathematics, whcih is the major difference between this study and others in the existing literature.

This study is concerned with finding out areas of difficulty and also differences in performance that might exist between boys and girls in various subtopics of algebraic content of the JSS - 3 mathematics curriculum in Sokoto State.

1.2 Purpose of the Study

It is common practice that teachers of mathematics usually evaluate students' work and allocate marks only without making any attempt to find in which area(s) the students often make mistake in the process of solving mathematical problems. This practice does not provide the opportunity for arranging remedial work to those students who are found to have common mistake(s) in the process of solving a problem. Thus, it has contributed to the consistently poor performance in the subject by the students every year.

Therefore the main objectives of this study in specific terms are as follows;

i) To find out any difference of performance by JSS - 3 students in the four subtopic categories of algebraic content, compared

pairwise.

ii) To find out gender differences among JSS - 3 students in each of the various subtopic-categories of algebraic content of the school mathematics curriculum.

iii) To find out who performs better between boys and girls in the overall algebraic content of the JSS - 3 mathematics curriculum in Sokoto State.

However, it should be noted at this point that, the comparison is from category to category and not for individual items within the categories.

1.3 Significance of the Study

Research in gender differences in mathematics achievement and performance has been carried out extensively both within and outside the country. The general findings of these researches were that boys performed better than girls in mathematics generally. For instance, a study conducted by Mitchelmore (1973) in Ghana, revealed that, boys scored more than girls in mathematics performance. Similarly, Nwagu (1977) found that, "Boys performed better than girls ..." in Borno State. However, few researchers, such as Jahun (1986) while developing his standardized test in algebra in Kano State, found the mean scores of boys and girls to be

6.36% and 7.65% respectively. This shows that, girls had scored statistically significant higher marks in the tests than boys, and therefore performed better in algebraic content even though the scores were generally low.

This new development had set a controversy in the existing literature as to who performs better in mathematics between boys and girls and in what area. The findings of this study may further furnish data in the new development, and perhaps help to resolve this controversy. The researcher also wishes to find out whether these differences in performances by gender could also be observed in Sokoto State. This will further check on Jahun's results as well as the validity and relaibility of the test developed.

Furthermore, one of the national goals for secondary education is "to equip students to live effectively in a modern age of science and technology (National Policy on Education, 1977, page 16) This goal can hardly be achieved if the science students are lacking the basic mathematical skills in solving algebraic equations. Lewis (1978, p.300) said, it's startling that some secondary students (seniors) can't differentiate between an expression and an equation or between a variable and coefficient. This is further confirmed by Inekwe (1984) while making error analysis

in the solution processes of literal equations. He found poor process skills clearing square roots signs and fractions; and incorrect transposition of letters/ symbols or numbers from one side of an equation to the other, to be great causes of error in the solution processes of literal equations. All these revealed how poorly deficient students are in algebraic content, which is needed for in the areas of physics, engineering, medicine, advanced mathematics and many others. Grove (1976) buttressed the importance of algebra in science and technology by saying, "in our modern scientific world, formulae are used by many professions".

Therefore, it is hoped to improve this situation and make it possible for the students to achieve the goal. The findings of this study should be useful to the classroom teachers in putting more emphasis on the areas identified while teaching. Remedial classes could also be designed on the common areas identified for the fresh students entering SS - 1. This will help to remove their deficiences in algebra and provide a solid foundation for in the subsequent topics in the algebraic content. Similarly, institutions of higher learning like polytechnics, universities, etc. could also design remedial courses for fresh students entering science and engineering based courses, in the identified areas of algebra. This will help to remedy their

deficiencies in the areas identified as well as providing the basis for the successful take-up of science and technology which the country is aspiring.

Finally, it is hoped that, the findings of this study would be helpful to researchers, mathematics educators and others concerned with improving the learning of mathematics.

1.4 Research Questions and Hypotheses

Research questions and hypotheses were used by the researcher as a guide in carrying out this study.

1.4.1 Research questions

The following research questions were used in this study, viz;

i) Do JSS - 3 students have significant pairwise differences of performance between subtopic-categories of algebraic content of the school mathematics curriculum?

ii) Do boys and girls from JSS - 3 have significant differences in achievement in each of the subtopic-categories of algebraic content?

iii) Who performs better between boys and girls in the overall performances in algebraic content of JSS - 3 mathematics curriculum?

1.4.2 Null-hypotheses

Three null-hypotheses were used in this study for statistical analyses, namely;

i) There are no significant pairwise differences in the performance of JSS - 3 students between various subtopic-categories of algebraic content of the school mathematics curriculum.

ii) There is no significant difference between boys and girls in achievement in each of the various subtopic-categories of algebraic content of the JSS - 3 school mathematics curriculum.

iii) There is no significant difference in overall performance between boys and girls in the algebraic content of the JSS - 3 school mathematics curriculum.

1.4.3 Alternative hypotheses

The following alternative hypothese were also used in this study.

i) There are significant pairwise differences in the performance of JSS - 3 students among various subtopic-categories of algebraic content of the school mathematics curriculum.

ii) There is a significant difference between boys and girls in each of the various subtopic-categories of algebraic content of the JSS - 3 school mathematics curriculum.

iii) There is a significant difference in overall performance between boys and girls in the algebraic content of the JSS - 3 school mathematics curriculum.

1.5 Scope of the Study

This study is limited to Secondary Schools in Sokoto State. As a result of the financial as well as time constraints, concentration was made on JSS - 3 students who were believed to have covered the algebraic content of the JSS - 3 mathematics curriculum. The study is also restricted to only those schools found to have had mathematics continuously from JSS - 1 to 3. Thus, the result of the study can only apply directly to students of Sokoto State.

The next chapter discusses the review of the related literature.

Chapter 2

REVIEW OF RELATED LITERATURE

The purpose of this chapter is to review the literature related to:-

2.1 Gender differences and Mathematic deficiency in algebra.

2.2 Gender differences in Mathematics achievement.

2.3 Gender differences and attitude towards Mathematics.

2.4 Gender differences and Mathematics anxiety.

2.5 Summary of the chapter.

Note that, the variables attitude and anxiety were chosen in the related literature because of their influence in the performance of the students in Mathematics generally and in particular algebra, which may be positive or negative. Also, the researcher found it very difficult to get enough literature in algebra, because not much has been done in specific areas of Mathematics. However, the few literature obtained are discussed in the Section 2.1 of this chapter.

2.1 GENDER DIFFERENCES AND MATHEMATIC DEFFICIENCY IN ALGEBRA

For the scientific and technological take-off of any nation, mathematics is required. Infact, it is the researcher's conviction that science without mathematics is incomplete. This is because, it is the medium by which and with which science generally expresses, formulates, continues and communicates with itself. Scientific inventions can not be achieved without the help of mathematics, because it is the mathematical calculations that determine the correctness of different scientific facts. Thus, it has to be called upon for assistance in order to determine the accuracy of the measurements involved. Numbers belong to the world of mathematics. Tables and graphs are made available only with the help of mathematics and all these things not only the teaching of science and mathematics are very intimately related. In particular, algebra being one of the branches of mathematics has manifested its significance in all the engineering fields and technology. However, Nigeria is aspiring towards scientific and technological take-off as has been clearly stated in the National Policy on Education (1977). Both the teaching and learning of mathematics in general and algebra in particular has numerous

problems. Students often have difficulties in finding common factors, factorising expressions, solving quadratic equations, graphing,etc. For example, Howarth et al, (1980) while investigating the mathematical deficiencies of engineering undergraduate entrants at Plymouth Polytechnic, found students deficient in such topics as solving inequalities, completing the square for solving quadratic equations, compound angle formulae, conic sections, the algebraic manipulation of indices, and factorization of quadratics. Also Ezenwa (1985) while identifying mathematical deficiency of N.C.E. chemistry students, found algebra to be one of the critical areas of deficiencies.

There is also the need to find out whether gender differences in mathematics performance exist among students. A survey of what researchers have found would be of value. For instance, Swafford (1980) investigated sex related mathematical differences in first year algebra. He found that, at the start of the session, no sex related differences were evident in arithmetic computational skills or attitude about usefulness and enjoyment of mathematics. Males showed a slight advantage on consumer items. In the spring no sex related differences in algebra achievement were found, a decline in attitude was observed for both

groups and the differences on consumer exercises became more pronounced. Keller (1974) found in her study which involved ninth-grade algebra that there is no statistically significant differences in attitude or achievement that could be attributed to sex. But a study reported by Time Magazine, revealed that, "at age 9 boys and girls are about equal in all school subjects, but that by age 17 boys have far exceeded girls in all but creative writing and music." Garai and Scheinfeld (1968) who reviewed a pre-1960 psychological literature, concluded that, no significant gender differences were found in computational tasks. However, in arithmetical reasoning and ability, males were observed to consistently perform better than females as a group.

In a nutshell therefore, it is apparent that gender differences are evident among students in certain areas of mathematics, in particular algebra. In Nigeria today, such differences among students seem to exist, particularly at post-primary schools, when one looks at the trend of students' poor performances in mathematics, which necessitated WAR AGAINST POOR ACHIEVEMENT IN MATHEMATICS (WAPAM) Conference in 1985. More specifically, Jahun (1986) who constructed standardized test of JSS - 3 algebra, found a majority of the pupils sat for the two tests scored below 15%.

Since gender differences seem to exist among students, it is pertinent to find our what are the possible causes of these differences in mathemathematics performance in general and algebra in particular. Could the differences be attributed alone to intelligence, thereby making it inevitable, or other factors? If the differences are due to intelligence, it implies that one sex has more mathematical ability than the other. However, according to Boorer (1974, 30 - 31) sex differences in mathematics is not necessarily due to higher intelligence but to different social pressure. This is further confirmed by Fennema (1978) who concluded in her study that, no inherent factors exist which keep girls from learning Mathematics at the same level as boys. To summarise these factors responsibel for sex differences in Mathematics genrally and algebra in particular, intelligence, societal, emotional and biological factors have their contributions.

2.2 Gender Differences in Mathematics Achievement

Since part of this study is to find out gender differences in mathematics performance among secondary students in various subtopics of algebraic content of the J. S. S. three school mathematics curriculum, there is the need to review what researchers have found about mathematics performance in general and algebra in particular. Throughout this century researchers have tried to find out whether and in which areas there are gender differences in mathematics performance and achievement. Although, most of the studies were not carried out in Nigeria, and the few that were done in Nigeria tend to be broad in terms of content area, rather than studying specific areas in mathematics as this study intends to do.

However, different views were obtained from the findings. While some researchers found boys to perform better than girls in mathematics, others concluded that there is no significant achievement. For instance, the International Project for the Evaluation of

Educational Achievement (I.E.A.) was conducted, in twelve countries. The results of this project revealed that in all the countries boys showed more interest in mathematics and had a higher performance in mathematics. Mitchelmore (1973) shared the same idea in the study he conducted in Ghana. He found that boys scored more than girls in mathematics performance. Also, in a test carried out by Fox (1978) revealed that there are consistent gender differences in mathematics performances among highly able students. The mean scores of boys were considerably higher than those of girls. To be more specific Jarvis (1964) and Parsley (1964) found that boys do better in tests dealing with mathematical reasoning, while girls do better in tests dealing with computational ability.

