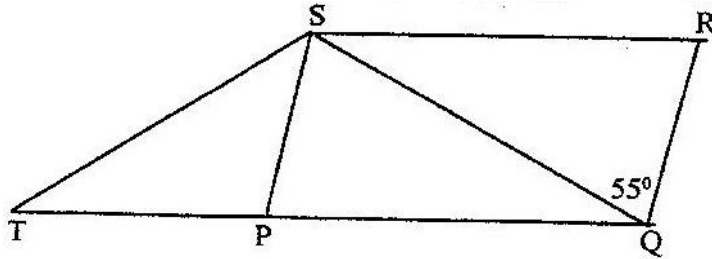


**MATHEMATICS PAPER 121/1 K.C.S.E 1997 QUESTIONS**

**SECTION 1 ( 52 marks)**

**Answer all the questions in this section**

1. Use logarithms to evaluate  $\frac{(1934)^2 \times 0.00324}{\sqrt{436}}$
2. Find the greatest common factor of  $x^3y^2$  and  $4xy^4$ . Hence completely the expression  $x^3y^2 - 4xy^4$
3. In the figure below PQRS is a rhombus,  $\angle SQR = 55^\circ$ ,  $\angle QST$  is a right angle and TPQ is a straight line



Find the size of the angle STQ

4. In geometric progression, the first is  $a$  and the common ratio is  $r$ . The sum of the first two terms is 12 and the third term is 16.
- (a) Determine the ratio  $\frac{ar^2}{a + ar}$
- (b) If the first term is larger than the second term, find the value of  $r$ .
5. There are two signposts A and B on the edge of the road. A is 400 m to the west of B. A tree is on a bearing of  $060^\circ$  from A and a bearing of  $330^\circ$  from B. Calculate the shortest distance of the tree from the edge of the road.
6. A cylinder of radius 14 cm contains water. A metal solid cone of base radius 7 cm and height 18cm is submerged into the water. Find the change in height of the water level in the cylinder.
7. A company saleslady sold worth Kshs 42, 000 from this sale she earned a commission of Kshs 4,000
- (a) calculate the rate of commission
- (b) If she sold goods whose total marked price was Kshs 360,000 and allowed a discount of 2% calculate the amount of commission she received.
8. The following enrollment figures for twenty primary schools were collected
- |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 934 | 923 | 936 | 924 | 933 | 933 | 937 | 926 | 923 |
| 934 | 931 | 929 | 934 | 927 | 932 | 934 | 927 | 940 |

(a) Determine the mode

(b) The difference from an assumed mean were obtained and rearranged as follows

(i) Determine the assumed mean

(ii) Use the assumed mean in (b) (i) to find the mean enrolment

9. Given that  $A = \begin{pmatrix} 1 & 2 \\ 5 & 3 \end{pmatrix}$ ,  $3 \begin{pmatrix} B \end{pmatrix} = \begin{pmatrix} 3 & 1 \\ 5 & -1 \end{pmatrix}$ ,  $C = \begin{pmatrix} p & 0 \\ 0 & q \end{pmatrix}$  and  $AB = BC$ , determine the value of P

10. The curve  $y = ax^3 - 3x^2 - 2x + 1$  has the gradient 7 when  $x=1$ . Find the value of a

11. Find the value of  $\theta$  between  $0^\circ$  and  $360^\circ$  satisfying the equation  $5 \sin \theta = 4$

12. A businesswoman bought two bags of maize at the same price per bag. She discovered that one bag was of high quality and the other of low quality. On the high quality bag she made a profit by selling at Kshs 1,040. Whereas on the low quality bag she made a loss by selling at Kshs 880. If the profit was three times the loss, calculate the buying price per bag.

13. Given that  $y = \frac{b - bx^2}{cx^2 - a}$  make x the subject

14. Two towns P and Q are 400 km apart. A bus left P for Q. It stopped at Q for one hour and then started the return journey to P. One hour after the departure of the bus from P, a trailer also heading for Q left P. The trailer met the returning bus  $\frac{3}{4}$  of the way from P to Q. They met t hours after the departure of the bus from P.

(a) Express the average speed of the trailer in terms of t

(b) Find the ratio of the speed of the bus so that of the trailer.

15. Akinyi bought three cups and four spoons for Kshs. 324. Wanjiku bought five cups and Fatuma bought two spoons of the same type as those bought by Akinyi. Wanjiku paid Kshs 228 more than Fatuma. Find the price of each cup and spoon.

16. (a) Work out the exact value of  $R = \frac{1}{0.003146 - 0.003130}$

(b) An approximate value of R may be obtained by first correcting each of the decimal in the denominator to 5 decimal places

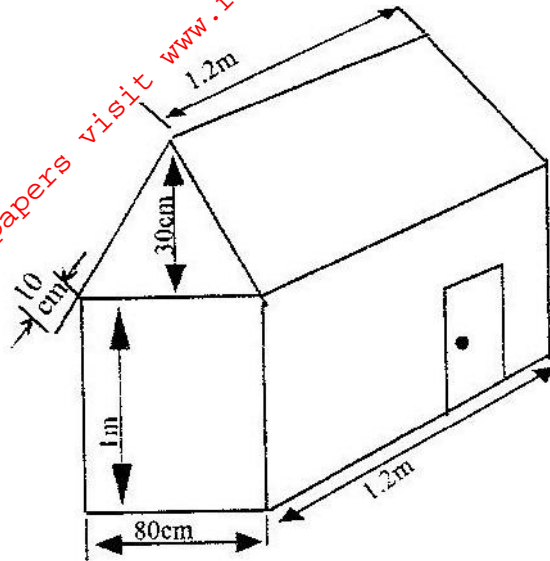
(i) The approximate value

(ii) The error introduced by the approximation

**SECTION II (48 MARKS)**

**Answer six questions from this section**

17. The figure below shows a portable kennel



(a) Calculate

- The total surface area of the walls and the roof (include the door as part of the wall)
- The total area of the roof

