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Index No.....

121/2
MATHAMATICS
PAPER 2
July/August – 2009
Time: 2 ½ Hours

INTERZONAL

Kenya Certificate of secondary Education

Mathematics
Paper 2
July/August – 2009
Time 2 ½ Hours

Answer all questions in this section

1. Use the logarithms to evaluate

(4 marks)

$$\left(\frac{0.6791 \times \sin 24}{\log 5} \right)^{8/4}$$

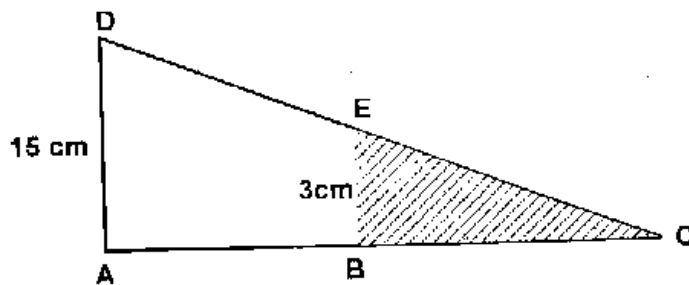
2. Make b the subject of the formula and simplify as far as possible (3 marks)

$$\left(\frac{bx + b^2}{x^2} \right) = \frac{x}{b}$$

3. (a) Expand $\left(1 + \frac{3}{x}\right)^6$ upto the 4th term (2 marks)

- (b) By expressing 2.5 in the form $1 + \frac{3}{x}$ use the expression in (a) to calculate $(2.5)^6$ correct to 3 d.p. (2 marks)

4. Find the area of the shaded region in figure below given that $AD = 15$ cm, $BE = 3$ cm, $AB = 8$ cm and $\angle DAB = \angle EBC = 90^\circ$ (3 marks)



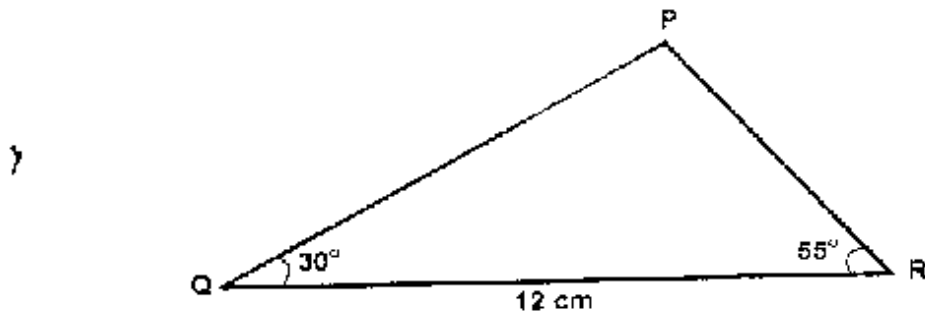
5. By calculation, find the coordinates of the inter – section of the graphs $Y = 3x + 1$ and $y = x^2 + 2x - 5$ (3 marks)

6. The gradient function of a curve is given by $\frac{dy}{dx} = 3x - 6$

Determine

- (a) The equation of the curve given that it passes through the point (0,7) (2 marks)
- (b) The coordinates of the turning point of the curve (1 mark)
7. A large estate is represented by a rectangle 8 mm long and 6 mm wide on a map whose scale is 1: 200,000. Determine the actual area of the estate in hectares (4 marks)

8.



The figure above shows ΔPQR where $QR = 12$ cm and $\angle PQR = 30^\circ$ and $\angle PRQ = 55^\circ$

- (a) The length of PQ (1 mark)
- (b) The area of ΔPQR (2 marks)

