FORM FOUR CLUSTER KCSE MODEL13

MATHEMATIC PAPER 2 QUESTIONS

SECTION A (50 Marks)

Attempt ALL questions in this section in the spaces provided. (50MARKS) Attempt ALL questions in this section in the spaces provided.

1. Use logarithms to evaluate to 4 s.f.

$$\sqrt{\frac{\cos 12.86^0}{0.8452 + \tan 54^0}}$$

2. Make x the subject in the formula

$$N = \sqrt{\left(\frac{T + x^2}{M^2}\right)}$$

3. The 7th and 10th terms of an arithmetic progression (A.P) are 23 and 38 respectively.

   Find;

   i) the 2nd term (3marks)

   ii) the 15th term (1mark)

4. Find radius and centre of a circle whose equation is $2x^2 + 2y^2 - 6x + 10y + 9 = 0$

5. Solve for x in the equation

   $5 \log x + \log 5 = 1 + 2 \log 4$

6. Rationalize the denominator and hence write down the values of a, b, and c if;

   $$\frac{2 - \sqrt{4}}{2 + \sqrt{4}} = a + b\sqrt{c}$$

7. The points P,Q and R lie on a straight line. The position vectors P and R are

   $2i + 3j + 13k$
   $5i - 6j + 4k$; and

   respectively. Q divides PR internally in the ratio 2 : 1 find;

   a) The position vector of Q in terms of i, j ana k. (2marks)

   b) The distance of Q from the origin. (2marks)

8. Find the values of x given that the matrix

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$$\begin{pmatrix} x+7 & 4 \\ -3 & x \end{pmatrix}$$

is a singular matrix.
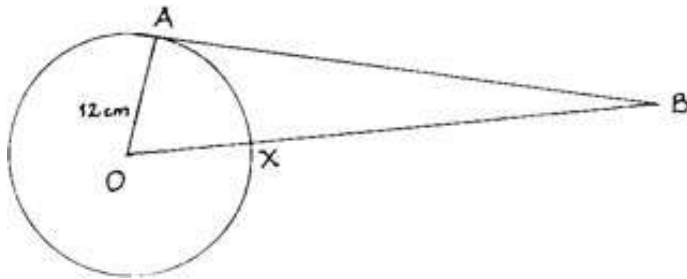
9. a) Expand

$$(1-2x)^6$$

(2marks)

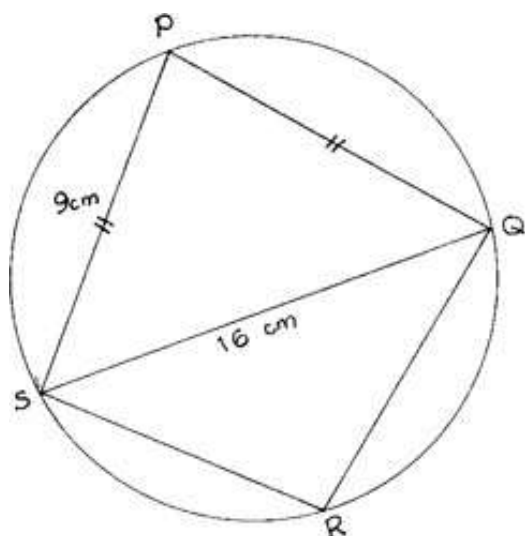b) Use the first four terms of the expansion in (a) above to estimate the value of (0.98)6 (2marks)

10. In the figure below, AB is a tangent to the circle centre 0 and radius 12cm. The area of the triangle AOB =120cm2. OXB is a straight line. Calculate the length XB (4marks)

11. There are two boxes on a table. Box A contains 5 red balls and 3 white balls, while box B contains 2 red balls and 6 white balls.

A box is chosen at random and two balls are drawn from it, one after the other without replacement. Find the probability that both balls have different colours. (3marks)

12. . The mass of a cylinder varies jointly as the square of the radius and its height. If the radius is increased by 20% and the height decreased by 10%, find the percentage change in the mass of the cylinder. (3marks)

13. In the figure below, PS= PQ = 9cm, QS = 16cm, Find the size of angle QRS. (3marks)

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14. A mixture of sand, cement and ballast is in the ratio 5 : 2 :3. If the cost of 7tonnes of sand is sh 3,000, 5 tonnes of cement is sh 50,000 and 8 tonnes of ballast is sh 4,000. Calculate the cost of 7tonnes of the mixture. (3marks)

15. The length and width of a rectangle is stated as 12.40cm and 8.5cm respectively. Calculate the percentage error in its perimeter. (3marks)

16. Every week the number of absentees in a school was recorded. This was done for 39 weeks and recorded in the table below.