In Nigeria, similar views were found but with some differences. For instance, in the most recent study, conducted by Jahun (1986), when he tried to construct and standardize algebra tests for J.S.S. three students in Kano State, the mean performance of girls was seen to be higher than the mean performance of boys in each test set he administered. But Omojuwa (1979) had a different view in a study he conducted to find out major factors responsible for poor performance among secondary school students in mathematics in WAEC examinations in Ondo State. He found that boys do better than girls in mathematics, with algebra inclusive

in the curriculum content. The same idea was also expressed by Nwagwu (1977) in his findings from Borno State. He concluded that "Boys perform better than girls in mathematics and boys have a more positive attitude than girls towards learning of mathematics. While some researchers have concentrated their studies in finding out whether gender differences do exist in mathematics and in what areas, of mathematics, others have diverted their attention to the factors responsible for these differences in mathematics performance. Most of these studies however, have attributed the difference to physiological and environmental factors. Few believed that the occasional differences observed in the achievement of the two sexes are due to the teaching and training expectations tradition, motivation and a range of socio-cultural factors (Fennema and Sherman, 1977). But Mednick and Weissman (1975) suggested fear of being successful in mathematics as a factor preventing girls from performing well in mathematics. Umeukeje (1977) found indiscipline as a factor responsible for the poor performance in mathematics, because according to him indiscipline affects learning. He further identified poor mathematical background as the greatest obstacle to the study of mathematics. However, boys attributed their poor performance to not working hard enough while girls invariably explained their grades by saying that they were not good at mathematics. This is an indication

of a societal stereo types affecting responses, that mathematics is a male domain and that it is essential males learn it, while females are not expected to know it. Since many factors were found to be responsible for the gender differences in mathematics in general and algebra in particular. To this effect, teachers should consider the rate at which their students learn, their background experiences and overall ability when teaching. In addition, Lawal (1981) in his study suggested that,

> To make the students like the subject that is create positive attitude in them, the teacher should not be harsh, instead he should encourage the students and try to answer, not to dodge questions from the students ... The teacher should be able to evaluate the students and lead but not drive them.

2.3 Gender Differences and Attitude Toward Mathematics

Many studies have been carried out in the area of gender differences and attitude toward mathematics and most of the findings do agree that students with positive attitude toward mathematics have a higher chance of performing better in the subject particularly algebra than those with negative attitude. In general, attitude affects learning and once a student has developed a kind of attitude not favourable to the subject, the result will consequently lead to a poor performance. Thus, there is a high correlation between

attitude and performance. Lassa (1976) has indicated in his findings about attitude and achievements among prospective teachers that "There was a significant correlation between the scores on mathemantcs tests and the scores on attitude scale for the prospective teacher in A.P. group". However, most studies also tend to show boys having more positive attitudes toward mathematics than girls, thus, they perform better in mathematics in general and algebra in particular than girls. Muraleedharam (1982) for example, in her study of sex differences in attitude toward mathematics in Secondary Schools, found that, there was statistically a highly significant difference between the attitude towards mathematics for boys and girls. She concluded that, "Boys have more positive attitude towards mathematics than girls." The same idea was expressed by Sherman (1980), who concluded that, sex differences in achievement could in part be attributed to the more favourable attitudes towards mathematics expressed by boys.

However, some vital questions could be raised at this juncture, namely, what are the possible causes of these differences in attitude toward mathematics? Why do boys have more positive attitude towards the subject than girls? Some recent studies ascribed the causes to be socio-cultural factors, example, type of father's marriage, family size, parental education,

environment, etc. A few researchers, mainly in the United States conducted investigations of which factors influence girls' attitudes towards mathematics. They concluded that, the parents' educational level and the rural or urban environment seemed to play a role on the attitude of girls towards mathematics. Fox (1976) found that parents'who use, enjoy and have confidence in their ability to do mathematics have shown to have a positive effect on children's attitudes towards mathematics. Fox (1974) also found that American girls from all-girls families seem to have a better attitude towards mathematics than girls from families with mixed off-spring. However, in Nigeria, a study was conducted in Kaduna State whose findings contradict that of United States. Ebeneba (1978) investigated the attitude of girls towards mathematics with different socio-cultural backgrounds. She concluded that, "The socio-cultural background does not seem to have any significant influence on a girl's attitude towards mathematics." On the other side of the coin, there are those who ascribed the causes to be the teachers, because according to them, the development of positive attitudes towards mathematics is a fundamental concern of any mathematics teacher since it affect learning of mathematics. Banks (1968) point out that, teachers' attitudes and effectiveness to mathematics are viewed as the prime determinants of students' attitudes and

performance in the subject. Again Banks (1963; 16 - 17) mentioned that, an unhealthy attitude towards mathematics may result from a number of causes. But by far the most significant contributing factor is the attitude of teacher. The teacher who feels insecure, who dreads and dislike the subject, for whom "mathematic" is largely rule manipulation, devoid of understanding, interest and enthusiasm can not only portray negative attitude toward the subject but also to the learners. Therefore, what teachers do to differentiate between male and female students need to be highlighted. There have been allegations that teachers treat females differently than males and this differential treatment is a negative influence on females studying mathematics. Schonborn (1975) found that, from the first grade through high school, teachers pay more attention to males than females. Not only do males receive more discipline or blame from teachers, they also receive more praise from teachers. Brophy and Good (1970) also found that, in high school mathematics classes, high-achieving boys receive significantly more attention from teachers than do high-achieving girls. And this is true not only for male mathematics teachers but for females mathematics teachers as well. Other researchers maintained that as teachers are spending more time with males, not only are they helping males more, but also they are communicating,

albeit subtly, that males' concerns in mathemathematics are more important than females concerns and that mathematics learning is more essential for males than for females.

In a nutshell therefore, teachers have different perceptions of males and females as learners of mathematics and these perceptions are often inaccurate, which may be caused, at least partly, from the stereotyped belief that mathematics is a male domain and that it is essential that males learn it. Consequently, these perceptions and expectations do influence teacher treatment of females and males as learners of mathematics.

Finally, since attitude has been found to affect students' performance in mathematics generally, it is therefore no exception in algebra, land that is why it was included in the review of literature of this study.

2.4 Gender Differences and Mathematics Anxiety

Mathematics anxiety is not necessarily related to general anxiety; a mathematics anxious person may not be the generally anxious type. Nor is mathematics anxiety related to general intelligence; it often afflicts persons who are higly successful in other areas. Comments such as "I can't do this." "No amount of practice or trying will make it work for me." "I never really understood mathematics." "Mathematics is very difficult." etc. often made by students, are symptoms of mathematics anxiety. It is therefore an "I can't" syndrome. Once a person has become frightened of mathematics, she/he begins to fear all manner of computations, and any quantitative data and words like proportion, exponential, percentage, curve, etc. Mathematics anxiety is an emotional as well as cognitive

problem and a student identified as mathematics anxious, will not have as high performance as the one who is not mathematics anxious.

Williamson (1980) found that the degree of anxiety toward the study of mathematics is the single best predictor for mathematics achievements. This implies that, high achievement in the study of mathematics depends (negatively) on the degree of anxiety, that is to say, if a student is less mathematically anxious his achievement may be high and vice versa. This assertion is further supported by some studies in United States of America that, low achievement in mathematics has been associated with high anxiety; low anxiety has been correlated with a high performance. Thus, one can see at this juncture how mathematics anxiety is related to this study, which is finding areas of difficulties and differences in performance among J.S.S. three secondary students. This is because if a student is found to have more areas of difficulties in algebraic content, implies tha his performance in the said content will be low. Which may be attributed to high mathematical anxiety.

What researchers have found about gender differences and mathematic anxiety are infavour of boys, that is, boys are less mathematically anxious than girls, hence, they perform better in the subject and subsequently in

algebra.

Fennema and Sherman (1977) found that at each grade level 6 through 12, boys were significantly more confident in their mathematics ability than were girls. Confidence here means that, boys were less mathematically anxious than girls. Crumpton (1977) found that, an increase in the mathematical competency of students is accompanied by a decrease in mathematical anxiety.

What are the causes of this mathematical anxiety? Some of the factors as mentioned by some researchers include psychological, peer influence and to some extent parental influence. And as a matter of remedy, a good number of suggestions were made. While some suggested psychological counselling, whereby students would be given advice after diagnosing their problems. Establishing a firm foundation in the basic mathematic skills has been recommended as an effective way of increasing student confidence. Others such as Tobias (1976), who quoted Blum, does not believe that the approaches to mathematics anxiety need to be either psychological or remedial, but provided at least one positive experienc in learning mathematics.

Therefore, from the above discussion, it is evident that, anxiety affects students performance in mathematics generally and algebra in particular, hence,

most of the poor performances in mathematics generally and algebra in particular could be attributed to lack of confidence in the students, which implies higher anxiety.

2.5 Summary

The above discussions reveal that, gender differences among students in mathematics seems to exist, and the general trend is that, boys performed better than girls in mathematics generally. Some of the causes of these differences were attributed to teachers, who make differential treatment in the classroom in favour of boys, Others are attitude towards mathematics and mathematical anxiety.

The next chapter explains the proceedure used in collecting data for this study.

Chapter 3

DESIGN OF THE STUDY

This study is about finding out areas of difficulty between boys and girls in the subtopic categories of algebraic content of the JSS - 3 school mathematics curriculum in Sokoto State. The design of the study is a 2x4 expost-facto repeated measures. This chapter attempts to describe the procedure used in this study. It is divided into the following sections;-

3.1 Population

3.2 Sample

3.3 Instrumentation

3.4 Administration of the Test

3.5 Approach to Data Analysis

3.1 Population

The population of this study is all of the JSS - 3 students of Sokoto State, who had mathematics teachers continuously from form one to three and covered the JSS - 3 algebraic content. It has been found that seventy-five out of one hundred and fifty-one secondary schools (both junior and senior) of Sokoto State satisfy these conditions. Thus, generalization would be made directly to this category of students only.

3.2 Sample

A sample of fifteen secondary schools was used, that is about twenty percent of the qualified schools of the population. The sampling was aimed at having a

fair representation of the characteristics of the parameters of the parent population.

The institutions were randomly selected from the eight education zones in the state, using proportional allocation (see table 3.1 below). This is aimed at giving equal opportunity for each of the schools in the zones of being selected or rejected. In each school all of the students in one randomly selected stream of JSS - 3 were tested. This gives a total of five hundred and sixteen students (516) both boys and girls, that is about thirty-five students from each class. There were three hundred and forty-one (341) boys and one hundred and seventy-five (175) girls.

Table 3.1: Sample Sizes of the Eight Education Zones in Sokoto State

S/NO	ZONES	TOTAL NUMBER OF SCHOOLS	NUMBER OF QUALIFIED SCHOOLS	SAMPLE SIZE	PERCENTAGE OF SAMPLE OUT OF QUALIFIED SCHOOLS
1.	Sokoto	32	22	4	18
2.	Argungu	16	9	2	22
3.	Birnin-Kebbi	20	9	2	22
4.	Gwadabawa	16	5	1	20
5.	Talata Mafara	16	3	1	33
6.	Zuru	14	9	2	22
7.	Gusau	24	11	2	18
8.	Yauri	13	7	1	14
TOTAL		151	75	15	20

3.3 Instrumentation

The instrument used in this study is a standardized test developed by Jahun (1986). This test was constructed and validated in Kano State. The test is aimed at helping appropriate authorities to check for the subjective judgement that classroom teachers are likely to make in the implementation of continuous assessment system in Kano State. The test contains two parallel or equivalent form tests, namely test A and B, with a high reliability significant at 0.001. Jahun declared, "It has been found that 8 of the 10 coefficients are in the 80's while only 2 are in the late 70's. It is observed that the two set of tests are reliable and one can be a substitute of the other". To support Jahun's reliability, Anastasi (1976) suggested that reliability coefficient of good tests should normally fall in the 80's or 90's. Jahun administered five sets of tests from which, he selected items for two equivalent forms. The selection of the final items for the two set of tests, were based on the difficulty level, discriminating power, content validity and objectives of the area under study. For this study, test A was used and it contains twenty-seven items.

However, the researcher has sorted the test items into four subtopic-categories for statistical analysis namely; factorization, equations, variation and graphing (see Table 3.2 below for more details). The number of items for each category are also indicated on the copy of the instrument in Appendix A.

Table 3.2: Number of Items in each of the Four Subtopic Categories and their Weighing

SUBTOPIC CATEGORIES	NUMBER OF ITEM	ITEM NUMBERS	TOTAL MARKS FOR EACH CATEGORY
Factorization	10	1,2,4,5,6,7,8, 9,14,15,	26
Equations	10	10,11,12,13,16, 17,18,20,22,24	39
Variation	3	3,23,27	13
Graphs	4	19,21,25,26	22
TOTAL	27	27	200

3.3.1 Development of the Instrument

The instrument was developed in Kano State by Jahun (1986). It covers three main topics under the algebraic content of the J.S.S. - 3 mathematics curriculum; viz, Factorization, Equation and Variation. The standardized processes undertaken by test publishers were strictly followed by the test-developer.