9. Find the equation of a circle centre (4,-3) and radius 6 units (3 marks)

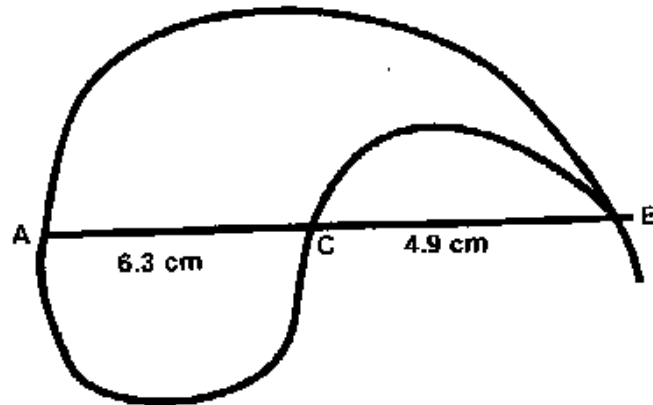
10. Given that $A = \begin{pmatrix} 3 & 1 \\ 2 & -1 \end{pmatrix}$ and $I = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ find two values of λ for which the determinant of $(A - \lambda I)$ is zero, leaving your answer in surd form $\sqrt{13}$ $\sqrt{2}$ is an unknown

11. Draw line $AB = 4.2$ cm. Construct the locus of point P such that $\angle APB = 40^\circ$ (3 marks)

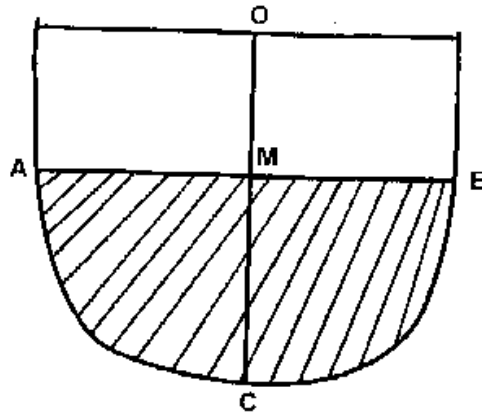
12. Solve the simultaneous equations (4 marks)
 $x^2 + y^2 = 29$
 $x + y = 3$

13. $\frac{\sqrt{5}}{\sqrt{7} - \sqrt{5}} - \frac{\sqrt{7}}{\sqrt{5} + \sqrt{7}}$ Simplify completely (3 marks)

14. Find the perimeter of the figure given that AC and CB are the diameters of the circle AC and CB respectively (2 marks)



15. Figure below shows a hemispherical bowl containing water of depth MC. If $CM:MD = 2:3$ and $AB = 8$ cm, find the radius of the bowl (3 marks)



16. Expand and simplify completely
 $(a + \frac{1}{2}x)(\frac{1}{2}a + x)$

(1 mark)

SECTION II: 50 MARKS)

ANSWER ANY 5 QUESTIONS IN THIS SECTION

17. The table below gives some values of the functions
 $y = 2x^2 - 2x - 21$
and $y = 3 + 5x - x^2$

X										
$Y = 2x^2 - 3x - 21$	-3	-2	-1	0	1	2	3	4	5	6

(a) Complete the table (3 marks)

(b) On squared paper draw the graph of
 $y = 2x^2 - 3x - 21$
and $y = 3 + 5x - x^2$ (4 marks)

(c) Use your graphs to estimate the roots of the equations

(i) $3x^2 - 8x - 24 = 0$ (1 mark)

(ii) $2x^2 - 3x - 16 = 0$ (1 mark)

(iii) $8 + 5x - x^2 = 0$ (1 mark)

18. From a point Y at the top of a cliff a man observes two boats P and Q the angle of depression of a boat P from the top of the cliff is 32° . Find the angle of elevation of the top of the cliff boat Q is 28° . the boat nearest to the foot of the cliff is 150m from Calculate

(a) The distance between the two boats P and Q (4 marks)

(b) The height of the cliff (3 marks)

(d) The distance between the furthest boat and the top of the cliff ignore the height of the man (3 marks)

19. (a) Comply and complete the table below

(2 marks)

X°	0	30	45	60	90	120	135	150	180	210	215	240	270	300	315
$3 \cos x^{\circ}$	3.00	2.61	2.13			-1.50	-2.13		-3.00	-2.61		-1.50	0.00	2.13	
$\sin (-\frac{1}{2}x)^{\circ}$	0.00			-0.5	-0.71	-0.87			-1.00	-0.96			0.71	0.50	0.38

(b) (i) Use the table to draw the graph of $y= 3 \cos x$ and $y = \sin (-\frac{1}{2}x)^{\circ}$ on the same axes (5 marks)

(ii) What is the period of the function $y = \sin (-\frac{1}{2}x)^{\circ}$?

