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Full Length Research Paper

Influence of attitude on performance of students in mathematics curriculum

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Mathematics is one of the core subjects in secondary school curriculum. Performance in the subject is crucial for students' admission to scientific and technological professions. However, there has been persistent poor performance in this subject particularly in Kisumu East District as revealed by the Kenya Certificate of Secondary Education examination results for the years 2006 to 2008 with mean scores of 3.2282, 3.3691 and 4.0660 respectively. This may deny students access to the competitive professions. Factors contributing to this poor performance have not been exhaustively studied. The purpose of this study was to examine students' attitude towards mathematics across gender with specific reference to objectives, content, methods and evaluation of mathematics curriculum. The study was conducted in public secondary schools in Kisumu East District and employed correlation design in which the dependent variable was performance and independent variable was attitude. The study sample was 986 Form 4 students, representing 33% of the population. Data collection instruments were Students Questionnaire (SQ) and Mathematics Test (MT). Quantitative data was analyzed using descriptive and inferential statistics. Pearson Product Moment Correlation Coefficient was used to determine the strength and direction of the relationship. The findings established that both girls and boys showed a neutral attitude towards Mathematics curriculum. Based on the results it is advisable that students' attitude be enhanced as this will translate into improved academic achievement in the subject.

Keywords: Students' attitude, mathematics curriculum, performance, Form 4 students

INTRODUCTION

There is widespread interest in improving the level of mathematics performance in schools. Apart from the economic benefits of better preparing young people for the numeracy demands of modern work place and raising the overall skill levels of the work force, there are also social benefits tied to improving access for larger numbers of young people to post- school education and training opportunities and laying stronger foundation to skills for lifelong learning. The interest in raising levels of performance has led to a focus on identifying the range of factors that shape performance as well as understanding how these factors operate to limit or enhance the performance of students by gender.

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In Kenya, while a small proportion of secondary schools continue to offer satisfying well- rounded education programmes, the majority of schools fall short of providing for the learning needs of their students. Poor academic performance in key subjects in the curriculum like Mathematics and Science at the Kenya Certificate of Secondary Education (KCSE) examinations has not been satisfactory for quite a long time (Republic of Kenya, 1999). Several reasons have been given to account for these variations in performance in mathematics. Some authors like Dugger (2004) attribute it to unfair distribution of qualified teachers in the country; while Odhiambo (2000) states that the root cause of poor performance in Mathematics is that mathematics teachers are poorly prepared. Siringi (2010) also reported that performance in key curriculum subjects like Mathematics and Sciences at KCSE examinations has not been satisfactory for quite a

Table 1: Kisumu East District KCSE Mathematics Mean score by year

Year	Mean Score
2006	3.2282
2007	3.3691
2008	4.0660

long time. The Third International Mathematics and Science Study (TIMSS) in Australia showed that students' background variables influence differences in achievement in Mathematics. Classroom and school variables also contributed to performance substantially (Lamb & Fullerton, 2000). These findings imply that several factors contribute to performance in Mathematics than have been identified. In Kenya, Mathematics is a compulsory subject in both primary and secondary curricula. The general objectives of secondary school Mathematics as outlined by the Kenya Institute of Education (2002) are to enable the students to:

1. develop a positive attitude towards learning Mathematics
2. perform mathematical operations and manipulations with confidence, speed and accuracy
3. think and reason precisely, logically and critically in any given situation
4. develop investigative skills in Mathematics
5. identify, concretise, symbolise and use Mathematical relationships in everyday life
6. comprehend, analyse, synthesise, evaluate and make generalisation so as to solve mathematical problems
7. collect, organise, represent, analyse, interpret data and make conclusions and predictions from its results
8. apply mathematical knowledge and skills to familiar and unfamiliar situations
9. appreciate the role, value and use of mathematics in society
10. develop a willingness to work collaboratively
11. acquire knowledge and skills for further education and training
12. communicate mathematical ideas

While the objectives are clearly stated and need to be achieved at the end of the four years course, the reality is that performance in Mathematics is dismal with an average score of below 25 per cent in KCSE examination (Ayodo, 2009).

According to Ramari (2004), performance in Mathematics has been generally poor. Njoroge (2004) also decries the poor performance in Mathematics despite the fact that it is one of the key subjects expected to turn Kenya into an industrialized country by the year 2030. The same trend has been noted in Kisumu East District over the last three years as depicted in the KCSE results of 2006 with a mean score of 3.2282, while in 2007 it had a mean score of 3.3691 and in 2008 it had a mean score of 4.0660 showing some slight improvement though still below average (D.E.O. Kisumu East District, 2009). The analysed results are given in Table 1.

Given the persistent poor performance, it was important to establish factors contributing to this. Of particular interest to the study was the influence of students' attitude towards mathematics with specific reference to content, objectives, methods and evaluation of Mathematics curriculum in Public Secondary Schools in Kisumu East District.