Two trials were made both consisting of five sets of tests which were meant to be parallel. The items of the tests were developed from books written for the 6-3-3-4 mathematics currculum. Some of these include; New General Mathematics for West Africa, by J.B. Channon et al, Oxford Secondary Mathematics by Adelaja et al, etc. A total of two hundred and twelve (212) short answer and essay items were consructed, out of which five sets of tests were developed containing 27 items each. Six experienced forms 3 and 4 teachers from various schools

validated the content of the tests.

In the first trial, all the five sets of tests were administered to form three students and the scoring was done by the test developer. The result was very poor and was therefore discarded. As a result of that, a one-day workshop was organised by the test developer (in conjunction with the Kano State Ministry of Education) for the Mathematics teachers to find out the real condition in schools with tregard to teaching of algebra. During the workshop some test items were also obtained from the participants, which were incorporated into the initial 212. These were later prepared into another five sets of tests which were meant to be equivalent.

The second trial took place after the content validation This was done by the Kano State inspector of Mathematics and six experienced teachers from various schools. The criteria of validation were based on the course objective, content coverage, scope and standard of the tests. Both the administration and scoring of the tests were carried out by the teachers with the marking scheme strictly followed.

The results obtained were later put to statistical analysis. The first analysis was to find the equivalent of the five sets of tests, using t-test with both 0.05 and 0.001 levels of significance. The results showed that sets 1 and 5; 2, 3 and 4 were equivalent by virtue of their means and standard deviations. The second analysis was to determine the difficulty

levels and discriminating powers of the tests. A difficulty level of 0.09 and above for the final test was established and discriminating index of 0.25 and above were established for the final test also.

The final test was prepared from the result of the item-analysis and it comprises of two sets of tests, viz, test A and B. Each test consisted of 27 short answer and essay type items of varying complexities, This was administered to 3081 form three students from 14 schools of Kano State. The administration and scoring were both done by teachers from the various schools. After the scoring, two main statistical tests were employed, vix, the determination of norms and reliability estimate.

The reliability coefficients of the two sets were calculated using split-half, based on Pearson product moment formula and corrected by Spearman Brown formula for each of the norms. It was found that 8 of the 10 coefficients are in the 80's while only 2 are in late 70's. It is observed that the two sets of tests are reliable and one can be a substitute of the other. The reliability of the tests were further checked by considering the standard error of measurement (S.M.E.) of each test by norm. The errors surrounding the performance of the students in the test by norm range from 0.23 to 0.66. This has further strengthened the reliability of the tests for all the norms.

3.4 Administration and Scoring of the Test

The test was administered to all sampled schools on the same day, at the middle of the third term 1986/87 academic session. The administration of the test

was carried out with the help of some teachers from various schools. Permission was obtained from the Ministry of Education, Sokoto State, by the researcher to carry out the research. A letter was given to the researcher by the Ministry instructing all principals from the sampled schools to give assistance to the researcher. With this, arrangement was made with both the principals and the teachers in all the sample schools. The test items were deposited with the principals a week before the time of the test in those schools that were far away and a day or two before the test in the nearby schools. On the day of the test, the researcher went round some of the schools to see how the administration of the test went on, which was found to be satisfactory. After the test, the researcher went round the schools and collected the answer-scripts immediately.

Five research assistants were employed to help in the scoring of the answer-scripts. They were given three-day thorough orientation about the marking scheme and how it should be used effectively. Discussions were often held with them whenever they had a problem in the scoring of the answer-scripts. Partially marks were given where it is indicated in the marking scheme. The total marks for the whole test is 100%.

A final moderation of the scored scripts was

carried by the researcher to make sure that, the marking strictly adhered to the given scheme and marks were allocated accordingly.

3.5 Approach to Data Analysis

After the items were marked, scores were found for each of the subtopic categories for each script, as well as the total sch scores. The raw scores were converted into percentage scores. The means and standard deviations for boys and girls were calculated in each subtopic categories as well as the total scores for the over all performance. Also the means and standard deviations of the total sample were calculated for each subtopic categories as well as the total scores. Percentage scores by subtopic, gender, mixed and over all performance were also calculated.

Three comparisons were made for statistical analysis of the data, viz;

i) From subtopic to subtopic for the whole group ($M_1 - M_2$, $M_1 - M_3$, etc.).

ii) Between boys and girls for each subtopic categories ($B_1 - G_1$, $B_2 - G_2$, etc.).

iii) Between boys and girls in the total scores (BT - GT). See Table 3.3 below.

Difference of means-tests were carried out for the three comparisons. The level of significance was used at 0.05. The researcher is aware of the fact that, ANOVA or t-test would have been the best statistical tool for comparing among and within the groups. However, Z-test was used in this study because of the size of the sample involved.

Areas of difficulties were identified from both the students answer scripts and the obtained raw scores in the subtopic categories of algebraic content.

Table 3.3: Mean Performance of Boys and Girls in the Subtopic Categories of Algebraic Content

	FACTORIZATION	EQUATIONS	VARIATION	GRAPH	TOTAL
Boys	B_1	B_2	B_3	B_4	BT
Girls	G_1	G_2	G_3	G_4	GT
Mixed	M_1	M_2	M_3	M_4	MT

Chapter 4

DATA PRESENTATION AND ANALYSIS

This chapter presents an account of the analysis of data obtained from this study. It contains the results of the standardized test administered to JSS three students in Sokoto State. These students were found to have had continuous mathematics teachers from form one to three and are believed to have covered the algebraic content of the JSS three school mathematics curriculum. The presentation includes both the results from null-hypotheses testing and discussion of specific areas of difficulties identified among students. The areas of difficulties were identified from the students' marked scripts as well as the raw scores obtained from the test. Difference of means tests were carried out to test the null-hypotheses with 0.05 level of sighificance.

4.1 Results from Null-hypotheses Testing

Three null-hypotheses were tested, using Z - tests with alpha put at 0.05. When Z - values are larger than 1.645, they are considered statistically significant at 0.05.

The results of the three null-hypotheses are discussed separately along with the research questions.

Hypothesis 1: There are no significant pairwise

differences in achievement of JSS three students between various subtopic categories of algebraic content.

Table 4.1: Percentage Means and Standard Deviations for Boys and Girls in each of the Subtopic categories

	FACTORIZATION	EQUATION	VARIATION	GRAPH
BOYS	$\bar{X}$ = 14.7 SD= 16.4 n = 341	$\bar{X}$ = 10.7 SD= 18.4 n = 341	$\bar{X}$ = 10.7 SD= 19.7 n = 341	$\bar{X}$ = 18.3 SD= 19.3 n = 341
GIRLS	$\bar{X}$ = 16.2 SD= 17.0 n = 175	$\bar{X}$ = 12.3 SD= 18.5 n = 175	$\bar{X}$ = 6.5 SD= 11.3 n = 175	$\bar{X}$ = 16.0 SD= 21.5 n = 175
MIXED	$\bar{X}$ = 15.2 SD= 16.7 N = 516	$\bar{X}$ = 11.3 SD= 18.8 N = 516	$\bar{X}$ = 8.6 SD= 15.8 N = 516	$\bar{X}$ = 17.5 SD= 20.1 N = 516

From the results of the table 4.1 above, pairwise comparisons in the subtopics were carried out using difference of means tests. The results of this comparison among boys shows that, there are significant pairwise differences in all the pairs, except in the pair - equation and variation. In this comparison, the Z - value was found to be 0.00, see the table 4.2 below.

Table 4.2: Z-Values of Difference of Means Tests for Boys' Scores in the Subtopics

1	2	3	4	
-	2.997*	2.832*	- 2.625*	1
	-	0.00	- 5.253*	2
		-	- 5.089*	3
			-	4

Key:

1. Factorization
2. Equation
3. Variation
4. Graph
*. Significant at 0.05

Also among the girls, all the pairwise comparisons were found to be statistically significant, except in the pair - factorization and graph where the Z - value was found to be 0.097, table 4.3 below provides the detailed results.

Table 4.3: Z-Values of Difference of Means Tests for Girls' Scores in the Subtopics

1	2	3	4	
	2.053*	7.582*	0.097	1
		4.760*	- 1.726*	2
			- 6.263*	3
				4

Key:

1. Factorization
2. Equation.
3. Variation
4. Graph
* Significant at 0.05

While in the mixed group comparisons, all of the pairs were found to have significantly different

The table 4.4 below provides the detailed results of Z - tests carried out..

Table 4.4: Z - Values of Difference Means Tests for Mixed Group Scores in the Subtopics

1	2	3	4	
	3.565*	6.329*	- 1.999*	1
		2.462*	- 5.138*	2
			- 7.717*	3
				4

Key:

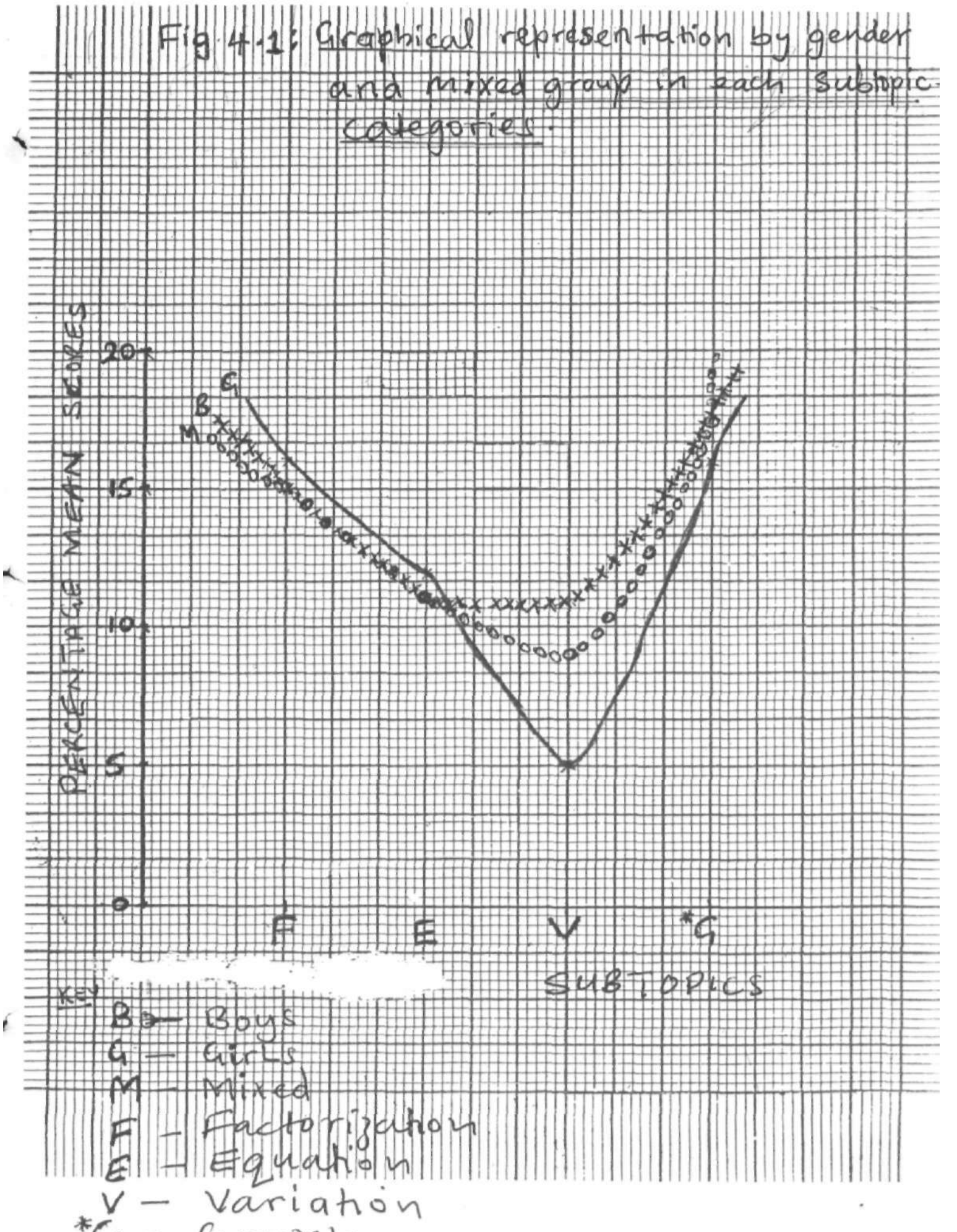
1. Factorization
2. Equation
3. Variation
4. 4. Graph

* Significant at 0.05 level

Therefore, these significant differences found has led to the rejection of the null-hypothesis which states "there are no significant pairwise differences..." The alternative hypothesis 1 is therefore accepted which indicates the existence of significant pair wise differences among boys and girls in the subtopic categories of algebraic content.

