

**MATHEMATICS PAPER 121/ 1 K.C.S.E 1999
QUESTIONS**

Answer all questions in this section

1. (a) Evaluate

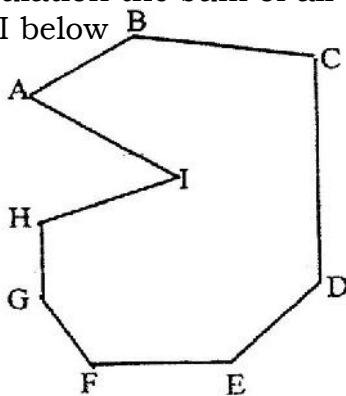
$$\frac{-8 \div 2 + 12 \times 9 - 4 \times 6}{56 \div 7 \times 2}$$

- (b) Simplify the expression

$$5a - 4b - 2 [a - (2b + c)]$$

2. A point $(-5, 4)$ is mapped onto $(-1, -1)$ by a translation. Find the image of $(-4, -5)$ under the same translation.

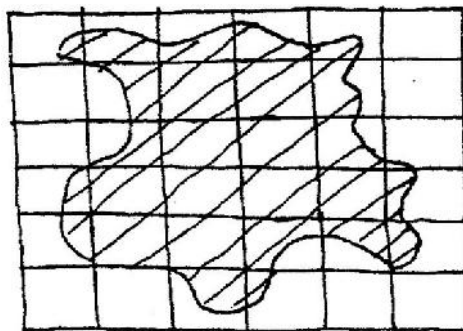
3. Find by calculation the sum of all the interior angles in the figure ABCDEFGHI below



4. An open right circular cone has a base radius of 5 cm and a perpendicular height of 12 cm.

Calculate the surface area of the cone (take π to be 3.142)

5. The figure below is a map of a forest drawn on a grid of 1 cm squares



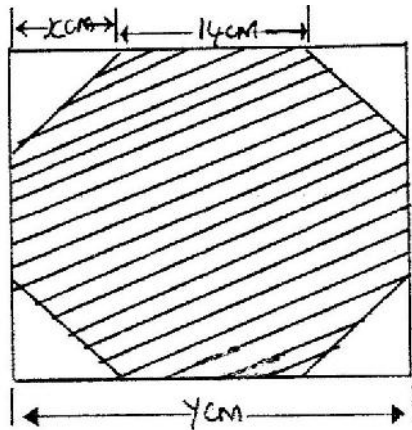
- (a) Estimate the area of the map in square centimeters
- (b) If the scale of the map is 1: 50,000 estimate the area of the forest in hectares
6. The table below shows the weight and price of three commodities in a given period

Commodity	Weight	Price Relatives
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X	3	125
Y	4	164
Z	2	140

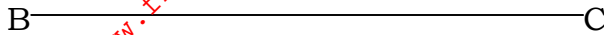
Calculate the retail index for the group of commodities

7. Two baskets A and B each contain a mixture of oranges and limes, all of the same size. Basket A contains 26 oranges and 13 limes. Basket B contains 18 oranges and 15 limes. A child selected a basket at random and picked a fruit at a random from it.
- (a) Illustrate this information by a probabilities tree diagram
- (b) Find the probability that the fruit picked was an orange
8. A girl wanted to make a rectangular octagon of side 14cm. She made it from a square piece of a card of size y cm by cutting off four isosceles triangles whose equal sides were x cm each, as shown below.



- (a) Write down an expression for the octagon in terms of x and y
- (b) Find the value of x
- (c) Find the area of the octagon
9. The length and breadth of a rectangular floor were measured and found to be 4.1 m and 2.2 m respectively. If possible error of 0.01 m was made in each of the measurements, find the:
- (a) maximum and minimum possible area of the floor
- (b) Maximum possible wastage in carpet ordered to cover the whole floor
10. A business woman opened an account by depositing Kshs. 12,00 in a bank on 1st July 1995. Each subsequent year, she deposited the same amount on 1st July. The bank offered her 9% per annum compound interest. Calculate the total amount in her account on
- (a) 30th June 1996
- (b) 30th June 1997

11. Given below is line BC. Without using a protractor construct another through B making an angle of $37\frac{1}{2}^\circ$ with BC. Using the constructed line subdivide BC into 7 equal parts.



