MATHEMATICS PAPER 121/1 K.C.S.E 2004
SECTION 1(52 MARKS)

Answer all the questions in this section

1. Without using logarithm tables evaluate

   $$\frac{0.015 + 0.45 \div 1.5}{4.9 \times 0.2 + 0.07}$$

   Giving the answer in decimal form.

2. The size of an interior angle of a regular polygon is 156^0. Find the number of sides of the polygon.

3. Simplify the expression $\dfrac{2a^2 - 3ab - 2b^2}{4a^2 - b^2}$

4. Given that OA = 3i -2j + and OB = 4i + j – 3k. Find the distance between points A and B to 2 decimal places.

5. The velocity V ms, of a moving body at time t seconds is given by
   V = 5t2 – 12t + 7

6. Point C divided the line AB given below externally in the ratio 5:2

   B

   A
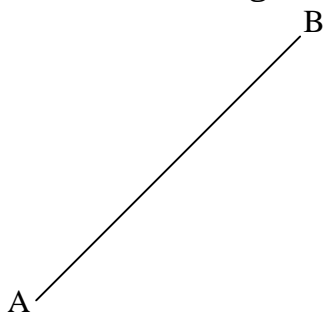
   By construction, determine the position of point c

7. In the year 2003, the population of a certain district was 1.8 million. Thirty per cent of the population was in the age group 15 – 40 years. In the same year, 120,000 people in the district visited the Voluntary Counseling and Testing (VCT) centre for an HIV test.

   If a person was selected at random from the district in this year. Find the probability that the person visited a VCT centre and was in the age group 15 – 60 years.

8. Use tables of reciprocals only to work out

$\dfrac{3}{0.6735} + \dfrac{13}{0.156}$

9. Give that xo is an angle in the first quadrant such that 8 sin 2x + 2 cos X -5=0
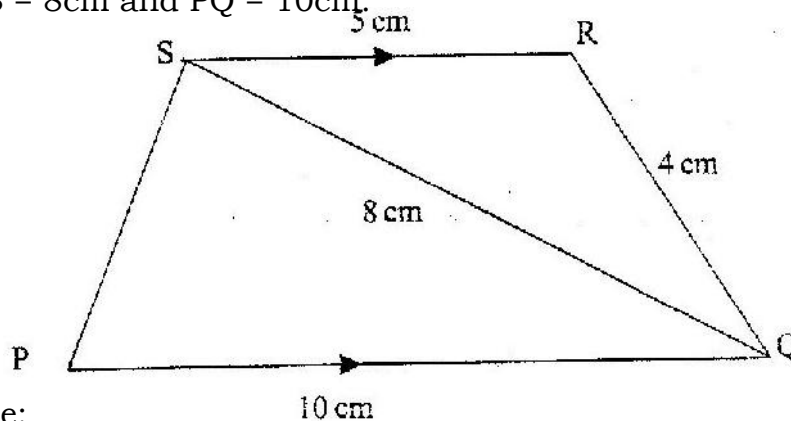   Find:
    a) Cos x
    b) tan x

10. Omolo bought a new car for ksh. 800,000. After 5 years, he sold it through a second- hand car dealer. The dealer charged a commission of 4% for the sale of the car. If Omolo received Ksh.480, 000, calculate the annual rate of depreciation of the car.

11. The table below shows some values of the function y = x2 +3

X	0	1/2	1	$1^1/_2$	2	$2^1/_2$	3	$3^1/_2$	4	$4^1/_2$	5	$5^1/_2$	6
y	3		4	$5^1/_4$	7		12	$15^1/_4$	19		28		39