The answer to the research question one, i.e. Do JSS three students have significant pair-wise differences between the subtopic categories of algebraic content? can be clearly seen from the results of null-hypothesis one. That is, JSS three students have

Fig 4.1: Graphical representation by gender and mixed group in each subtopic categories.



significant pair-wise differences between the subtopic categories of algebraic content. These differences among boys are in the pairs - factorization and equation, factorization and variation, factorization and graph, equation and graph, and variation and graph. Among girls such differences are in factorization and equation, factorization and variation, equation and variation, equation and graph, and variation and graph. While in mixed group, in all the pairs, it was only in equation and variation among boys and factorization and graph among girls that, no significant differences was established.

However, boys did well in the subtopics graphs and factorization with the mean scores of 18.3 and 14.7 respectively. Girls also did well in factorization and graph with the mean scores of 16.2 and 16 respectively. Boys did very poor in equation and variation with a means scores of 10.7 each. So also girls, in equation and variation also with the mean scores of 12.3 and 4.5 respectively. On the whole JSS three students performed better in the subtopics graph, and factorization with the mean scores of 17.5 and 15.2 respectively. While they did poorly in equation and variation with the mean scores of 11.3 and 8.6 respectively.

Hypothesis II: There is no significant different between boys and girls in each of

subtopic categories of algebraic content.

Table 4.5: Z - Values of Difference of Means Tests Between Boys and Girls in each Subtopics

SUBTOPICS	Z - VALUES
Factorization	0.971
Equation	0.933
Variation	3.850*
Graph	1.232

* Significant at 0.05

The results on table 4.5 above indicate that, a significant difference between boys and girls does exist in the subtopic category - variation. While in the remaining categories - factorization, equations and graph, no significant differences were found, see table 4.5 above. The Z - value in variation comparison was found to be 3.850. This difference found in the variation has therefore led to the rejection of the null-hypothesis and thus, acceptance of the alternative hypothesis.

In response to the research question II, a significant difference in achievement does exist between male and female JSS three students. This difference was found in the subtopic of variation only. However, boys were found to score higher than girls in the subtopic categories - graph and variation with the mean

scores of 18.3 and 10.7 respectively. While girls in factorization and equation with mean scores of 16.2 and 12.3 respectively (table 4.1 above). This indicates, although the differences are not statistically significant, boys performed relatively better than girls in the high levels of algebraic content (variation and graph). While girls in lower levels of algebraic content viz - factorization and equations.

Hypothesis III: There is no significant difference in over all performance between boys and girls in the algebraic content of JSS three school mathematics curriculum.

The result of the comparison of over all performance of boys and girls in algebraic content, revealed that, there is no statistically significant difference. The Z - value was found to be 0.205. This means that, boys and girls performed equally the same in over all algebraic content. The table 4.6 below provides a detailed results.

Table 4.6: Mean, Standard Deviation and Z-Value for Boys and Girls in over all Performance

	$\bar{X}$	SD	N	Z-Value
BOYS	13.396	13.52	341	0.205
GIRLS	13.126	15.36	175	

The null hypothesis is therefore retained. However, when one examines the standard deviations for boys and girls in the over all performance (table 4.6 above). One notices a larger standard deviation for girls, i.e. 15.36, suggesting a greater variability and large spread of scores. While for boys, a smaller standard deviation 13.52 would appear to be more homogenous. This implies that girls have their scores more spread than boys.

With regard to research question III, the answer is quite straight forward, i.e. niether boys nor girls performed better than the others in algebraic content of JSS three school mathematics curriculum.

4.2 Further Findings

Jahun (1986, page 116) while constructing a standardized test for JSS three in Kano State, concluded that, girls performed better than boys in algebraic content. He found the mean scores of girls and boys to be 7.65 and 6.36 respectively. This finding had actually set a new development into the existing literature, because the majority of the research findings have concluded that boys perform better than girls in mathematics generally. Part of this research findings has found a contrary result, that is, boys and girls performed equally the same in algebraic content. This implies that, there is no difference in

achievement between boys and girls from Sokoto State in algebraic content. Thus, this finding had further sets a new dimension into the existing literature which calls for further investigation. This perhaps suggest that, girls are now coming up to the task of performing equally the same with boys or even better than them as the case in Kano State.

Therefore, this research finding had also added a new look into the existing controversy in the literature which needs further investigation to resolve.

Furthermore, from the table 4.7 below, the total mean score of JSS three students from Sokoto State is significantly higher than the mean score of their counterpart in Kano State, viz, 13.30 and 7.94 respectively. The Z-value was found to be 9.242, significant at 0.05. This implies that JSS three students from Sokoto State performed significantly better than those from Kano State in algebraic content.

Table 4.7: Mean, Standard Deviation and Z-Value of JSS Three Students from Sokoto and Kano States

	$\bar{X}$	SD	N	Z-Value
Sokoto	13.304	14.17	516	9.242*
**Kano	7.94	9.06	1356	

* Significant at 0.05

** Extracted from Jahun (1986, page 116)

4.3 Areas of Difficulties among JSS Three Students in Algebraic Content

The performance of boys and girls in the test administered was found to be generally very low. This may be attributed to lack of proper understanding of the basic concepts and processes involved. This was clearly manifested in the students' Answer scripts.

This section of the chapter discusses some of the specific areas of difficulties found among JSS three students in the subtopic categories of algebraic content. The identification process was based on the students marked scripts as well as their raw scores. The four subtopic categories are discussed below separately. However, it should be noted at this juncture that, the discussion is not intended to b formal item analysis, but just an informal kind of discussion.

Factorization:

In factorization both boys and girls were found to have difficulties on how to factorize an equation, particularly - factorizing difference of two squares. Most of them interpreted the expression $1 - x^2$ as $1 - x$, x or $x(1 - x)$ or $1x^2$. This is an indication of lack of proper understanding of how to factorize an equation involving difference of two squares. A few of them also have difficulties in finding common factors. For instance, it was found from their marked scripts that while answering question one - i.e. $np + mp$. The most

common answers were $nm^{-}p^{2}$, $n(p + m)m$ and $n + m + p$. This also indicates lack of proper underst anding of the processes involved in factorization. On the whole, about 62% of the boys and 60% of the girls scored below 5 out of the 26 marks allocated for the sub-topic. This implies that, students have difficulties in factorization which is a pre-requisite knowledge to the subsequent sub-categories in algebra.

Equation:

In equation, the majority of the boys and girls were found to have difficulties in solving fractional equations, particularly in the process of cross-multiplication. Some tried to multiply the two denominat and then equate the numerator, e.g. in equation $\frac{n + 7}{6} = \frac{n}{3}$, solved as $\frac{n + 7}{6} = \frac{n}{3} = 18$, $n + 7 = 6$. Others solved the equation as $\frac{n + n + 7}{6 - 7} = \frac{7}{9}$ or $\frac{3n + 21}{6n} = \frac{21}{2}$.

Solving simultaneous equations using both methods of elimination and substitution is another area of difficulty identified among boys and girls. From the marked scripts it was clearly seen that, the majority of the students, both boys and girls have shown no sign of understanding the processes involved in the two methods. A few of them did well using the two methods correctly, but on the whole about 72% of the boys and

71% of the girls scored below 5 out of the total 39 marks allocated to the subtopic category.

Therefore, this is an indication of how difficulty students found equations, which is as a result of lack of proper understanding of the basic concepts and processes involved.

Variation:

This is the most difficult area found among the students in this study. Seventy-three percent of the boys and eighty-three percent of the girls were found to have scored zero in this sub-category. However, boys were found to perform better than girls in this section with the mean scores of 10.7 and 4.5 respectively.

The very poor performance in this section may be attributed to the complexity of the subtopic itself and lack of proper understanding of the terms and symbols used in the subtopic category. Moreover, the students were lacking basic background knowledge of how to factorize and solve equation which are pre-requisite knowledge to variation. Most of the students used symbols wrongly, for instance, some wrote $y \propto x$ to mean y varies inversely as x or even $y = x$.

Graph:

In this subtopic, the majority of the students were able to complete the table given and draw a graph. However, one of the areas which posed difficulty among

students was the scale of measurement used in drawing a graph. A good number of the students, especially girls, found it difficult to use the scale say 1 cm to 5 units. Other areas of difficulties found among boys and girls are reading the values as well as solving the equations graphically, though a good number of boys read the values from the graph correctly. On the whole, about 60% of the boys and 69% of the girls scored below 5 out of the total 25 marks allocated to the subtopic category. This also indicates some difficulties encountered by the students in the subtopic category-graph.

In summary therefore, the following areas of difficulties among JSS three students in the subtopic categories of algebraic content were identified.

(i) Finding common factors.

(ii) Factorization with particular reference to difference of two squares.

(iii) Cross multiplication in fractional equations.

(iv) Solving simultaneous equations using the two methods of elimination and substitution.

(v) Reading the values of a variable from the graph.

(vi) Solving equations graphically.

(vii) Using scale of measurement e.g. 1 cm to 5 units.

(viii) Terms such as varies directly or inversely as well as their symbols.

The next chapter provides summary, conclusions and recommendations for the research study.

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Chapter 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This investigation is about comparing performance as well as finding areas of difficulties among JSS - 3 students in algebraic content of the school mathematics curriculum. The instrument used in this study is a standardized test developed by Jahun (1986) in Kano State. This chapter therefore, intends to summarize and draw necessary conclusions as well as make recommendations based on the findings from this investigation.

5.1 Summary

From the start, this study was aimed at comparing JSS - 3 students in four subtopic categories of algebraic content and finding their areas of difficulties also. The study then proceeded with the formulation of research questions and null-hypotheses. Justification for the need of the study was drawn from the practical application of algebra in such areas as science, engineering, advanced mathematics, agriculture, etc. as well as the poor performance manifested by the students in algebraic content.

While reviewing the related literature, there seemed to be a controversy in the existing literature about who perform better between boys and girls in

mathematics. While some researchers found boys performing better than girls in mathematics. Others concluded that, girls performed better than boys, particularly the research made by Jahun (1986) in Kano State. Also, there were those who found no gender differences in mathematics. One of the goals of this research was to resolve this controversy by at least re-affirming whether boys performed better than girls in mathematics generally and algebra in particular or the vise-versa.

Furthermore, other studies have found that, boys have more positive attitude toward mathematics than girls and therefore tend to achieve higher than girls. In addition, anxiety has been found to affect the performance of the student. Such that the more matematics anxious a student is, the less he/she perform in mathematics.

The population of this study is the entire JSS - 3 students from Sokoto State and it is to whom generalization would be made directly. Fifteen out of the seventy-five qualified schools were randomly selected from the eight education zones using proportionate allocation. On the whole a total of 516 students were used, made up of 341 boys and 175 girls. In each sampled school, one stream of the JSS - 3 was tested using Jahun's standardized test. One of the two

parallel tests (test A) was administered to only those students found to have had continuous mathematics teaching from form one to three and were believed to have covered the JSS - 3 algebraic content. This test was administered in all the sampled schools on the same day.

After the test, some research assistants were employed to assist in marking the answered scripts together with the researcher. These research assistants were given a three-day orientation on how to use the marking scheme effectively before the start of the marking.

Jahun's marking scheme provided was strictly followed Some moderation of the marked scripts was carried out by the researcher after the marking exercise to make sure that marks were awarded accordingly.

Some statistical analysis, such as finding the mean, standard deviation of each subtopic categories for boys and girls as well as the mixed group was carried out. Difference of means tests were also carried out to make comparisons between each pair of subtopic categories and between boys and girls.

