RELATIONSHIP BETWEEN THE ACHIEVEMENT OF FORM FOUR STUDENTS IN MOCK EXAMINATION AND KENYA CERTIFICATE OF SECONDARY EXAMINATION IN SOME SCHOOLS IN MIGORI DISTRICT, KENYA

BY

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DECLARATION

This research project is my original work and has not been presented for a degree award in any other university.

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

22/9/2004

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DEDICATION

To my little angel

Nigel Oyugi Omondi

(Babu)

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It is not possible to express appreciation to all the individuals who have assisted me in this task. However, there are some who should be singled out.

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ABSTRACT

The purpose of this study was to investigate the relationship between mock achievement and K C S E achievement among form IV students in Migori district.

The study adopted a comparative associative survey. The target population composed of the 2003 form four candidates in Migori district. The stratified sampling technique was used to select six categories of schools in form of boys, girls and mixed schools .From this, two schools in each category was selected by simple random sampling .To get the required number of students (240), 40 from each school, the researcher applied systematic sampling method.

Data was collected by use of a data collection sheet for each school (see appendix A). The data was analysed using the Pearson product moment correlation formula to help obtain correlations between mock and KCSE variables.

The results were tested using ANOVA at 0.05 level of significance. The result was that mock examinations were highly and significantly related to the KCSE examinations. The study therefore recommends that the various stakeholders: the Head Teachers Associations, Teachers, Mock Panels, Parents, the District Education Officers should regard mock highly given its validity as the predictor of the KCSE.

CHAPTER ONE

INTRODUCTION

1.0 Background of the Problem

According to Eggleston and Kerr (1969), measurement is an integral part of any educational process of pupil achievement. Achievement in this case means any test that measures the attainments or learning (Downie, 1967). For example university, college and high school examinations.

For teachers to get information concerning a student's level of attainment, students have to be evaluated by having them sit for a test. Measures of attainment are used to predict and select students at various levels of education. It also creates fairness and justice in the selection process. The demand that the scores in the test should correlate well with an appropriate later measure of attainment is the most directly relevant of prediction and selection process. This would demonstrate that the test does what it was designed to do; that is predicting a pupil's future attainment.

Although evaluation is important in learning process, it has been abused in many schools in Kenya, which give several tests that do not add value to learners' academic progress. A number of schools do not have a policy for evaluating children. They depend on street vendors and unscrupulous businessmen, who sell poorly constructed tests. The examination vendors have hijacked the teacher's role and are making a lot of money out of providing test papers to schools. The tests are never valid and therefore not reliable ("Tests Abuse", 2002).

Kigotho, a former education editor with The East African Standard, observed that "a recent annual conference of secondary schools heads attracted traders of all sorts. But the feature at this year's conference was the large number of ready made examination hawkers." These tests have one thing in common; they are a faulty means of evaluation. They are hurriedly prepared and have many spelling mistakes. The design of objective tests is so faulty that some questions could yield two acceptable answers or even none which puts their validity and reliability to question ("Fake Examinations" 2004).

Schools heavy reliance on unreliable assessment tests is likely to have negative effects on students' academic achievement in KCSE. Ideally, evaluation tests should mirror the objectives of the course they are expected to measure.

Most of the examinations administered in schools are achievement tests. According to Grounland (1965), achievement testing plays an important role in the school program. Published achievement tests, are widely used at both the elementary and secondary school levels.

Evaluation has several purposes ranging from diagnosis, assessment, selection and prediction. The question is, of what use do we make of the test and examinations administered by teachers in our schools? An answer to this question requires one to understand why we have tests and examinations within the instructional process. This point out the need of tests which gives insight into some of the uses of the tests that can be applied by the stakeholders in education.

The tests and examinations administered by the teachers are collectively referred to as teacher made tests. The teacher made tests are concerned with monitoring and management of students' progress. They provide continuing assessment of pupils' attainment in school.

According to Ebel (1972), periodic assessment of educational progress is essential to effective education. He says good tests afford very useful assistance to teachers in making these assessments. If what is contained in the examination is not representative of the expected outcomes of education, the entire education system may be derailed.

As observed by Gandye (1991), well designed tests and examinations help improve the curriculum. They encourage teaching-learning process of the designated curriculum in the classroom. The test results are therefore of importance to the curriculum developers.

In the Kenyan system of examination, students take an examination known as mock. This is normally scheduled for mid to end of second term in the fourth year of secondary education. The mock examination is administered as a parallel examination to the Kenya Certificate of Secondary Examination (KCSE). The structure of each emanation paper is similar to that of the KCSE. The aim of mocks is to determine the level of content mastery in subjects and also to reflect the level of achievement of the students. Most mock examinations are district specific, meaning the examination is common to all schools within a particular district. Apart from the aim for which it is

constructed, the mock examination results are used to diagnose areas of weaknesses of individual learners.

The KCSE examination is administered at the end of third term of fourth year, from October to November. Because it is used as a tool for selection, for joining tertiary institutions (both middle level colleges and universities), it is highly valued. The KCSE examination results are important, most decisions made about a students future after school are dependent on these results. Therefore, it is important that mock examinations are well constructed to reflect performance in KCSE.

1.2 Statement of the Problem

Within the 8.4.4 system (Kenyan Education System), continuous assessment of students is highly encouraged and is a requirement in the education setup. This includes mock examinations, the purpose of which is to improve the quality of education given to students.

The mock examination plays an important role in preparing form four candidates for the end of course examination (KCSE). The use made of mock examinations should be geared towards improving the student's level of achievement and the educational process as a whole in all levels of instruction. For this to be achieved, the mock needs to be related to the KCSE examination in terms of the results obtained hence indicating that it is a good achievement measure.

Based on this background, the study therefore looked into the relationship between the achievements of form four students in mock examinations and Kenya Certificate

of Secondary examination in some schools in Migori district, Kenya with a view to coming up with a prediction index/formula.

1.2 Research Questions

This study specifically addressed the following research questions:

1. How well do mock grades predict performance in KCSE?
2. What is the relationship between the joint district mock examinations and Kenya Certificate of Secondary Examination?

1.3 Objective of the Study

From the above research questions, the following objectives were generated.

1. To establish a prediction formulae (regression line) predicting KCSE scores (Criterion) from the mock scores (predictor).
2. To determine the relationship between mock and KCSE examinations.

1.4 Hypothesis

The researcher formulated the following hypothesis.

Ho_1: There is no significant difference between English Mock scores and English KCSE scores.

Ho_2: There is no significant difference between Maths Mock scores and Maths KCSE scores.

Ho_3: There is no significant difference between Biology mock scores and Biology KCSE scores.

Ho_4: There is no significant difference between mock aggregate scores and KCSE aggregate scores.

1.5 Significance of the Study

It is hoped that the outcome of this study will enable students, teachers and the public consider examinations administered during instructional process with high regard. The relationship established between mock examination and KCSE examination would indicate the worth of the mock examination. It would also encourage the district examination panels to construct valid and reliable examinations.

1.6 Assumptions

Major assumptions were:

Teachers who set mock examination are of the same competence level just as the KCSE panel setters. This would assure the validity and reliability of the mock examination.

That schools which take the mock examinations attach a high level of seriousness to it. The other assumption is that the mock results reflect the results got in KCSE examinations and therefore, can be relied upon for selection and certification.

A further assumption is that the mock examination is done under standard conditions of examination with minimal flows. Finally, by the time KCSE examination is being administered, all schools will have covered the entire syllabus content.

1.7 Limitations

My research only covered six schools in Migori district out of fifty five schools and therefore it may not give a true representation of other districts given the variation that exists in those districts.

1.8 Definition of Central Terms

KCSE Examination done at the end of four years in Secondary Education.

Mock Examination- Joint examinations done by schools in a district in the second term of the fourth year.

Performance - This refers to achievement of students in the examinations.

Teacher made tests- This is an examination administered by a teacher during the instructional process.

Validity- This refers to the degree to which the test actually measures what it claims to measure.

Reliability- This refers to the degree to which a test is consistent and stable in measuring what it is intended to measure.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter discusses related literature in four themes:

i. Validity

ii. Correlation coefficient and prediction

iii. Statistical model

iv. Related studies

2.1 Validity

In general, validity is the extent to which a test or other evaluation device does what it is supposed to do (Downie, 1967). According to Gatumu (1984), validity of a test is high if the test measures what it is supposed to measure, that is if it gives the information the decision maker needs. A test which measures what it is not supposed to is a worthless test.

Validity can be classified as predictive, concurrent, content and construct. Of importance in this study is concurrent and predictive validity. These differ essentially in time factor otherwise they are the same. There is no difference in principle between the methods of computing predictive and concurrent validity. Both are determined by computing correlation between test scores and a measure of a criterion variable and the validity is expressed in both cases as a correlation coefficient. The coefficient of validity gives the test validity with respect to the variable which is defined by criterion measurement.

When a test is constructed, the primary interest should be whether it has high validity. For concurrent validity the question is whether the test measure what it is intended to measure and the validity coefficient indicates how adequate the test data are as a basis for diagnosis. For predictive validity, the question is accuracy with which the test predicts what it is intended to predict.

Smith & Adams (1972) says:

> *Predictive validity is an important feature of aptitude and Intelligence tests because these types of tests are usually given in schools for the purpose of prediction. When a test is used for this purpose, the question of validity becomes specific. To what extent do scores on this test correlate with grades in this course? (pp. 77 – 78).*

The higher the correlation coefficient between scores on the test and grades in the course the more the confidence we have that it is a valid predictor of performance. Gale (1971) outlines three types of information provided by prediction studies as follows;

(i) The extent to which a criterion behaviour pattern can be predicted.

(ii) As data for theory building about possible determinants of the criterion behaviour pattern.

(iii) As evidence regarding the predictive validity of the test or tests that are correlated with the criterion.

The type of information required depends on what the researcher is interested in. Many prediction studies have been aimed at short term prediction of students' performance in a specific course of study. Others have aimed at long term prediction of general academic success as is predicting future college or university success based on secondary level achievements.

According to Gatumu (1989), the school performance is dependent upon at least two important variables, the students' level of scholastic aptitude (ability) and the quality of education. Where the quality of education is more uniform, the variance in school grades can be considered as a reflection of students' ability for learning (as assumed in this study). But when the quality of education varies widely, the school performance is not a valid and reliable indicator of students, capabilities. This implies that in those cases where school performance is used as a predictor for future school success and for selection and admission purposes, students from poorer schools as well as poorer background are disadvantaged.

2.2 Correlation Coefficient and Prediction

Thorndike (1997), observes that the correlation coefficient along with the means and standard deviations of the predictor and criterion variables can be used to make the best possible prediction about criterion performance for each person based on their scores on the predictor.