    a) Complete the table
        b) Use the mid – ordinate rule with six ordinates to estimate the area bounded by y = x ÷3, the y – axis, the x – axis and the line x = 6
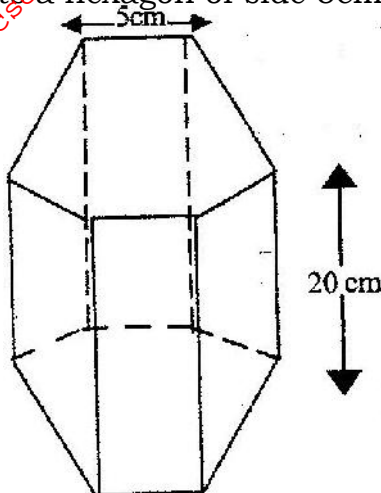
12. In the figure below PQRS is a trapezium with SR parallel to PQSR = 5cm, RQ = 4cm, QS = 8cm and PQ = 10cm.
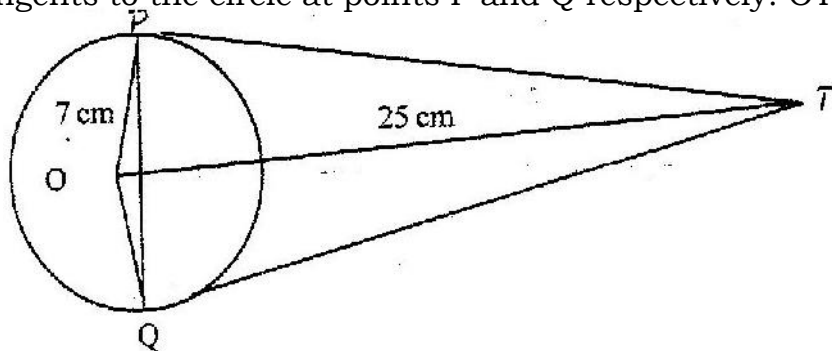

    Calculate:
    a) The size of angle QSR
    b) The area of triangle PQS

13.   The figure below represents a hexagon of side 5cm.

Find the volume of the prism.

14.   The figure below shows a circle, centre, O of radius 7cm. TP and TQ are tangents to the circle at points P and Q respectively. OT =25cm.

Calculate the length of the chord PQ

15.   The figure below is a triangle XYZ. Using a pair of compasses and a ruler only, construct an inscribed circle such that the centre of the circle and the point x are the opposite sides of line ¥z.
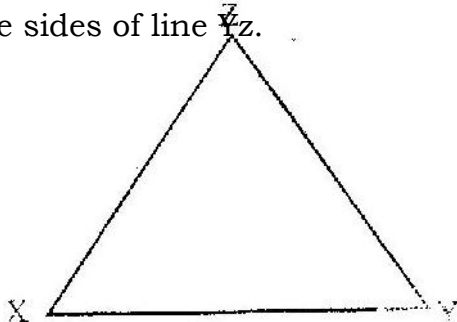
16.   P(5,) and Q (-1,2) are points on a straight line. Find the equation of the perpendicular bisector of PQ: giving the answer in the form y = mx+c.

SECTION II (48 MARKS)

17. The table below shows monthly income tax rates for the year 2003.

Monthly taxable income in Ksh.	Tax rates(Percentage)
1-9860	10%
9681 – 18800	15%
27921 – 37040	20%
37041 and above	25%
	30%

In the year 2003.Ole Sanguya's monthly earnings were as follows:-
Basic salary   Ksh 20600
House allowance   ksh 12000
Medical allowance Ksh 2880
Transport allowance   Ksh 340.
Ole Sanguya was entitled to a monthly tax relief of Ksh 1056.
   Calculate:
   a)   His monthly taxable income
   b)   The monthly tax paid by Ole Sanguya.

18. The equation of a curve is given $y = x^2 + 4x^2 – 2$
   a)   Determine the coordinates of the tuming points of the curve, correct to 1 decimal place.
   b)   Use the equation of the curve to complete the table below.

X	-4	-3	-2	-1	0	1
y	-2		6	1		

   c) i)   On the grid provided, use the solutions in part (a) and the values in
      the table in part (b) to draw the curve for -4 < x< 1.
   ii)   Use the graph to solve the equation $x^3 + 4x^2 – 2 = 0$

19. The figure below represents a model of a solid structure in the shape of a frustum of a cone with hemispherical top. The diameter of the hemispherical part is 70cm and is equal to the diameter of the top of the frustum. The frustum has a base diameter of 28cm and slant height of 60cm.
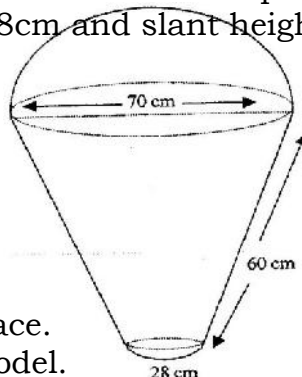
Calculate
a) The area of hemispherical surface.
b) The total surface area of the model.

