FORM FOUR CLUSTER KCSE MODEL9

MATHEMATICS PAPER 2 QUESTIONS

SECTION A (50 Marks)

Answer all the questions

1. Use logarithms, correct to 4 decimal places, to evaluate.

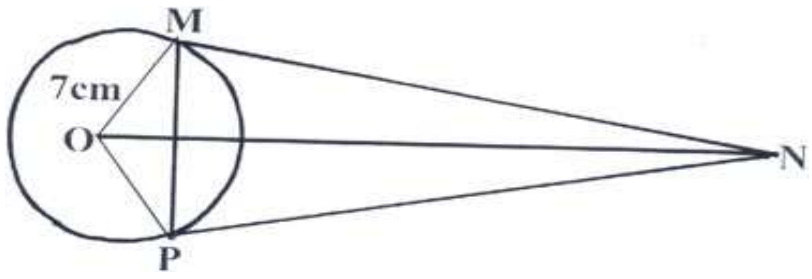
$$\frac{0.0738\ Sin\ 30.36^0}{Log\ 3.2}$$

2. Given that $2 \le A \le 4$ and $0.1 \le B \le 0.2$ find the maximum value of $\frac{AB}{A-B}$

3. Without using a calculator or mathematical tables, express $\frac{Cos30^0}{Tan\ 45^0 + \sqrt{3}}$ in surd form and simplify leaving your answer in the form $a + b\sqrt{c}$

   where a, b and c are rational numbers.

4. The figure shows a circle, centre O of radius 7cm MN and PN are tangents to the circle at M and P respectively. ON =25cm calculate the length MP.



5. Find the radius and the coordinates of the centre of the circle whose equation is

$$2x^2 + 2y^2 - 6x - 10y + 9 = 0$$

6. a) Expand $\left(1 + \frac{1}{4}x\right)^4$

   b) Use your expansion in (a) above to evaluate

$(0.975)^4$ t

to 4 significant figures

7. After millet, the cost per kilogram of maize flour and millet flour shs 24 and shs. 40 respectively. The maize and millet flour are now mixed in the ration 5 : 3 what should the selling price per kilogramme of the mixture be, in order to make a 25% profit?

8. a) Construct a parallelogram PQRS such that PQ =8cm PS = 4.5cm and angle QPS = 60^0

   b) Locate locus of a point x such that x is equidistant from P and R.

9. If OA =3i+2j-4k and OB =4i+5j-2k, P divides AB in the ratio 3 : -2. Determine the modulus of OP leaving your answer to 1 decimal place. Given that O is the origin.

10. Solve for x in $2+\log_7(3x-4)=\log_7 98$.

11. A quantity P varies partly as Q and partly as the square root of Q. Given that P=30 when Q=9, and P=14 when Q=16. Find P when Q=36.

12. A two- digit positive number is such that the sum of its digits is nine. When the digits are reversed, the new number formed exceeds the original number by 27. Find the original number.

13. Find the compound interest on shs.15, 200 on deposited in a bank paying compound interest of 10.5% per annum for 5 years.

14. A group of 5men can so a piece of work in 12 hours. How long would a group of 8 men take to complete the same work if they work at thrice the rate of the first group?

15. Find the inverse of the matrix $\begin{bmatrix} 3 & 1 \\ 2 & -1 \end{bmatrix}$. Hence find the coordinates of the point of intersection of the line 3x+y=4 and 2x-y=1

16. A square copper, slab is 2mm thick and has a mass of 1.05kg. The density of the copper is $8.4g/cm^3$. Find the length of the slab in centimeters.