Students' attitude towards Mathematics and mathematics learning and their implications for mathematics instruction have long been a common interest among mathematics educators. Attitude towards mathematics has been considered an important factor in influencing participation and success in mathematics. Weidmann and Humphrey (2002) state that investigation into student mathematics attitude and perspective not only informs teachers, parents, and administrators about students needs, but also serves as a catalyst for reform in mathematics education. There is research evidence showing that students' high performance in mathematics is not necessarily positively associated with their attitudes about mathematics and mathematics learning. Results of Third International Mathematics and Science Study (TIMSS) revealed that while Japanese students outperformed students from many other countries in mathematics, they displayed relatively negative attitudes towards mathematics (Mullis, 2000). The reported gender difference in attitude towards Mathematics influenced some researchers to study some affective variables as mediators of gender differences in Mathematics achievement (Casey et al, 2001). However, little consensus existed among researchers regarding the influence of affective variables on gender and mathematics achievement. Some studies reported statistically significant effects of affective variables on the learning of Mathematics (Casey et al, 2001; Ho et al 2001, Ma and Kishor, 1997), while others indicated no relationship between attitude variables and Mathematics achievement (Papanastasious, 2000). Even among those studies that found a significant relationship, there was still a controversy regarding the educational implications of the results. For example, some researchers concluded that although statistically significant, the mean effect size for the relationship between attitude towards mathematics and achievement in Mathematics was not strong enough to have useful implications for educational practice (Ma and Kishor, 1997). One explanation for inconsistent findings regarding the relationship between attitude and Mathematics achievement was that such a relationship existed only with respect to particular Mathematics content areas (Casey et al,1997; Ma, 1997) and for specific affective variables (Ho et al, 2000). Studies have shown that factors such as motivation and attitude have impacted students' achievement (Cote and Levine, 2000; Singh, Granville and Dika, 2002). Tymm

(2001) investigated 21,000 students attitude towards math and suggested that the most important factors were the teacher and students' academic level, while age, gender and language were weakly associated with attitudes. Webster and Fisher (2000) study revealed that rural and urban students' attitude in math and career aspiration positively affected their performance. Altermat and colleagues (2002) found that students' attitude changes could be predicted and influenced by types of classmates. The student's attitude towards an academics subject is crucial factor in learning and achievement in that subject. Whether a student views himself or herself as a strong or weak person in a specific subject may be an important factor in his or her academic achievement. Papanastasiou (2002) showed that there is a positive relation between Mathematics and math achievement. According to Schreiber (2002), those who have positive attitudes towards Mathematics have a better performance in the subject.In Kenya, studies done by Auma (2004) and Achieng (2007) looked at the relationship between teacher factors and student Mathematics achievement as factors affecting mathematics performance but did not consider students attitude. However this study focuses on student's attitude towards Mathematics with specific reference to objectives, content, methods and evaluation of the Mathematics curriculum and establish their influence on Mathematics performance.

Therefore the Specific objectives of the study were:

1. To determine students' performance in Mathematics across gender.
2. To establish students' attitude towards Mathematics across gender, with reference to:
   i. Objectives
   ii. Content
   iii. Methods
   iv. Evaluation
3. Determine the level of relationship between attitudes towards Mathematics and performance in Mathematics.

RESEARCH METHODOLOGY

Venue and sample

The study was carried out in Kisumu East District in Kenya. The total number of Form four students was 2960 out of which 986 (33.3%) was selected by simple random sampling and stratified random sampling technique was applied to draw the sample from provincial and district schools. This comprised of 493 female students and 493 male students.

Data collection instruments

Two tools were used. These were Mathematics Test (MT) and a questionnaire for students. The MT had paper one and paper two. The MT is attached as Appendix B. The Student Questionnaire (SQ) had open ended questions and a five point Likert scale developed by the researcher which was used to establish students' attitude towards mathematics curriculum. The SQ is attached as Appendix A. Students were expected to indicate their level of agreement with various statements which were constructed based on the four Mathematics curriculum elements namely objectives, content, methods and evaluation procedures. Students' level of agreement ranged from Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D), and Strongly Disagree (SD). The MT was used to measure students' performance in mathematics across gender which was drawn from the secondary school syllabus and it covered work from form 1 to form 3. This was so because students had not covered work for the whole secondary syllabus by the time the researcher was administering the joint test though they had covered what was sufficient to be tested on achievement.

Validity and Reliability of the Instruments

The content validity of the MT was established by use of Table of specification after which three experts in the field of study in Maseno University were used to ascertain the face and content validity of MT and SQ. Kothari (2004) notes that validity is the extent to which a measuring instrument provides adequate coverage of the topic under study, if the measurements contain a representative sample, then content validity is good. Also a panel of persons can judge how well the measuring instrument meets the standard. The suggestions made by the experts were used to revise the instruments before collecting data. For SQ on attitude, Borg, Gall & Gall (2007) recommend Alpha formula for rating scales. The results for MT and SQ were established through test retest and application of Pearson Product Moment correlation coefficient reliability which yielded a correlation coefficient of 0.71, and 0.73 respectively. Mugenda and Mugenda (2003) recommend for a 0.7 and above threshold. The pilot study involved 5 schools (not part of the study sample) representing 10% of the total number of schools in Kisumu East District.

Data Collection

The researcher sought for a research permit and a research authorization letter from the Ministry of Higher Education, National Council for Science and Technology in Nairobi before embarking on data collection process as dictated by ethics. The instruments were administered through personal visits on appointment with heads of mathematics departments in schools through the schools'

Table 2: Distribution of Mathematics grades in MT by gender

	Girls		Boys	
Mathematics grade	**Frequency**	**Percentage**	**Frequency**	**Percentage**
A	10	2.03	10	2.03
A-	8	1.62	11	2.23
B+	20	4.06	18	3.65
B	24	4.87	26	5.27
B-	19	3.85	20	4.06
C+	44	8.93	39	7.91
C	16	3.25	21	4.26
C-	32	6.49	32	6.49
D+	21	4.26	22	4.46
D	42	8.52	63	12.78
D-	69	14.00	72	14.60
E	188	38.13	159	32.25
Total	**493**	**100**	**493**	**100**

Mean score for girls: 33.64, SD=18.24, Mean grade score-3.20, Mean grade- D plain
Mean score for boys: 35.08, SD=19.31, Mean grade score- 3.86, Mean grade- D+
Overall mean score-34.86, SD= 18.79, Mean grade score- 3.86, Mean grade- D+

principals. The MT was administered in the presence of the researcher after agreeing on the dates. While the questionnaires were administered a day after MT was done. The researcher took time to explain any issues arising from the questionnaires.