To do this, a regression equation is used. The regression equation for a person's score on criterion variable Y from their score on predictor variable X is;

$$Y' = \frac{\sigma_Y}{\sigma_X} r_{xy}(X) + \left(\bar{Y} - \frac{\sigma_Y}{\sigma_X} r_{xy} \bar{X} \right)$$

Where $Y' = The\ predicted\ score\ on\ Y$

$\sigma_Y = Standard\ deviation\ of\ the\ creterion\ variable.$

$\sigma_X = Standard\ deviation\ of\ the\ predictor\ variable.$

$r_{xy} = The\ predictor - criterion\ correlation.$

$X = The\ persons\ score\ on\ the\ predictor.$

$\bar{Y} = The\ mean\ of\ the\ criterion\ distribution.$

$\bar{X} = The\ mean\ of\ the\ predictor\ distribution.$

From this, a prediction formula (regression line) is derived, as seen later in this study. Suppose the relationship between a predictor and a criterion is less than perfect, there will be some variability in criterion performance for people who all have the same predictor score. Not all people who fall in a given quarter of the predictor test distribution will fall in the same quarter of the criterion distribution. There will be an average criterion performance, for people with a particular predictor score and there will be variation around that average.

The spread of actual criterion performance around that mean is reflected by the standard error of estimate. It uses the correlation between the test and some criterion to provide an estimate of how much a predicted score might be in error as an estimate of a person's actual performance on the criterion.

An overall value for the standard error of estimate is obtained from the following equation.

$$\sigma_e = \sigma_y \sqrt{1 - r_{xy}^2}$$

Where σ_e = *Standard error of estimate.*

σ_y = *Standard deviation of the entire distribution of criterion scores.*

r_{xy}^2 = *The squared validity coefficient of the predictor test for predicting this criterion.*

2.3 Statistical Model

The statistical models discussed here are the ones used in correlation studies. The term correlation refers to the degree of relationship between two variables (Collins, Johasen & Johnson, 1969). Classroom teachers are often interested in the relationship between two variables when dealing with concepts in educational measurement. The degree of relationship between two variables is expressed by the coefficient of correlation. Collins, et al, state that,

> *A correlation between two variables does not necessarily imply that one is the cause of the other. Sometimes we find that two variables are correlated simply because they are both related to a third variable. For example, a positive correlation between science achievement and mathematics achievement does not mean that one of these variables causes the other. Rather, perhaps both of these variables are caused by yet a third variable such as scholastic aptitude. (P104)*

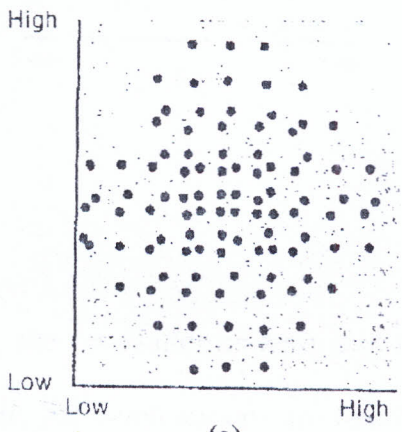
Two related models are considered below: The scattergram and the Pearson product moment.

2.3.1 Scattergram

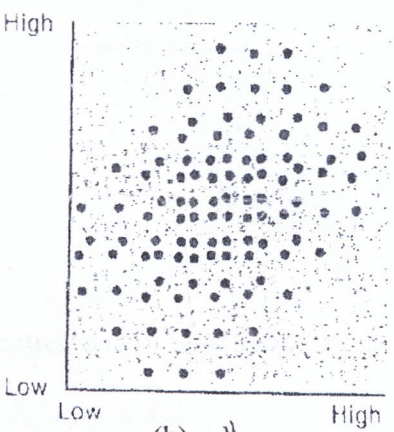
Scattergram is a statistic expressing the relationship between two sets of scores (Thorndike & Hagen, 1969). According to Coolican (1994) one way of investigating the relationship between two variables is to put pairs of values (one on variable A, the other on variable B) on a scattergram. So named because it shows the scattering of

pairs. The extent to which pairs of readings are not scattered randomly on the diagram, but do form a consistent pattern is a sign of the strength of the relationship. Below are illustrations of four different levels of relationships.

Figure 2. 1 Scatter grams Showing Different Levels of Relationships



(a)



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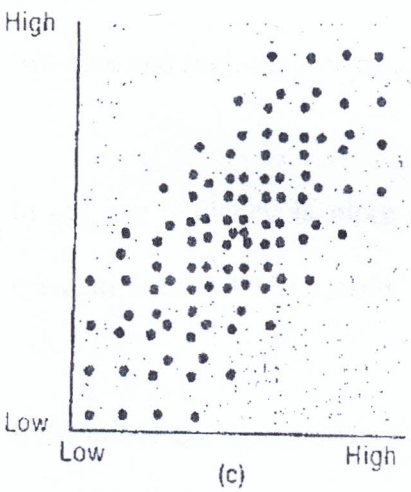
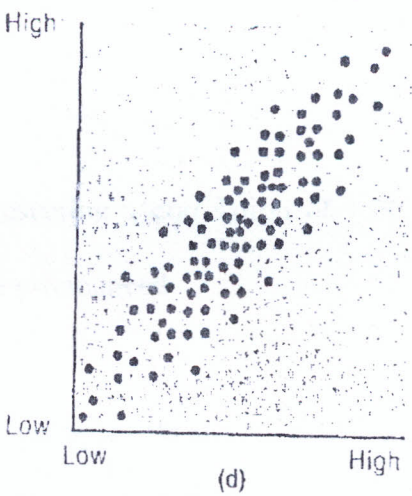


(c)



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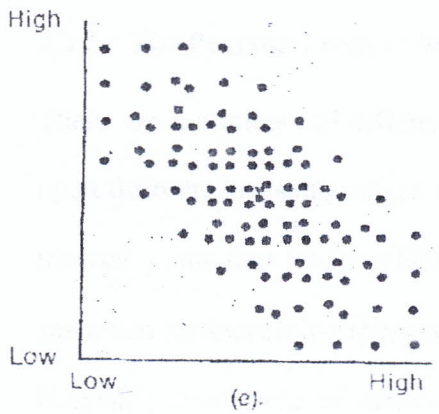
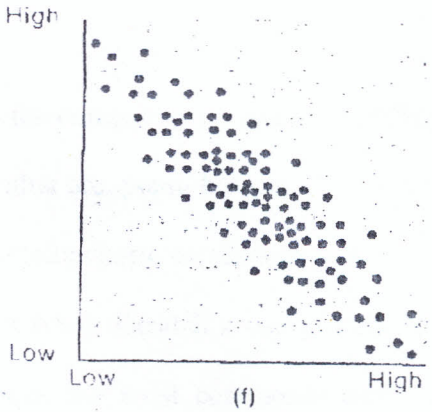




In (a), the correlation is zero, and the points scatter out in a pattern that is just about circular. All combinations are found to be high-high, low-low, high-low and low-high. (b) depicts a correlation of +.30, here there is a visible trend for the points to group in the low-low and high-high direction.

In (c), the tendency is more marked representing a correlation of +.60. (d) portrays a correlation of +.90, the trend is much more pronounced.

If the above correlations were negative, for example -.90 and so on, the scattering of plots would just be the same, but the swarm of dots could fall along the other diagonal from lower right hand corner to upper left hand corner, as depicted in figures (e) and (f).The tendency of the scattergram to fall along straight line is sometimes referred to as linear regression (Collins; Johasen & Johnson, 1969). To supplement this information an index of this degree of relationship (correlation coefficient's) is computed.

2.3.2 The Pearson Product Moment

There are a number of different techniques for computing correlation coefficients, apart from the Pearson product- moment, the other are; point- biserial, the biserial, the triserial y, the four fold coefficient or phi, the tetra choric correlation coefficient, the spearman rank-order correlation or coefficient (rho), Kendall's tau- correlation and Kendall's coefficient of concordance. Of these, the most commonly used one in general statistical work is the Pearson product moment correlation, coefficient of which the symbol is r.

The formula for r is: -

$$r = \frac{N\sum XY - \sum X \sum Y}{\sqrt{\left(N\sum X^2 - (\sum X)^2\right)\left(N\sum Y^2 - (\sum Y)^2\right)}}$$

Where: $\sum$ – Indicates summation

X and Y - the two variables being correlated

γ - The correlation coefficient

(Source: Coolican, 1994)

The use of this technique is an application of the correlation theory, correlation being the degree of relationship between the variables.

The correlation techniques yield correlations between variables that have been defined according to the purpose of a given study though they are widely used in validity researches they have one major disadvantage. The correlation techniques tend to break down complex behaviour into simpler components (Borg, 1967). The success in many of the complex behaviours that interest us can be attained in a number of different ways. For example, a study attempting to relate success of high school

principles to specific individual variable might fail because of lack of any set of characteristics common to all successful principals.

Despite the disadvantage observed, the correlation technique has a number of advantages which outweigh the disadvantage hence its use in research.

(i) The correlation techniques permit one to measure a great number of variables and their inter-relationships simultaneously.

(ii) It provides information concerning the degree of relationship between the variables studied

(iii) The correlation technique minimises the high level of artificiality into research situations encountered in behavioural science when experimental technique is used.

(iv) The partial correlation allow for the statistical control of variables that one wishes to hold constant and does so without changing the field situation as for an experimental technique.

2.4 Related studies

There are numerous studies that have been done on predictive validity of which previous examination performance have been used to predict future (or present) performance. Many of such studies have revealed that previous examination performances have tended to predict very well the future performance in both tertiary institutions and secondary institutions.

2.4.1 Studies Based Outside Kenya

A review of literature shows that studies to predict success have been on going over a period of years. Bray (1931) studied the relationship between chemistry achievements

and abilities on 325 students enrolled in Freshman chemistry in five colleges in Missouri. He administered the Otis self- administering test of Mental Ability Higher Examination, the Iowa chemistry training test, and Ability tests which he constructed by himself. He compared scores of these tests with teachers' marks and scores on the lowa chemistry Training tests, administered at the end of second quarter. Bray reported that his self-constructed tests gave the highest correlations.

Hurd (1926) related scores on high school physics to intelligence as measured by two tests, the Miller Mental Ability Test and the Otis self-Administering test of Mental Ability. He obtained an average correlation coefficient of .76 between intelligence and physics scores when measured by the Pearson formula and .82 when measured by the spearman rank difference. He reported that I.Q was a good basis for predicting success in physics but observed that other factors affected scores. In his study nine students having I.Q scores higher than mean of 107.7 made scores lower than the mean and five with I.Q scores lower than the mean in physics scores higher than the mean of pupils having an I.Q of 108 or higher, seventy-eighty percent performed satisfactory work.