5.2 Conclusions

From the findings reported in chapter four, it is possible to make the following conclusions of the study:

There are significant pair-wise difference in achievement between the subtopic categories of algebraic content among boys and among girls. These pair-wise differences among boys are in factorization and equations factorization and variation, factorization and graphs, equations and graphs. Among girls, differences are in factorization and equations, factorization and variation, equations and variation, equations and graphs, variation and graphs. While in mixed group all the pairs of means were found to be significantly different.

The only pairs not found to be significantly different were equation and variation for boys, and factorization and graphs for girls.

However, boys performed well in the subtopic categories, graphs and factorization, with the mean scores of 18.3 and 14.7 respectively. Girls also performed well in factorization and graphs with the mean scores 16.2 and 16 respectively. Boys did very poor in equation and variation with a mean score of 10.7 each. Girls also did very poor in equations and variation with the mean scores of 12.3 and 4.5 respectively On the whole, JSS - 3 students preformed better in graphs and factorization with the mean scores 17.5 and 15.2 respectively. While in equation and variation, they did poorly with the mean scores of 11.3 and 8.6 respectively.

A significant difference does exist among boys and girls in the subtopic category of variation. In the remaining subtopic categories, namely factorization, equations and graphs, the difference was not established.

There is no significant difference between boys and girls in their over all performance in algebraic content of the JSS - 3 school mathematics curriculum. This therefore implies that both boys and girls performed equally in the algebraic content of the JSS - 3 school mathematics curriculum.

Form 3 students Junior Secondary Schools from Sokoto State performed better than their counterparts from Kano State in the algebraic content of the school mathematics curriculum.

In the areas of difficulties, few of the JSS - 3 students have difficulties in finding common factors, cross multiplication (i.e. solving fractional equations) and terms such as "varies inversely" with its symbol. The majority of them have difficulties in solving simultaneous equations using the methods of elimination and substitution. They also have difficulties in reading the values of a variable from the graph-drawn and solving equations graphically.

5.3 Recommendations

Considering the position occupied by algebra in the

educational system and its practical application in the fields of science, engineering, etc., plus the poor performance manifested among the students in the said content. It is worthy to make the following recommendations in order to remedy some of the difficulties the students encounter to try to improve their performance in the content.

1. Remedial classes in the areas of difficulties should be designed at SSS - 1 level to remedy the situation. This will help improve their performance in algebraic content and subsequently lay a good foundation for further topics in algebra. Similar programmes could also be made available at post secondary institutions such as polytechnics, universities, etc.

2. Teachers should always put more emphasis on the identified areas while teaching and also make sure that concepts, terms and symbols are fully comprehended by the students. This will ensure a proper foundation in algebraic content.

3. In particular, teachers should pay great attention to the subtopic variation, which because this is the area appeared to be most difficult among students. Therefore,

they should make sure that students understand the concepts, and symbols involved in the subtopic; e.g. "varies directly or inversely" and their correct symbols.

4. Also, care should be taken by teachers, while solving equations involving finding common factors, cross multiplication, as well as solving simultaneous equations using the two methods of elimination and substitution, reading values from the graph and solving equations graphically.

5. Further research of this kind should be conducted in a wider scale in two or more states. Results from this wider scale will reveal more than what this study has done and also can be of vital use to th curriculum designers teachers of mathemathematics as well as the students.

6. Similarly, research of this kind should be extended to all topics of mathematics, such as, geometry trigonometry, etc., to find out students difficulties in mathematics as a whole. This will provide a clear picture of the areas of difficulties among students in mathematics and also

provide bases on which these areas of difficulties could be tackled effectively.

7.

There is the need to study how performance in our subtopic category will affect the performance of the other. For instance, how performance in factorization will affect performance in equation or variation or graph.

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APPENDIX A

JUNIOR SECONDARY SCHOOL 3 ALGEBRA TEST

NAME:---------- DATE:----------

SCHOOL:----------

SEX:----------

INSTRUCTIONS:

This test is aimed at assessing your total achievement in the algebra course of your Mathematics curriculum and also find out your areas of weaknesses in the said content. So you do your best to answer each question correctly.

Answer each question on the attached foolscap sheets--not Do/remove the question-paper from the attached answer sheets.

ATTEMPT ALL QUESTIONS. Time Allowed 2½ Hours.

Factorize the following expression.

1) $np + mp$ (Factorization - 2 marks)

2) $1 - x^2$ (Factorization - 2 marks)

3) Write down the expression connecting the variables in this statement.

"y varies inversely as x" (Fariation - 2 marks)

Factorize the following:-

4) $M^2 - 7M + 12$ (Factorization - 3 marks)

5) $21nz + 2zq - 7bq - 6z^2$ (Factorization - 3 marks)

6) $36^2 - y^2$ (Factorization - 2 marks)

7) $2mp^2 - 6m^2p$ (Factorization - 2 marks)

Evaluate using the idea of factors

8) 13 x 3 + 13 x 7 (Factorization - 3 marks)

9) $(1.56)^2 - (0.44)^2$ (Factorization - 3 marks)

Solve the following pairs of Equations by elimination.

10) $y - 2x = 4$ (Equation - 4 marks)

11) $x + 4y = 12$ (Equation - 4 marks)

$3y - x = 16$

Solve the following equations.

12) $\frac{n + 7}{6} = \frac{n}{3}$ (Equation - 4 marks)

13) $\frac{3}{4x + 3} = \frac{1}{x - 7}$ (Equation - 4 marks)

Factorize.

14) 6np - 2upk - 9rv + 3krv (Factorization - 3 marks)

15) $4y^2 + 8y + 3$ (Factorization - 3 marks)

Solve the following equations by substitution.

16) $x + 2y = 5$ (Equation - 4 marks)

$x + y = 4$

17) $3x - 2y = -2$ (Equation - 4 marks)

$x - 3y = 4$

18) Make θ the subject of the formula.

$U = \frac{\theta}{270} \pi h$. (Equation - 2 marks)

19) Complete the following table if the first line is directly proportional to the second. Draw the graph of the table and state if y oc x. (Use graph sheet. Use 1 cm for one unit on the x-axis and 1 cm for 5 units on the y-axis.

x	2	3	5		9
y		15		35	

20) If the sum of a number and seven is divided by four, the result is the same as subtracting five from the number and dividing the difference by three. What is the number? (5 - marks)

21) Draw the graph of the table below.

(a)

x	1	2	3	4	5	6
y	5	10	15	20	25	30

(Graph 6 marks)

Use 2cm for one unit on the x-axis and 1cm for 5 units on y-axis.

(b) Read off the value of:-

i. x when y = 17 .....

ii. y when x = 3 .....

iii. x when y = 29 .....

iv. y when x = 5.3 .....

22) Mustapha has ₦40.00 more than what Hafsatu has and the sum of their money is ₦150.00. How much does Hafsatu have?
(Equation - 5 marks)

23) If m $\propto$ n and m = 7 when n = $10\frac{1}{2}$, find:-

(a) m when n = $7\frac{1}{2}$ (Variation - 3 marks)

(b) when m = 15

24) Find r if U = 99 from $U = \frac{7}{2}\ \pi r^2$ (Equation - 3 marks)
(Take $\pi = \frac{22}{7}$)

Solve the following simultaneous equations graphically. Use the graph sheets.

25) $x + y = 5$ (Equation - 5 marks)
$2x - y = 1$ (Take the values of x from + 1 to = 3)

26) $x - y = 1$
$2x + y = 5$ (Take the values of x from 0 to +3)
(Equation - 5 marks)

27) 15 men can dig a ditch in 4 days. How long will it take 6 men to dig a similar ditch if they work at the same rate?
(Variation - 8 marks)

GOOD LUCK!

APPENDIX B

MARKING SCHEME - TEST A

1. $p(n+m)$ ..... 2 Marks
2. $(1+x)(1-x)$ ..... 2 Marks
3. $y \propto \frac{1}{x}$ ..... 2 Marks
4. $(M-3)(M-4)$ ..... 3 Marks
5. $7n(3z-q) + 2z(q-3z)$ .....(1)
   $= 7n(3z-q)-2x(3z-q)$ .....(1)
   $+ (7n-2z)(3z-q)$ .....(1) 3 Marks
6. $(6x+y)(6x-y)$ .....2 Marks
7. $2mp(p-3m)$ ..... 2 Marks
8. $13(3+7)$ .....(1)
   $= 13 \times 10$ .....(1)
   $= 130$ .....(1) 3 Marks
9. $(1.56+0.44)(1.56-0.44)$ .....(1)
   $= 2(1.12)$ .....(1)
   $= 2.24$ .....(1) 3 Marks
10. $y - 2x = 4$ .....(1)
    $y + x = 7$ .....(2)
    (1)-(2) .....(1)
    $-3x = 4-7$ .....(1)
    $= -3$
    $x = -\frac{3}{3}$
    $x = 1$ .....(1)
    Subst. in (2)
    $y + 1 = 7$
    $y = 7 - 1$
    $= 6$ .....(1) 4 Marks
    (1,6)

Test A: 2

11. $x + 4y = 12$ .....(1) .....
    $3y - x = 16$ .....(2)
    (1)+(2) .....(1)
    $7y = 28$ .....(1)
    $y = 4$ .....(1)
    Subst. in (2)
    $3.4 - x = 16$

Subst. in (2)

$3.4 - x = 16$

$- x = 16-12$

$- x = 4$

$x = -4$ .....(1) 4 Marks

$(-4,4)$

12. $3n + 21 = 6n$ .....(1)

$6n - 3n = 21$ .....(1)

$3n = 21$ .....(1)

$n = \frac{21}{3}$

$= 7$ .....(1) 4 Marks

OR $\frac{n+7}{6} - \frac{n}{3} = 0$ .....(1)

$\frac{n+7}{6} - \frac{2n}{6}$

$\frac{n+7-2n}{6} = 0$ .....(1)

$n + 7 - 2n = 0$ .....(1)

$-n + 7 = 0$

$-n = -7$

$n = 7$ .....(1) 4 Marks

Test A: 3

13. $3x - 21 = 4x + 3$ .....(2)

$4x - 3x = -21 - 3$ .....(1)

$x = -24$ .....(1) 4 Marks

OR

$\frac{3}{4x+3} - \frac{1}{x-7} = 0$ .....(1)

$\frac{3}{4x+3} - \frac{1}{x-7}$

$\frac{3x-21 - 4x-3}{(4x+3)(x-7)} = 0$ .....(1)

$3x-21 - 4x-3 = 0$ .....(1)

$-x - 24 = 0$

$-x = 24$

$x = -24$ .....(1) 4 Marks

14. $2up(3-k)-3rv(3-k)$ .....(2)

$=(2up-3rv)(3-k)$ .....(1) 3 Marks

15. $(2y+3)(2y+1)$ ..... 3 Marks

16. $x+2y = 5$ .....(1)

$x+y = 4$ .....(2)

From (2)

$x = 4-y$ .....(.....(2)

Subst. in (1)

$4-y+2y = 5$

$4+y = 5$

$y = 5-4$ .....(1)

$y = 1$

Subst. y in (2)

$x+1 = 4$

$x=4-1$

$= 4$ .....(1) 4 Marks

(3,1)

Teast A: 4

17. $3x - 2y = -2$ .....(1)

$x - 3y = 4$ .....(2)

From (2)

$x = 4+3y$ .....(2)

Subst, in (1)

$3(4+3Y)-2y = 2$

$12+9y - 2y = 2$

$12 + 7y = -12$

$7y = -2-12$

$= -14$

$y = -\frac{14}{7}$

$= 12$ .....(1)

S Subst. y in (1)

$3x-2\ (-2) = -2$

$3x+4 = -2$

$3x = -2-4$

$= -6$

$x=-\frac{6}{3}$

$=-2$ .....(1) 4 Marks

(-2,-2)

18. $270u = \overline{\text{III}}h$ .....(1)

$\frac{\overline{0\text{I}\text{I}}h}{\text{I}\text{I}h} = \frac{270u}{\text{I}\text{I}h}$

$\therefore\ 0 = \frac{270u}{\overline{\text{I}\text{I}}\ h}$ .....(1) 2 Marks

20. Let the number be x

then $\frac{x+7}{4} = \frac{x-5}{3}$ .....(2)

$\therefore$ 3x+21 = 4x-20 .....(1)