Data Analysis Procedures

The results from MT and filled questionnaires by students' provided data which was scrutinized and then coded for computer data analysis. Original data on mathematics performance was first worked out as percentage and in form of grades i.e. A, A-, B+, B, B-, C+, C, C-,D+, D, D-, and E (Table 2). The highest grade was A while the lowest grade was E. These grades were coded into their numerical equivalents i.e. 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, and 1 respectively from A to E. While the percentage of each grade was as follows: A; 75 and above, A-; (70-74), B+; (65-69), B; (60-64), B- ;(55-59), C+ ;(50-54), C ;(45-49), C- ;(40-44), D+ ;(35-39), D; (30-34), D- ;(25-29), E; (0-24). Analysis of data concerning students' attitude on secondary school mathematics curriculum was done by calculating mean scores on the attitude scale. To achieve this, numerical scores were assigned to five response options given to each item on the attitude scale. For positively stated items the score values were assigned as follows: Strongly Agree (SA) -5; Agree (A) – 4; Undecided (U) – 3; Disagree (D) - 2; Strongly Disagree (SD) – 1. However for negatively stated items, the scoring was reversed as follows, Strongly Disagree (SD) – 5; Disagree (D) – 4; Undecided (U) – 3; Agree (A) – 2; and Strongly Agree (SA) – 1. The data was keyed into SPSS data editor for analyses. Arithmetic mean was done for every element on the Likert scale, thereafter; an average of the arithmetic means of the four elements on the Likert scale was done. In the interpretation of the scores, a value between 2.5 and 3.4 meant a neutral attitude; on the other hand, a value between 3.5 and 5.0 meant a positive attitude while a value between 2.4 and 1.0 meant a negative attitude. Therefore data on attitude was analyzed by using frequencies, means and percentages. Qualitative data was analyzed using responses to the open ended items in the questionnaire which were organized and reported in emergent themes. The data was presented in terms of tables. A one-way (ANOVA) Analysis of Variance; test was used to determine whether gender caused a variation in performance at 95% confidence interval..

RESULTS AND DISCUSSION

Students Performance in Mathematics Test across gender

The result to performance of students in Mathematics Test across gender was as shown in Table 3.

The finding of the study on performance was as follows: The girls had a mean percentage of 33.64 (SD=18.24) with a mean score of 3.20 corresponding to a mean grade of D plain while boys had a mean percentage of 35.08 (SD=19.31) with a mean score of 3.86 corresponding to a mean grade of D+. Overall performance of the students' was a mean percentage of 34.36 (SD=18.79) with a mean score of 3.80 corresponding to a mean grade of D+. This high drop in performance may have been as a result of the negative / neutral attitude displayed by the students in regard to methods and evaluation which are two out of the four elements of Mathematics curriculum. According to Odhiambo (2000), the cause of poor performance in

Table 3: Mean Students' performance in Mathematics in secondary schools across gender

Gender of students	Mean percentage	Standard deviation	Mean score	Mean grade score	N
Female	33.64	18.24	3.20	D	493
Male	35.08	19.31	3.86	D+	493
All students	34.36	18.79	3.80	D+	986

Table 4: Attitude of girls and boys towards the elements of Mathematics curriculum

	Girls		Boys	
Elements	**Mean scores**	**Attitude**	**Mean scores**	**Attitude**
Objectives	3.8	Positive	3.8	Positive
Content	2.7	Neutral	3.5	Positive
Methods	2.3	Negative	2.8	Neutral
Evaluation	2.4	Negative	2.7	Neutral
Overall	**2.8**	**Neutral**	**3.2**	**Neutral**

mathematics is as a result of mathematics teachers who make the subject appear abstract that learners cannot relate to learning. The teachers approach to mathematics content may also have affected the performance in MT.

Students' Attitude towards Mathematics Curriculum across Gender

Students' attitude towards mathematics was done with specific reference to the four elements of Mathematics curriculum namely: Objectives, Content, Methods and Evaluation. On objectives both girls and boys had a mean score of 3.8 displaying a positive attitude. On content, girls had a mean score of 2.7 displaying a neutral attitude while boys had a mean score of 3.5 displaying a positive attitude. On methods girls had a mean score of 2.3 displaying a negative attitude while boys had a mean score of 2.8 displaying a neutral attitude. Finally on evaluation, girls had a mean score of 2.4 displaying a negative attitude while boys had a mean score of 2.7 displaying a neutral attitude. In general, girls attitude towards Mathematics have a mean score of 2.8 displaying a neutral attitude while boys had a mean score of 3.2 displaying the same neutral attitude towards Mathematics curriculum. This finding shows that students attitude towards the elements of Mathematics curriculum may have affected performance at MT. The analysis of students attitude is given in Table 4.

The overall attitude of students towards Mathematics is neutral. A study done by Webster and Fisher (2000) revealed that rural and urban students' attitude in Mathematics positively affects their performance. It may be concluded from this study that the students' attitude affected their performance.

Relationship between Gender and Performance in Mathematics

In this study, ANOVA test was done to determine whether gender has an effect on performance in Mathematics as shown in Table 5.