Baldauf (Jr) and Dawson (1980) carried out a study with a sample of students from a wide variety of linguistic and tribal cultural backgrounds, they found that English proficiency test was a very valid predictor of general academic attainment in a teacher college in Papua New Guinea. Their conclusion was based on correlation analysis between the scores of Michigan test of English, Language Proficiency and the overall grade Average point (GPA) for students who completed the teacher training.

Akeju and Michael (1970) wanted to determine the degree of validity of several selection devices in the prediction of success of a sample of 109 college students at Federal school of science, Lagos, Nigeria. The selection devices used were scores on six essay types achievement test very much like O-Level and the success they were trying to predict was general certificate of education (Advanced Level). Another achievement test done after two years of schooling. They used Pearson products moments correlation coefficient among prediction and criterion variables and multiple regression equations involving the prediction of each criterion variable. Their conclusion was that an achievement examination based on high school subjects was the most valid prediction of subsequent success in the A level. The aptitude test was not a good prediction as the O-level type examination.

Another study by Bruno (1981), in Canada investigated the concurrent validity of learning ability profile against college GPA. The purpose of the study was to determine the concurrent validity of the learning Ability profile (LAP) by correlating the results obtained on the LAP with GPA. The sample used consisted of 80 French speaking students in the Bachelors degree program in Business Administration. Scores in LAP, both weighted and non-weighed were correlated with correlations of .30 ($P<.01$) and .31($P<.01$) respectively with GPA. It was concluded that learning ability measures obtained with this test could present an acceptable validity in academic contexts in which selection is concerned. They employed the person product moment correlation formula in their analysis.

2.4.2 Kenya Based Studies

S.K Bali (1983), carried out studies to determine the psychometric efficiency of the Intelligence and Development tests for East Africa (IDEA) test battery in measuring scholars ability of the individuals who had been grouped by the following variables;

a) Urbanisation level (Urban/rural);

b) Quality of schooling (High/Low).

The correlation matrices of the IDEA tests were found to be equivalent for the High/low subgroups and significantly different for the urban/rural subgroups. Based on the above findings it was concluded that the PT-IDEA battery was not functionally equivalent for the urban/rural condition of comparison.

Gatumu (1989), carried out a study attempting to answer the following questions.

(i) How well do O-level grades predict the performance in primary teachers training colleges?

(ii) And is there any causal relationship between O-level grades with the performance in primary teachers training colleges?

He used a large sample of 1922 subjects. The independent variables were O-Level grades. Dependent variables were scores of final year college examinations obtained form the Kenya Examination Council. A predictive validity using both Inter-correlation and multiple regression analyses was done for this sample, using path analysis. The findings were O-level grades predict very well performance in final year college examination. It was also observed that definitely O-level grades have a causal relationship with performance in final year college examinations.

Another study carried out by Ssali (1986), on validating the use of the Draws – A-Person (DAP) test in Kenya to measure the intellectual maturity of children between the ages of six and nine years. The measure was then used to accurately group pupils in the lower primary classes of Kenya in terms of their mental capabilities in order to be able to offer them more effective classroom instruction. All the subjects were administered the DAP test. The test consisted of a drawing of a man, a drawing of a woman and a drawing of the self in a test booklet. The children's drawings were then hand-scored and an average score obtained for each pupil. In addition, information on each subject's past academic performance in class was obtained from the class teachers. The analysis revealed that the DAP test scores were well correlated. The correlation between Non-drawing and woman drawing was + 0.62, between man and self + 0.63, and between woman and self + 0.71. These scores also correlated well with school performance.

Nganga (1995), carried out studies to establish the relationship between first term, mock and KCSE examinations. She used a sample consisting of 585 form four students of the year 1990 from eight schools in Uasin Gishu District. The variables used were seven compulsory subjects. The data was analysed using Pearson- product moment correlation formula to help obtain correlation between the variables used and multiple regression equation were also obtained for each examination. The results were tested for their significance using Fishers Z-transformation and F-tests at 0.05 level of significance. The result was that mock examination was highly and significantly related to the KCSE examinations compared to the first term examination.

2.5 Conclusion

It is therefore very important that if certain predictor measures are used for selection then they should predict the criterion measure. Otherwise if there is evidence to the contrary then there would be need to look at both the predictor and criterion measures so as to establish whether they meet the required objectives.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter has the following key sections of which the description of each is given.

- ❖ Research design.
- ❖ Population and Sample
- ❖ Sampling techniques
- ❖ Instruments
- ❖ Data collection procedure
- ❖ Data analysis

3.1 Research Design

The study employed a comparative associative survey research design. This was a correlation study between English, Maths and Biology subject variables of both the mock and KCSE examinations. It also looked at the relationship between overall students aggregate points of both mock and KCSE examinations.

3.2 Population and Sample

The target population were the form four students of the year, 2003. Six out of 55 secondary schools in Migori district were selected as follows, two boys' schools, two girls' schools and two mixed schools to give a total of six schools. Each school contributed forty students who totalled up to a sample of 240 students. One of the students did not sit for all the examination papers in KCSE examination and therefore was discarded, so this left only a total of 239 students.

3.3 Sampling Technique

To determine the sample, the researcher used stratified systematic random sampling technique. The stratified sampling technique was used to group schools in terms of boys, girls, and mixed schools. To come up with the six schools, two from each category, the researcher applied simple random sampling by lottery method. Eight pieces of paper with names of schools for each of the three groups (Boys', Girls', and mixed schools) were prepared and folded to conceal the names of the schools. These were placed in three containers. From each container (group) two papers were picked bearing a name of a school. A total of six schools were picked at random from the sampling frame to form the school sample.

The next step was to come up with a sample of 40 students from each school. Here the researcher used systematic sampling. This involved selecting the subjects from a class list on a system rather than random number. This was done by dividing the total number of students in each form four class of each school by the sample number (40 per school). These provided the interval at which to select the units for the sample. Schools which had small populations of form fours, selections of even or odd numbers was preferred. That is 1, 3, 5, 7 ... or 2, 4, 6, 8... and so on.

3.4 Instruments

3.4.1 Mock Examinations

This was an external examination done at the end of second term in the forth year during the month of July/August by all schools in Migori District. The construction of the examination was done by a panel of teachers derived from various schools within the district. Each panel was responsible for constructing an examination in its subject

area. The construction exercises were coordinated by the District Education Officer (DEO) with the assistance of the District Headteachers Association.

The examination majorly consisted of two examination papers in each subject administered at different times as scheduled in the District Mock Examination Timetable just like in KCSE examination. For instance, mathematics consisted of two papers, I and II. The science subjects had the second paper as a practical paper except chemistry, which had three papers.

The structures of the test papers were similar to those of KCSE. They included short answer questions and essay questions. The examination was administered during the months of July and the process lasted for about three weeks.

The marking of the examination was done at a central point in one of the schools in the district. Each subject had three team leaders who guided the examiners through the coordination process of the scheme.

The marking process was continuously checked by picking sample scripts from the examiners by the team leaders. This was to ensure that marks were allocated objectively to every paper marked with minimal deviations. Initial scoring was in percentage, which was then converted to grades using a twelve point grading system (Appendix B). The results were all reported in grade form.

The aim of the examination was to measure the level of achievement of the students in second term during the fourth year of study. It was intended to reflect ones performance in the KCSE examination. It also helped identify areas of weaknesses in the learning process and content coverage. The results were released to all the schools in Migori district. The records were then availed to the examination office of each school.

3.4.2 Kenya Certificate of Secondary Examination (KCSE)

This was a National Examination done at the end of the fourth year of secondary education in the 8-4-4 system of education. Its main purpose is selection and certification of students destined into the universities and other institutions for higher learning.

The average grade gotten reflects a students overall achievement in the minimum number of subjects done (seven). The Kenya National Examination Council (KNEC) administered and conducted the examination in all secondary schools in Kenya, in 2003. The examination was conducted between 25th October and 19th November. The administration process involved supervisors, invigilators, and security personnel from within the district who ensured the smooth flow of the process.

This was a standardized examination having been taken through all the processes of standardization. After the last paper was done, the examination papers were then sent back to the examination council for making.

Marking of the examination papers was done by trained examiners for a period of one month. Further processing of the results was done by the Kenya National Examination Council (KNEC). This involved changing the percentages into grades in the 12 point

scale (Appendix B). After processing, the results were publicly announced in the month of February 2004 and released to all schools.

3.5 Data Collection Procedures

In order to be able to collect data from the selected schools and the education office, the researcher obtained an introductory letter from the university identifying him as a bonafied student of the University.

1. The needed data were obtained from examination records in the examination office of the identified schools and some from the District Education Office. The data collected was for the year 2003 for both Mock and KCSE examinations.
2. The process of data collection lasted for a period of one and a half months.
3. A data collection sheet (Appendix A) aided the collection of data. This enabled the researcher to keep record of data for each school considered for the two instruments.

3.6 Data Analysis

The data involved in this study assumed an interval scale for the following variables; (see Appendices C and D).

1. Mock/KCSE English
2. Mock/KCSE Mathematics
3. Mock/KCSE Biology
4. Mock/KCSE Aggregate points

The data was computer analysed. The Statistical Package for Social Science (SPSS) and Excel Packages were used. Both descriptive and inferential statistics were applied. The analysis included computation of;

1. The means, variance, standard deviations of the mock/KCSE examination variables.
2. The Skewness and Kurtosis of the examination variables.

3. The Mock/KCSE aggregate were used to generate the scattergram showing the regression line using the excel package.
4. The Pearson product moment formulae were used to determine the correlation between the four variables of the mock and KCSE.
5. The generated standard deviations, means and correlations coefficient was used to derive the prediction formulae $Y' = mX + c$ from the regression equation in chapter two.
6. ANOVA technique was used to test the null hypotheses in chapter one of the four KCSE/Mock variables. The statistical significance of the result was obtained in order to help in the interpretation of the meaning of the correlation coefficients obtained. The interpretation was at 0.05 level of significance.

ANOVA is used to compare more than two populations means based on independent sample of interval (or ratio) data from each population. In order to compare the variation between sample means with variability within a sample, an F statistics is used. If the F statistics is larger than expected (critical value of F tables), this is interpreted to mean that there is a difference occurring in the population means.

CHAPTER FOUR

4.0 DATA ANALYSIS, PRESENTATION AND DISCUSSION OF FINDINGS

The study investigated the relationship between the achievement of form four students in mock examination and Kenya Certificate of Secondary Examination in some schools in Migori District. Specifically the study sought responses to the following major areas and hypotheses.

The areas:

i) Establishing a prediction formula for predicting KCSE scores from mock scores.

ii) The relationship between mock and KCSE examination variables.

The null hypotheses tested were:

Ho_1: There is no significant difference between English Mock score and English KCSE scores.

Ho_2: There is no significant difference between Maths Mock score and Maths KCSE scores.