SECTION B (50 Marks)

Answer any five questions

17. Triangle OPQ is such that $\vec{OP}=\mathbf{p}$ and $\vec{OQ}=q$ point **R** divides **OP** in the ratio 1 : 3 and a point **S** divided **PQ** in the ratio 5 : 2 $\vec{OS}$ *and* $\vec{QR}$ meet at **T.**

    a) Express $\vec{OS}$ *and* $\vec{QR}$ in term of **p** and **q**.

    b) Given that $\vec{OT}=K\vec{OS}$. Express $\vec{OT}$ in terms of K, $\underset{\sim}{p}$ *and* $\underset{\sim}{q}$

c) (i) Given also that $\vec{RT} = h\vec{RQ}$, express $\vec{OT}$ interms of **h**, $\underset{\sim}{p}$ and $\underset{\sim}{q}$

ii) Find the value of h and k.

d) State the ratio in which Q divided RT.

18. A bag contains 5 red, 4 white and 3 blue beads. Three beads are selected at random without replacement. Find the probability that.

a) The first red bead is the third bead picked.

b) The beads selected were, white and blue;

i) In that order

ii) In any order

c) No red bead is picked

d) Beads picked are of the same colour.

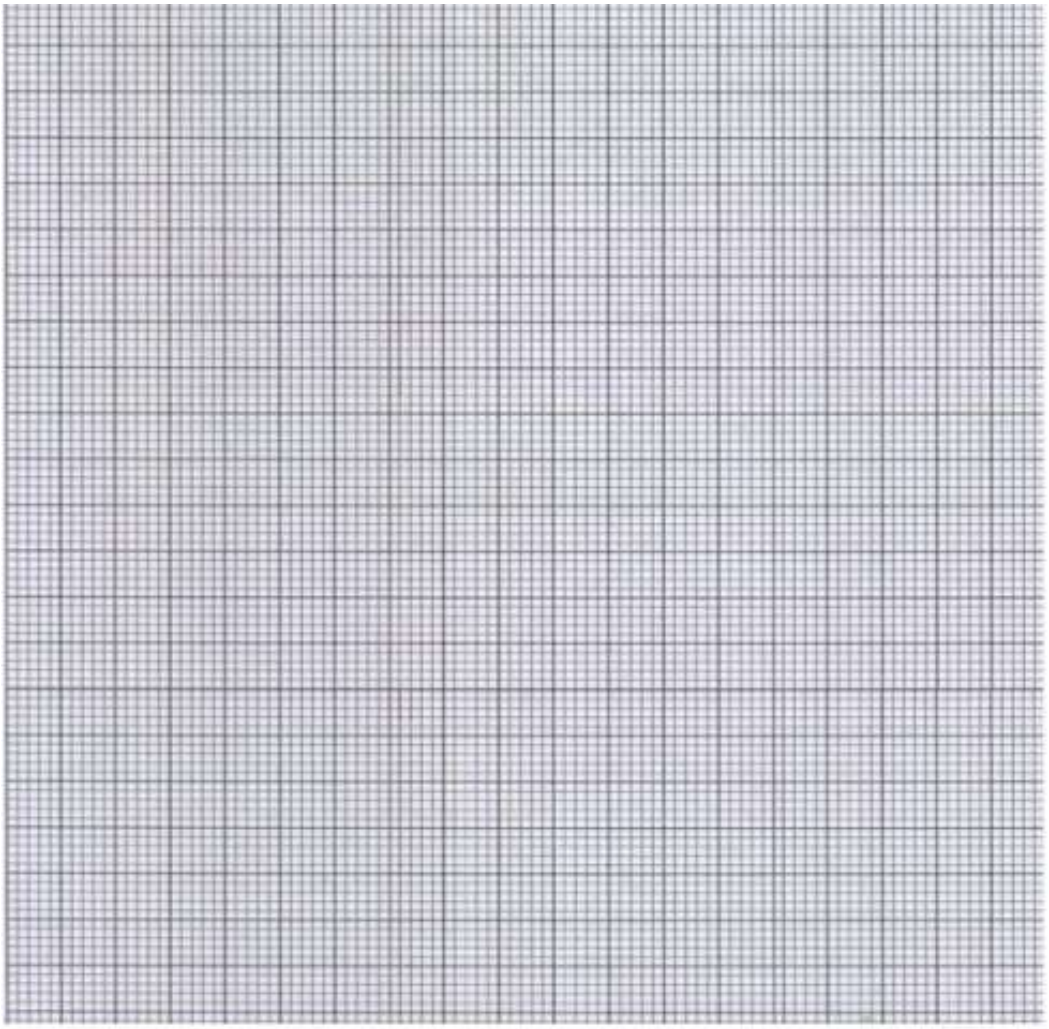
19. On the graph paper provided, with the same scale on both axes, draw the square S whose vertices are (0,0), (2,0), (2,2) and (0,2)