20. The simultaneous equations below, are satisfied when x = 1 and y =p

    -3x + 4y = 5

    $qx^2 - 5xy + y^2 = 0$

    a) Find the values of P and Q.

    b) Using the value of Q obtained in (a) above, find the other values of x and y which also satisfy the given simultaneous equations.

21. a) If A,B and C are the points P and Q are p and q respectively is another point with position vector r = 3q $-^1/_2$ p.

    Express in terms of p and q.

    i) PR

    ii) RQ hence show that P,Q and R are collinear.

    iii) Determine the ratio PQ:QR.

22. In the figure below, K M and N are points on the circumference of a circle centre O. The points K, O, M and p are on a straight line.

    PN is a tangent to the circle at N.Angle KOL = 130^0 and angle MKN = 40^0
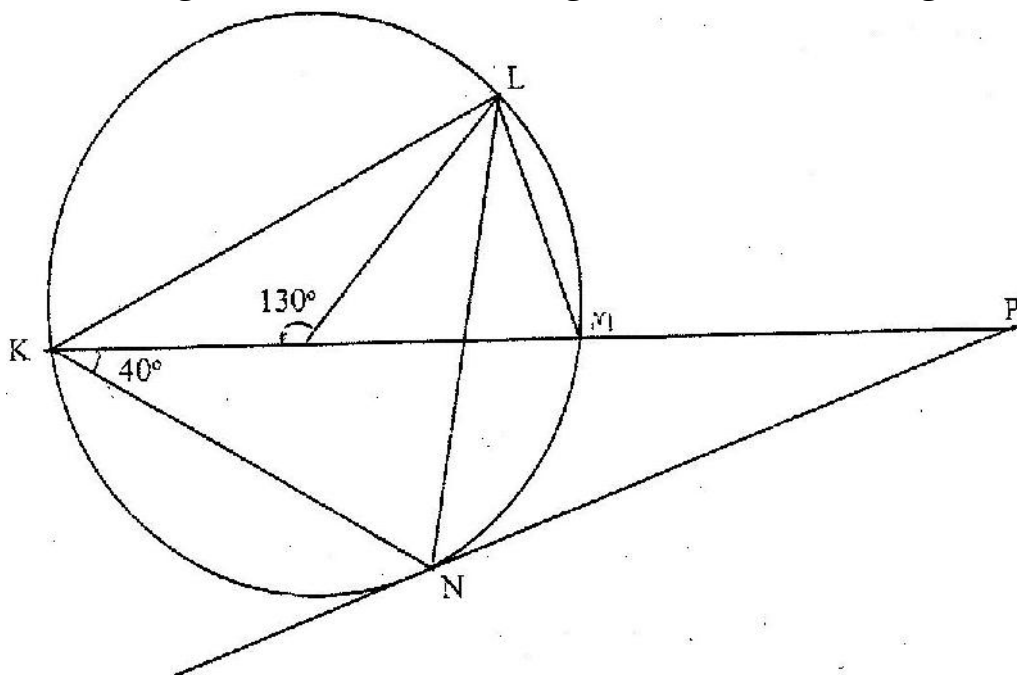
    Find the values of the following angles, stating the reasons in each case:

    a) <MLN

    b) <OLN

    c) < LNP

    d) <MPN

23. A triangular plot ABC is such that the length of the side AB is two thirds that of BC. The ratio of the lengths AB:AC = 4:9 and the angle at B is obtuse.
   a) The length of the side BC
   b) i) The area of the plot
      iii) The size of <ABC

24. A man who can swim at 5km/h in still water swims towards the east to cross arriver. If the river flows from north to south at the rate of 3km/h
   a) Calculate:
      i) The resultant speed
      ii) The drift
   b) If the width of the river is 30m, find the time taken, in seconds, for the man to cross the river.