Ho_3: There is no significant difference between Biology Mock score and Biology KCSE scores.

Ho_4: There is no significant difference between Mock Aggregates points and KCSE Aggregates points.

4.1 Prediction Formula (Regression Line) for KCSE Aggregate Scores Based on Mock Aggregate Scores

This study attempted to establish a formula to predict KCSE scores based on Mock scores and also to come up with the standard error of estimate of prediction.

The results are presented and discussed in this section.

4.1.1 Prediction Formulae for Predicting KCSE Scores from Mock

Based on the data collected the formula of predicting KCSE aggregates on Mock aggregates was determined as:

$Y' = 1.05(X) + 9.5$ Where m (slope/gradient) was substituted with 1.05 and C (coefficient/y-intercept) with 9.5. The general formula is thus, $Y' = mX + C$.

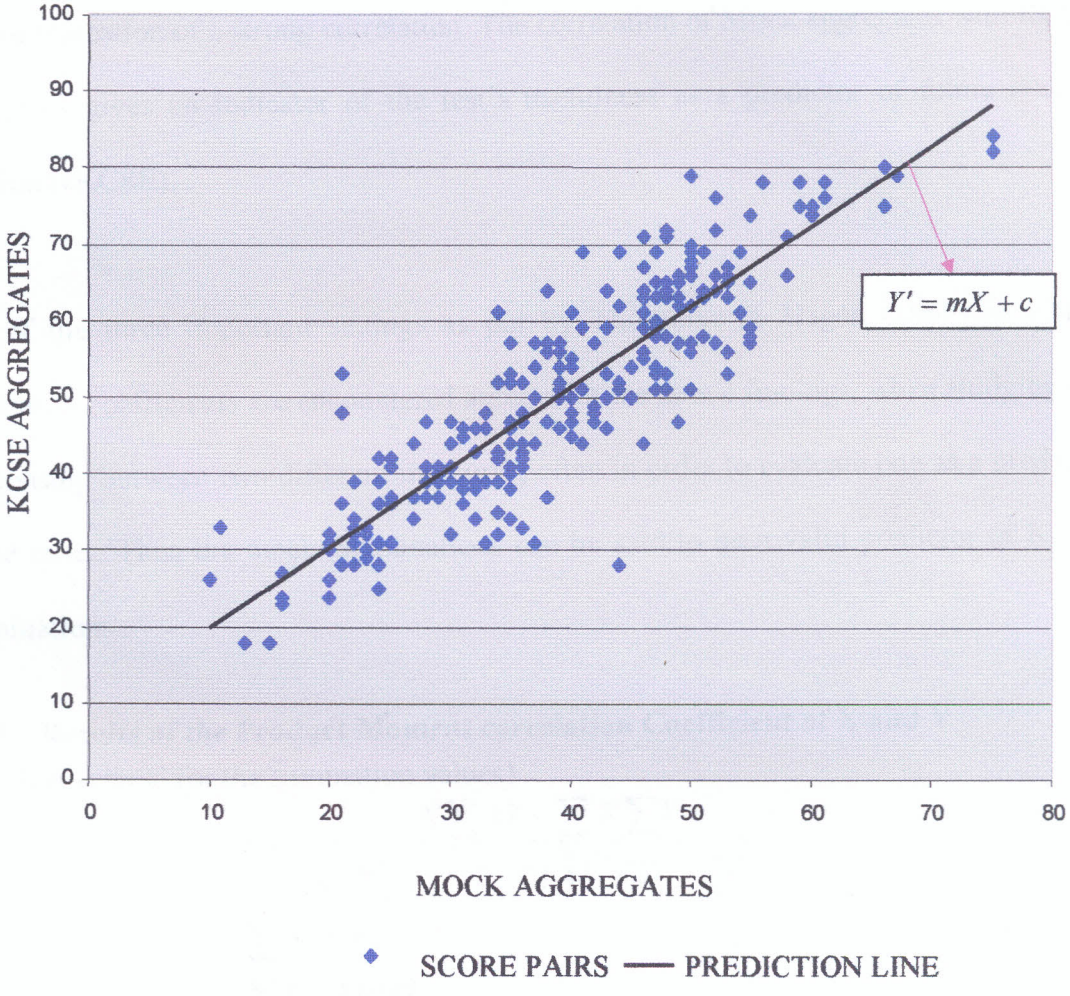
The above formulae derivation was based on the regression equation in chapter two. The two constants (m and c) were determined using the results on ANOVA table 4.8. This provided the means and standard deviations of the Mock (X) and KCSE (Y) aggregates. The correlation coefficient was computed and substituted in the regression equation formula.

The formulae $Y' = 1.05(X) + 9.5$ can now be used to predict the KCSE (criterion) *performance based on future mock performances of individual students.*

The above finding confirms Thorndike's observation that the information on correlation coefficient, along with the means and standard deviations of the predictor can be used to make the best possible prediction about criterion performance for each person based on their scores on the predictor. This can now be applied to future similar examinations.

4.1.2 The Best Fitting Straight Line for Bivariate Distribution Predicting Y (KCSE) from X (Mock) aggregate scores when m is 1.05 and c is 9.5

Figure 4. 1 Scattergram of Mock and KCSE Aggregates



The above scattergram shows the prediction line given by $Y' = 1.05(X) + 9.5$. It also shows the scattering of score pairs taking the orientation from bottom left, to top right indicating a positive correlation of the predictor and criterion score variables.

To present the prediction formulae graphically as above, the X and Y variables were further treated using the Computer Package Excel to generate the scattergram together

with the prediction line (regression line). The above results on the scattergram shows a positive association between X and Y variables. It means that, above average values of X tend to go with above average values of Y and below average values of both variables also tend to occur together. It also shows that most pair plots fall close to the prediction line, an indication of a strong correlation. The correlation of Mock aggregates with KCSE aggregates gives an indicator of the test's usefulness as a predictor of future similar criterions (KCSE).

One of the three important settings as put by Thorndike & Hagen (1969) in which correlation coefficients are encountered agree with the above findings, when studying the relationship between two different measures, often in order to evaluate one as a predictor of the other. Thus the mock examinations can be said to be a valid predictor of KCSE examinations.

4.1.3 *Results of the Product Moment correlation Coefficient of X and Y*

(See Appendix C for the summation values)

$$r = \frac{N\sum XY - \sum X \sum Y}{\sqrt{\left(N\sum X^2 - \left(\sum X\right)^2\right)\left(N\sum Y^2 - \left(\sum Y\right)^2\right)}}$$

$$\sum X = 9252$$

$$\sum Y = 11977$$

$$\sum X^2 = 392864$$

$$\sum Y^{2\cdot} = 648697$$

$$\sum XY = 500056$$

$$N = 239$$

$$= \frac{8702180}{\sqrt{9.6139405210000}}$$

$$= \frac{8702180}{9805070}$$

r = 0.89.

This indicates a strong positive correlation and confirms the closeness of most of the plots to the prediction line. This means that r is strong enough not to be considered to have occurred by chance.

4.1.4 Established Standard Error of Estimate of the X and Y Variables

$$SD_e = SD_{crit}\sqrt{(1 - r_{xy}^{\ 2})}$$

Where SD_e = Standard error of estimate.

SD_{crit} = Standard deviation of the entire criterion distribution.

$r_{xy}^{\ 2}$ = the squared validity coefficient of the predictor test for predicting the criterion.

$$SD_e = SD_{crit}\sqrt{(1 - r_{xy}^{\ 2})}$$
$$= 14.2\sqrt{(1 - (0.89)^2)}$$
$$= (14.2)(0.456)$$
$$= 6.47$$

$SD_e = 6.47$

This(6.47) gives a confidence interval around a persons prediction and also along the prediction line, with a $\pm$ 6.47 as the confidence limit of the person's with the same predictor score (mock scores).

Thorndike (1997), confirms the above that not all people who fall in a given quarter of the predictor test distribution will fall in the same quarter of the criterion distribution. There will be an average criterion performance for people with a particular predictor score and there will be a variation around that average. This is taken care of by the computed standard error of estimate.

4.2 Relationship between Mock and KCSE Examination Scores

This section deals with the descriptive statistics of measures of central tendencies and dispersions. It also presents the correlations and ANOVA results of the four variables.

4.2.1 Relationship between English Mock Scores and English KCSE Scores

This study sought to establish the relationship between English Mock Scores and English KCSE Scores. The results are presented on table 4.1 below.

Table 4. 1 Descriptive Results for English Mock Scores and English KCSE Scores

	Min. Score	Max. Score	Mean	Variance	Skewness	Kurtosis	Standard Deviation
English Mock	1.00	11.0	6.3724	2.974	-0.243	0.228	1.7246
English KCSE	2.00	12.00	6.4268	4.590	-0.153	-0.778	2.1425
Difference			**0.0544**				

According to the findings, minimum score in English Mock was 1.00 (E) while in the English KCSE it was 2.00 (D-). Slight difference in scores was also noted in the maximum scores achieved in the English Mock and the English KCSE, where English Mock registered a maximum score of 11.00 (A-), while English KCSE had a maximum score of 12.00 (A).

Comparatively Mock English had a small score variation (2.974) while KCSE English had a large variation (4.590) showing that KCSE English scores had a large spread than Mock English scores, the Kurtosis confirms this. The Mock English curve Kurtosis was positive (0.228) while that of KCSE English was negative (-0.778) indicating the flatness of the KCSE English Curve as compared to that of Mock English. Both KCSE and Mock

English had a negative skew (-0.153) and (-0.293) respectively, indicating a shift from the arithmetic mean towards the right side of the curve.

In general, the difference in the means for Mock English and KCSE English was minor (0.0544). This shows that there was only a slight improvement in the mean scores in KCSE English examination. At the same time the variance of the two variables show that in Mock English, most students attained average grade as opposed to KCSE English, which had most of the scores, concentrated on the right hand side of the curve. This indicates that the students worked hard to improve on their scholastic aptitude prior to sitting for KCSE English examination.

4.2.1.1 Correlation Results of Mock English and KCSE English Scores

(See Appendix D for English summation values)

$$r_{EM} = \frac{N\sum EM - \sum E\sum M}{\sqrt{\left(N\sum E^2 - (\sum E)^2\right)\left(N\sum M^2 - (\sum M)^2\right)}}$$

$\sum M = 1523$

$\sum E = 1536$

$\sum M^2 = 10413$

$\sum E^2 = 10964$

$N = 239$

$$r = \frac{2472933 - 2339328}{\sqrt{(261099)(169178)}}$$

$$= \frac{133605}{210172}$$

$r_{EM} = 0.64.$

The product moment formula was employed to compute the correlation to determine the relationship between English Mock Scores and English KCSE Scores. According

to the results, the Pearson Product Moment Correlation was 0.64, which imply that there is a positive correlation between English Mock Scores and English KCSE Scores. This means that English Mock Scores is a reliable predictor of English KCSE Scores.

