NAME…….. INDEX NO…….....

SCHOOL …… CANDIDATE'S SIGN…..……...

CLASS ……..…ADM NO: ……..…DATE……....

121/1
MATHEMATICS
JULY/AUGUST, 2016
PAPER 1
TIME: 2½ HOURS

KAMDARA JET 2016

Kenya Certificate of Secondary Education (K.C.S.E.)

INSTRUCTION TO CANDIDATE'S:

- ✓ *Write your name, index number in the spaces provided at the top of this page.*
- ✓ *Sign and write the date of examination in spaces provided above.*
- ✓ *This paper consists of **TWO** sections: **Section I** and **Section II**.*
- ✓ *Answer **ALL** the questions in **Section I** and any **five** questions from Section **II**.*
- ✓ ***Answers and working must be written on the question paper in the spaces provided below each question**.*
- ✓ *Marks may be given for correct working even if the answer is wrong.*
- ✓ ***Non-programmable** silent electronic calculators and **KNEC** Mathematical tables may be used, except where stated otherwise.*

FOR EXAMINER'S USE ONLY

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

SECTION II

17	18	19	20	21	22	23	24	TOTAL

GRAND TOTAL

This paper consists in 16 printed pages. Candidates should ensure that all the pages are printed as indicated and that no question is missing.

SECTION I (50 MARKS)

Answer all the questions in this section in the spaces provided below each question.

1. Using an assumed mean of 50 , calculate the standard deviation of the marks obtained in a test recorded as follows: 50, 52, 45, 40, 55, 51 56, 48, 55, 60 (2 marks)

2. Make x the subject of the formula $P = \frac{1}{2}\sqrt{\frac{x+2w}{4x+3R}}$ (3Marks)

3. Find the value of x in the equation (4 marks)

$\text{Log}_3 X - 4\log_X 3 = -3$

4. a) Expand the binomial $(2 - ¼ x)^5$ (2 marks)

b) Using the first 4 terms of the binomial above solve for 1.75^5 (2 marks)

5. a) Find the inverse of the matrix $\begin{pmatrix} 1 & 1 \\ 3 & 1 \end{pmatrix}$ (1 mark)

b) Hence determine the point of intersection of the lines (2 marks)

$x + y = 7$
$3x + y = 15$

6. Rationalise the denominator and simplify the answer completely.

$$\frac{\sqrt{3}}{1+\sqrt{2}}+\frac{2+5\sqrt{3}}{\sqrt{3}-\sqrt{2}}$$

(3Marks)

7. Solve for x in the trigonometric equation $4\cos^2 x+4\sin^2 x=16\sin^2 x\cos^2 x$ in $0^0 \leq x \leq 360^0$ (3 marks)

8. The mass of a cylinder of a small material varies jointly as the square of the radius and as the height. If the radius is increased by 20% and the height by 10%. Find the percentage increase in mass.

(3 marks)

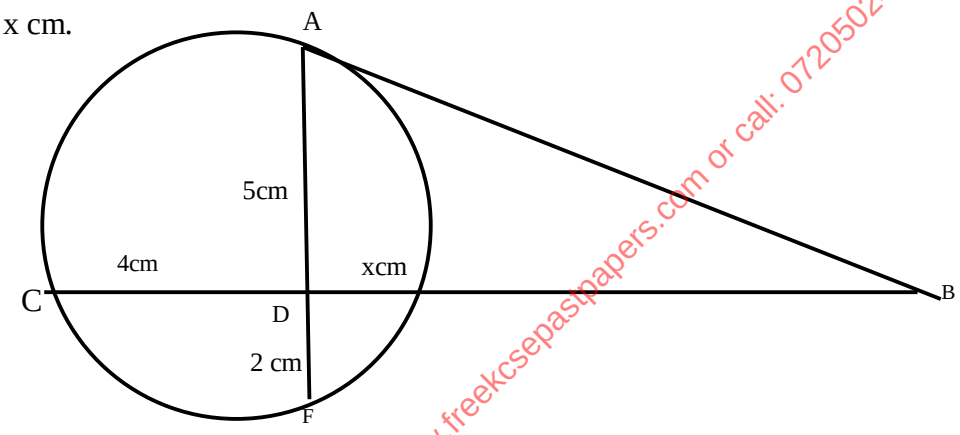
9. Given that the dimensions of a rectangle are 20.0cm and 25.0. Find the percentage error in calculating the area. (3 marks)