MATHEMATICS PAPER 121/2 K.C.S.E 2004
QUESTIONS
SECTION 1 (52 marks)

Answer all the questions in this section

1. Use logarithms to evaluate

$$\sqrt{\frac{34.33}{5.25 \times 0.042}}$$

2. The marked price of a car in a dealer's shop was Kshs 400,000. Wekesa bought the car at 8% discount. The dealer still made a profit of 15%. Calculate the amount of money the dealer had paid for the car.

3. Find the number of terms of the series 2 + 6 + 10 + 14 + 18 + ... that will give a sum of 800.

4. Two trains T1 and T2 traveling in the opposite directions, on parallel tracks are just beginning to pass one another. Train T1 is 72 m long and traveling at 108 km/h. T2 is 78 m long and is traveling at 72 km/h.

   Find the time, in seconds, the two trains take to completely pass one another

5. Evaluate without using mathematical tables, the expression
   $2 \log_{10} 5 - \frac{1}{2} \log_{10} 16 + 2 \log_{10} 40$

6. A students obtained the following marks in four tests during a school term: 60%, 75%, 48% and 66%. The tests were weighted as follows: 2,1 4 and 3 respectively.
   Calculate the students weighed mean mark of the tests

7. Use matrices to solve the simultaneous equations
 $$4x + 3y = 18$$
   $$5x - 2y = 11$$

8. (a) Expand $(1 + x)^5$
   (b) Use the first three terms of the expansion in (a) to find the approximate value of $(0.98)^5$

9. Make b the subject
   $$a = \frac{bd}{\sqrt{(b^2 - d)}}$$

10. A group of 5 people can do a piece of work in 6 hours. Calculate the time a group of people. Working at half the rate of the first group would take to complete the same work.

11. In the figure below ABCDE is a cross- section of a sold. The solid has uniform cross- section. Given that BG is a base edge of the solid, complete the sketch, showing the hidden edges with broken lines.
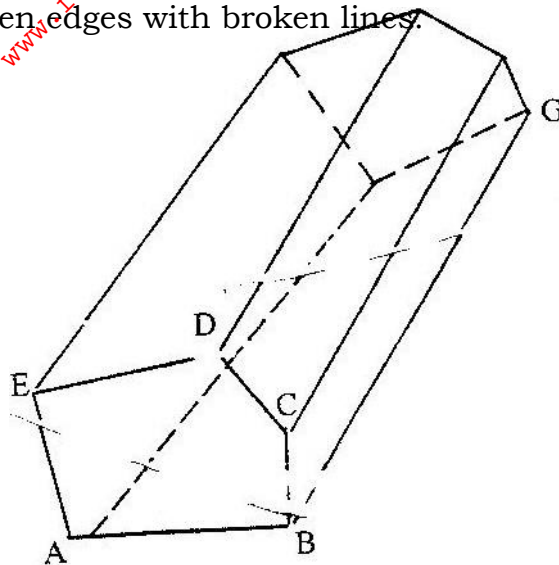
12. An industrialist has 450 litres of a chemical which is 70% pure. He mixes it with a chemical of the same type but 90% pure so as to obtain a mixture which is 75% pure.