Further analysis involved testing the hypothesis that there is no significant difference between English Mock scores and English KCSE scores. The differences were found to be statistically significant ($p<0.05$). The results in table 4.2 show that the f-value was 16.862, which is greater than the critical value at 0.05 level of significance. The stated hypothesis, therefore is rejected, suggesting that differences observed are real and not due to chance. This therefore implies that English Mock results can be used to predict KCSE English results.

Table 4. 2 ANOVA Results between English Mock Results and English KCSE Results

	Sum of Squares	df	Mean Square	f-value	Sig.
Between Groups	464.460	10	46.446	16.862	0.000
Within Groups	628.009	228	2.754		
Total	**1092.469**	**238**			

4.2.2 Relationship between Maths Mock Scores and Maths KCSE Scores

This study also investigated the relationship between Maths Mock Scores and Maths KCSE Scores. The means are on presented on table 4.3 below.

Table 4. 3 Descriptive Results for Maths Mock Scores and Maths KCSE Scores

	Min. Score	Max. Score	Mean	Variance	Skewness	Kurtosis	Standard Deviation
Maths Mock	1.00	12.00	3.8536	6.630	0.886	0.277	2.5748
Maths KCSE	1.00	12.00	5.6234	11.303	0.340	-1.036	3.3620
Difference			**1.7698**				

The above findings show that the range (11.00), the least score (1.00) and the maximum score (12.00) was the same in both Mock Maths and KCSE Maths. The KCSE Maths mean improved by 1.7698, though both Mock and KCSE Maths were still below the average mean (6.00). The positive skewness indicates this, mock maths (0.886) KCSE Maths (0.340). The standard deviation of KCSE maths (0.340), shows an increased spread of scores (3.3620) despite the mean improvement confirmed by Kurtosis (-1.036).

Generally there was a great improvement with each student improving his/her score by (1.7698). The increase in score spread in KCSE maths is an indication that the students and perhaps the maths teachers did not put in enough effort similarly, leading to some students improving a great deal and some stagnating. Hinton (1998) confirms this by saying small spread in a study is often seen as a good thing as it indicates that all the people are behaving the same and hence, the mean value represents the score very well. He also asserts that a large spread may be a problem as it indicates that there are large differences between the individual scores and the mean therefore is not representative.

4.2.2.1 Correlation Results of Mock Maths and KCSE Maths

The Pearson product moment coefficient was computed for the mock maths and KCSE maths as shown below (see appendix D for Maths summation values).

$$r_{EM} = \frac{N\sum EM - \sum E\sum M}{\sqrt{\left(N\sum E^2 - \left(\sum E\right)^2\right)\left(N\sum M^2 - \left(\sum M\right)^2\right)}}$$

$\sum M = 921$

$\sum E = 1344$

$\sum M^2 = 5123$

$\sum E^2 = 10227$

$N = 239$

$$r = \frac{1660333 - 1237824}{\sqrt{(637917)(376156)}}$$

$$= \frac{422509}{489853}$$

$r = 0.86$

The result (r = 0.86) showed a strong direct positive correlation. This indicated that there is a strong relationship between mock maths and KCSE maths, and that mock maths is a useful tool for predicting KCSE maths.

The hypothesis that there is no significant difference between Maths Mock scores and Maths English KCSE scores was tested using ANOVA. According to the ANOVA results the differences were found to be statistically significant ($p<0.05$). The results in table 4.4 show that the f-value was 68.990 which is greater than the critical value at 0.05 level of significance. The stated hypothesis, therefore is rejected, suggesting that differences observed are real and not due to chance. This therefore implies that Maths Mock results can be used to predict KCSE Maths results.

Table 4. 4 ANOVA Results between Maths Mock Results and Maths KCSE Results

	Sum of Squares	df	Mean Square	f-value	Sig.
Between Groups	2070.714	11	188.247	68.990	0.000
Within Groups	619.395	227	2.729		
Total	**2690.109**	**238**			

4.2.3 Relationship between Biology Mock Scores and Biology KCSE Scores

This study further sought to establish the relationship between Mock Biology Scores and KCSE Biology Scores. The means are presented on presented on table 4.5 below.

Table 4. 5 Descriptive Results for Biology Mock Scores and Biology KCSE Scores

	Min. Score	Max. Score	Mean	Variance	Skewness	Kurtosis	Standard Deviation
Biology Mock	1.00	12.00	5.4644	7.132	-0.112	-0.798	2.6706
Biology KCSE	2.00	12.00	8.1967	7.974	-0.472	-0.862	2.8238
Difference							

The above findings indicate slight difference (1.00) on the minimum score of both MOCK/KCSE Biology. The KCSE Biology mean improved tremendously by (2.7323). The difference in the standard deviation was minimal (0.1532). Both had a negative Kurtosis; Biology Mock (-0.798) and KCSE Biology (-0.862).

Overally, there was an overwhelming general improvement for each candidate in KCSE biology, an indication that most students and their Biology teachers did put in extra effort to achieve the high grades. The minimal difference in the spread of scores a test to the fact that the students behaved similarly.

4.2.3.1 Correlation Results of Mock Biology and KCSE Biology

In order to determine the relationship between mock Biology and KCSE Biology a correlation coefficient by product moment r was computed as given below (see appendix D for Biology summation values).

$$r = \frac{N\sum EM - \sum E \sum M}{\sqrt{(N\sum E^2 - (\sum E)^2)(N\sum M^2 - (\sum M)^2)}}$$

$\Sigma M = 1306$

$\Sigma E = 1959$

$\Sigma M = 8834$

$\Sigma E = 17955$

$\Sigma EM = 12017$

$$r = \frac{313609}{428959.6}$$

$= 0.73$

The Pearson product moment correlation of (0.73) implies that there is a direct positive correlation between Mock biology and KCSE biology scores. This means that the Mock biology is a valid predictor of KCSE biology.

Further analysis involved testing the hypothesis that there is no significant difference between Biology Mock scores and Biology KCSE scores using ANOVA. According to the ANOVA results the differences were found to be statistically significant ($p<0.05$). The results in table 4.6 show that the f-value was 26.171 which is greater than the critical value at 0.05 level of significance. The stated hypothesis, therefore is rejected, suggesting that differences observed are real and not due to chance. This therefore implies that Biology Mock results can be used to predict KCSE Biology results.

Table 4. 6 ANOVA Results between Biology Mock Results and Biology KCSE Results

	Sum of Squares	*df*	*Mean Square*	*f-value*	*Sig.*
Between Groups	1061.073	11	96.461	26.171	0.000
Within Groups	836.684	227	3.686		
Total	**1897.757**	**238**			

4.2.4 Relationship between Mock Aggregate Points and KCSE Aggregate Points

This study finally sought to establish the relationship between Aggregates Mock points and Aggregate KCSE points. The results are presented on table 4.7 below.

Table 4. 7 Descriptive Results for Aggregates Mock Scores and Aggregates KCSE Scores

	Min. Score	Max. Score	Mean	Variance	Skewness	Kurtosis	Standard Deviation
Aggregate Mock	10.00	75.00	38.7113	145.828	0.126	-0.235	12.0759
Aggregates KCSE	18.00	84.00	50.1130	203.756	0.123	-0.717	14.2743
Difference			**11.4017**				

Above results show that the difference between minimum mock aggregate points (10.00) and KCSE minimum aggregate points (18.00) as (8.00), while the maximum points for mock aggregate as (75.00) and KCSE aggregate as (84.00) with a difference of (9.00). The mean difference (11.4017) indicates a marked improvement in point's for students who sat for KCSE. Standard deviation shows an increase in score dispersion in KCSE aggregate points (14.2743) as compared to mock aggregate points(12.0759). Generally, the above presentation shows that most students worked hard in all the subjects so as to have this improvement.

Further analysis involved testing the hypothesis that there is no significant difference between Aggregate Mock scores and Aggregate KCSE scores. The difference were found to be statistically significant ($p<0.05$). The results in table 4.8 show that the f-value was 19.195 which is greater than the critical value at 0.05 level of significance. The stated hypothesis, therefore is rejected, suggesting that differences observed are

real and not due to chance. This therefore implies that Aggregate Mock results can be used to predict KCSE Aggregate results.

Table 4. 8 ANOVA Results between Mock Aggregates and KCSE Aggregate Results

	Sum of Squares	df	Mean Square	f-value	Sig.
Between Groups	40020.846	47	851.507	19.195	0.000
Within Groups	8473.105	191	44.362		
Total	**48493.950**	**238**			

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.0 Introduction

This chapter presents the summary of the findings, draws conclusion, gives recommendations and makes suggestions based on the findings.

5.1 Summary of the Findings

The prediction formula for KCSE aggregate scores based on mock aggregate scores was as follows.

$$Y' = 1.05(X) + 9.5$$

The researchers established the above formula to be used for future predictions of the KCSE criterion based on the mock aggregate scores (X). The researcher hopes that this formula can be used for forecasting future performances at KCSE in any district in Kenya.

The study also derived a scattergram for predicting KCSE achievement scores. Based on the X and Y axes, one can use vertical projection lines from the X axis (Mock aggregates), which is then attached to the regression line (prediction line). Another horizontal projection line is extended to the Y axis (KCSE aggregates) to determine the predicted scores. Therefore, this is an alternative to the prediction formula which is represented as the regression line on the scattergram. As such, one way of predicting future KCSE scores is by the use of the scattergram.

Another finding was the establishment of the standard error of estimate, given that there will always be variability on a particular mean criterion score for a group of students who have the same predictor score, it was necessary to come up with the standard deviations of such variability. It was found to be 6.47. This standard error of estimate takes care of any extraneous variables that may be experienced in the wider population such as level of teachers' competence, syllabus coverage, and students' strikes e.t.c.

The research revealed that the relationship between the Mock and KCSE aggregates was highly positively correlated (r = 0.89) showing that the relationship was not by chance as confirmed by the scattering of aggregate score pairs on the scattergram and as later depicted by the significance of the ANOVA results (sign = 0.00) tested at significance level of 0.05. Most score pairs were shown to be close to the regression line therefore falling within the area of confidence.

The researcher also found out that there was a significantly high correlation between the district mock scores and the KCSE scores (r = 0.89), which was further confirmed by the ANOVA results. This indicated that the mock examinations are a valid and a reliable predictor of KCSE scores. Therefore the null hypothesis (Ho) was not confirmed.

The standard deviation of the two examinations showed a variation in scores; the mock aggregates (SD = 12.0759), KCSE aggregates (SD = 14.2743). The KCSE aggregates SD seemed to be greater than mock aggregates SD. It is probable that the

students could have prepared well for the KCSE examination thus improving their scores positively as depicted by the mean improvement.