a) Find draw the image T of S under the transformation whose matrix if $A = \begin{bmatrix} 2 & -1 \\ 1 & 2 \end{bmatrix}$ and the image **U** of **S** under the transformation whose matrix is $B\begin{bmatrix} 2 & -1 \\ 1 & 2 \end{bmatrix}$

b) Describe fully a transformation, either of which would map **T** onto **S**.

c) From the product **AB**< and draw the image **V** of **S** under the transformation whose matrix is **AB.**

Describe the single transformation that maps **S** onto **V**.

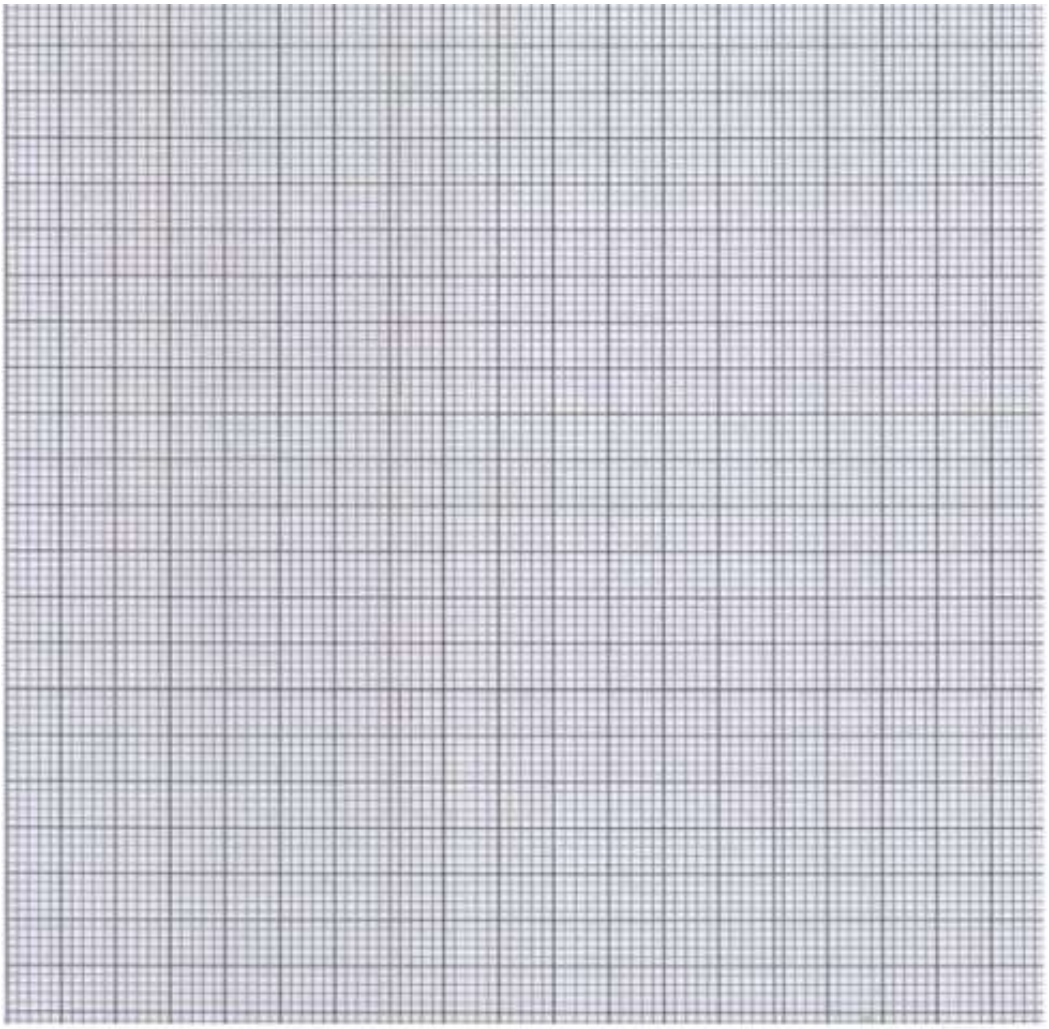


20. a) Complete the table below for the equation $y = x^3 - 5x^2 + 2x + 9$

x	-2	-1	0	1	2	3	4	5
x^3	-8		0	1	8	27	64	125
$-5x^2$		-5	0	-5	-20		-80	
2x	-4	-2	0	2	4	6	8	10
9	9	9	9	9	9	9	9	9
y			9	7	1		1	

b) On the grid provided, draw a graph of