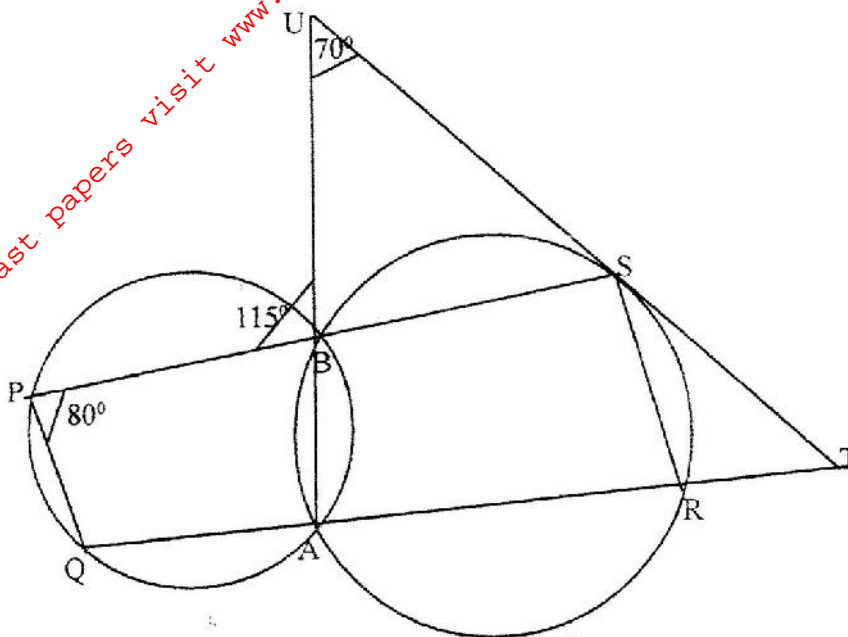
12. ABCD is a cyclic quadrilateral and AB is a diameter. Angle $ADC = 117^\circ$. Giving reason for each step, calculate $\angle BAC$.
13. An artisan has 63 kg of metal of density $7,000\text{kg/m}^3$. He intends to use to make a rectangular pipe with external dimensions 12 cm by 15 cm and internal dimensions 10 cm by 12 cm. Calculate the length of the pipe in metres.
14. An equilateral triangle ABC lies in a horizontal plane, A vertical flag AH stand at A. If $AB = 2 AH$ find the angle between the planes ABC and HBC.
15. By substituting triangle for $(2 - 0)$ or otherwise simplify the expression $(x + 2 - a)^2 + (2 - a - x)^2 - 2(x - 2 + a)(x + 2 - a)$. Give your answer in terms of a and as a product of two squares.
16. A particle moves on a straight line. The velocity after t seconds is given by $V = 3t^2 - 6t - 8$. The distance of the particle from the origin after one second is 10 metres. Calculate the distance of the particle from the origin after 2 seconds.

SECTION II (48 Marks)

Answer any six questions from this section

17. The cost of a minibus was Kshs. 950,000. It depreciated in value by 5% per year for the first two years by 15% per year for the subsequent years.
- (a) Calculate the value of the minibus after 5 years
- (b) After 5 years the minibus was sold through a dealer at 25% more than its value to Mr. X. If the dealer's sale price was to be taken as its value after depreciation, calculate the average monthly rate of depreciation for 5 years.
18. A triangle plot of land ABC is such that $AB = 34\text{ m}$, $AC = 66\text{ m}$ and $\angle BAC = 96.70^\circ$
- (a) Calculate the length of BC
- (b) In order to subdivide the plot, a fencing post P is located on BC such that $BP:PC = 1:3$. Calculate the area of the plot ABC and hence find the area of the triangular subdivision APB.
- (c) A water pipe running through the subdivision APB is parallel to AB and divides the area in the ratio 4:5 where the bigger portion is a trapezium. Calculate the distance of the pipe from P.