    Find the amount of the 90% pure chemical used

13. The gradient function of a curve is given $\dfrac{dy}{dx} = 3x^2 - 8x + 2$. If the curve passes through the point, (0, 2), find its equation.
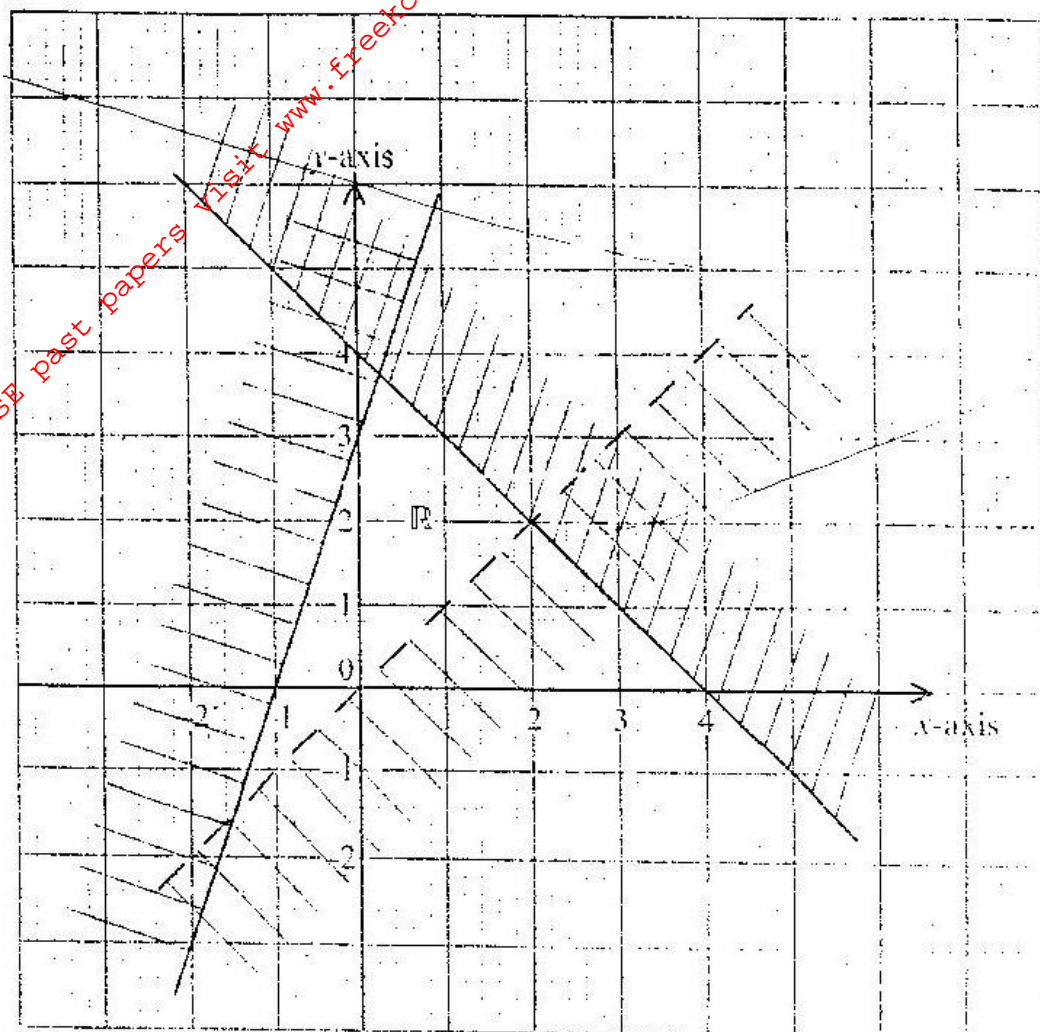
14. In this questions, mathematical tables should not be used
    At Kenya bank buys sells foreign currencies as shown below:

	Buying (Kenya Shillings	Selling (Kenya Shillings)
1 Euro	84.15	84.26
100 Japanese yen	65.37	65.45

    A Japanese traveling from France arrives in Kenya with 5000 Euros, he converts all the 5000 Euros to Kenya Shillings at the bank.

    Calculate the amount in Japanese yen, than he receives.

15. Form the three inequalities that satisfy the given region R.

16. Without using mathematical tables, simplify

$$\frac{2}{3 - \sqrt{7}} - \frac{2}{3 + \sqrt{7}}, \text{ in the form } \sqrt{a} \quad b$$

SECTION II (48 Marks)

Answer any six questions from this section

17. Farmer has two tractors A and B. The tractors, working together can plough a farm in 21/2h. One day, the tractors started to plough the farm together. After 1 h 10 min tractor B broke down but A continued alone and completed the job after a further 4 h.

Find;
(a) The fraction of the job done by the tractors, working together for one hour
(b) The fraction of the job done by tractor A and B broke down
(c) The time each tractor working alone would have taken to plough the farm.

