

Name \_\_\_\_\_ Class \_\_\_\_\_ Index No \_\_\_\_\_

121/2  
MATHEMATICS  
PAPER 2  
JULY/AUGUST 2009  
2 ½ HOURS

## THE BARINGO - KOIBATEX DISTRICT EDUCATIONAL IMPROVEMENT EXAMINATIONS

Kenya Certificate of secondary Education  
121/2  
Mathematics  
Paper 2  
July/August – 2009  
2 ½ hours

### SECTION 1 ( 50 Marks)

1. Use logarithm tables to evaluate ( 4 marks)

$$\sqrt[3]{\frac{13.6 \cos 40^\circ}{63.5}}$$

2. The interior angle of a  $n$ -sided regular polygon exceeds its exterior angle by  $132^\circ$   
find the value of  $n$  ( 3 marks)

3. Given that  $y = Bx^n$ . Make  $n$  the subject of the formula and simplify your answer  
( 3 marks)

4. Given that  $\frac{8}{4-2\sqrt{3}} = a + b\sqrt{3}$  and that  $a$  and  $b$  are rational numbers, find the  
values of  $a$  and  $b$  ( 3 marks)

5. Given that  $p = 2i + j - 2$ , and that  $q = I + 5j$ , determine  $2p - q$  to 2 d.p  
( 3 marks)
6. Using a ruler and a pair of compass only, construct triangle ABC in which line BC 8.8, line AC = 5 cm AB = 7.5 cm  
Locate point X inside triangle ABC which is equidistant from point A and C such that angle AXC =  $90^0$   
( 3 marks)
7. A circle passing through the point (3, -2) has its central at (5, -2). Determine the equation of the circle in the form  $X^2 + y^2 + ax + by + c = 0$

Where a, b and c are constants

( 3 marks)

8. By connecting each number to one significant figure, approximate the value of  $788 \times 0.006$ . Hence, calculate the percentage error in the product ( 3 marks)

9. Without using table or calculator, find the value of t in

( 3 marks)

$$\text{Log}_8 (t + 5) - \log_8 (t - 3) = \frac{2}{3}$$

10. The sum of the first 8 terms of an A.P is 236 and the sum of the first 6 terms of the same series is 147. Find the sum of the first 15 term of the series ( 3 marks)

11. Solve for x in the equation ( 2 marks)

$$\frac{3x-5}{4} - \frac{5x-6}{9} = 3\frac{1}{2}$$

12. Given that  $\sin(2x - 15)^\circ = -0.866$  for  $0^\circ \leq x \leq 360^\circ$ , find the values of x ( 4 marks)

13. Using matrix method, solve the following pair of simultaneous equation ( 3 marks)

$$\begin{aligned} 3p - 4q &= 2 \\ 5p + 3q &= 13 \end{aligned}$$

14. Find the equation of the normal to the curve ( 3 marks)

$$Y = x^3 - 2x^2 + 3x - 1 \text{ at } x = 2$$

15. XYZ is an equilateral triangle and YZ is produced to T so that  $2 ZT = YZ$   
If  $XY = 8\text{cm}$ , find the length of XT ( 3 marks)

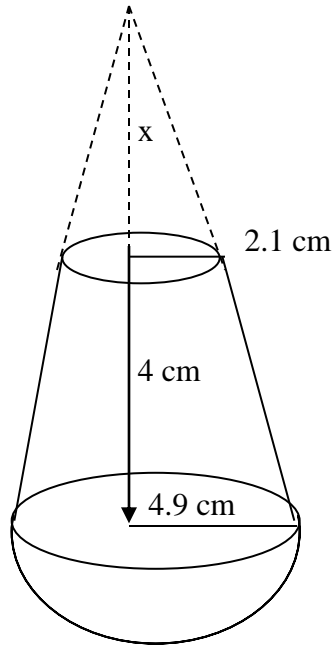
16. Expand  $\left(1 - \frac{1}{(2x)^{-1}}\right)^3$  upto the term in  $x^3$

Hence or otherwise evaluate  $(0.98)^5$  to 4.d.p ( 4 marks)

