

## FORM FOUR CLUSTER KCSE MODEL 12

### MATHEMATICS PAPER 2 QUESTIONS

#### SECTION 1 (50 Marks)

Answer all the questions in this section in the spaces provided.

1. Without using a calculator, solve for x in,

$$\frac{1}{2}\log_3 16 + \log_3 6.75 = \log_2 x$$

(3mks)

2. Make x the subject of the formula; (3mks)

$$\frac{x-s}{c-d} = \frac{t-x}{y}$$

3. Simplify,  $\frac{2}{3+\sqrt{2}} + \frac{5}{4-\sqrt{2}}$ ,

leaving the answer in the form

$$a+b\sqrt{c}$$

(3mks)

4. Solve the simultaneous equation (3mks)

$$\begin{aligned} 2x - y &= 3 \\ x^2 - xy &= -4 \end{aligned}$$

5. Given that  $x = 2.5 \pm 0.1$  and  $y = 10 \pm 0.1$ . Find the percentage error in  $\frac{y}{x}$

(3mks)

6. P and Q are two points with position vectors  $6i + 2j - 4k$  and  $10i + 10j + 8k$  respectively. Find the position vector of A if it divides PQ in the ratio -2 : 3 (3mks)

7. Determine the amplitude and the period of the graph

$$y = -4 \sin\left(\frac{x}{4} - 55^\circ\right)$$

(2mks)

8. a) Expand and simplify

$$\left(3 + \frac{1}{8x}\right)^4$$

in ascending powers of x. (2mks)

b) Hence evaluate

$$(3.025)^4$$

to 3 decimal places. (2mks)

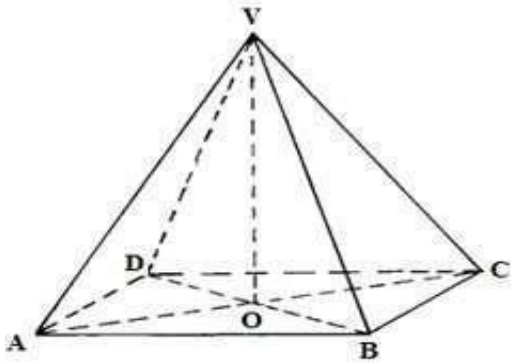
9. The resistance of an electric conductor is partly constant and partly varies as the temperature. When the temperature is 200c the resistance is 50 Ohms and when the temperature is 250c the

resistance is 60 Ohms. Form an equation relating resistance R to temperature T. (3mks)

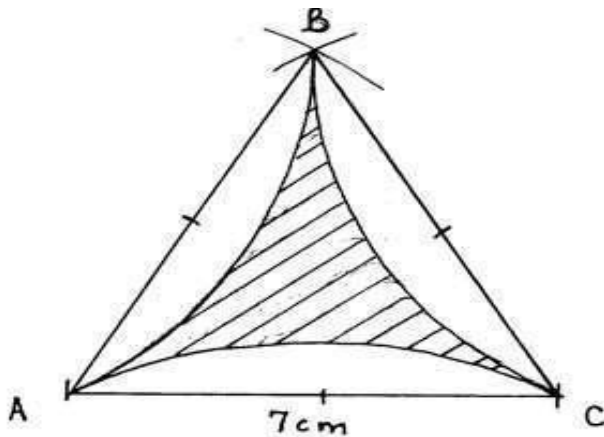
10. The normal to the curve  $y = x^{\frac{1}{2}} + x^{\frac{3}{2}}$

at the point (1,2) meets the axes at (h,0) and (0, k). Find the values of h and k. (3mks)

11. A business man has 450 litres of chemical which is 70% pure. He mixes it with a chemical of same type but 90% pure so as to obtain a mixture which is 75% pure. Find the amount of 90% pure chemical used. (3mks)
12. Find the radius and the co-ordinates of the centre of a circle whose equation is  
 $2x^2 + 2y^2 - 6x + 10y + 9 = 0$  (3mks)
13. A right pyramid below has a rectangular base ABCD with AB=12cm and BC=16cm. O is the centre of the base and VO= 15cm.