An interesting finding was that the relationship between mock English scores and KCSE English scores was (r = 0.64). This was the least of all the correlations computed. It could have been an indication that both the mock English and KCSE English examinations were difficult.

Though both mock English and KCSE English were difficult, the mock English exams can still be relied upon to predict the outcomes of English scores at KCSE as further confirmed by the ANOVA results at a significance level of 0.05. The computed significance was 0.000. Thus the null hypothesis (Ho) was not accepted.

Findings about the mock maths and KCSE maths indicated that there was a great mean improvement in the KCSE maths (1.7698), with mock maths having a mean of 3.8536 and KCSE maths 5.6234. This improvement could be an indication of the level at which the students were prepared for KCSE maths examination. The size of dispersion of scores from the mean confirms this. The ANOVA outcome was also significant at 0.05 level. The computed significance was 0.000. The null hypothesis was not confirmed.

The analysis of mock Biology and KCSE Biology showed a direct positive correlation (r = 0.73). This was an indication that mock Biology was a valid predictor of the KCSE Biology examination. Although there was a high improvement on the mean (2.7323) the difference in standard deviation was minimal (0.1532). It means almost

all the students had a positive improvement index to maintain the dispersion area of the scores. The ANOVA output (0.000) was significant at level 0.05 of significance, thus the null hypothesis was not confirmed.

5.2 Conclusion

This study concludes that it is possible to derive a prediction formula for the KCSE Examination scores based on the Mock Examination scores. In this case the formula is $Y' = 1.05(X) + 9.5$. It also confirms that there is a strong relationship between scores in Mock Examination and scores in KCSE Examination.

5.3 Recommendations

Recommendations made after this research is directed to; the District Mock Subject Panels, the Heads Association, the District Education Office, Teachers, Parents and Students.

The District Mock Subject Panels

Based on the findings of this study the researcher recommends that the District Mock Panels should continue strengthening the standards of setting of the mock examinations, so that the mock exams can still continue to have stronger reflection of KCSE examinations.

The Heads Associations

A recommendation that the researcher wishes to make to the Heads Association is that the district mock examinations have a high correlation to the KCSE examination. Since the District Head Associations deals with finances and organization of mock activities within the District. It is imperative that they continue or even improve the standards

of service that they render to the hard-working teachers involved in setting mocks examinations.

The District Education Office

The District Education Office is concerned with the implementation of curriculum within the district. The researcher wishes to urge them to emphasize the role of mocks in all the forums when meeting heads and teachers.

Recommendations to Teachers

Teachers are important curriculum implementers. There is need to urge the teachers to fully participate in mock examination panels so as to ensure that they improve on the standards of setting mock examinations. Along side this is the effective improvement of content delivery and syllabus coverage. This is important if the objective of the examinations is to be met.

Recommendations to Parents and Students

Parents and students are important stakeholders in education. Mock examination is a valid and reliable measure of what a student is going to attain at KCSE level. It can therefore be said that the results of this examination is an important feedback to both parents and students. A student who does not meet the expectations at mock should be urged to work hard in preparation for the KCSE examinations. The weaknesses of the student identified during mock should be corrected early enough to enable the students perform well in KCSE examinations.

5.4 Suggestions for Further Research

A similar research needs to be carried out on a wider population involving many districts to determine the validity and reliability of the prediction formula.

Another area that needs to be researched on is the determination of the inter-correlations of the form three end year examinations, the mock examinations and KCSE examinations. Such a research will be able to tell whether form three end year examinations can be useful to tell future criterion behaviour.

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APPENDIX A: DATA COLLECTION SHEET

Name of the school ……

Students No.	English		Maths		Biology		Aggregates	
	M	E	M	E	M	E	MOCK	KCSE
1.								
2.								
3.								
4.								
5.								
6.								
7.								
8.								
9.								
10.								
11.								
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33.								
34.								
35.								
36.								
37.								
38.								
39.								
40.								

Key
M – Mock
E – KCSE

APPENDIX B: KCSE NATIONAL EXAMINATION GRADING SCALE

GRADE	POINTS
A	12
A-	11
B+	10
B	9
B-	8
C+	7
C	6
C-	5
D+	4
D	3
D-	2
E	1

Note: attainment is indicated by grades of which 'A' if the highest and 'E' is the lowest.

APPENDIX C: SUMMATIONS OF MOCK AND KCSE AGGREGATES (X, Y, X^2, Y^2, AND XY)

MOCK AGG (X)		KCSE AGG (Y)		
X	X^2	Y	Y^2	XY
60	3600	75	5625	4500
50	2500	69	4761	3450
48	2304	65	4225	3120
55	3025	58	3364	3190
50	2500	70	4900	3500
53	2809	66	4356	3498
50	2500	66	4356	3300
50	2500	62	3844	3100
51	2601	58	3364	2958
47	2209	58	3364	2726
47	2209	51	2601	2397
46	2116	61	3721	2806
46	2116	55	3025	2530
47	2209	59	3481	2773
39	1521	52	2704	2028
45	2025	50	2500	2250
43	1849	59	3481	2537
36	1296	48	2304	1728
40	1600	54	2916	2160
38	1444	56	3136	2128
32	1024	43	1849	1376
47	2209	60	3600	2820
35	1225	52	2704	1820
35	1225	47	2209	1645
28	784	47	2209	1316
31	961	39	1521	1209
37	1369	50	2500	1850
52	2704	66	4356	3432
21	441	48	2304	1008
31	961	45	2025	1395
30	900	41	1681	1230
28	784	41	1681	1148
28	784	39	1521	1092
22	484	34	1156	748
24	576	36	1296	864
24	576	39	1521	936
22	484	39	1521	858
20	400	31	961	620
61	3721	78	6084	4758
37	1369	57	3249	2109

MOCK AGG (X)		KCSE AGG (Y)		
X	X^2	Y	Y^2	XY
75	5625	82	6724	6150
66	4356	75	5625	4950
60	3600	74	5476	4440
59	3481	75	5625	4425
58	3364	66	4356	3828
55	3025	59	3481	3245
55	3025	57	3249	3135
53	2809	63	3969	3339
52	2704	57	3249	2964
50	2500	57	3249	2850
49	2401	47	2209	2303
48	2304	53	2809	2544
48	2304	51	2601	2448
47	2209	53	2809	2491
47	2209	63	3969	2961
46	2116	44	1936	2024
44	1936	51	2601	2244
43	1849	53	2809	2279
43	1849	46	2116	1978
43	1849	50	2500	2150
42	1764	47	2209	1974
41	1681	44	1936	1804
40	1600	48	2304	1920
39	1521	50	2500	1950
39	1521	56	3136	2184
38	1444	37	1369	1406
37	1369	31	961	1147
36	1296	33	1089	1188
35	1225	34	1156	1190
35	1225	44	1936	1540
35	1225	38	1444	1330
34	1156	39	1521	1326
34	1156	32	1024	1088
33	1089	31	961	1023
32	1024	39	1521	1248
31	961	38	1444	1178
30	900	39	1521	1170
30	900	32	1024	960
28	784	37	1369	1036
24	576	25	625	600
75	5625	84	7056	6300
67	4489	79	6241	5293

MOCK AGG (X)		KCSE AGG (Y)		
X	X^2	Y	Y^2	XY
66	4356	80	6400	5280
61	3721	76	5776	4636
59	3481	78	6084	4602
58	3364	71	5041	4118
56	3136	78	6084	4368
55	3025	65	4225	3575
55	3025	74	5476	4070
54	2916	69	4761	3726
54	2916	61	3721	3294
53	2809	67	4489	3551
53	2809	65	4225	3445
52	2704	72	5184	3744
52	2704	76	5776	3952
51	2601	69	4761	3519
50	2500	79	6241	3950
50	2500	67	4489	3350
49	2401	66	4356	3234
48	2304	72	5184	3456
48	2304	58	3364	2784
48	2304	65	4225	3120
48	2304	71	5041	3408
47	2209	58	3364	2726
47	2209	65	4225	3055
46	2116	63	3969	2898
46	2116	71	5041	3266
46	2116	67	4489	3082
44	1936	62	3844	2728
44	1936	69	4761	3036
43	1849	64	4096	2752
42	1764	49	2401	2058
41	1681	51	2601	2091
41	1681	59	3481	2419
41	1681	69	4761	2829
40	1600	55	3025	2200
40	1600	61	3721	2440
39	1521	57	3249	2223
38	1444	64	4096	2432
38	1444	57	3249	2166
38	1444	56	3136	2128
37	1369	54	2916	1998
37	1369	50	2500	1850
36	1296	48	2304	1728

MOCK AGG (X)		KCSE AGG (Y)		
X	X^2	Y	Y^2	XY
36	1296	47	2209	1692
35	1225	57	3249	1995
35	1225	53	2809	1855
34	1156	61	3721	2074
34	1156	52	2704	1768
53	2809	53	2809	2809
40	1600	45	2025	1800
38	1444	47	2209	1786
36	1296	41	1681	1476
36	1296	43	1849	1548
35	1225	41	1681	1435
34	1156	35	1225	1190
32	1024	34	1156	1088
31	961	38	1444	1178
30	900	39	1521	1170
29	841	41	1681	1189
29	841	40	1600	1160
27	729	34	1156	918
27	729	37	1369	999
27	729	34	1156	918
25	625	37	1369	925
25	625	31	961	775
24	576	36	1296	864
24	576	31	961	744
24	576	28	784	672
24	576	31	961	744
23	529	33	1089	759
23	529	32	1024	736
23	529	30	900	690
22	484	34	1156	748
22	484	32	1024	704
22	484	28	784	616
21	441	28	784	588
20	400	30	900	600
20	400	32	1024	640
20	400	24	576	480
20	400	26	676	520
16	256	23	529	368
16	256	27	729	432
16	256	24	576	384
15	225	18	324	270
13	169	18	324	234

MOCK AGG (X)		KCSE AGG (Y)		
X	X^2	Y	Y^2	XY
44	1936	52	2704	2288
37	1369	44	1936	1628
36	1296	42	1764	1512
35	1225	44	1936	1540
35	1225	40	1600	1400
53	2809	56	3136	2968
52	2704	64	4096	3328
52	2704	64	4096	3328
51	2601	63	3969	3213
51	2601	64	4096	3264
50	2500	56	3136	2800
50	2500	51	2601	2550
50	2500	68	4624	3400
49	2401	57	3249	2793
49	2401	65	4225	3185
49	2401	63	3969	3087
49	2401	62	3844	3038
48	2304	64	4096	3072
48	2304	63	3969	3024
47	2209	69	4761	3243
47	2209	65	4225	3055
47	2209	54	2916	2538
46	2116	64	4096	2944
46	2116	56	3136	2576
46	2116	59	3481	2714
45	2025	54	2916	2430
44	1936	52	2704	2288
44	1936	28	784	1232
44	1936	62	3844	2728
42	1764	48	2304	2016
40	1600	50	2500	2000
40	1600	47	2209	1880
39	1521	46	2116	1794
39	1521	51	2601	1989
39	1521	54	2916	2106
36	1296	47	2209	1692
36	1296	44	1936	1584
36	1296	52	2704	1872
35	1225	46	2116	1610
35	1225	47	2209	1645
34	1156	43	1849	1462
33	1089	39	1521	1287