4x-3x = 21+20 .....(1)

x = 41 .....(1) 5 Marks

OR

Test A: 5

21 Let the number be x

then $\frac{x+7}{4} = \frac{x-5}{3}$ .....(1)

$\frac{x+7}{4} - \frac{x-5}{3} = 0$

$\frac{x+7}{4} - \frac{x-5}{3}$

$\frac{3x+21 - 4x+20}{12}$ ..... (1)

$\frac{3x+21 - 4x+20}{12} = 0$ .....(1)

3x+21-4x+20 = 0 .....(1)

-x+41 = 0

x = 41 .....(1) 5 Marks

22. Let Mustapha's money be M and Hafsatu's be H

Then M = G-40

i.e. M-G = 40 .....(1) .....(1)

and M+G = 150 .....(2) .....(1)

(1)+(2) 2M = 190

M = 95 .....(1)

$\therefore$ Hafsatu has ₦55.00 .....(1) 5 Marks

OR

By substitution 5 Marks

OR

Graphically 5Marks

Test A: 6

23. M = kn

$7 = \frac{21k}{2}$

$K = \frac{7 \times 2}{21_3^1}$

= 2/3 .....(1)

(a) M = 2/3 x 15/2

= 5 .....(1)

(b) $15 = 2/3n$

$n = 3/2 \times 15$

$= \frac{45}{2}$

$n = 22\frac{1}{2}$ .....(1) 3 Marks

24. $u = 7/2 \Pi r^2$

$r^2 = 2/7\frac{u}{\Pi}$ .....(1)

$= \frac{2}{7} \times 99 \times \frac{7}{22}$ .....(1)

$r^2 = 9$

$r = 9$

$= 3$ .....(1) 3 Marks

Test A: 7

27. As the number of men decreases the time taken to dig the ditch increases

Let M = men

T = Time

K = constent

$M \propto \frac{1}{T}$ .....(2))

$M = \frac{k}{T}$ .....(1))

i.e. $5 = \frac{k}{4}$ .....(1)

$k = 20$ .....(1)

$\therefore 6 = \frac{60}{T}$ .....(1)

$T = \frac{60}{6}$

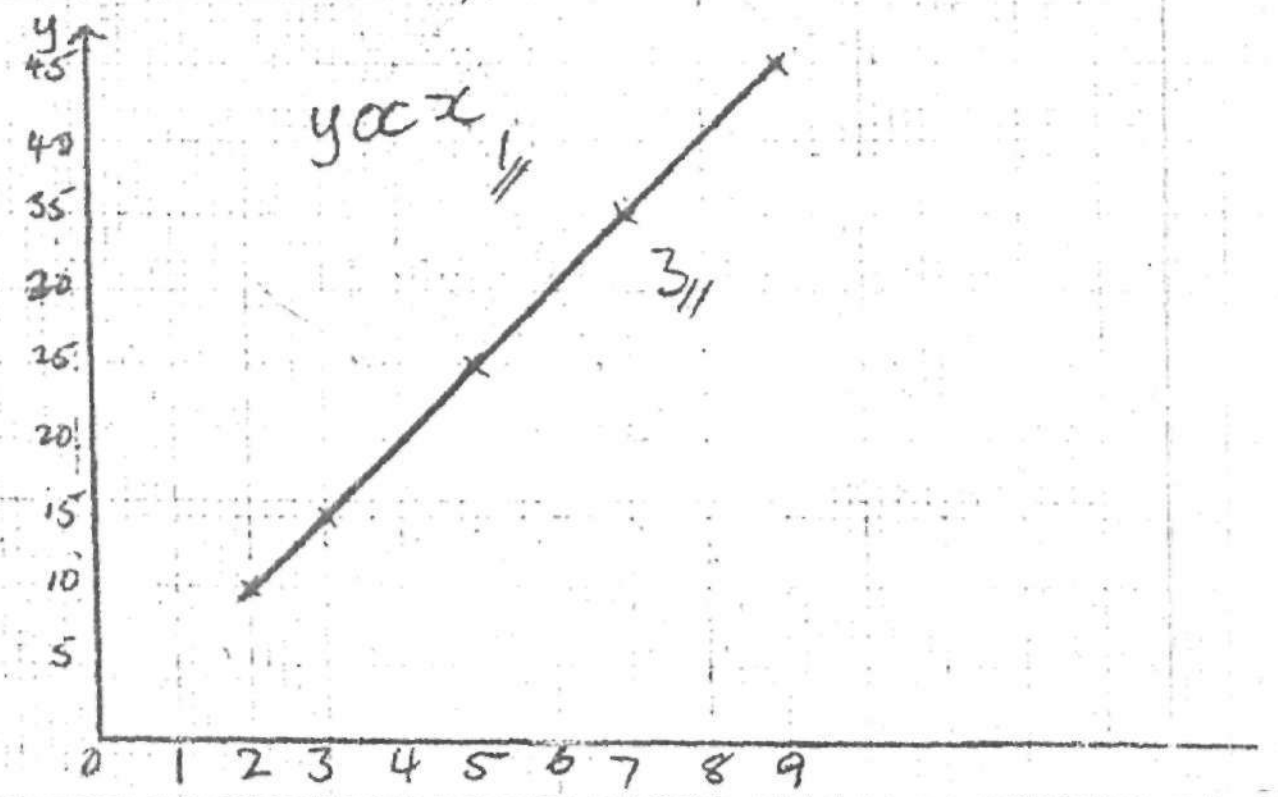
$= 10$ .....(1)

$\therefore$ Time taken by 6 men is 10 days (1) 8 Marks

(19.)

x	2	3	5	7	9
y	10	15	25	35	45

2//

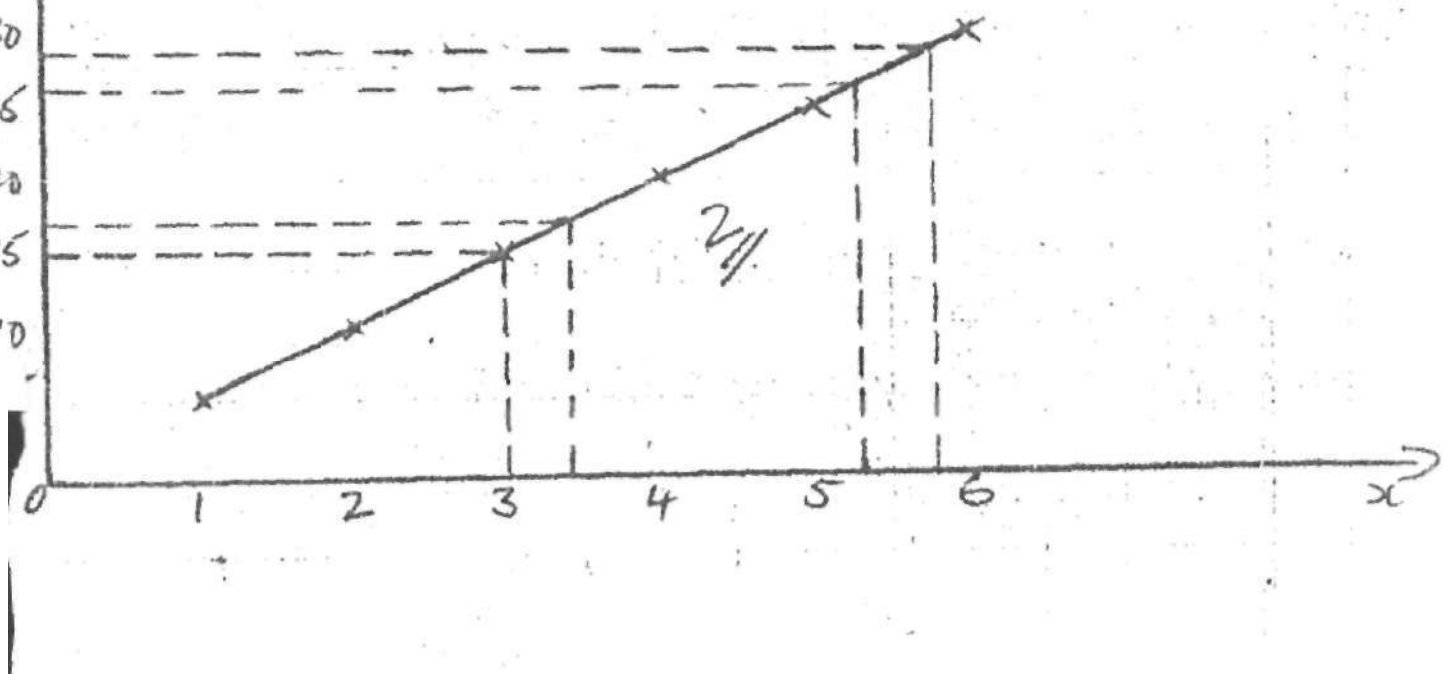


(21) y

(b) (i) $x = 3 \cdot 4$
(ii) $y = 15$
(iii) $x = 5 \cdot 8$
(iv) $y = 28$

4//

(a)



(6)

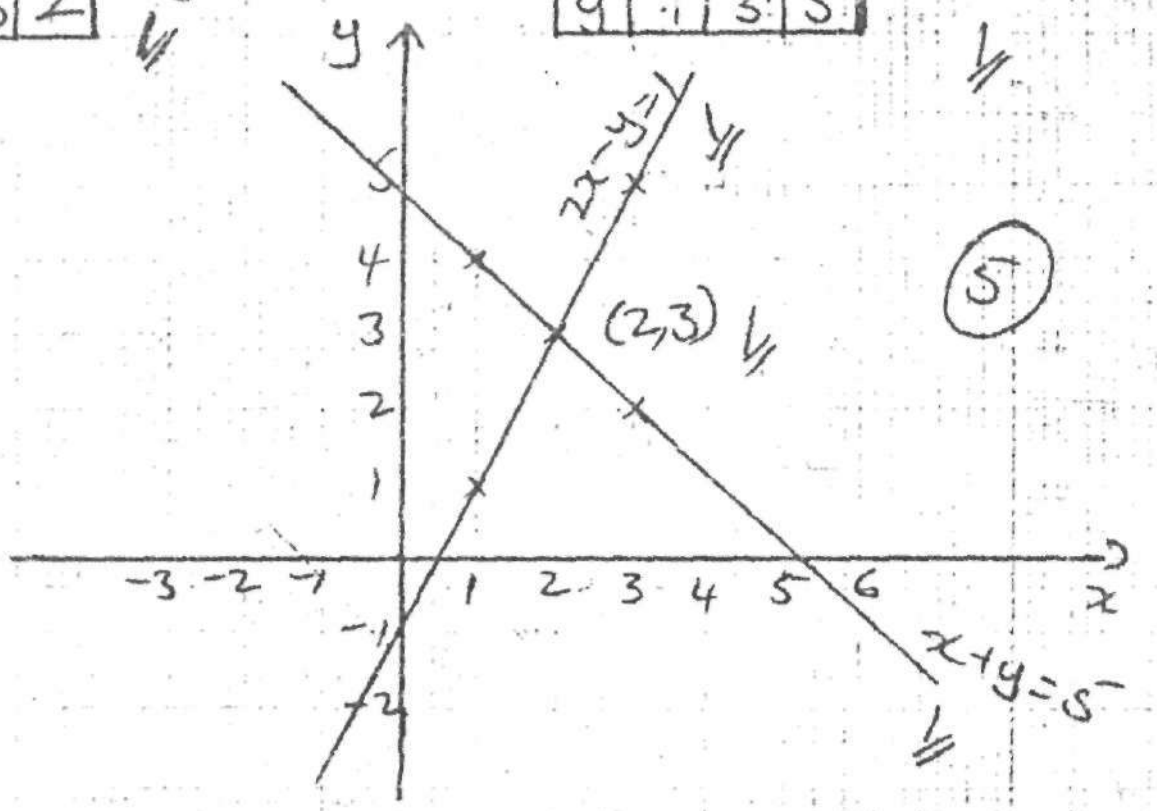
(25)