- b) The angle between the line VD and the base ABCD. (2mks)
14. The mean of 4,5,7,8, x and 15 is 8. Find x hence calculate the standard deviation. (4mks)
15. The figure below shows arcs AB, AC and BC drawn from centres O1, O2 and O3 respectively of equal circles of radius 7cm.



Find the area of the shaded part.

Find the area of the shaded part. (3mks)

16. Using the trapezoidal rule with 4 strips estimate the area bounded by the curve  
 $y = x^3 - 3x^2 - 10x + 24$ , the x-axis, line  $x=0$  and  $x=4$ . (4mks)

$$y = x^3 - 3x^2 - 10x + 24, \text{ the } x\text{-axis, line } x=0 \text{ and } x=4.$$

## SECTION 2 (50 Marks)

Answer only five questions from this section in the spaces provided.

17. Income tax in a particular year was charged as follows

Income in Ksh P.m	Rate in Ksh per K£
1 – 8000	2
8001- 16000	3
16001-24000	4
24001- 32000	5
32001 -40000	6
40001 and above	7

A civil servant pays a tax of Ksh 3844 per month. Given that he gets a monthly house allowance of Ksh 9000 and a monthly medical allowance of Ksh 5000 and is entitled to a monthly tax of Ksh 1162.

a) Calculate his basic salary per month. (8 marks)

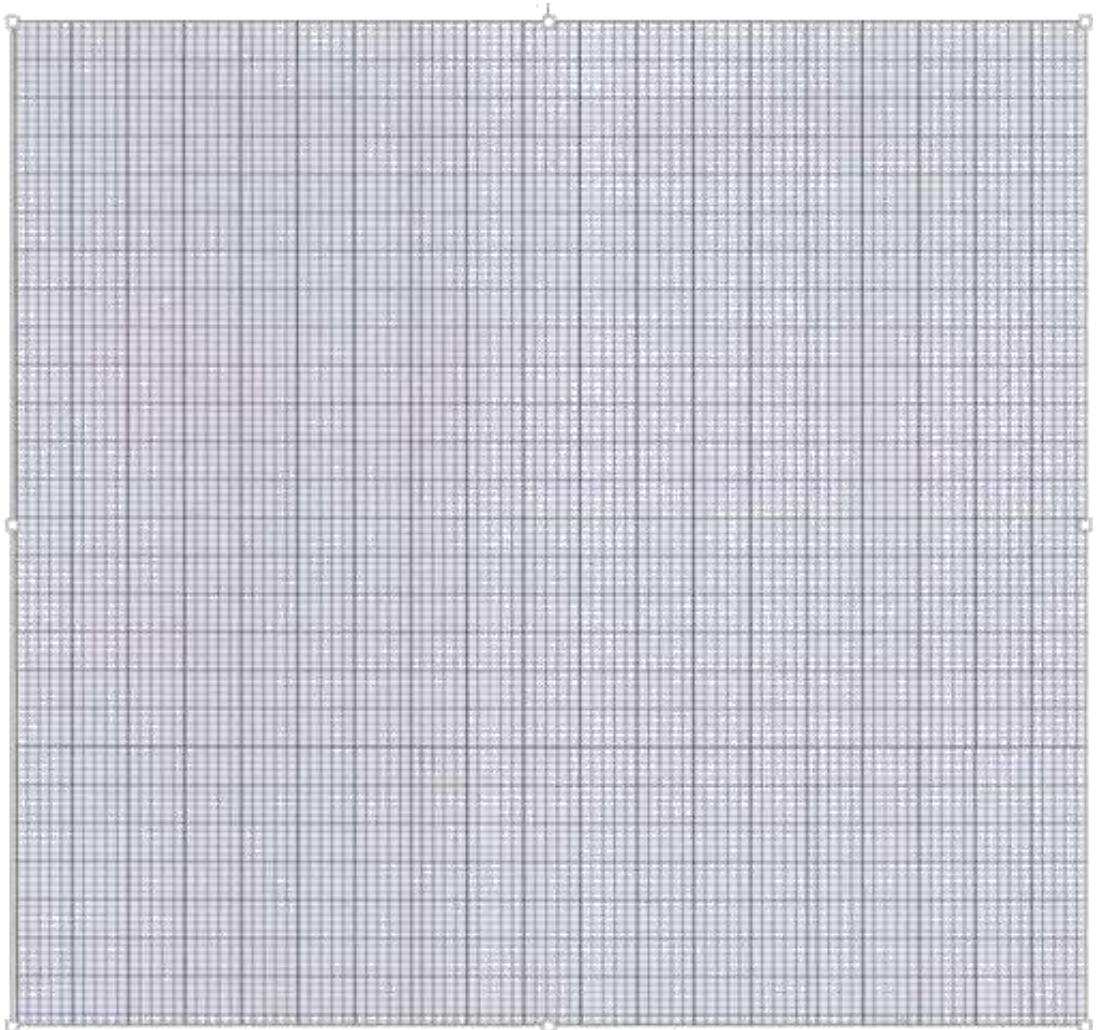
b) Apart from tax the following deductions are also made.