The p-value was 0.2278 which is greater than 0.05 indicating that gender does not affect variation in Mathematics Test.

Relationship between performance and Attitude

The objective of this study was to determine the relationship between attitude towards mathematics and performance in Mathematics Test across gender. To achieve this, first the researcher correlated two variables namely students' attitude towards Mathematics with specific reference to the four elements of Mathematics curriculum namely: Objectives, Content, Methods, and Evaluation with performance in Mathematics Test. Pearson product Moment Correlation was used to establish the strength and direction of the relationship that existed between the two variables. It gave rise to the following correlation matrices between students' attitude towards Mathematics curriculum and performance in Mathematics. Table 6 and 7 shows the correlation matrices for girls and boys respectively. The correlation analysis for girls was X_{11}, r = .651; X_{12}, r = .685; X_{13}, r = .670; X_{13}, r = .667. While for boys the correlation analysis was X_{21}, r = .796; X_{22}, r = 794; X_{23}; r= 778; X_{24}, r = .773.

Table 5: ANOVA Summary table for the effect on performance in mathematics

Source	SS	df	MS	F	p -value
Model	514.141988	1	514.141988	1.46	0.2278
Residual	347379.323	984	353.027767		
Total	347893.465	985	353.191335		

Table 6: Correlation Coefficients N =493

	Y_1	X_{11}	X_{12}	X_{13}	X_{14}
Y_1 Pearson Correlation	1.000				
X_{11} Pearson Correlation	.651**	1.000		.	
X_{12} Pearson Correlation	.685**	.885**	1.000		
X_{13} Pearson Correlation	.670**	.781**	.986**	1.000	
X_{14} Pearson Correlation	.667**	.677**	.791**	.886**	1.000

** Correlation is significant at the 0.01 level (2-tailed).
X_{11} is Objectives, X_{12} is Content, X_{13} is Methods, x_{14} is Evaluation

Table 7: Correlation Coefficients N=493

		Y_2	X_{21}	X_{22}	X_{23}	X_{24}
Y_2	Pearson Correlation	1.000				
X_{21}	Pearson Correlation	.796**	1.000			
X_{22}	Pearson Correlation	.794**	.982**	1.000		.
X_{23}	Pearson Correlation	.778**	.985**	.989**	1.000	
X_{24}	Pearson Correlation	.733**	.980**	.988**	.987**	1.000

** Correlation is significant at the 0.01 level (2- tailed).
X_{21} is Objectives, X_{22} is Content, X_{23} is Methods, X_{24} is Evaluation

Correlation between dependent variable (MT) and independent variable (Attitude)

Correlation matrix for girls (Table 6)

Correlation between dependent variable (MT) and independent variable (Attitude)

Correlation matrix for boys (Table 7)

It is worth noting that all the independent variables both for girls and boys had significant association with dependent variable. When regression statistics was run to determine the relationship between performance and attitude, the analysis of variance gave a p-value of 0.000 indicating that attitude for both girls and boys had a significant effect on performance which was the dependent variable. This finding is in line with the findings of Casey et al, 2001; Ho et al 2001, Ma and Kishor, 1997 which reported statistically significant effects of affective variables on the learning of Mathematics. The difference in performance between boys and girls is in line with what was cited by Menya, the coordinator of Global Leadership Interlink (Ayodo, 2009).

CONCLUSION

Mathematics Test (MT) was administered to 986 Form 4 students in Kisumu East District, Kenya to establish students' attitude towards mathematics. The study established that boys performed slightly higher in MT as compared to the girls. Boys registered a mean percentage of 35.08 while girls had a mean percentage of 33.64. The attitude of both girls and boys towards Mathematics curriculum was analyzed using the four elements of Mathematics curriculum namely Objectives, Content, Methods and Evaluation. Girls and boys were positive towards objectives, on content, girls were neutral while boys were positive, on methods used in teaching, girls were negative while boys were neutral, finally on

evaluation, girls were negative while boys were neutral. The mean scores of the four elements of Mathematics curriculum for both girls and boys was 2.8 and 3.2 respectively showing a neutral attitude for all the students.

IMPLICATION

This variation notwithstanding; the overall performance in mathematics in Kisumu East district at a mean percentage of 34.06 is considered as below average and was rated as poor performance. This result is quite dismal hence wanting.

If students could participate in activities related to Mathematics like technology which they depend on such as the internet, play stations, Face Book, Twitter and Google this might help to keep them interested in the fields of Mathematics which might change their attitude to being positive hence improve on Mathematics performance.

RECOMMENDATIONS

Based on the above conclusions, the study recommends that:

i) The teachers of mathematics should make mathematics concepts to be practical to help improve on understanding of the subject hence improve on performance.

ii)Constant practice in mathematics on the side of students and meaningful revision organized by teachers should be enhanced.

iii) There is need to ensure that students attitude is enhanced which in turn will improve their performance in Mathematics.

iv) The same study should be carried out in other districts using Form 4 results from Kenya National Examination Council to establish the findings of the present study which used researcher made test.

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APPENDIX A: STUDENTS' QUESTIONNAIRE

The purpose of the study for which the questionnaire is designed is to examine your attitude towards the four elements of mathematics curriculum in relation to your performance in Mathematics. All the responses and information you give will be treated with confidentiality and only used for analytical purposes of this study. Please give your views by filling in the blank spaces or putting a tick in the appropriate corresponding space. Please be honest.