10. Maina bought a new laptop on hire purchase. The cash value of the laptop was Ksh. 56,000. He paid a deposit of Ksh. 14,000 followed by 24 equal monthly installments of Ksh. 3500 each. Calculate the monthly rate at which the compound interest was charged. (3marks)

11. Find the equation of tangent to a curve $x^2 = 4y+1$ at the point (2, 0.75) (3 marks)

12. Object A of area 12cm^2 is mapped onto its image B of area 72cm^2 by a transformation. Whose matrix is given by p $= \begin{pmatrix} x & 4 \\ 3 & x+3 \end{pmatrix}$. Find the positive values of x (3 marks)

13. In the figure below, AB is a tangent, meeting chord CDE at B. AD = 5cm, CD = 4cm, DF = 2cm, EB = 7.5cm and DE = x cm.



Determine:

(a) The value of x (1mark)

(b) The length of AB. (2 marks

14. A ship covers 60km on a bearing of 230°. If then it changes course and heads due west for 80km, determine its direct distance from the starting point. (3 marks)

15 Find the centre and the radius of the circle whose equation is $x^2 + y^2 - 7x + 6 + 11y = 0$ (3marks)

16. The 2^{nd}, 4^{th} and 7^{th} terms of A.P are the first 3 consecutive terms of a G.P. Find:

(a) The common ratio (2Marks)

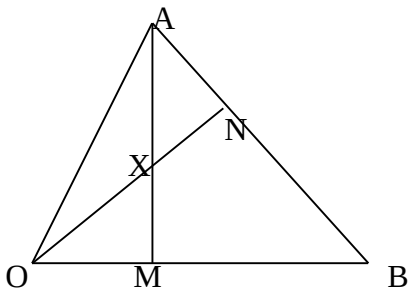
(b) The sum of the first eight terms of the G.P if the common difference of the A.P is 2.

(2Marks)

SECTION II(50 MARKS)

Answer **ONLY FIVE** questions in this section in the spaces provided.

17.



In the figure above, M divides line OB in the ratio 1:2 and N divides $\overrightarrow{AB}$ in the ratio 2:3 $\overrightarrow{AM}$ and $\overrightarrow{ON}$ intersect at X. Given $\overrightarrow{OA} = 2\underset{\sim}{a}$ and $\overrightarrow{OM} = \underset{\sim}{b}$:

a) Find in terms of a and b :

(i) $\overrightarrow{AB}$ (1 mark)

(ii) $\overrightarrow{AM}$ (1 mark)

(iii) $\overrightarrow{ON}$ (1 mark)

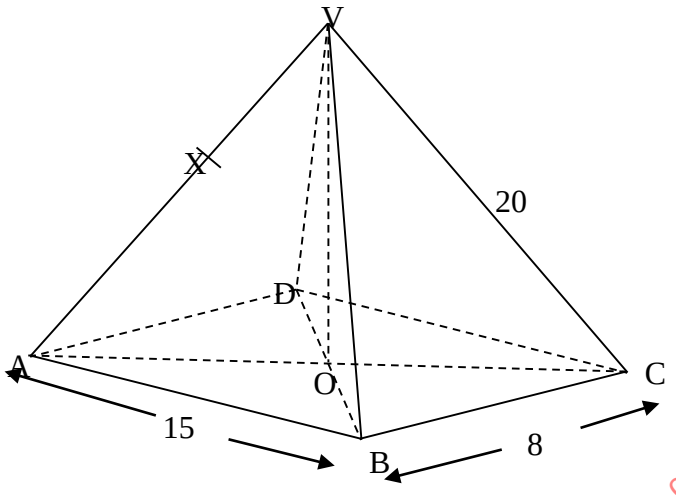
b) If $\overrightarrow{AX} = h\overrightarrow{AM}$ and $\overrightarrow{OX} = K\overrightarrow{ON}$ where h and k are scalars

(i) Express $\overrightarrow{OX}$ in two ways. (2 marks)

Hence find the value of h and k (4 marks)

c) Find the ratio of $\overrightarrow{AM}$:$\overrightarrow{MX}$ (1 mark)

18. The figure below shows a right pyramid with a rectangular base. The length of the rectangular base is 15cm and the width is 8cm. The slant edges are all equal to 20cm.