MOCK AGG (X)		KCSE AGG (Y)		
X	X^2	Y	Y^2	XY
33	1089	48	2304	1584
32	1024	46	2116	1472
32	1024	38	1444	1216
31	961	46	2116	1426
31	961	36	1296	1116
30	900	44	1936	1320
30	900	47	2209	1410
29	841	39	1521	1131
25	625	36	1296	900
20	400	31	961	620
22	484	33	1089	726
27	729	44	1936	1188
28	784	41	1681	1148
28	784	39	1521	1092
36	1296	48	2304	1728
25	625	41	1681	1025
21	441	36	1296	756
33	1089	46	2116	1518
34	1156	42	1764	1428
29	841	37	1369	1073
31	961	45	2025	1395
42	1764	57	3249	2394
10	100	26	676	260
11	121	33	1089	363
21	441	53	2809	1113
22	484	31	961	682
23	529	29	841	667
24	576	42	1764	1008
25	625	42	1764	1050
25	625	31	961	775
25	625	41	1681	1025
$\Sigma X=9252$	$\Sigma X^2=392864$	$\Sigma Y=11977$	$\Sigma Y^2=648697$	$\Sigma XY=500056$

APPENDIX D: SCORE SUMMATIONS OF SELECTED COMPULSORY SUBJECT VARIABLES

ENGLISH					MATHS					BIOLOGY				
M	M^2	E	E^2	ME	M	M^2	E	E^2	ME	M	M^2	E	E^2	ME
9	81	9	81	81	5	25	9	81	45	11	121	12	144	132
9	81	9	81	81	6	36	10	100	60	9	81	12	144	108
9	81	10	100	90	3	9	6	36	18	8	64	9	81	72
8	64	8	64	64	4	16	5	25	20	9	81	10	100	90
9	81	9	81	81	5	25	8	64	40	8	64	12	144	96
8	64	8	64	64	5	25	6	36	30	8	64	11	121	88
8	64	9	81	72	4	16	8	64	32	7	49	11	121	77
8	64	7	49	56	4	16	8	64	32	7	49	12	144	84
9	81	6	36	54	2	4	5	25	10	8	64	11	121	88
7	49	8	64	56	3	9	3	9	9	10	100	11	121	110
6	36	5	25	30	3	9	4	16	12	8	64	9	81	72
10	100	8	64	80	5	25	8	64	40	7	49	11	121	77
9	81	8	64	72	4	16	6	36	24	9	81	11	121	99
7	49	9	81	63	4	16	5	25	20	9	81	11	121	99
7	49	8	64	56	1	1	2	4	2	6	36	9	81	54
8	64	6	36	48	4	16	6	36	24	7	49	9	81	63
8	64	7	49	56	3	9	7	49	21	7	49	9	81	63
6	36	7	49	42	3	9	4	16	12	6	36	7	49	42
7	49	6	36	42	4	16	8	64	32	7	49	11	121	77
7	49	8	64	56	3	9	6	36	18	5	25	9	81	45
4	16	4	16	16	3	9	4	16	12	5	25	7	49	35
7	49	5	25	35	4	16	5	25	20	6	36	12	144	72
9	81	11	121	99	3	9	3	9	9	3	9	8	64	24
6	36	4	16	24	4	16	6	36	24	6	36	9	81	54
4	16	7	49	28	2	4	3	9	6	5	25	10	100	50
5	25	4	16	20	1	1	1	1	1	5	25	9	81	45

ENGLISH					MATHS					BIOLOGY				
M	M^2	E	E^2	ME	M	M^2	E	E^2	ME	M	M^2	E	E^2	ME
5	25	6	36	30	3	9	5	25	15	5	25	9	81	45
8	64	8	64	64	4	16	8	64	32	8	64	9	81	72
5	25	8	64	40	3	9	6	36	18	5	25	8	64	40
6	36	7	49	42	2	4	5	25	10	4	16	8	64	32
6	36	8	64	48	1	1	2	4	2	2	4	8	64	16
7	49	7	49	49	3	9	3	9	9	3	9	7	49	21
6	36	5	25	30	1	1	2	4	2	3	9	7	49	21
3	9	4	16	12	1	1	2	4	2	2	4	7	49	14
7	49	7	49	49	2	4	2	4	4	1	1	8	64	8
5	25	8	64	40	1	1	2	4	2	1	1	5	25	5
6	36	9	81	54	1	1	2	4	2	1	1	9	81	9
4	16	5	25	20	1	1	2	4	2	1	1	5	25	5
8	64	11	121	88	9	81	12	144	108	7	49	11	121	77
5	25	5	25	25	3	9	3	9	9	6	36	11	121	66
10	100	10	100	100	11	121	12	144	132	12	144	12	144	144
8	64	7	49	56	8	64	12	144	96	11	121	12	144	132
7	49	6	36	42	10	100	12	144	120	10	100	12	144	120
8	64	9	81	72	7	49	10	100	70	9	81	11	121	99
8	64	8	64	64	3	9	7	49	21	10	100	11	121	110
6	36	6	36	36	7	49	8	64	56	10	100	10	100	100
7	49	8	64	56	4	16	6	36	24	10	100	10	100	100
6	36	5	25	30	7	49	11	121	77	8	64	10	100	80
6	36	3	9	18	8	64	11	121	88	11	121	11	121	121
6	36	8	64	48	3	9	4	16	12	9	81	9	81	81
7	49	3	9	21	3	9	3	9	9	9	81	11	121	99
9	81	7	49	63	3	9	4	16	12	7	49	9	81	63
7	49	4	16	28	6	36	9	81	54	7	49	7	49	49
6	36	7	49	42	3	9	6	36	18	9	81	8	64	72
6	36	7	49	42	6	36	12	144	72	9	81	11	121	99

ENGLISH					MATHS					BIOLOGY				
M	M^2	E	E^2	ME	M	M^2	E	E^2	ME	M	M^2	E	E^2	ME
6	36	3	9	18	4	16	4	16	16	8	64	6	36	48
8	64	4	16	32	3	9	6	36	18	8	64	9	81	72
6	36	5	25	30	3	9	5	25	15	7	49	8	64	56
6	36	5	25	30	6	36	7	49	42	9	81	8	64	72
7	49	9	81	63	2	4	2	4	4	5	25	6	36	30
9	81	5	25	45	4	16	5	4	20	8	64	8	64	64
7	49	5	25	35	4	16	6	36	24	7	49	8	64	56
6	36	4	16	24	4	16	5	25	20	2	4	8	64	16
7	49	6	36	42	3	9	3	9	9	8	64	10	100	80
7	49	4	16	28	4	16	8	64	32	3	9	7	49	21
6	36	3	9	18	5	25	7	49	35	6	36	5	25	30
7	49	3	9	21	3	9	2	4	6	9	81	5	25	45
7	49	3	9	21	2	4	3	9	6	7	49	5	25	35
5	25	3	9	15	3	9	3	9	9	6	36	5	25	30
5	25	4	16	20	5	25	8	64	40	7	49	8	64	56
7	49	3	9	21	3	9	3	9	9	6	36	9	81	54
5	25	4	16	20	6	36	8	64	48	8	64	8	64	64
6	36	3	9	18	2		6	36	12	6	36	4	16	24
5	25	4	16	20	4	16	6	36	24	7	49	4	16	28
6	36	5	25	30	2	4	4	16	8	6	36	8	64	48
6	36	5	25	30	2	4	3	9	6	5	25	7	49	35
5	25	4	16	20	3	9	3	9	9	6	36	7	49	42
5	25	3	9	15	1	1	2	4	2	5	25	5	25	25
6	36	3	9	18	1	1	3	9	3	5	25	7	49	35
6	36	2	4	12	1	1	4	16	4	4	16	4	16	16
11	121	12	144	132	11	121	12	144	132	10	100	12	144	120
9	81	9	81	81	9	81	12	144	108	9	81	12	144	108
9	81	10	100	90	12	144	12	144	144	7	49	12	144	84

ENGLISH					MATHS					BIOLOGY				
M	M^2	E	E^2	ME	M	M^2	E	E^2	ME	M	M^2	E	E^2	ME
9	81	8	64	72	8	64	10	100	80	7	49	11	121	77
8	64	10	100	80	6	36	11	121	66	9	81	12	144	108
9	81	8	64	72	6	36	10	100	60	7	49	11	121	77
9	81	9	81	81	9	81	12	144	108	8	64	12	144	96
9	81	8	64	72	7	49	10	100	70	7	49	10	100	70
9	81	9	81	81	6	36	11	121	66	9	81	10	100	90
8	64	7	49	56	11	121	12	144	132	5	25	10	100	50
8	64	8	64	64	10	100	12	144	120	5	25	9	81	45
8	64	7	49	56	9	81	12	144	108	6	36	10	100	60
9	81	10	100	90	5	25	10	100	50	7	49	9	81	63
8	64	8	64	64	5	25	10	100	50	7	49	12	144	84
9	81	9	81	81	7	49	12	144	84	6	36	11	121	66
8	64	10	100	80	5	25	10	100	50	8	64	10	100	80
10	100	10	100	100	5	25	12	144	60	8	64	12	144	96
8	64	8	64	64	5	25	9	81	45	6	36	12	144	72
5	25	8	64	40	8	64	10	100	80	6	36	11	121	66
7	49	9	81	63	3	9	9	81	27	7	49	12	144	84
6	36	6	36	36	11	121	12	144	132	7	49	9	81	63
8	64	8	64	64	9	81	10	100	90	5	25	8	64	40
9	81	9	81	81	4	16	9	81	36	8	64	12	144	96
7	49	8	64	56	9	81	11	121	99	6	36	10	100	60
8	64	9	81	72	8	64	10	100	80	4	16	9	81	36
8	64	9	81	72	1	1	8	64	8	6	36	9	81	54
7	49	8	64	56	7	49	12	144	84	6	36	12	144	72
9	81	8	64	72	3	9	9	81	27	5	25	11	121	55
7	49	8	64	56	5	25	10	100	50	7	49	10	100	70
8	64	11	121	88	4	16	7	49	28	5	25	11	121	55
7	49	9	81	63	3	9	7	49	21	5	25	10	100	50