**SECTION II ( 50 MARKS)**

**Answer any five questions in this section**

17. The diagram below represents a solid consisting of a hemispherical bottom and a conical frustum at the top.

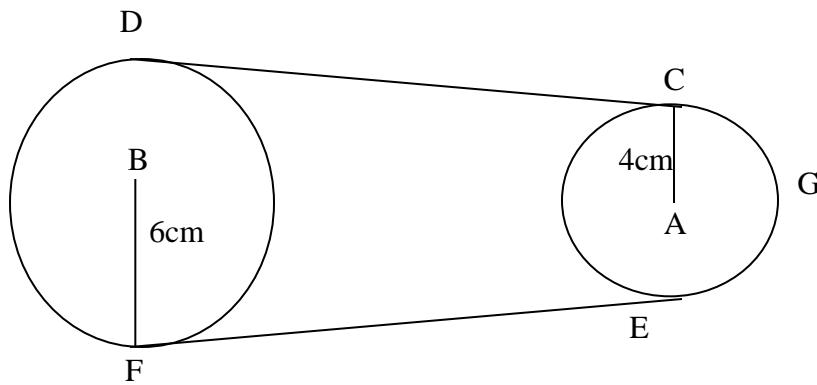


(a) Determine the values of  $x$  and hence the height of the cone ( 2marks)

(b) Calculate (i) The surface area of the solid ( 4 marks)

(ii) The volume of the solid ( 4 marks)

18. The figure below shows a belt passing round two pulleys of centres A and A. The radius of the pulleys are 4cm and 6cm respectively and the distance between them is 25cm.



19. Clients who attended a salon in one week were grouped by age as in the table below

Age ( yrs	$0 \leq x < 5$	$5 \leq x < 15$	$15 \leq x < 25$	$25 \leq x < 45$	$45 \leq x < 75$
No of clients	14	41	60	70	15

Calculate the:

(4 marks)

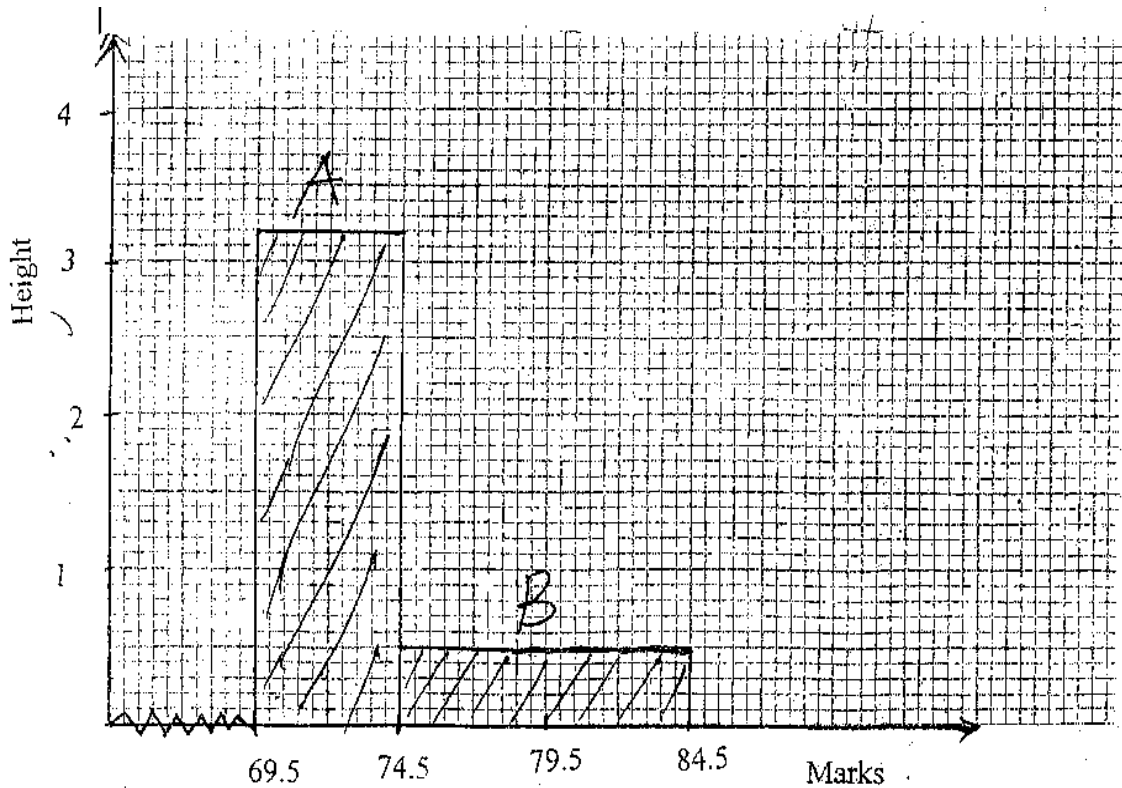
- (a) Mean age



(b) Standard deviation

( 4 marks)