No. of absentees	0 - 3	4 - 7	8 - 11	12 - 15	16 - 19	20 - 23
No. of weeks	6	9	8	11	3	2

Estimate the median absentee rate per week in the school. (2marks)

SECTION B (50 Marks)

Attempt only FIVE questions from this section)

17. . The table below shows the income tax rate for a certain financial year. Mr. Njibwakale is a civil servant who earns a basic salary of Ksh 24,800p.m. He lives in a government house and pays a nominal rent of Ksh 1,220. He earns monthly allowances totaling to Ksh 12,000. He is entitled to a monthly tax relief of Ksh 1,020.

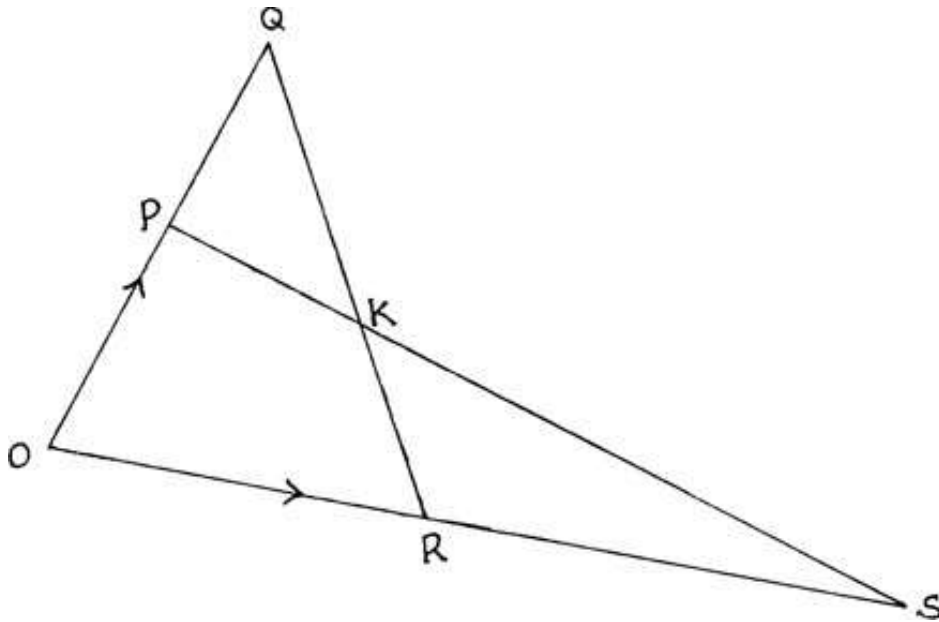| Income p.m £	Rate in Ksh/£
1 - 325	2
326 - 975	3
976 - 1300	5
1301 – 1625	6
Over 1625	7.5

a) Calculate i) Mr. Njibwakale's taxable income in K£ per month. (2marks)

ii) His gross tax in Ksh. (3marks)

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iii) His monthly net tax in Ksh. (2marks)

His other monthly deductions are as follows; i) HELB loan repayment sh 2,400 ii) NHIF Ksh 1,200
iii) 2% of his basic salary as union dues.
Calculate his net income per month. (3marks)

18.
b)   In the figure below $OP = p$ and $OR = r$. Given that $OS = 2r$ and $OQ = \frac{3}{2}p$

a) Express in terms of
~ p and
~ r

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

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

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b) The lines **QR** and **PS** intersect at **K** such that $\overrightarrow{QK} = m\,\overrightarrow{QR}$ and $\overrightarrow{PK} = n\,\overrightarrow{PS}$ where m and n are scalars. Find two distinct expressions for $\overrightarrow{OK}$ in terms of $\underset{\sim}{p}$, $\underset{\sim}{r}$ m and n. Hence find the values of **m** and n.   (6marks)

c) State the ratio
   i) PK : KS   (1mark)

   ii) QR : RK   (1mark)

19. a) The first term of a geometric progression is 36. The sum of the first three terms is 27. Calculate;
    i) the common ratio. (3marks)
    ii) the value of the second term. (1mark)

    b) The first term of an A.P is 2. The first term of a geometric sequence is also 2 and its common ratio equals to the common difference of the A.P. The square of the fifth term of A.P exceeds the third term of the geometric sequence by 2. Find; i) the common difference where d is not an integer. (4marks)

    ii) the sum of the first 50 terms of the A.P. (2marks)

20. Two variables R and V are known to satisfy a relation $R = kV^{n}$ where k and n are constants. The table below shows data collected from an experiment involving the two variables R and V

V	3	4	5	6	7	8
R	27	48	75	108	147	192

a) Complete the table of log V and log R given below, by giving the values correct to 2 decimal places.