18. The table below shows the ages in years of 60 people who attended a conference.

Age in years	30 – 39	40- 49	50- 59	60-69	70-79
Number of people	10	12	18	17	3

Calculate
(a) The inter-quartile range of the data
(b) The percentage of the people in the conference whose ages were 54.5 years and below.

19. For electricity posts, A,B,C, and D stand on a level ground such that B is 21 m on a bearing of 060^0 from A, C, is 15 m to the south of B and D is 12 m on a bearing of 140^0 from A.

(a) (i) Using scale of 1 cm of I cm to represents 3 metres, draw a diagram to show the relative positions of the posts
(ii) Find the distances and the bearing of C from D
(b) The height of the post at A IS 8.4m. On a separate scale drawing, mark and determine the angle of depression of the foot of the post at C from the top of the top of the post at A.

20. (a) Given that the matrix A = $\begin{pmatrix} 2 & 3 \\ 3 & 4 \end{pmatrix}$ Find A^{-1} the inverse of A

(b) Kimtai bought 200 bags of sugar and 300 bags of rice for a total of Kshs. 850,000. Buya bought 90 bags of sugar and 120 bags of rice for a total of Kshs. 360,000. If the price of a bag of sugar is Kshs x and that of rice is Kshs. Y,
(i) Form two equations to represent the information above
(ii) Use the matrix A^{-1} to find the prices of one bag of each item.

(c)   Kali bought 225 bags of sugar and 360 bags of rice. He was given a total
        discount of Kshs. 33, 300.
        If the discount on the price of a bag of rice was 2%, calculate the
        percentage discount on the price of a bag of sugar.

21.   Triangle ABC is the image of triangle PQR under the transformation $M = \begin{pmatrix} 2 & 4 \\ 0 & 2 \end{pmatrix}$

       Where P,Q and P map onto A, B, and C respectively.
        (a) Given the points P(5, -1), Q(6,-1) and R (4, -0.5), draw the triangle ABC
   on the grid provided below.
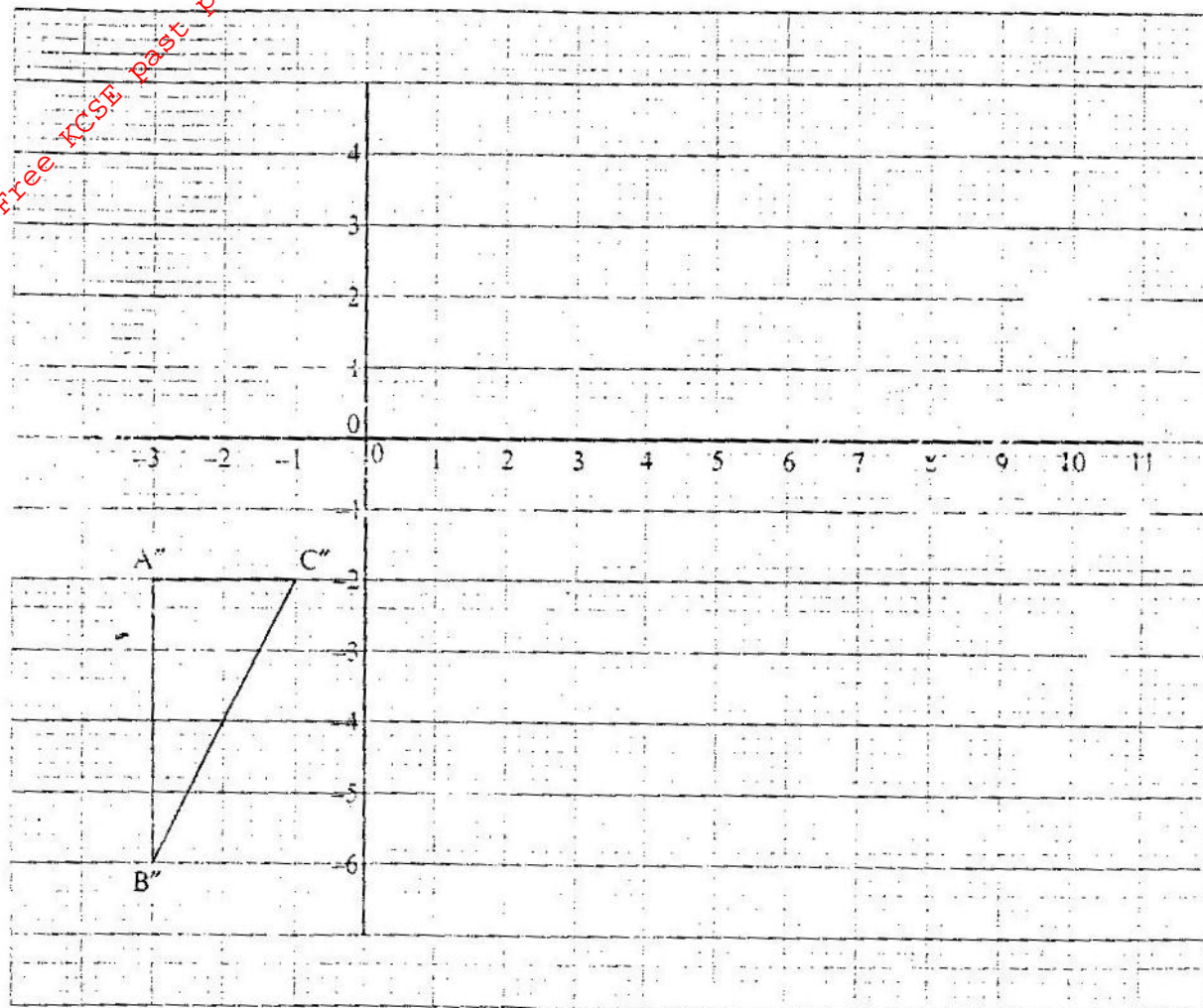
    (b) Triangle ABC in part (a) above is to be enlarged scale factor 2 with centre at
        (11, -6) to map onto A'B'C.
        Construct and label triangle A'B'C' on the grid above.