19. The figure below shows two circles ABPQ and ABSR intersecting at A and B. PBS, QART and ABU are straight lines. The line UST is a tangent to a circle ABSR at S. $\angle BPO = 80^\circ$, $\angle PBU = 115^\circ$ and $\angle BUS = 80^\circ$



Find the values of the following angles, stating your reason in each case.

(a) $\angle BAR$

(b) $\angle STR$

(c) $\angle BSU$

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

x	-2	-1.5	-1	0	1	2	3	4	5
x^2		-3.4	-1	0	1		27	64	125
$-5x^2$	-20	-11.3	-5	0	-1	-20	-45		
$2x$	-4	-3		0	2	4	6	8	10
9	9	9	9	9	9	9	9	9	99
		-8.7			9	7		-3	

(b) On the grid provided draw the graph of $y = x^3 - 5x^2 + 2x + 9$ for $-2 \leq x \leq 5$

(c) Using the graph estimate the root of the equation $x^3 - 5x^2 + 2 + 9 = 0$ between $x =$

2 and $x = 3$

(d) Using the same axes draw the graph of $y = 4 - 4x$ and estimate a solution to the

equation $x^2 - 5x^2 + 6x + 5 = 0$

21. In triangle OAB, $OA = a$ $OB = b$ and P lies on AB such that $AP:BP = 3:5$
- (a) Find the terms of a and b the vectors

- (i) AB
- (ii) AP
- (iii) BP
- (iv) OP

- (b) Point Q is on OP such $AQ = \frac{-5a + 9b}{8 - 40}$

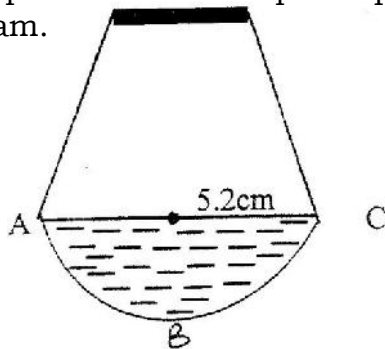
Find the ratio OQ:QP

22. If $x^2 + y^2 = 29$ and $x + y = 3$
- (a) Determine the values of

- (i) $x^2 + 2xy + y^2$
- (ii) $2xy$
- (iii) $x^2 - 2xy + y^2$
- (iv) $x - y$

- (b) Find the value of x and y

23. The diagram below shows a cross-section of a bottle. The lower part ABC is a hemisphere of radius 5.2 cm and the upper part is a frustrum of a cone. The top radius of the frustrum is one third of the radius of the hemisphere. The hemisphere part is completely filled water as shown in the diagram.