(c) The histogram in the figure below represents the distribution of the marks obtained in the test. Determine the frequency of the class represented by bar A



20. Given that  $y = 2 \sin 2x$  and  $y = 3 \cos (x + 45^\circ)$

(a) Complete the table below

X	$0^\circ$	$20^\circ$	$40^\circ$	$60^\circ$	$80^\circ$	$100^\circ$	$120^\circ$	$140^\circ$	$160^\circ$	$180^\circ$
$2 \sin 2x$	0		1.97		0.68	-0.68	-1.73		-1.28	0.00
$3 \cos (x + 45^\circ)$	2.12	1.27		0.78		-2.46			-2.72	-2.12

(b) Use the data to draw the graph of  $y = 2 \sin 2x$  and  $y = 3 \cos (x + 45^\circ)$

For  $0^\circ \leq x \leq 180^\circ$  on the same axes

( 5 marks)

(c) State the amplitude and the period of each curve

( 2 marks)

(d) Use your graph to solve  $2 \sin 2X - 3 \cos (x + 45^\circ) = 0$  for  $0 \leq x \leq 180^\circ$  ( 1 mark)

## GRAPH

21. The table below shows the income tax rates

Income per month (K£)	Rate in Kshs./ £
1 - 325	2
326 -975	3
976 - 1300	5
1301 - 1625	6
Over 1625	7.5

Mr Kurgat is a public servant who lives in a government house and pays a normal rent of Kshs. 1220 per month. He earns a basic salary of Kshs 24,800 and a house allowance of Kshs 12,000 per month. He is entitled to a monthly tax of Kshs. 1620.

(a) Calculate his monthly

(i) Taxable income in K£ ( 2 marks)

(ii) Tax payable without relief ( 2 marks)

(iii) The tax after relief ( 2 marks)

(b) A part from the income tax. The following monthly deductions are made from his earnings

- HELB loan repayment Kshs. 2400
- Health insurance fund Kshs 1200
- 2 % of basic salary union fee

Calculate

(i) The total monthly deduction made on Mr. Kurgat's income ( 2 mark)

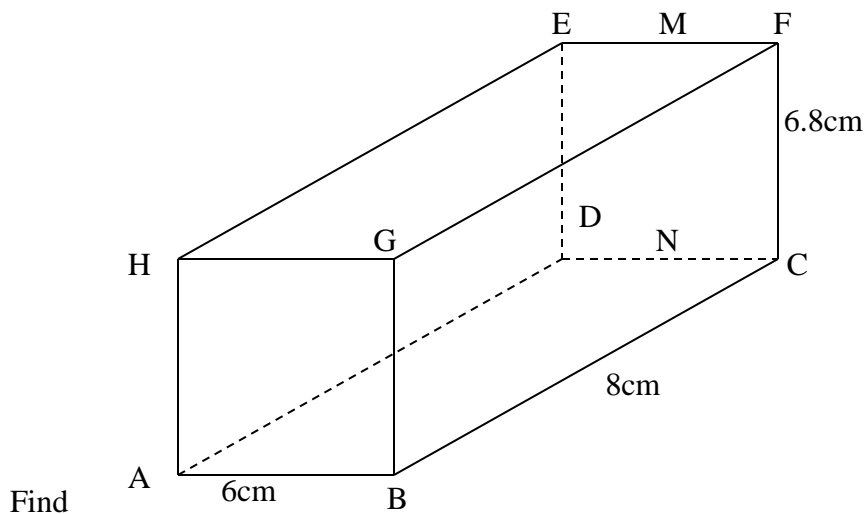
(ii) Mr. Kurgat's net income per month ( 2 marks)