    (c) By construction find the coordinates of the centre and the angle of rotation
        which can be used to rotate triangle A'B'C' onto triangle A" B" C", shown on
        the grid above.

22. A particle moves in a straight line. It passes though point O at t = O with velocity v= 5m/s. The acceleration a m/s^2 of the particle at time t seconds after passing through O is given by a = 6t + 4

   (a) Express the velocity v of the particle at time t seconds in terms of t

   (b) Calculate
       (i) The velocity of the particle when t = 3
       (ii) The distance covered by the particle between t = 2 and t = 4

23. Three quantities P,Q and R are sure that P varies directly as the square of Q and inversely as the square root of R.
   (a) Given that P = 20 when Q = 5 and R = 9, find P when Q and R = 25
   (b) If Q increases by 20% and decreases by 36%, find the percentage increase in P.

24. The figure below shows a model of a roof with a rectangular base PQRS PQ = 32 cm and QR = 14 cm. The ridge XY = 12 cm and is centrally placed. The faces PSX and QRY are equilateral triangles M is the midpoint of QR.
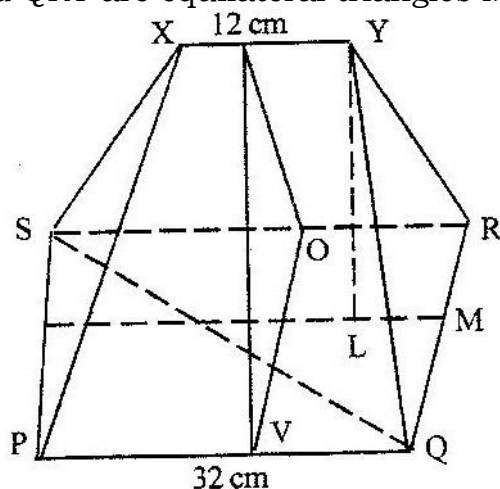
Calculate
    (a) (i) the length of YM
       (ii) The height of Y above the base PQRS

    (b) The angle between the planes RSXY and PQRS
    (c) The acute angle between the lines XY and QS