SECTION A: GENERAL INFORMATION

Name of your school ……
K.C.S.E Examination index number ……..
Sex: Female [ ] Male [ ]

1. Which two topics do you like and which two topics do you hate in the secondary mathematics curriculum?
   Like: (I)……
   (ii)……
   Hate: (i) ……
   (II) ……..
2. Do you like the methods used in teaching mathematics by your teacher ?
   A. Yes ( )
   B. No ( )
   Give reasons for your answer.
   ……

SECTION B: A SCALE FOR MEASURING ATTITUDE.

Below is a list of 40 items. You will find that you agree with some statements and disagree with others. Under each statement, five possible options are provided. Of the five options offered, select the one which represents your true feelings about Mathematics as a subject in the secondary school curriculum. If you agree strongly with a statement place a tick (√) against STRONGLY AGREE (SA); if you only agree slightly, place a tick against AGREE (A). For a statement you disagree with completely tick against STRONGLY DISAGREE (SD), and for an item you disagree with only slightly, tick against DISAGREE (D). There may be items for which you are not sure. In that case tick against UNDECIDED (U).

	Statement	Responses				
		SA	A	U	D	SD
	Example: The time allocated for Mathematics should be increased	√				
1.	For students to pass Mathematics, they should develop a positive attitude towards the subject.					
2.	Mathematics involves performing mathematical operations with confidence, speed and accuracy.					
3.	Mathematics has greater application to life outside classroom than other subjects.					
4.	I know I should be able to acquire knowledge and skills in mathematics for further education and training.					
5.	I know I should be able to utilize mathematical skills to enable me play a positive role in the development of a modern society.					
6.	Learning Mathematics will enable me to be accurate in doing accounts in future.					
7.	Passing Mathematics will enable me get a job in the Bank.					
8.	Learning Mathematics will enable me to identify, symbolize and use mathematical relationships in everyday life.					
9.	Learning Mathematics will enable me to communicate mathematical ideas.					

APPENDIX A cont

10.	Learning Mathematics will enable me to be numerate and orderly in thought.
11.	Mathematics syllabus is too wide to be covered effectively.
12.	Mathematics is the greatest nightmare for students in our school.
13.	Mathematics should be allocated more time in school.
14.	It does not make any difference to the students whether they are taught Mathematics or not.
15.	Learning commercial arithmetic is the most important topic to Form 4 students.
16.	Understanding Mathematics does not necessarily require practice.
17.	It is easier to understand Mathematics than any other subject.
18.	Content set for the students should only relate to needs of the present but not abstract.
19.	Some of the topics in Mathematics should not be taught because they are not applicable anywhere after leaving school.
20.	Because of the difficulty of some topics in Mathematics it should be selected right from Form 1.
21.	Group work as a teaching/learning activity is not necessary for the caliber of students in our school since it is time consuming.
22.	Sometimes the Mathematics teacher invites a guest teacher to handle some of the topics students do not understand.
23.	Use of activity methods as well as project work makes Mathematics enjoyable.
24.	It is not possible to teach all topics in Mathematics using the same method.
25.	Too many projects are given to us in Mathematics.
26.	I do not like working in a group to solve Mathematics problems because later some lazy students earn marks for nothing.
27.	We have all the learning materials and equipment we need in Mathematics lesson.
28.	Improvisation of teaching aids in Mathematics cannot be done because the teachers have a lot of work.
29.	Mathematics cannot be learnt without the use calculators.
30.	Peer teaching succeeds only with bright students.
31.	Continuous Assessment Tests should count forward to the student final grade.
32.	Emphasis on examination should not be done at the expense of students understanding of content in Mathematics.
33.	Mathematics should not be examined nationally.
34.	To enable faster syllabus coverage in Mathematics short tests should be done away with.
35.	The joint examination in Mathematics is a predictor of the students' final score in KCSE.
36.	Form 4 school leavers are unable to secure employment mainly because of the marks they get in KCSE examination.
37.	The Mathematics Paper 2 done in KCSE examination has most difficult questions and therefore should be made simpler to enable students perform in Mathematics.
38.	I have discovered that marks awarded to me by the Mathematics teacher in the CATs and end term exams are very useful.
39.	Mathematics is a practical subject which should be tested regularly.
40.	I am aware that not many good courses are available to form 4 leavers without performing well in Mathematics therefore I should work hard in the subject.

APPENDIX B: MATHEMATICS TEST

MATHEMATICS TEST PAPER 1
SECTION I (50MARKS) **TIME: 2 ½ HRS**
Answer all questions from this section

1. Evaluate (3mks)

$$\frac{32 - 4 \div 6 \text{ of } 9 \times 27 - 16}{8 + 5 \div 3 \text{ of } 4 - 6}$$

2. Evaluate without calculators or mathematical tables (3mks)

$$\frac{0.72 \times 0.068}{0.34 \times 0.000018}$$

3. 3 pens and 7 exercise books costs Sh. 185. 4 pens and 5 exercise books cost Sh. 160. Find the cost of each pen and each exercise book (3mks)

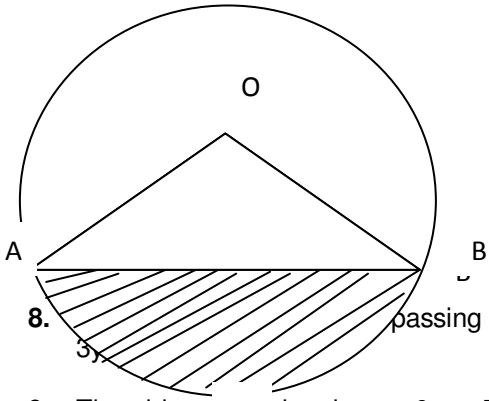
4. The volumes of two similar figures are $960cm^3$ and $120cm^3$ respectively. The surface area of the smaller one is $25cm^2$. Find the surface area of the larger one (3mks)