- Co-operative loan 3000 p.m

- N.H.I.F 300 p.m

- N.S.S.F 350 p.m

18. a) Triangle  $A_1B_1C_1$  where  $A_1(3,1)$ ,  $B_1(4,4)$  and  $C_1(0,3)$  is the image of  $ABC$  where  $A(1,3)$ ,  $B(4,4)$  and  $C(3,0)$ .



i) Determine the matrix that transforms ABC onto A1B1C1 (2mks)

ii) Plot triangle ABC and A1B1C1 on the same graph. (3mks)

iii) Describe the transformation in (a) i) above. (1mk)

b) A11B11C11 is the image of A1B1C1 under the transformation given by  $\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$ .

Find the

co-ordinates of A11B11 and C11 and plot A11B11C11 on the same graph. (2mks)

c) Describe the transformation fully. (2mks)

19. a) Using a ruler and a compass only construct triangle ABC where AB=7cm, Angle CBA=82.50 and BC=5cm (4mks)

b) i) Locate a point T inside the triangle which is equidistant from points A and B and also equidistant from lines AB and AC (3mks)

ii) Measure TB (1mk)

c) By shading the unwanted region show the area inside the triangle where P lies if it is nearer to point B than to point A and also nearer to the line AB than line AC. (2mks)

20. The 2nd, 3rd and 6th terms of an arithmetic progression form the first three terms of a geometric progression.

a) If the common difference of AP is 24, find the common ratio of the GP. (3mks)

b) Calculate the sum of the first 8 terms of the GP. (3mks)

c) Write down the first four terms of the AP. (1mk)

d) Find the greatest number of terms that will give AP a sum less than 760. (3mks)