Calculate

a) The volume of the pyramid. (3 marks)

b) The angle VAB makes with ABCD (3 marks)

c) The angle plane XBD makes with VBD given that point X lies on VA such that VX: XA = 2: 3 (4 marks)

19. The number x is chosen at random from the set (0,3,6,9) and the number y is chosen at random from the set (0,2,4,6,8). Calculate the probability of each of the following separate events.

(i) $x > 6$ (1 mark)

(ii) $x + y = 11$ (2 marks)

(iii) $x > y$ (3 marks)

(iv) $xy = 0$ (2 marks)

(v) $10x + y < 34$ (2 marks)

20. P and Q are two points on the same parallel of latitude $66^{o}25^{1}$, whose longitudes differ by 120^{o}. Calculate in kilometres. Radius of the earth =6370.

a) The radius of the parallel of latitude where P and Q lie. (2 marks)

b) The distance of P and Q measured along the parallel of latitude. (2 marks)

c) (i) find the length of the straight line joining PQ (2 marks)

(ii) Find the distance between P and Q along the same latitude in nautical miles. (2 marks)

(iii)If an aircraft took 30min to fly from P to Q, Calculate its speed in knots. (2 marks)

21. a) Use the trapezium rule to estimate the area between the curve $y = 3x^2 + 1$, lines x=1 and x=3 and x-axis. Use five ordinates. (5 marks)

b) Using integration method find the exact area under a curve $y=3x^2 + 1$ (3 marks)

d) Find the percentage error in estimating the area. (2 marks)

22. The table below shows the rate at which income tax is charged for all income earned in a month in 2015.

Taxable Income p.m (Kenya pound)	**Rate in % per Kenya pound**
1 -236	10%
237 -472	15%
473 -708	20%
709 – 944	25%
945 and over	30%

A total of Ksh. 14,500 is deducted from Mrs. Momanyi monthly salary .She is entitled to a house allowance of Ksh. 8,000 a person relief of Ksh. 1064 month and Monthly insurance relief at the rate of 15% of the premium paid.

. Every month she pays the following.

(i) Electricity bill shs.780
(ii) Water bill shs. 560
(iii) Co-operative shares shs. 1200
(iv) Loan repayment Ksh. 5000
(v) Monthly insurance premiums of Ksh 1260

(a) Calculate her P.A.Y.E (2Marks)