ENGLISH					MATHS					BIOLOGY				
M	M^2	E	E^2	ME	M	M^2	E	E^2	ME	M	M^2	E	E^2	ME
6	36	6	36	36	2	4	3	9	6	8	64	8	64	64
9	81	7	49	63	7	49	9	81	63	4	16	7	49	28
7	49	10	100	70	1	1	3	9	3	6	36	9	81	54
8	64	9	81	72	3	9	10	100	30	5	25	10	100	50
8	64	7	49	56	3	9	5	25	15	5	25	10	100	50
7	49	8	64	56	4	16	7	49	28	4	16	12	144	48
7	49	8	64	56	5	25	9	81	45	5	25	10	100	50
4	16	8	64	32	8	64	12	144	96	4	16	8	64	32
5	25	4	16	20	3	9	7	49	21	5	25	11	121	55
5	25	4	16	20	3	9	8	64	24	5	25	10	100	50
6	36	7	49	42	6	36	7	49	42	5	25	9	81	45
6	36	7	49	42	3	9	5	25	15	3	9	8	64	24
7	49	6	36	42	3	9	4	16	12	5	25	9	81	45
7	49	5	25	35	4	16	5	25	20	3	9	8	64	24
7	49	8	64	56	4	16	6	36	24	6	36	10	100	60
4	16	7	49	28	4	16	7	49	28	6	36	10	100	60
6	36	7	49	42	3	9	7	49	21	5	25	10	100	50
6	36	4	16	24	3	9	8	64	24	6	36	7	49	42
7	49	8	64	56	6	36	5	25	30	6	36	6	36	36
7	49	7	49	49	2	4	3	9	6	5	25	5	25	25
6	36	7	49	42	1	1	2	4	2	4	16	7	49	28
6	36	7	49	42	1	1	2	4	2	3	9	3	9	9
6	36	7	49	42	6	36	5	25	30	3	9	5	25	15
6	36	6	36	36	6	36	3	9	18	3	9	5	25	15
6	36	5	25	30	1	1	1	1	1	4	16	4	16	16
7	49	5	25	35	1	1	2	4	2	2	4	3	9	6
5	25	7	49	35	2	4	1	1	2	3	9	3	9	9
7	49	6	36	42	1	1	2	4	2	1	1	5	25	5

ENGLISH					MATHS					BIOLOGY				
M	M^2	E	E^2	ME	M	M^2	E	E^2	ME	M	M^2	E	E^2	ME
5	25	6	36	30	3	9	3	9	9	3	9	5	25	15
6	36	6	36	36	4	16	3	9	12	3	9	6	36	18
4	16	5	25	20	1	1	2	4	2	3	9	3	9	9
5	25	3	9	15	1	1	2	4	2	3	9	4	16	12
5	25	7	49	35	1	1	1	1	1	3	9	4	16	12
5	25	8	64	40	1	1	1	1	1	3	9	3	9	9
4	16	4	16	16	1	1	1	1	1	1	1	4	16	4
6	36	5	25	30	3	9	4	16	12	2	4	5	25	10
4	16	4	16	16	3	9	2	4	6	3	9	5	25	15
5	25	4	16	20	1	1	1	1	1	2	4	3	9	6
6	36	3	9	18	1	1	1	1	1	2	4	3	9	6
3	9	4	16	12	1	1	1	1	1	1	1	3	9	3
6	36	7	49	42	1	1	1	1	1	1	1	3	9	3
7	49	9	81	63	1	1	1	1	1	1	1	3	9	3
4	16	5	25	20	1	1	2	4	2	2	4	3	9	6
4	16	5	25	20	1	1	1	1	1	1	1	3	9	3
5	25	3	9	15	1	1	1	1	1	3	9	3	9	9
2	4	3	9	6	1	1	2	4	2	1	1	3	9	3
4	16	3	9	12	1	1	1	1	1	1	1	3	9	3
4	16	6	36	24	1	1	1	1	1	2	4	4	16	8
4	16	3	9	12	1	1	1	1	1	1	1	3	9	3
4	16	3	9	12	1	1	2	4	2	1	1	2	4	2
3	9	3	9	9	2	4	2	4	4	1	1	3	9	3
2	4	5	25	10	2	4	1	1	2	1	1	3	9	3
3	9	3	9	9	1	1	1	1	1	1	1	3	9	3
2	4	2	4	4	1	1	1	1	1	1	1	2	4	2
1	1	3	9	3	1	1	1	1	1	1	1	2	4	2
8	64	8	64	64	2	4	4	16	8	5	25	6	36	30

ENGLISH					MATHS					BIOLOGY				
M	M^2	E	E^2	ME	M	M^2	E	E^2	ME	M	M^2	E	E^2	ME
8	64	7	49	56	2	4	2	4	4	3	9	5	25	15
4	16	7	49	28	4	16	3	9	12	4	16	6	36	24
5	25	5	25	25	2	4	3	9	6	4	16	7	49	28
6	36	6	36	36	2	4	3	9	6	4	16	5	25	20
8	64	7	49	56	6	36	9	81	54	9	81	10	100	90
9	81	9	81	81	5	25	6	36	30	7	49	12	144	84
5	25	8	64	40	11	121	8	64	88	9	81	12	144	108
5	25	6	36	30	7	49	10	100	70	10	100	12	144	120
7	49	9	81	63	6	36	8	64	48	9	81	10	100	90
7	49	6	36	42	6	36	6	36	36	8	64	11	121	88
7	49	8	64	56	5	25	5	25	25	7	49	8	64	56
7	49	8	64	56	7	49	9	81	63	9	81	12	144	108
7	49	7	49	49	8	64	9	81	72	6	36	10	100	60
7	49	8	64	56	6	36	7	49	42	7	49	11	121	77
6	36	8	64	48	7	49	9	81	63	8	64	12	144	96
7	49	9	81	63	7	49	8	64	56	9	81	12	144	108
4	16	8	64	32	7	49	8	64	56	7	49	11	121	77
7	49	8	64	56	7	49	8	64	56	8	64	10	100	80
6	36	9	81	54	4	16	9	81	36	6	36	11	121	66
6	36	9	81	54	5	25	8	64	40	10	100	11	121	110
7	49	7	49	49	4	16	6	36	24	8	64	10	100	80
7	49	8	64	56	7	49	11	121	77	7	49	11	121	77
7	49	8	64	56	5	25	6	36	30	6	36	10	100	60
6	36	8	64	48	8	64	10	100	80	8	64	10	100	80
6	36	7	49	42	6	36	7	49	42	8	64	10	100	80
7	49	8	64	56	5	25	8	64	40	7	49	10	100	70
10	100	8	64	80	1	1	5	25	5	8	64	12	144	96
7	49	9	81	63	5	25	8	64	40	6	36	10	100	60

ENGLISH					MATHS					BIOLOGY				
M	M^2	E	E^2	ME	M	M^2	E	E^2	ME	M	M^2	E	E^2	ME
7	49	6	36	42	3	9	4	16	12	7	49	8	64	56
7	49	7	49	49	3	9	5	25	15	9	81	12	144	108
6	36	7	49	42	9	81	9	81	81	8	64	10	100	80
4	16	6	36	24	4	16	5	25	20	5	25	9	81	45
5	25	6	36	30	8	64	9	81	72	7	49	10	100	70
8	64	9	81	72	3	9	8	64	24	4	16	8	64	32
6	36	7	49	42	5	25	6	36	30	6	36	10	100	60
7	49	4	16	28	3	9	3	9	9	6	36	8	64	48
5	25	7	49	35	6	36	8	64	48	6	36	11	121	66
6	36	7	49	42	6	36	7	49	42	6	36	10	100	60
5	25	3	9	15	5	25	7	49	35	7	49	12	144	84
5	25	3	9	15	4	16	8	64	32	6	36	7	49	42
7	49	6	36	42	4	16	3	9	12	7	49	5	25	35
7	49	8	64	56	1	1	2	4	2	6	36	9	81	54
7	49	8	64	56	1	1	2	4	2	6	36	10	100	60
7	49	6	36	42	4	16	4	16	16	4	16	6	36	24
9	81	8	64	72	1	1	2	4	2	6	36	9	81	54
6	36	3	9	18	2	4	1	1	2	4	16	7	49	28
8	64	8	64	64	1	1	2	4	2	6	36	9	81	54
6	36	7	49	42	3	9	5	25	15	5	25	7	49	35
5	25	7	49	35	5	25	5	25	25	5	25	5	25	25
4	16	3	9	12	1	1	2	4	2	3	9	5	25	15
4	16	5	25	20	1	1	2	4	2	1	1	5	25	5
5	25	4	16	20	1	1	2	4	2	1	1	5	25	5
5	25	7	49	35	1	1	1	1	1	1	1	7	49	7
5	25	6	36	30	3	9	4	16	12	3	9	9	81	27
6	36	5	25	30	1	1	2	4	2	3	9	7	49	21
6	36	6	36	36	3	9	4	16	12	4	16	8	64	32

ENGLISH					MATHS					BIOLOGY				
M	M^2	E	E^2	ME	M	M^2	E	E^2	ME	M	M^2	E	E^2	ME
5	25	3	9	15	1	1	4	16	4	3	9	8	64	24
5	25	6	36	30	1	1	1	1	1	2	4	6	36	12
7	49	5	25	35	2	4	3	9	6	6	36	9	81	54
6	36	7	49	42	1	1	2	4	2	3	9	7	49	21
6	36	5	25	30	3	9	6	36	18	6	36	9	81	54
7	49	7	49	49	2	4	3	9	6	4	16	9	81	36
5	25	6	36	30	5	25	7	49	35	6	36	9	81	54
1	1	2	4	2	1	1	2	4	2	1	1	5	25	5
3	9	3	9	9	1	1	4	16	4	1	1	5	25	5
4	16	6	36	24	5	25	8	64	40	1	1	9	81	9
6	36	3	9	18	2	4	5	25	10	1	1	6	36	6
4	16	3	9	12	1	1	2	4	2	4	16	4	16	16
4	16	5	25	20	1	1	4	16	4	1	1	7	49	7
5	25	7	49	35	1	1	3	9	3	2	4	9	81	18
5	25	5	25	25	1	1	2	4	2	1	1	6	36	6
6	36	4	16	24	3	9	6	36	18	1	1	5	25	5
$\Sigma M=$	$\Sigma M^2=$	$\Sigma E=$	$\Sigma E^2=$	$\Sigma ME=$	$\Sigma M=$	$\Sigma M^2=$	$\Sigma E=$	$\Sigma E^2=$	$\Sigma ME=$	$\Sigma M=$	$\Sigma M^2=$	$\Sigma E=$	$\Sigma E^2=$	$\Sigma ME=$
1523	10413	1536	10964	10347	921	5123	1344	10227	6947	1306	8834	1959	17955	12017