21. The quantities P and r are connected by the equation  $r = nkP \log \log \log P$  values of P and r are given below.

P	1.2	1.5	2.0	2.5	3.5	4.5
r	1.58	2.25	3.39	4.74	7.86	11.5

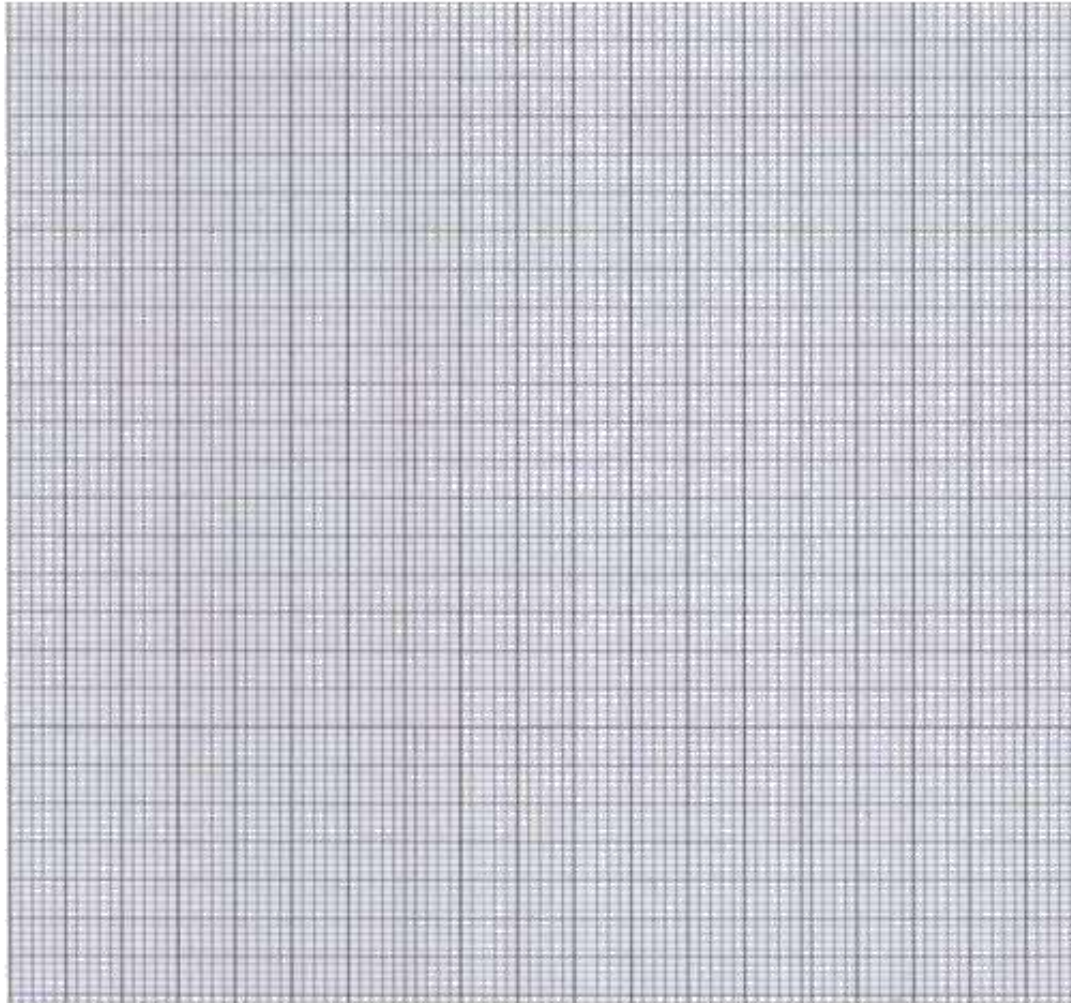
a) Complete the table for  $\log P$  and  $\log r$

$\log P$			0.30			
$\log r$			0.53			

(2mks)

b) Using a scale of 1cm to represent 0.1 units on both axis, draw a suitable straight line graph of  $\log P$  against  $\log r$ . (3mks)

c) Use your graph to estimate



i) the values of k and n. (3mks)

ii) r given that  $\log P=0.5$  (2mks)

22. . Points P, Q, X and Y are points on the surface of the earth where P(500N, 150 W), Q(500N,200E), X(00,150W) and Y(00,200E) Travellers wishes to move from point X to point Q and there are two alternative routes.

i) From X due North to P and then East to Q.

ii) From X due East to Y and then due North to Q. Using

$$\pi = \frac{22}{7}$$

and radius of earth=6370km

Calculate

a) The distance to the nearest km through the first route. (2mks)

b) The distance to the nearest km through the second route. (2mks)

c) Which of these routes is shorter and by how many km. (2mks)

d) If two travellers set out at the same time from X and travel by route (i) and (ii) respectively at the same speed.