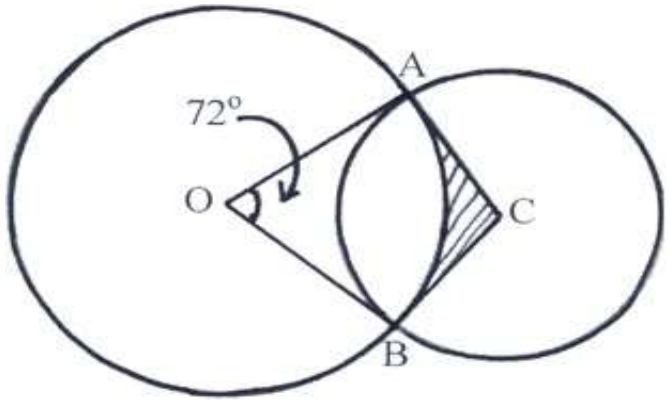
$$y = x^3 5x^2 + 2x + 9 \ for - 2 \le x \le 5$$



c) Use your graph to estimate the roots of the equation $x^3 - 5x^2 + 2x + 9 = 0$ between x = 1 and x =4

d) By drawing a suitable line on the same axis, estimate the roots of the equation $x^3 - 5x^2 + x + 5 = 0$

21. In the figure below OA =8.4cm, AC= 7cm< AOB=72^0 and < ACB=90^0



Calculate

i) The area of the intersection of the two circles (take π to be 3.142)

ii) The area of the quadrilateral OACB

iii) Area of the shaded region

22. a) Complete the table below giving your values correct to 2 decimal places.

X	0^0	15^0	30^0	45^0	60^0	75^0	90^0	105^0	120^0
3 Cos x	3.00		2.60		1.50	0.78	0.00	-0.78	
$4\text{Sin}(2x-10^0)$	-0.69	1.37		3.94	3.76		0.69		-3.06