5. Solve without calculators or mathematical tables (3mks)

$$27^{x+2} = \frac{1}{81}$$

6. Simplify $\frac{6x^2 + 7xy + 2y^2}{4x^2 - y^2}$ (3mks)

7. In the figure below O is the circle centre of radius 10cm. Angle AOB is 105^o. Find the area of the shaded segment ACB (3mks)



8. passing through (3, -2) and is perpendicular to the line 3y (4mks)

9. The sides C riangle are 6cm, 7cm and 9cm. The triangle is a uniform cross-section of a prism of length 24cm. Fin C volume of the prism (3mks)

10. Solve Sin (3x + 10) – Cos (2x – 30) = 0 (2mks)

11. Find all the integral values of x for which (4mks)

$$2x - 3 \leq x + 4 < 4x + 7$$

12. The interior angle of a regular polygon is 11 times the exterior angle. Find the sum of all interior angles of the polygon. (3mks)

13. The exchange rates on a given day in a bank were as follows:

APPENDIX B Cont.

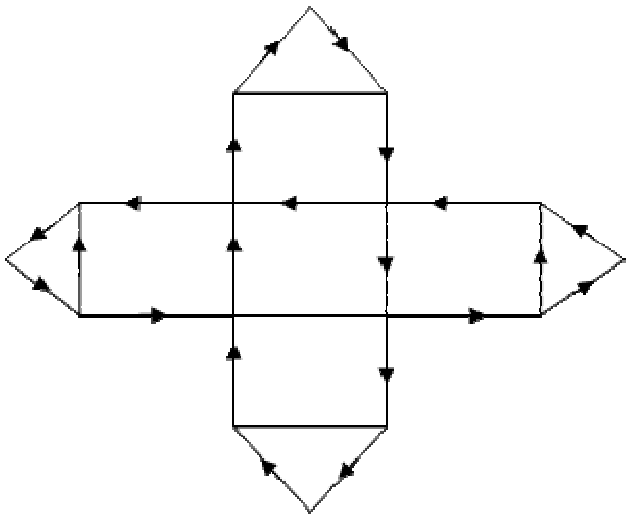
	Buying	Selling
1 Sterling Pound	Kshs. 132	Kshs. 134
1 US Dollar	Kshs. 78	Kshs. 79

Joseph arrived in Kenya with 4,230 Sterling Pounds. He converted the amount into Kenya Shillings in the bank, the above rates shown. He spent Kshs. 224,190 and was left with the remaining amount which he changed into US Dollars. Determine the amount he had in US Dollars
(4mks)

14. The marked price of an item is Kshs. 10,400. The dealer gave a discount of 70% and still made a profit of 30% above the cost price. Determine the cost price (3mks)

15. Using a ruler and a pair of compasses. Construct a line AB such that AB = 8cm. Divide the line proportionally into eight equal parts using a set square and a ruler ,on the line, locate point P such that AP = $^{3}/_{8}$ AB
(3mks)

16. Draw the figure represented by the solid net below clearly indicate the paths drawn on the figure
(3mks)



SECTION II (50MKS) Answer any FIVE questions

17. John got a commission of 12% for sales above Kshs. 150,000 and a salary of Kshs. 25,000 per month for all sales made

a) During the month of June he made sales worth Kshs. 290,000. Determine:
   i. His total commission (2mks)

   ii. His total earnings (1mk)

b) During the month of July, his total earnings was Kshs. 61,000. Determine:
   i. His total sales during the month of July (2mks)

APPENDIX B Cont

ii. The percentage increase in his sales in the month of July (2mks)

c) If his sales increased by 20% in the month of August, determine his total earnings in the month of August (3mks)

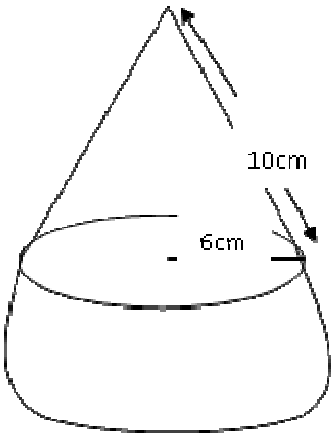
18. Vectors of A and B from the origin O Is given as OA =
The displacement vector BC = $\begin{pmatrix} 3 \\ 5 \end{pmatrix}$ and AD = $\begin{pmatrix} 5 \\ 11 \end{pmatrix}$

a) Write down the displacement vectors CD (5mks)

b) Find the modulus of AD (2mks)

c) If vector AE + 3AC – 2BD = 4BC. Find the modulus of OE (3mks)

19. The figure below is partly an hemisphere and partly a cone with dimensions as shown below



Determine

a) The curved surface area of the solid (4mks)
b) The volume of the solid (4mks)
c) Find the mass of the solid if its density is 4.2g / cm^3 (2mks)

20. The table below shows the marks scored by students in a mathematics test

Marks	0 – 9	10 - 29	30 - 69	70 – 99
No. of candidates	8	12	16	24

a) State the class in which the median student lies (2mks)
b) Estimate the median (2mks)

c) Calculate the mean (3mks)

d) Draw a histogram to represent the information. Take the height of class 10 – 29 to be 6 (3mks)

21. The vertices of triangle ABC are A (3, 1) B(-1, 0) and C(1, 3).
a)Draw ABC and $A^1B^1C^1$ on the same axes if $A^1B^1C^1$is the image of ABC under reflection on the line y + x = 0 (4mks)