x	1	2	3
y	4	3	2

$x+y=5$

x	1	2	3
y	1	3	5

$2x-y=1$



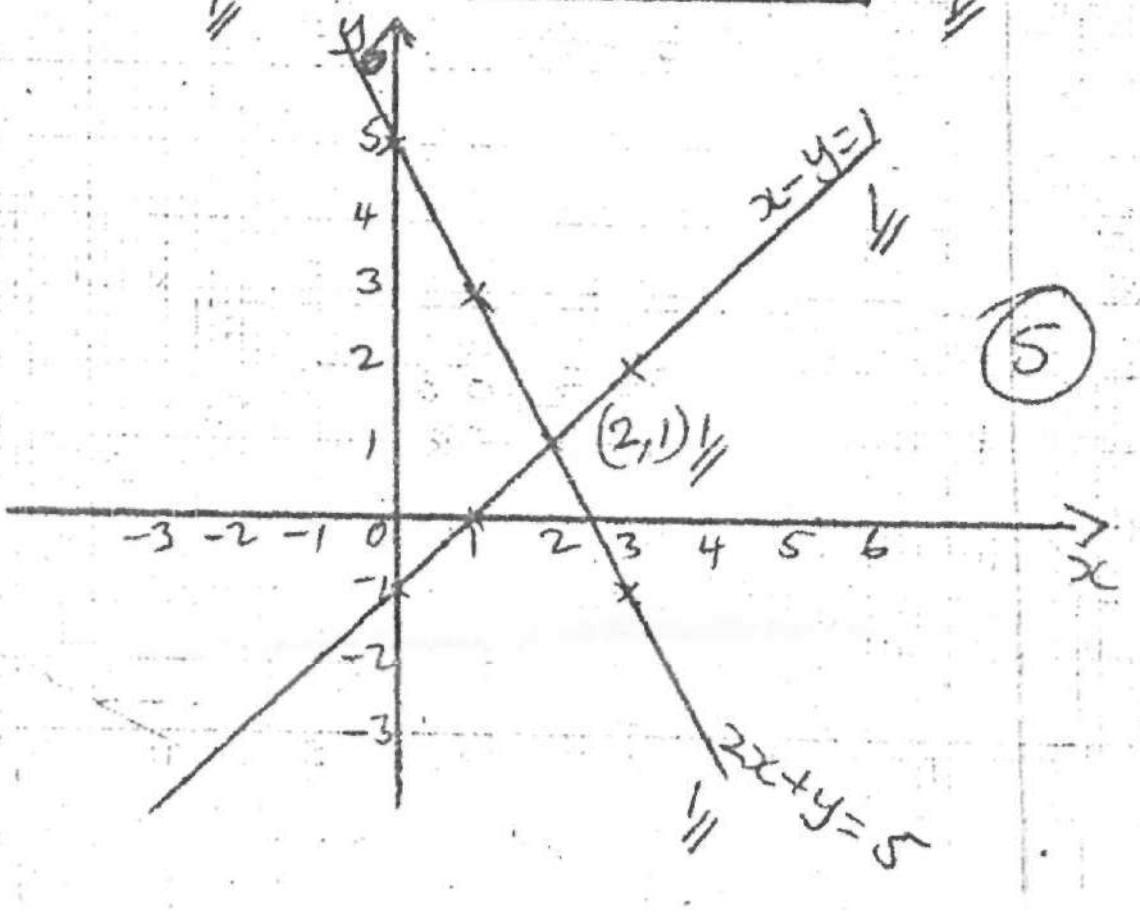
(26)

x	0	1	2	3
y	-1	0	1	2

$x-y=1$

x	0	1	2	3
y	5	3	1	-1

$2x+y=5$



APPENDIX C:

STUDENTS' RAW SCORES

S/NO	FACTORIZATION	EQUATION	GRAPHS	VARIATION	TOTAL	SEX
1.	2	[illegible]	2	[illegible]	[illegible]4	Male
2.	6	0	7	[illegible]	13	"
3.	5	[illegible]	7	[illegible]	12	""
4.	8	[illegible]	7	[illegible]	15	"
5.	[illegible]	[illegible]	4	[illegible]	[illegible]9	"
6.	8	0	6	[illegible]	14	"
7.	5	[illegible]	2	[illegible]	[illegible]7	"
8.	9	0	7	4	2[illegible]	"
9.	7	[illegible]	7	2	16	"
10.	4	0	7	3	14	"
11.	2	[illegible]	4	[illegible]	[illegible]6	"
12.	5	[illegible]	7	[illegible]	12	"
13.	5	[illegible]	4	[illegible]	[illegible]	"
14.	5	0	8	[illegible]	13	"
15.	9	[illegible]	4	[illegible]	13	"
16.	11	0	7	[illegible]	18	"
17.	13	13	12	4	42	"
18.	[illegible]1	0	9	0	1[illegible]	"
19.	6	0	10	0	16	"
20.	5	01	7	4	17	"
21.	3	0	2	[illegible]	05	"
22.	2	0	2	4	08	"
23.	7	0	11	4	22	"
24.	5	0	0	4	[illegible]9	"

25.	6	0	4	3	13	"
26.	8	0	4	3	15	"
27.	2	0	4	0	06	"
28.	5	0	5	0	10	"
29.	7	0	2	4	13	"
30.	0	0	9	4	13	"
31.	0	3	7	0	10	"
32.	[illegible]	7	5	[illegible]	12	"
33.	1	0	4	4	08	"
34.	3	15	6	[illegible]9	33	"
35.	0	0	0	0	00	"
36.	6	5	4	0	[illegible]5	"
37.	0	0	2	0	[illegible]2	"
38.	0	0	3	0	[illegible]3	"
39.	0	3	7	[illegible]	10	"
40.	[illegible]	0	0	0	00	"
41.	10	0	[illegible]	0	18	"
42.	0	0	2	0	02	"
43.	[illegible]	7	5	[illegible]	18	"
44.	2	0	6	0	08	"
45.	5	2	13	0	20	"
46.	6	3	7	4	20	"
47.	4	22	7	8	41	"
48.	01	0	4	4	09	"
49.	6	27	12	[illegible]	45	"
50.	0	0	0	4	[illegible]4	"
51.	0	0	5	0	05	"

52.	3	0	5	0	08	"
53.	01	0	7	0	08	"
54.	11	22	6	4	43	"
55.	6	0	3	[illegible]	[illegible]	"
56.	0	0	0	0	0[illegible]	"
57.	4	15	5	8	32	"
58.	3	6	0	2	11	"
59.	6	17	5	4	32	"
60.	2	0	1	0	03	"
61.	0	3	6	1	10	"
62.	0	2	2	0	04	"
63.	9	2	4	0	15	"
64.	6	0	10	0	16	"
65.	4	0	7	3	14	"
66.	5	0	8	0	13	"
67.	1	1	2	0	04	"
68.	10	4	4	0	18	"
69.	5	3	8	[illegible]	16	"
70.	2	0	7	0	09	"
71.	11	11	5	5	32	"
72.	4	12	2	0	18	"
73.	2	0-	6	0-	08	"
74.	12	0-	1	0-	13	"
75.	12	0-	11	2	19	"
76	4	2	11	2	13	"
77.	9	9	4	0-	22	"
78.	0-	0-	4	0-	04	"

79.	9	14	11	5	39	"
80.	5	6	7	2	20	"
81.	0	0-	0-	0-	00	"
82.	0-	0-	3	0-	03	"
83.	2	9	5	0-	16	"
84.	0-	4	6	0-	10	"
85.	10	9	6	0-	25	"
86.	9	1	6	0-	16	"
87.	2	16	4	3	25	"
88.	4	10	10	0-	24	"
89.	17	5	9	2	33	"
90.	18	7	10	2	37	"
91.	3	0-	0-	0-	03	"
92.	24	34	20	6	84	"
93.	11	21	8	4	44	"
94.	7	0-	8	0-	15	"
95.	6	27	10	0-	43	"
96.	2	7	0	0	09	"
97.	8	2	6	2	18	"
98.	2	0	6	0	08	"
99.	5	2	4	0	11	"
100.	5	12	0	0	17	"
101.	2	0	0	0	02	"
102.	0	1	0	8	09	"
103.	0	2	0	0	02	"
104.	0	2	0	0	02	"
105.	6	6	0	0	12	"

106.	0	0	0	0	00	"
107.	0	0	0	0	0●	"
108.	0	5	0	0	0ט	"
109.	0	0	0	0	00	"
110.	6	19	13	10	48	"
111.	6	10	9	8	33	"
112.	2	3	0	0	●5	"
113.	2	0	5	●	13	"
114.	05	8	1	1	15	"
115.	●	4	7	1	12	"
116.	0	0	0	0	00	"
117.	4	15	0	●	1●	"
118.	7	0	2	●	●9	"
119.	0	0	0	●	00	"
120.	10	4	0	0	14	"
121.	4	0	5	0	●9	"
122.	●	1	0	8	09	"
123.	2	3	0	0	05	"
124.	7	0	0	0	07	"
125.	1	2	0	0	03	"
126.	0	0	0	0●	●0	"
127.	2	5	9	1	17	"
128.	4	30	2	8	44	"
129.	9	3	4	●	16	"
130.	6	0	10	0	1●	"
131.	10	4	5	●	19	"
132.	5	1	7	4	17	"

133.	1	0	0	0	01	"
134.	2	4	0	8	14	"
135.	0	0	0	0	00	"
136.	0	0	0	[illegible]	[illegible]	"
137.	2	8	0	0	1[illegible]	"
138.	0	3	1	0	[illegible]	"
139.	2	0	0	[illegible]	02	"
140.	0	0	0	0	00	"
141.	0	0	0	0	[illegible]0	"
142.	[illegible]	0	0	[illegible]	[illegible]	"
143.	[illegible]	0	1	0	01	"
144.	2	0	0	[illegible]	[illegible]2	"
145.	2	0	2	[illegible]	[illegible]4	"
146.	9	0	2	[illegible]	11	"
147.	2	[illegible]	2	[illegible]	04	"
148.	0	1	0	6	07	"
149.	1	1	0	[illegible]	[illegible]2	"
150.	0	0	0	[illegible]	[illegible]	"
151.	0	2	0	[illegible]	03	"
152.	5	3	0	8	16	"
153.	2	1	0	7	10	"
154.	2	1	2	2	[illegible]7	"
155	6	4	2	2	14	"
156.	0	0	0	[illegible]	[illegible]0	"
157.	2	0	0	0	02	"
158.	2	0	2	[illegible]	04	"
159.	[illegible]	0	4	[illegible]	1[illegible]	"
160.	2	0	0	[illegible]	[illegible]2	"

161.	2	0	7	0	09	Male
162.	2	0	0	0	02	"
163.	0	0	0	0	00	"
164.	0	0	0	0	00	"
165.	3	0	0	[illegible]	03	"
166.	2	1	1	2	06	"
167.	3	2	1	2	08	"
168.	4	2	2	1	[illegible]9	"
169.	1	0	1	[illegible]	[illegible]2	"
170.	3	15	[illegible]	9	33	"
171.	0	0	[illegible]	0	[illegible]	"
172.	6	5	4	0	15	"
173.	0	0	2	2	02	"
174.	0	0	3	0	[illegible]3	"
175.	0	3	78	0	10	"
176.	[illegible]	0	[illegible]	[illegible]	00	"
177.	10	0	8	0	18	"
178.	0	0	2	0	02	"
179.	6	7	5	0	18	"
180.	2	0	6	0	08	"
181.	5	2	13	[illegible]	2[illegible]	"
182.	6	3	7	4	2[illegible]	"
183.	4	22	7	8	41	"
184.	1	0	4	4	09	"
185.	6	27	12	[illegible]	45	"
186.	0	0	0	4	[illegible]4	"
187.	1	0	5	0	06	"
188.	3	0	5	0	08	"
189.	10	0	7	0	08	"
190.	11	22	6	4	43	"
191.	6	0	3	0	09	"
192.	0	0	0	0	00	"
193.	4	15	5	8	32	"
194.	3	6	[illegible]	2	11	"
195.	6	17	5	4	32	"
196.	2	0	1	0	03	"
197.	[illegible]	3	6	1	1[illegible]	"
198.	0	2	2	0	04	"
199.	9	2	4	0	15	"
200	6	0	10	0	16	"
201.	4	0	7	3	14	"
202.	5	0	8	0	13	"
203.	1	1	2	[illegible]	4	"
204.	1[illegible]	4	4	0	18	"
205.	5	3	8	0	16	"
206.	2	0	7	[illegible]	9	"
207.	12	10	[illegible]	[illegible]	32	"
208.	4	12	2	[illegible]	18	"
209.	2	-	6	-	8	"
210.	0	-	4	-	4	"