Calculate the latitude and longitude of the point reached by the traveller taking the longer route at the instant when the other traveller reaches Q. (4mks)

23. A certain engineering course requires that a candidate scores straight As in mathematics and Physics at KCSE. Kiprono intends to take up the course. The probability that he will obtain A in mathematics and physics is  $\frac{2}{5}$  and  $\frac{3}{8}$  respectively.

a) Find the probability that; i) He will not get A in both subjects. (2mks)

ii) He will qualify for the course (2mks)

iii) He will get A in at least one of the subjects. (2mks)

iv) He will get A in one of the subjects. (2mks)

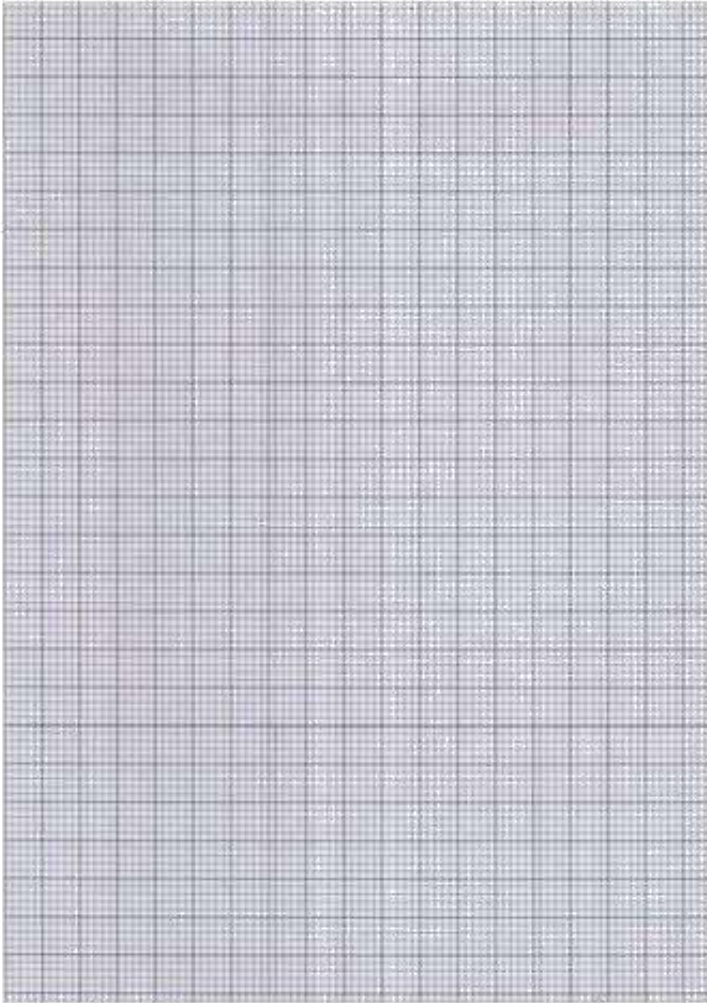
b) A school registered 200 candidates for KCSE. 28 candidates got A in mathematics and 17 of those got the same grade in both subjects.

What was the percentage of the candidates who qualified for the course? (2mks)

24. Laikipia County is to take 384 students for national Music/ drama festival. There are two buses available, Bus A and Bus B. Bus A can carry 64 students and Bus B can carry 48 students. These should be at least seven trips altogether.

a) Form all linear inequalities which will represent the above information. (3mks)





b) Represent the inequalities in the grid provided. (4mks)

c) The charges for hiring the buses are

Bus A is Ksh 25000

Bus B is Ksh 20000

Use your graph to determine the number of buses that will be hired to minimise the cost. (3mks)