APPENDIX B Cont

b) $A^2B^2C^2$ is the image of $A^1B^1C^1$ under enlargement of l.s.f 2 and centre (1, 2).State the coordinates of $A^2B^2C^2$.Draw the triangle $A^2B^2C^2$ (3mks)

c) $A^3B^3C^3$ is the image of $A^1B^1C^1$ under rotation of 90^o about (-2, 1). Draw $A^1B^1C^1$ hence state the coordinates of the vertices of $A^1B^1C^1$ (3mks)

22. B is 137^o from A. AB = 96km. C is 84Km on the bearing of 223^o from B. D is 70km in the direction of N38W of C. Using 1cm to represent 20km.

a. Determine the positions of towns A, B, C and D (4mks)

b. Find the bearing of (3mks)
   i. A from D
   ii. B from D
   iii. A from c.

c. Find the distance (3mks)
   i. AD
   ii. AC
   iii. BD

23. Two buses A and B move in the opposite direction from two towns. A moves from Mombasa at 7.30am towards Nairobi at 80km/hr. B left Nairobi at 8.30am moving towards Mombasa at an average speed of 90km/hr. Determine

a. The time of their meeting (6mks)

b. Find the distance of Mombasa from their meeting point (2mks)

c. Find the distance between the two buses 30 minutes after meeting (2mks)

24. A bus has a capacity of X people. The cost of hiring the bus is Kshs. 300,000. Every person going for a tour is expected to pay equal amount of fare. If an institution hires the vehicle and the number of passengers is 10 less than the capacity, then each person will have to pay Kshs. 1,500 more to meet the cost of hiring the bus.

a. Determine the amount to be paid by each person in each case in terms of x (2mks)

b. From a quadratic equation involving X hence find the value of x (6mks)

c. Find the amount paid by each person from the institution (1mk)

d. Find the capacity of the bus (1mk)

MATHEMATICS TEST PAPER 2

SECTION 1: 50 MARKS **TIME: 2 ½ HRS**

Answer all questions in this section.

1. Use logarithm to evaluate. (4mks)

$$\left(\frac{0.3245}{63.34 \log 82.79}\right)^{1/5}$$

2. Three tapes A, B and C takes 60mins, 75mins and 90mins to fill a tank. Tap D can take 180mins to empty the whole tank. All taps were opened at the same time. Determine the time it will take the tank to be full. (3mks)

APPENDIX B Cont

3. Make x the subject. (3mks)

$$Y = \left(\frac{ax^2 + b}{bx^2} \right)^{1/3}$$

4. Expand $(1-¼x)^5$ up to x^3. Hence evaluate $(0.975)^5$ to 4 significant figures. (4mks)

5. Using matrices solve. (3mks)

$3x + 4y = 7$

$5x + 6y = 9$

6. Evaluate. $\frac{3}{\sqrt{3}-2} - \frac{4}{\sqrt{3}+2}$ hence find its value if $\sqrt{3} = 1.732$ (3mks)

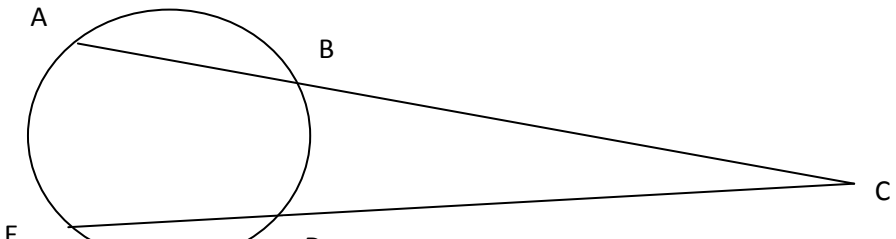
7. Onyango invested Kshs. 200,000 compounded semi-annually at a rate of 21% p.a. if the amount in the bank after n years is Kshs. 800,000. Find the value on n (3mks)

8. OA=2i+3j-5k: OB=6i- j + k. P divides AB externally in the ratio 3:2. Find in terms of i, j and k the position vectors of p (3mks)

9. Solve without using logarithms

$\log_3 (12x + 5) - 3 = \log_3 (x - 5)$. (3mks)

10. In the figure below AB=4cm, BC=6cm ED=7cm. find the length DC (3mks)



11. The length and width of a ngle are 8.5cm and 6.3cm respectively. Find the percentage error in the estimation of the area of the rectangle. (3mks)

12. The equation of a circle is given as $3x^2 + 3y^2 + 24y - 60x + 240 = 0$. (3mks)
Find the centre and the radius.

13. A varies as the square of P and inversely as the square root of Q. When P is increased by 30% and Q is reduced by 5%. Find the percentage change in the value of A leaving your answer to 4 significant figures. (4mks)

14. Evaluate without using tables or calculator

$$\frac{\sin 300^0 \sin 450^0}{\cos 420^0}$$ (2mks)

15. The cost price of a television set is Kshs. 42,000. The dealer can dispose the item by selling it at a deposit of Kshs. 12,000 and 20 often monthly installments of Kshs. 3200. Determine the carrying charge hence find the simple rate of interest on hire purchase. (4mks)

16. Find the value of k if $9x^2 + 25x + k + 6$ is a perfect square. (2mks)

APPENDIX B Cont

SECTION B (50MKS)

Answer any FIVE questions from this section

17. The cost of two brands of coffee A and B per kilogram is Sh. 80 and Sh. 120 respectively. The two brands are mixed in the ration 2:3.