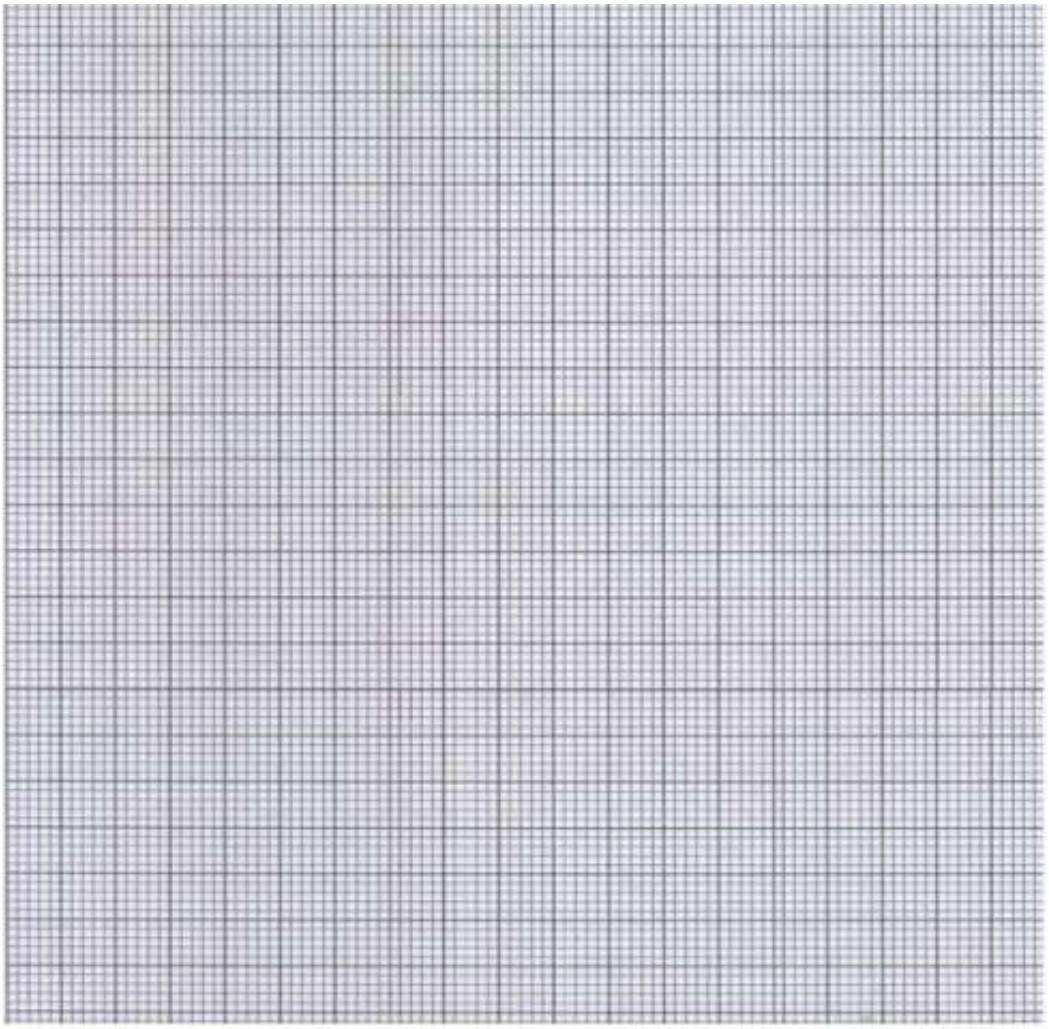
b) Taking 1cm to represent 15^0 on the x-axis and 2cm to represent 1 unit on the y-axis, draw the graphs of $y= 3\text{Cos } x°$ and $y= 4\sin (2x-10^0)$ on the same set of axes on the grid provided.

c) Use your graph to find the values of x for which $3\text{Cos}x-4\sin(2x-10)=0$

d) State

i) the amplitude of the graph $y= 3\cos x$

ii) the period of the graph $y= 4\sin (2x-10^0)$



23. The table below shows income tax rates.

Monthly income (Kshs)	Tax Rate (%)
Upto 9680	10
9681 -18800	15
18801- 27920	20
27921 -37040	25
37041 and above	30

Omari's monthly taxable income is Kshs. 24200

a) Calculate the tax charged on Omari's monthly earnings.

b) Omari is entitled to the following tax relief of 15% of the premium pound. Calculate the tax Omari pays each month if he pays a monthly insurance premium of Kshs.2400 and is entitled to a personal relief of Ksh.1056 per month.

c) During a certain month, Omari receive additional earnings which were taxed at 20% each shilling. Given that the paid 36.3% more tax that month, calculate the percentage increase in his earning.

24. The table below shows distribution of mass of students in form 4 class.

Mass kg	35-39	40-44	45-49	50-54	55-59	60-64	65-69
No. of students	12	21	22	23	20	21	5

Using 52 as working mean, calculate

a) The actual mean mass of the class.

b) The standard deviation of the masses.