211.	12	-	1	4	13	"
212.	4	2	11	2	19	"
213.	9	9	4	0	22	"
214.	-	-	4	-	4	"
215.	9	14	5	11	39	"
216.	5	6	2	2	20	"
217.	-	-	-	-	0	"
218.	-	-	3	-	3	"
219.	2	9	5	-	16	"
220.	-	4	6	-	10	"
221.	10	9	6	-	25	"
222	9	1	6	-	16	"
223.	2	16	4	3	25	"
224.	4	10	10	-	24	"
225.	17	5	9	2	33	"
226.	18	7	10	2	37	"
227.	3	-	-	-	3	"
228.	24	37	22	6	89	"
229.	11	21	8	4	44	"
230.	7	-	8	-	15	"
231.	6	27	10	-	43	"
232.	2	7	0	0	9	"
233.	8	2	6	2	18	"
234.	2	0	6	0	8	"
235.	5	2	4	0	11	"
236.	1	0	0	0	1	"
237.	2	4	0	8	14	"
238.	0	0	0	0	00	"
239.	0	0	0	0	00	"
240.	2	8	0	0	10	"
241.	0	3	1	0	04	"
242.	2	0	0	0	02	"
243.	0	0	0	0	00	"
244.	0	0	0	0	00	"
245.	0	0	0	0	00	"
246.	0	0	1	0	01	"
247.	2	0	0	0	02	"
248.	2	0	2	0	04	"
249.	9	0	2	0	11	"
250.	2	0	2	0	04	"
251.	0	1	0	6	07	"
252.	1	1	0	0	02	"
253.	0	0	0	0	00	"
254.	0	3	0	0	03	"
255.	5	3	0	8	16	"
256.	2	1	0	7	10	"
257.	2	1	2	2	07	"
258.	6	4	2	2	14	"
259.	0	0	0	0	00	"
260.	0	0	0	0	00	"

261.	0	0	3	[illegible]	03	"
262.	[illegible]	0	3	[illegible]	03	"
263.	2	0	[illegible]	[illegible]	02	"
264.	0	0	[illegible]	[illegible]	06	"
265.	3	5	[illegible]	[illegible]	17	"
266.	0	0	3	0	03	
267.	0	0	9	0	09	"
268.	0	0	0	0	00	"
269.	0	0	3	0	03	"
270.	0	0	0	0	[illegible]0	"
271.	0	0	0	0 [illegible]	00	"
272.	[illegible]	0	3	[illegible]	03	"
273.	0	5	9	0	14	"
274.	0	2	3	0	05	"
275.	[illegible]	0	[illegible]	0	03	
276.	[illegible]	5	9	0	[illegible]	"
277.	4	5	3	0	12	"
278.	[illegible]	0	3	[illegible]	03	"
279.	[illegible]	0	3	0	[illegible]3	
280.	[illegible]	5	[illegible]	[illegible]	05	"
281.	0	0	9	[illegible]	09	"
282.	2	0	0	[illegible]	[illegible]2	"
283.	3	0	4	0	07	"
284.	0	0	3	0	03	"
285.	0	0	3	0	03	"
286.	0	0	0	0	00	"
287.	0	0	0	0	00	"
288.	0	0	0	0	00	"
289.	11	11	3	2	27	"
290.	[illegible]	7	1	0	1[illegible]	"
301.	15	17	22[illegible]	11	65	"
302.	2	0	2[illegible]	0	24	"
303.	[illegible]	0	6	0	9	"
304.	[illegible]	10	25	0	43	"
305.	[illegible]	0	[illegible]	[illegible]	8	"
306.	[illegible]	8	9	[illegible]	[illegible]0	"
307.	3	0	22	0	25	"
308	3	0	0	0	[illegible]3	"
309.	2	0	0	0	02	"
310.	6	11	9	8	34	"
312.	3	0	3	[illegible]	06	"
313.	0	12	9	8	29	"
314.	1[illegible]	39	[illegible]	11	68	"
315.	[illegible]	4	0	0	07	"
316.	3	32	3	0	38	"
317.	3	9	14	0	26	"
318.	3	14	9	8	34	"
319.	6	5	9	0	2[illegible]	"
320.	6	5	9	[illegible]	[illegible]0	"
321.	[illegible]	4	6	8	18	"
322.	[illegible]	0	0	8	[illegible]8	"

323.	3	0	3	8	14	"
324.	3	6	6	0	09	"
325.	0	7	6	8	21	"
326.	0	0	12	0	12	"
327.	0	0	3	0	03	"
328.	0	0	0	0	00	"
329.	9	10	0	0	19	"
330.	4	0	0	1	05	"
331.	5	5	5	6	22	"
332.	4	10	5	4	23	"
333.	0	0	0	0	00	"
334.	7	0	3	0	10	"
335.	19	13	0	0	32	"
336.	10	20	2	0	32	"
337.	0	8	0	0	08	"
338.	4	10	03	3	20	"
339.	9	20	0	6	35	"
340.	9	29	0	6	44	"
341.	6	20	0	5	37	"
342.	6	2	1	0	09	Female
343.	1	5	2	3	11	"
344.	2	0	0	2	04	"
345.	6	14	5	1	26	"
346.	5	3	2	0	11	"
347.	8	14	2	0	24	"
348.	21	29	5	7	62	"
349.	6	15	2	0	23	"
350.	4	0	0	0	04	"
351.	13	0	0	0	13	"
352.	1	0	0	7	08	"
353.	2	1	7	2	12	"
354.	2	3	2	0	07	"
355.	1	0	0	0	01	"
356.	0	0	0	0	00	"
357.	4	0	4	0	08	"
358.	0	0	0	0	00	"
359.	11	15	14	5	45	"
360.	10	18	0	0	28	"
361.	1	0	4	0	05	"
362.	6	2	0	0	08	"
363.	4	9	4	0	17	"
364.	8	2	6	1	17	"
365.	8	3	7	0	18	"
366.	9	3	2	0	14	"
367.	3	3	3	0	09	"
368.	8	4	5	0	17	"
369.	7	3	6	0	16	"
370.	12	17	5	0	34	"
371.	0	1	2	0	03	"
372.	14	5	2	0	21	"
373.	8	0	0	0	08	"
374.	15	7	5	0	27	"

375.	9	1	2	0	12	"
376.	9	1	0	0	10	"
377.	10	18	17	5	50	"
378.	11	2	0	0	13	"
379.	6	3	2	0	11	"
380.	1	8	0	0	09	"
381.	9	6	5	0	20	"
382.	7	16	8	0	31	"
383.	15	26	14	3	58	"
384.	7	8	11	0	26	"
385.	10	31	15	5	61	"
336.	5	18	3	0	31	"
387.	4	5	10	2	21	"
388.	8	22	13	0	43	"
389.	8	12	13	2	35	"
390.	9	21	14	0	44	"
391.	6	22	13	2	43	"
392.	9	23	15	5	52	"
394.	8	11	14	4	37	"
395.	0	0	0	0	00	"
396.	0	4	5	1	10	"
397.	17	9	5	0	31	"
398.	6	1	7	0	14	"
399.	0	2	0	0	02	"
400.	3	2	3	0	08	"
401.	0	7	0	3	10	"
402.	0	4	0	0	04	"
403.	0	1	0	0	01	"
404.	0	2	0	0	02	"
405.	0	2	0	0	02	"
406.	0	0	1	0	01	"
407.	0	8	7	0	15	"
408.	0	2	3	0	05	"
409.	0	4	0	0	04	"
410.	0	0	1	0	01	"
411.	8	0	7	0	15	"
412.	0	2	0	4	06	"
413.	0	4	0	0	04	"
414.	0	3	0	0	03	"
415.	0	0	0	0	00	"
416.	0	2	0	0	02	"
417.	0	2	0	0	02	"
418.	0	5	8	0	13	"
419.	0	3	0	0	03	"
420.	0	0	4	0	04	"
421.	0	1	4	0	05	"
422.	0	8	0	0	08	"
423.	0	1	0	0	01	"
424.	17	10	9	5	41	"
425.	0	2	0	0	02	"
426.	0	2	0	0	02	"
427.	0	3	2	0	05	"

428.	0	0	0	0	00	"
429.	0	0	0	0	00	"
430.	0	0	0	0	00	"
431.	0	0	0	0	00	"
432.	0	0	0	0	00	"
433.	0	0	0	0	00	"
434,	0	0	0	0	00	"
435.	0	0	0	0	00	"
436.	0	0	0	0	00	"
437.	0	0	0	0	00	"
438.	2	0	0	0	02	"
439.	2	0	0	2	04	"
440.	6	0	1	0	07	"
441.	2	0	0	2	04	"
442.	0	0	0	0	00	"
443.	2	0	0	0	02	"
444.	3	0	0	0	03	"
445.	2	2	0	0	04	"
446.	2	0	0	0	02	"
447.	2	0	0	0	02	"
448.	3	0	2	0	05	"
449.	2	0	3	0	05	"
450.	0	3	0	2	05	"
451.	0	0	0	0	00	"
452.	0	0	0	0	00	"
453.	0	0	0	0	00	"
454.	0	0	0	0	00	"
455.	0	0	0	0	00	"
456.	0	0	0	0	00	"
457.	0	0	0	0	00	"
458.	0	0	0	0	00	"
459.	0	0	0	0	00	"
460.	11	15	5	14	45	"
461.	10	18	0	0	28	"
462.	1	0	0	4	05	"
463.	6	2	0	0	08	"
464.	4	9	0	4	17	"
465.	8	2	1	6	17	"
466.	8	3	0	7	18	"
467.	9	3	0	2	14	"
468.	3	3	0	3	09	"
469.	8	4	0	5	17	"
470.	7	3	0	6	16	"
471.	12	17	0	5	34	"
472.	0	1	0	2	03	"
473.	14	5	0	2	21	"
474.	8	0	0	0	08	"
475.	15	7	0	5	27	"
476.	9	1	0	2	12	"
477.	9	1	0	0	10	"
478.	10	18	5	17	50	"
479.	11	2	0	0	13	"
480.	6	3	0	2	11	"
481.	1	8	0	0	09	"

482.	9	6	0	5	20	"
483.	7	16	0	8	31	"
484.	15	26	3	14	58	"
485.	7	8	0	11	26	"
486.	10	31	5	15	61	"
487.	5	18	0	3	31	"
488.	4	5	2	10	21	"
489.	8	22	0	13	43	"
490.	8	12	2	13	35	"
491.	9	21	0	14	44	"
492.	6	22	2	13	43	"
493.	9	23	5	15	52	"
494.	8	11	4	14	37	"
495.	0	0	0	0	00	"
496.	4	0	0	1	05	"
497.	9	17	0	5	31	"
498.	1	6	0	7	14	"
499.	2	0	0	0	02	"
500.	2	3	0	3	08	"
501.	7	0	3	0	10	"
502.	4	0	0	0	04	"
503.	1	0	0	0	01	"
504.	2	0	0	0	02	"
505.	2	0	0	0	02	"
506.	0	0	0	0	00	"
507.	4	0	0	0	04	"
508.	7	0	0	3	10	"
509.	0	0	0	0	00	"
510.	0	0	0	1	01	"
511.	8	0	0	7	15	"
512.	2	0	0	4	06	"
513.	4	0	0	0	04	"
514.	0	0	0	1	01	"
515.	2	2	0	0	04	"
516.	3	0	0	0	03	"
517.	0	0	0	0	00	"
518.	2	0	0	0	02	"
519.	2	0	0	0	02	"
520.	2	0	0	0	02	"
521.	2	0	0	0	02	"
522.	5	0	8	0	13	"
523.	3	0	0	0	03	"
524.	0	0	0	4	04	"
525.	1	0	0	4	05	"
526.	8	0	0	0	08	"
527.	1	0	0	0	01	"
528.	10	17	5	9	41	"