a. Find the selling price of 1 packet of coffee if it was sold at a profit of 20% above the cost and each packet is 300grams (5mks)

b. Another brand of coffee Q costing Sh. 140 per kilogram was mixed with 1kg mixture of brand A and B to form superior coffee. The superior coffee was sold at a profit of Sh. 150 resulting into a profit of 20% on the sale of 1kg mixture. Find the ratio in which A, B and Q were mixed (5mks)

18. The relationship between X and Y is such that $Y = ax + bx^2$ where a and b values of x and corresponding values of y

X	1	2	3	4	5	6
Y	5	14	27	44	65	90

a. Draw a suitable straight line on the grid provided (5mks)

b. Find the values of a and b (3mks)

c. Find the value of Y when X = 4.2 from your graph (2mks)

19. The probability of Alloyce, Okeyo and Jakadibo passing an examination are 0.7, 0.6 and 0.9 respectively

a. Draw a tree diagram to represent the information above (2mks)

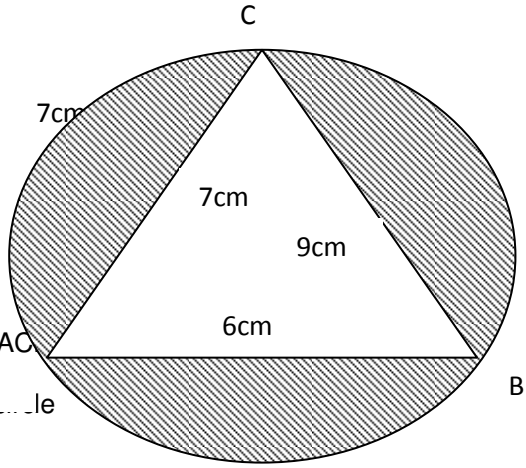
i. Using the tree diagram determine the probability of All the three passing (2mks)

ii. Only one passing (2mks)

iii. At most two passing (2mks)

iv. At least one passing (2mks)

20. In the figure below triangle ABC is circumscribed inside a circle. AC = 7cm, AB = 6cm and BC = 9cm



Calculate,

a. The size of angle AC (3mks)

b. The radius of the circle (2mks)

c. The area of the shaded region (5mks)

21. a) Complete the table below for y = 2 sinx + 3cosx (2mks)

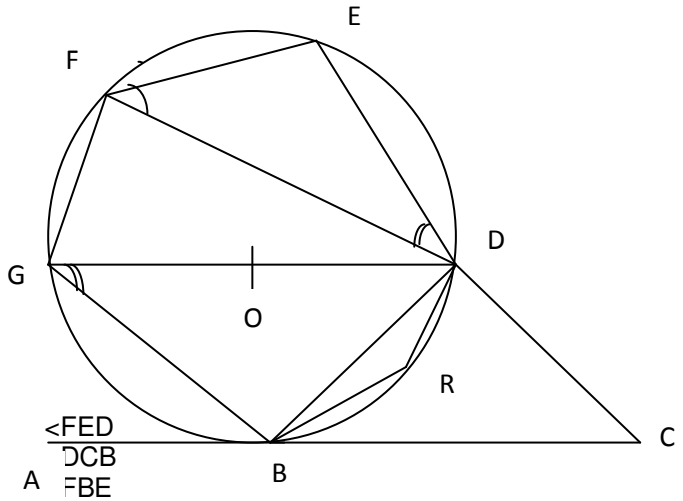
x	0	30	60	90	120	150	180	210	240	270	300	330	360
2 sin x	0	1.0		2		1.0	0	-1.0		-2	-1.73		
3 cos x			1.5	0	-1.5	2.60	-3.0		-1.5				0
y													

APPENDIX B Cont.

b) Draw the graph $y = 2 \sin x + 3 \cos x$ (4mks)

c) Use your graph to solve (4mks)
i) $2 \sin x + 3\cos x = 0$
ii) $2 \sin x + 3\cos x = 3$

22. In the figure below, GOD is a diameter. ABC is a tangent to the circle at B. O is the circle centre. $<FGD = 62^o$, $<EFD = 32^o$ and $<GDB = 52^o$. Giving reasons determine the size of:



a) <FED (2mks)
b) DCB (2mks)
c) FBE (2mks)
d) <FOB obtuse (2mks)
e) <DRB (2mks)

23. The table below shows the income tax rates for the month of December 2008

Income in K£ p.m	**Rate in Percentage**
1 – 360	10%
361 – 840	15%
841 – 1200	20%
1201 – 1500	25%
1501 – above	30%

John earns a monthly salary of Kshs. 28,000. His medical and house allowances are Kshs. 3,000 and Kshs. 12,000 respectively per month. The monthly personal relief is Kshs. 1,216. His deductions per month are NHIF Kshs. 520, WCPS Kshs. 560 and Cooperative loan of Kshs. 3,020. Determine

a. The taxable income per month in Kenya pounds (2mks)
b. The net tax per month in Kenya shillings (6mks)
c. The net earnings per month in Kenya shillings (2mks)

24. The sequence below is given as
5, 7, 9, 11, 13, …… 201.

a. Determine:
i. The number of terms in the sequence (2mks)
ii. The sum of all the terms in the sequence (2mks)

b. The 2^{nd}, 9^{th} and 30^{th} terms in the series above are the first three consecutive terms of a geometric progression. Determine:
i. The 2^{nd}, 9^{th} and 30^{th} term of the sequence (3mks)

APPENDIX B Cont

ii. The common ratio of a geometric progression (1mk)
iii. The sum of all the first 20 terms in the sequence of a geometric progression (2mks)