22. The manager of a car park allows  $10\text{m}^2$  of parking space for each car and  $30\text{m}^2$  for each lorry. The total space available is  $300\text{m}^2$ . He decides that the maximum number of vehicles at any time must not exceed 20 and he also insists that there must be at least as many cars as lorries. If the number of cars is  $x$  and the number of lorries is  $y$

- (a) (i) Write down all the inequalities which must be satisfied ( 3 marks)
- (ii) On the grid provided, draw a graph to show the inequalities in (a) (i) ( 3 marks)
- (b) (i) If the parking charge is Kshs. 10 for cars and Ksh. 50 for a lorry, find how many vehicles of each kind he should admit to maximize his income and calculate his income ( 3 marks)
- (ii) If the charges are changed to Kshs 20 for a car and Kshs . 30 for a lorry find how many of each kind he should now admit to maximize his profit. ( 1 mark)

## GRAPH

23. The figure below represents a cuboid ABCDEFGH, with  $AB = 6\text{ cm}$ ,  $BC = 8\text{ cm}$  and  $CF = 6.8\text{ cm}$ . M is the mid – point of EF and N is mid – point of DC



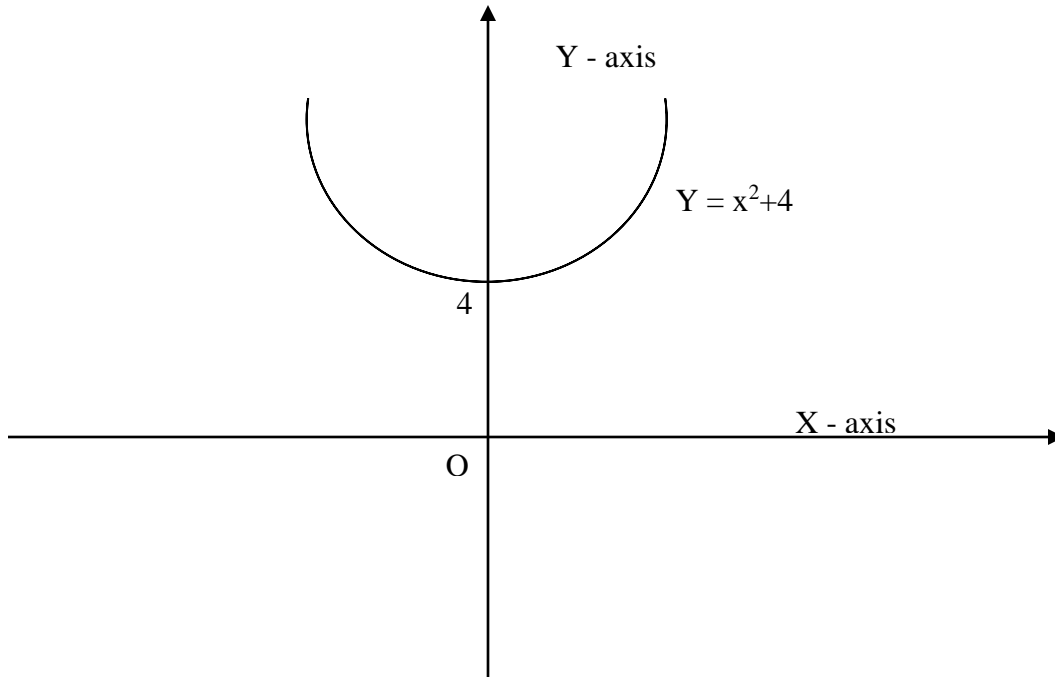
- (a) The angle AF makes with the plane ABCD ( 2 marks)

(b) The angle between the lines HF and DC ( 2 marks)

(c) The angles between the planes GHEF and ABFE ( 2 marks)

(d) The angle between BM and the plane ABCD ( 4 marks)

24. The figure below shows a sketch of the graph of  $y = x^2 + 4$ , find the area bounded by the curve, the x- axis, and the lines  $x = -4$  and  $x = 4$  using



(a) The trapezium rule with 8 strips

( 3 marks)

(b) The mid- ordinate rule with 8 strips ( 3 marks)

(c) Integration method ( 2 marks)

(e) Percentage error mid- ordinate rule was used t o find the area under the curve.

25.