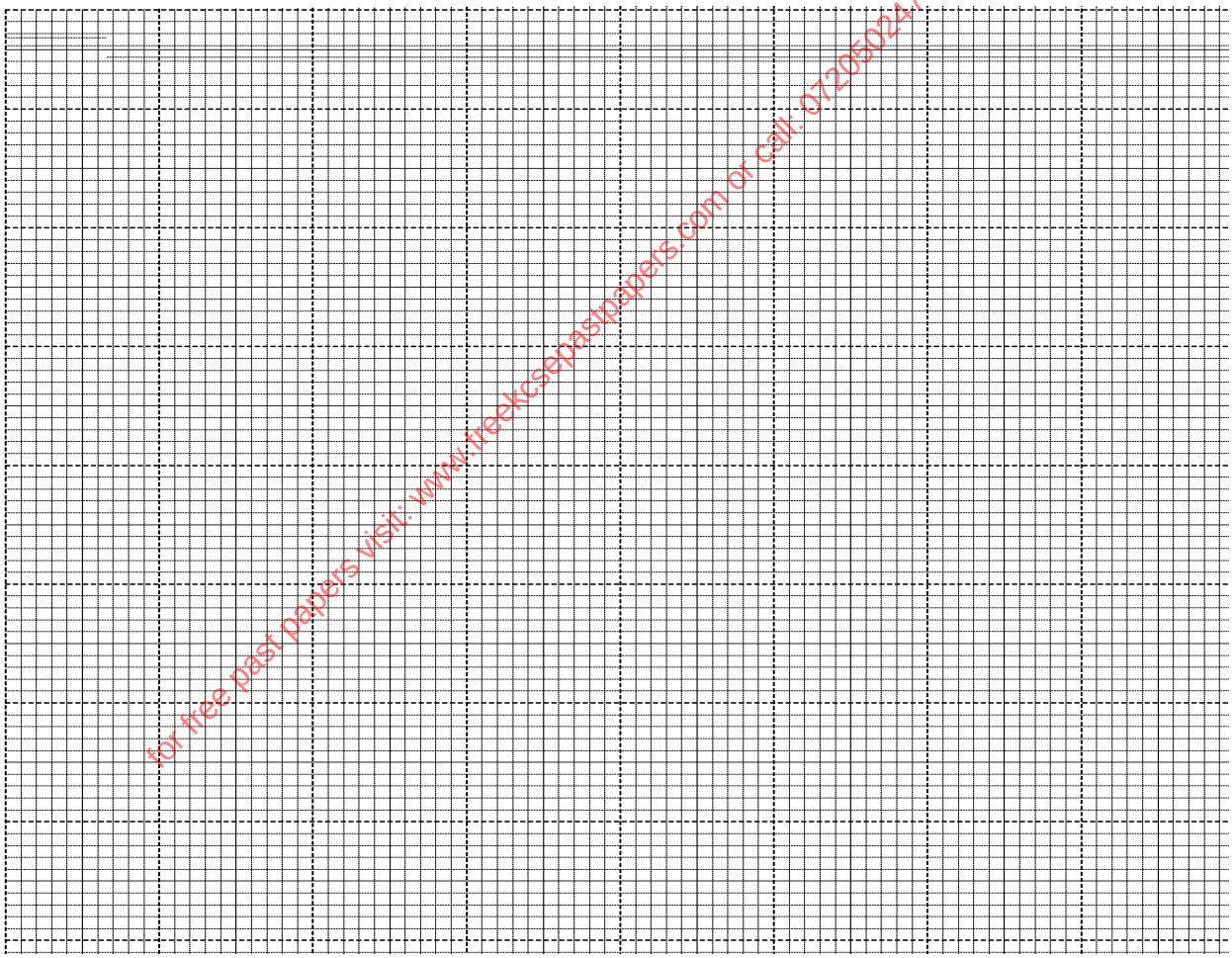
(b)Calculate her monthly taxable income . (6Marks)

(c) Calculate her basic salary per month (2Marks)

23. Mr. Wanyama wishes to take student from wonderful mixed secondary school for a tour. The total number of pupils to be taken should not exceed 60. Each girl must contribute sh.10,000 and each boy sh.15,000 and money to be contributed must not exceed sh.120,000. If this trip is to be successful the number of boys must conditionally be greater than girls.

a) Write down five inequalities to represent this information taking the number of boys and girls to be x and y respectively. (4 marks)

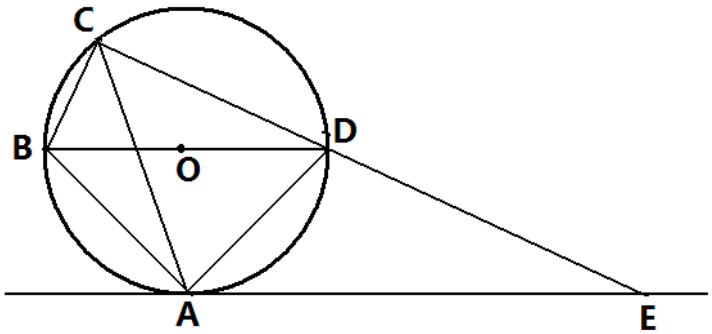
b) Represent the above information on the graph paper below. (4 marks)



c) What is the optimum number of boys and girls to be taken in order to be minimise cost. (2 mark)

24. In the figure below, line BD is the diameter of the circle, centre O and AE is a tangent.

Angle CBA = 110^0 and angle BAC =26^0.



Find the following angles, giving reasons for each answer.

a) $\angle ABD$ (3marks)

b) $\angle DAE$ (1mk)

c) $\angle AED$ (3marks)

d) $\angle AOD$ (3marks)