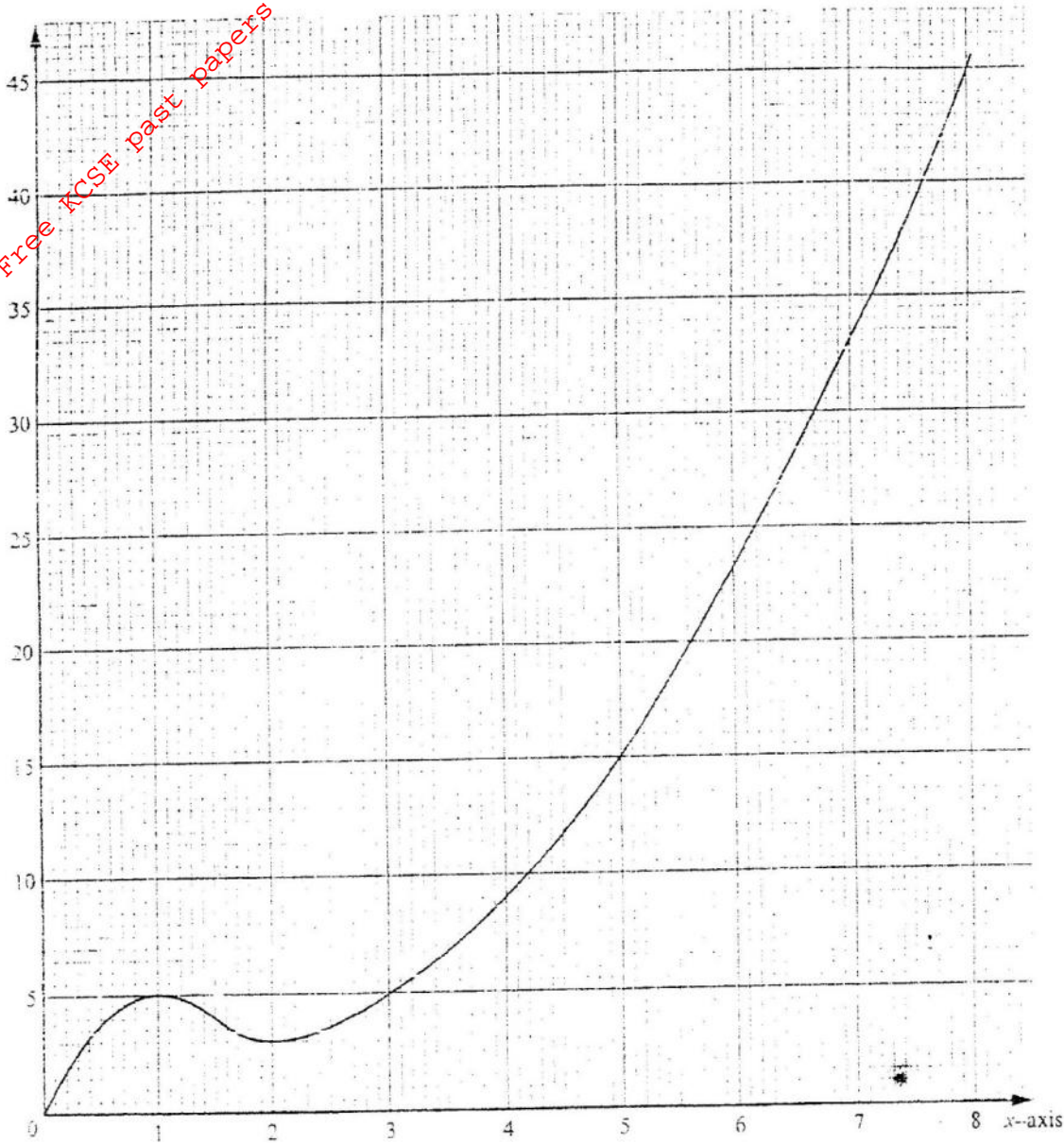


When the container is inverted, the water now completely fills only the frustrum part.

(a) Determine the height of the frustrum part

(b) Find the surface area of the frustrum part of the bottle.

24. The graph below consists of a non-quadratic part ($0 \leq x \leq 2$) and a quadratic part ($2 \leq x \leq 8$). The quadratic part is $y = x^2 - 3x + 5$, $2 \leq x \leq 8$



(a) Complete the table below

x	2	3	4	5	6	7	8
y	3						

(1 mark)

(b) Use the trapezoidal rule with six strips to estimate the area enclosed by the

curve, $x =$ axis and the line $x = 2$ and $x = 8$ (3 marks)

(c) Find the exact area of the region given in (b) (3 marks)

(d) If the trapezoidal rule is used to estimate the area under the curve between

$x = 0$ and $x = 2$, state whether it would give an under- estimate or an over estimate. Give a reason for your answer (1 mark)