(b) The cost of roofing is Kshs 300 per square metre and that of making walls and floor Kshs 350 per square metre. Find the cost of making the kennel

(c) Find the cost of roofing another kennel whose dimensions are 50% more than those of given kennel.

18. A ship leaves an island ( $5^{\circ}\text{N}$ ,  $45^{\circ}\text{E}$ ) and sails due east for 120 hours to another island. The average speed of the ship is 27 knots.

(a) Calculate the distance between the two islands

- in nautical miles
- in kilometers

(b) Calculate the speed of the ship in kilometers per hour

(c) Find the position of the second island

(take 1 nautical mile to be 1.853 Km and the radius of the earth to be 6370 Km)

19. Using ruler and compasses only construct triangle ABC such that  $AB = 4$  cm,  $BC = 5$  cm and  $\angle ABC = 120^{\circ}$ . Measure AC.

On the diagram, construct a circle which passes through the vertical of the triangle ABC.

Measure the radius of the circle

Measure the shortest distance from the centre of the circle to line BC.

20. (a) Draw the graph of  $y = 6 + x - x^2$ , taking integral value of  $x$  in  $-4 \leq x \leq 5$ . (The grid is provided). Using the same axes draw the graph of  $y = 2 - 2x$

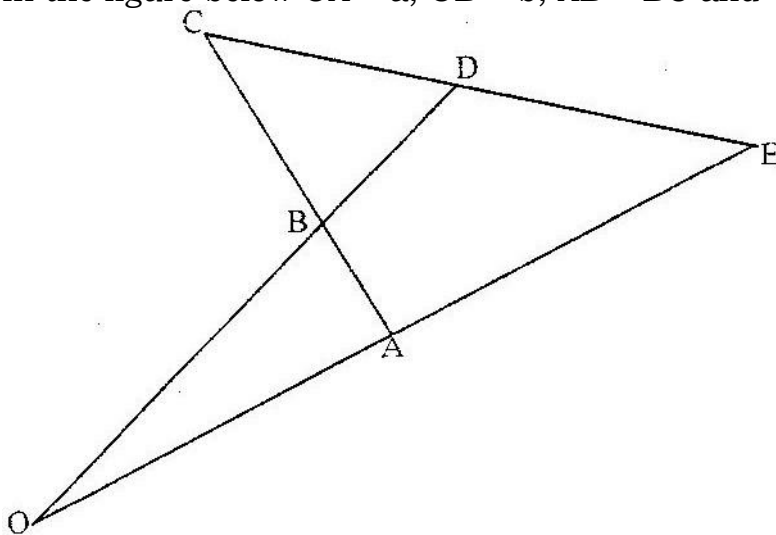
(b) From your graphs, find the values of  $X$  which satisfy the simultaneous equations  $y = 6 + x - x^2$   
 $y = 2 - 2x$

(c) Write down and simplify a quadratic equation which is satisfied by the values of  $x$  where the two graphs intersect.

21. The water supply in a town depends entirely on two water pumps. A and B. The probability of pump A filling is 0.1 and the probability of pump B failing is 0.2. Calculate the probability that

- (a) Both pumps are working
- (b) There is no water in the town
- (c) Only one pump is working
- (d) There is some water in the town

22. In the figure below  $OA = a$ ,  $OB = b$ ,  $AB = BC$  and  $OB:BD = 3:1$



- (a) Determine
  - (i)  $AB$
  - (ii)  $CD$ , in terms of  $a$  and  $b$

- (b) If  $CD : DE = 1:k$  and  $OA:AE = 1: m$  determine
  - (i)  $DE$  in terms of  $a$ ,  $b$  and  $k$

23. The figure on the grid shows a triangular shaped object  $ABC$  and it's image  $A'B'C'$

(a) (i) Describe fully the transformation that maps  $ABC$  and  $A'B'C'$

(ii) Find a  $2 \times 2$  matrix that transforms triangle  $ABC$  onto triangle  $A'B'C'$

(b) The matrix  $\begin{pmatrix} 2 & \\ & 1 \end{pmatrix}$  transforms triangle  $ABC$  onto  $A''B''C''$

- (i) Find the coordinates of A" B" C"
- (c) Find the area of triangle ABC
- (d) Hence find the area of the image A" B" C
24. The coordinates of the points P and Q are ( 1, -2) and ( 4, 10) respectively. A point T divides the line PQ in the ratio 2: 1
- (a) Determine the coordinates of T
- (b) (i) Find the gradient of a line perpendicular to PQ
- (ii) Hence determine the equation of the line perpendicular PQ and passing through T
- (iii) If the line meets the y- axis at R, calculate the distance TR, to three significant figures