(c) Use your graph to solve for x in $\frac{1}{3} \sin (-\frac{1}{2}x)^{\circ} = \cos x$ (2 marks)

20. (a) Use the trapezium rule to find the area between the curve $y = x^2 + 6$, the x – axis and the ordinates $x = 0$ and $x = 4$ using 8 trapezia (5 marks)

(b) Find the exact area bounded by the curve, the y axis and the ordinate $x = 4$ and hence find the percentage error in your value in (a) above (5 marks)

21. 3 girls Jane, Alice, and Maxine complete a crossword puzzle. The probability of getting it correct for each of them is as follows:

Jane $\frac{2}{5}$, Alice $\frac{2}{3}$ and Maxine $\frac{3}{7}$

Find the probability that:

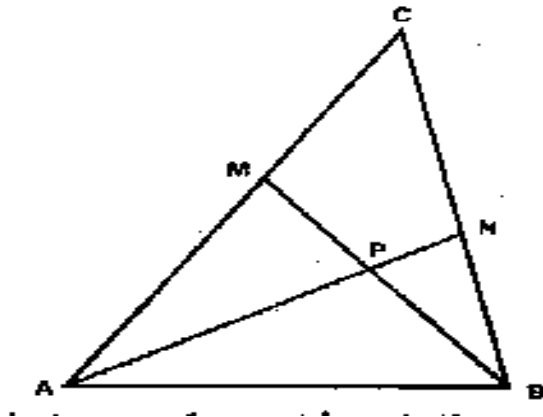
(a) none of them gets it correct (2 marks)

(b) Exactly one gets it correct (3 marks)

(c) At least one gets it correct (3 marks)

(d) Exactly two get it correct given that Maxine has it correct (2 marks)

22. The figure below shows a right pyramid ΔABC standing on a triangular base ABC . Each of the triangle faces of the pyramid is an equilateral triangle of side 12 cm. M is the mid point of BC and vertical height OX of the pyramid is 9.6 cm. Calculate to 1 d.p



(a) the volume of the pyramid (6 marks)

(b) the total surface area of the pyramid (2 marks)

(c) the angle between the plane XBC and ABC (2 marks)

23. The proprietor of happy Valley Secondary School placed an order for x lockers and y chairs from Fair Deal Metal works with the following conditions.

- (i) The number of chairs should be more than the number of lockers
 - (ii) The total number of lockers and chairs must not exceed 100
 - (iii) There should be at least 20 chairs and not less than 10 lockers
 - (iv) The cost of a locker is Kshs 2500 and that of a chair is Kshs. 1000 and proprietor had only Ksh. 150 000 to spend on lockers and chairs during the term.
- (a) Write down all the inequalities describing the situation above (4 marks)
- (b) On the Grid provided, draw the inequalities in part (a) above then shade the unwanted regions (4 marks)
- (c) Determine the maximum number of lockers and chairs that can be bought (2 marks)

24. In triangle ABC, $AB = a$ $AC = b$, $BN = \frac{1}{3} BC$

M is the midpoint of AC and AN and BM intersect at P

(a) Express in terms of a and b only the vectors

(i) \vec{BC} (1 mark)

(ii) \vec{AN} (1 mark)

(iii) \vec{BM} (1 mark)

(b) Given further that $\vec{AP} = k\vec{AN}$ and $\vec{BP} = m\vec{BM}$ where k and m are scalars. Express

(i) \vec{AP} in terms of a , b , k and m (2 marks)

(ii) Find the values of k and m hence express \vec{AP} in terms of a and b only (5 marks)