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Log **V**	0.48		0.70		0.85	0.90
Log **R**		1.68		2.03	2.18	

b) On the grid provided draw a suitable linear graph to represent the relation $R = kV^n$
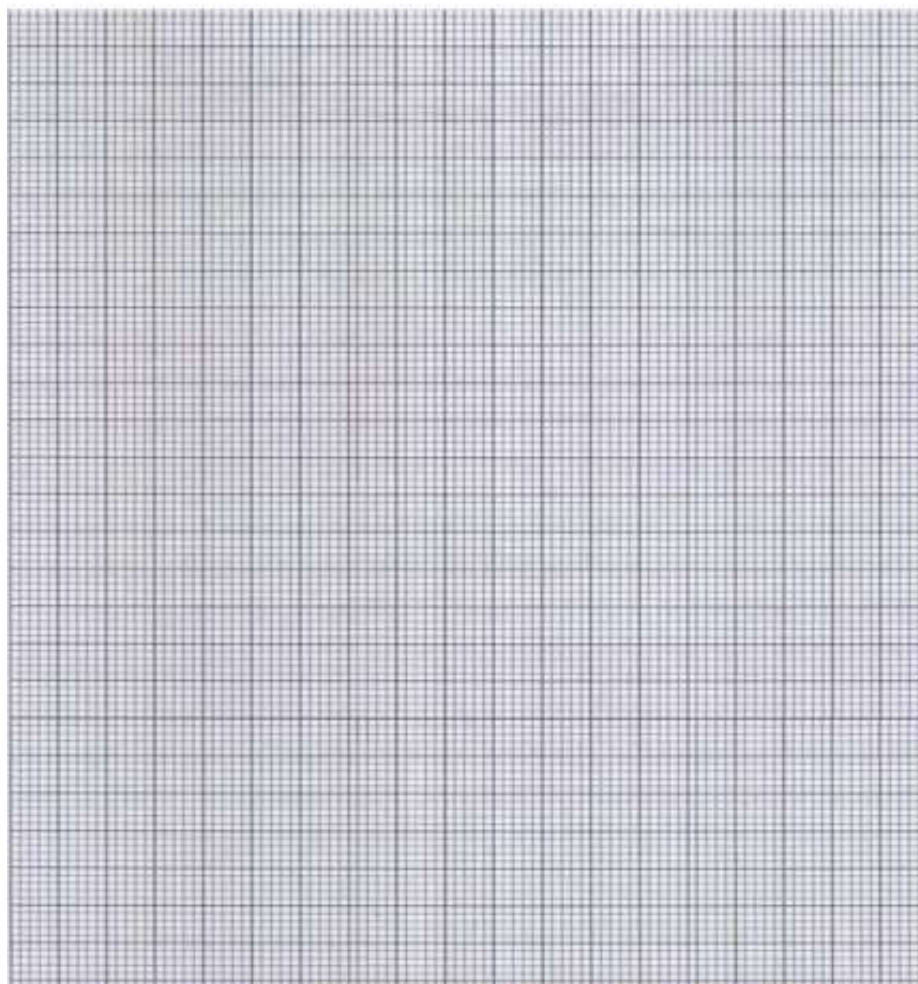
c) Determine

i) the gradient of the line. (2marks)

ii) the relationship connecting R and V. (3marks)

21. . a) A quantity P is partly constant and partly varies as q. When q= 2, P=40 and when q =3, P=65 Determine: i) The law connecting P and q(4marks)

ii) the value of P when q = 5(2marks)

iii) the value of q2 when P=90(2marks)

iv) the value of 2P when q =15(2marks)

22. a) Find A-1 of the matrix

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$$A = \begin{pmatrix} 5 & 6 \\ 7 & 9 \end{pmatrix}$$
(2marks)

b) Kimeli bought 5 Physics books and 6 Mathematics books for a total of Ksh 2,440. Ndoboli bought 7 Physics books and 9 Mathematics books for a total of Ksh 3,560. i) Form a matrix equation to represent the above information. (1mark)

ii) Use matrix method to find the price of a Physics book and that of a Mathematics book. (4marks)

c) School bought 36 Physics books and 50 Mathematics books. A discount of 5% and 8% was allowed on each Physics book and each Mathematics book respectively. Calculate the percentage discount on the cost of all books bought. (3marks)

23. a) i) Draw two circle centres P and Q of radii 3cm and 2cm respectively with the centres P and Q 10cm apart. (3marks)

ii) Using pair of compasses and ruler only, construct the transverse common tangents to the two circles in a (i) above. (5marks)

b) Measure and record; i) the length of one tangent. (1mark)

ii) the acute angle the tangent forms with line PQ. (1mark)

24.

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