

NAME..... INDEX NO.....

121/2  
MATHEMATICS  
PAPER 2  
JULY/AUGUST 2010  
TIME: 2 ½ HOURS

**KENYA CERTIFICATE OF SECONDARY EDUCATION**  
**FORM FOUR EVALUATION EXAMINATION**

**INSTRUCTIONS TO CANDIDATES**

- a) Write your name and index number in the spaces provided above.
- b) This paper consists of TWO sections I & II
- c) Answer ALL the questions in section I and only FIVE questions from section II
- d) All answers and working must be written on the question paper in the spaces provided below each question.
- e) Show all the steps in your calculations giving your answers at each stage in the spaces below each question.
- f) Marks may be given for correct working even if the answer is wrong.
- g) Non-programmable silent electronic calculators and KNEC mathematical tables may be used except where stated otherwise.

**FOR EXAMINERS USE ONLY**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

17	18	19	20	21	22	23	24	TOTAL

GRAND TOTAL

**SECTION I (50 MARKS)**

Answer all the questions in this section in the spaces provided below each question.

1. The mean of five numbers is 15 and the mean of further eight numbers is 2. Calculate the mean of all thirteen numbers. (2 marks)

2. Make x the subject of the formula in: (3 marks)

$$y + x^2 = (x + t)(x + y)$$

3. Find the value of x in the equation (4 marks)

$$\log_3 x - 4\log_x 3 = -3$$

4. a) Expand the binomial  $(2 - \frac{1}{4}x)^5$  (1 mark)

- b) Using the first 4 terms of the binomial above solve for  $1.75^5$  (3 marks)

5. a) Find the inverse of the matrix  $\begin{bmatrix} 1 & 1 \\ 3 & 1 \end{bmatrix}$  (1 marks)

b) Hence determine the point of intersection of the lines (2 marks)

$$\begin{aligned}x + y &= 7 \\3x + y &= 15\end{aligned}$$

6. Simplify:  $\frac{10}{2\sqrt{3}-\sqrt{7}} - \frac{10}{2\sqrt{3}+\sqrt{7}}$  (3marks)

7. Given that three numbers x, y and z are in the ratio 6:4:5, find the value of: (3 marks)

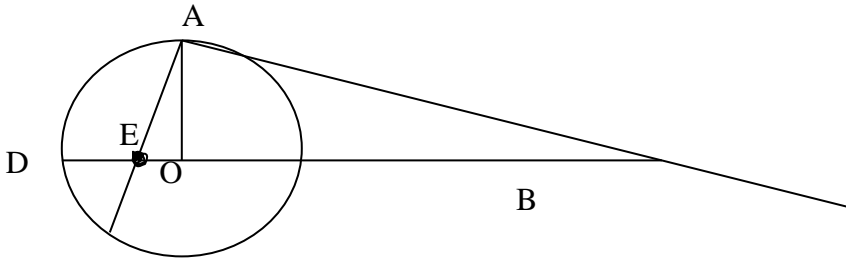
$$\frac{3x - y}{4y - z}$$

8. The mass of a cylinder of a small material varies jointly as the square of the radius and as the height. If the radius is increased by 20% and the height by 10. Find the percentage increase in mass.

(3 marks)

9. Given that the dimensions of a rectangle are 20.0cm and 25.0. find the percentage error in calculating the area. (3 marks)

10. In the figure below AB is the tangent to the circle centre O. Given that AB = 24cm, OB = 26cm, AC=13cm and CE=4cm, Calculate the length DE. (3 marks)



11. Find the equation of tangent to a curve  $x^2 = 4y+1$  at the point (2, 0.75) (3 marks)

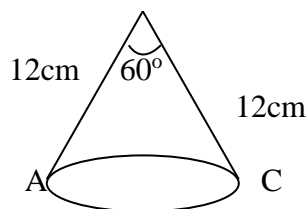
12. PQR is a triangle of area  $9\text{cm}^2$ . If PQ is the fixed base of the triangle and is 6cm long, draw it and describe the locus of point R. (3 marks)

13. Nairobi and Kisumu lie on the same longitude. The latitude of Nairobi is  $1^{\circ}12'S$  and that of Kisumu is  $5^{\circ}50'N$ . Calculate the distance between them in nautical miles. (3 marks)

14. A ship covers 60km on a bearing of  $230^{\circ}$ . If then it changes course and heads due west for 80km, determine its direct distance from the starting point. (3 marks)

15. An upcoming school in Gatundu District participated in the District Ballgames. The probability of winning football and volleyball is  $\frac{2}{3}$  and  $\frac{1}{4}$  respectively. Find the probability of winning at least one game. (3 marks)

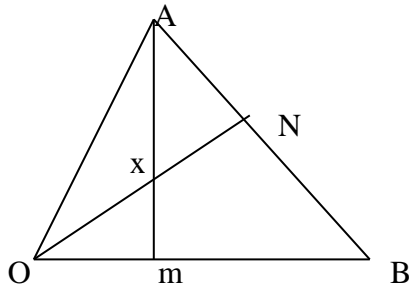
16. The sector below has a radius of 12cm and angle  $AOC = 60^{\circ}$ . If it is folded to form a cone, find the volume of the cone formed. (4 marks)



**SECTION II(50 MARKS)**

Answer ONLY FIVE questions in this section in the spaces provided.

17.



In the figure above, m divides line OB in the ratio 2:3 and N divides AB in the ratio 1:2 AM and ON intersect at x. Given  $\vec{OA} = 2\vec{a}$  and  $\vec{OM} = \vec{b}$ :

a) Find in terms of a and b (1 marks)

(i)  $\vec{AB}$  (1 mk)

(ii)  $\vec{AM}$  (1 mk)

(iii)  $\vec{ON}$  (1 mk)

b) If  $\vec{AX} = h\vec{am}$  and  $\vec{OX} = k\vec{ON}$  where h and k are scalars

(i) Express  $\vec{OX}$  in two ways. (2 marks)

(ii) Find the value of h and k (4 marks)

C) Find the ratio of AM:MX

(1 marks)

18. Three points  $A(0,4)$ ,  $B(2,3)$  and  $C(-2,-1)$  are vertices of a triangle.

Find:

a) (i) the gradient of AC

(1 mark)

(ii) the gradient of the perpendicular bisector of line AC

(1 marks)

(iii) The co-ordinates of the midpoint of line AC

(1 marks)

b) (i) the gradient of AB (1 mark)

(ii) the gradient of the perpendicular bisector of line AB. (1 mark)

(iii) The co-ordinates of the midpoint of AB (1 mark)

c) Find the equation of

a. Perpendicular bisector of AC (1 mark)

b. Perpendicular bisector of AB (1 mark)

c. Hence find the co-ordinates of the circumcentre of the triangle. (2 marks)

19. The number  $x$  is chosen at random from the set  $(0,3,6,9)$  and the number  $y$  is chosen at random from the set  $(0,2,4,6,8)$ . Calculate the probability of each of the following separate events.

(i)  $x > 6$  (1 mark)

(ii)  $x + y = 11$  (2 marks)

(iii)  $x > y$  (3 marks)

(iv)  $xy = 0$  (2 marks)

(v)  $10x + y < 34$  (2 marks)



20. P and q are two points on the same parallel of latitude  $66^{\circ}25'$ , whose longitudes differ by  $120^{\circ}$ . Calculate in kilometres

a) the radius of the parallel of latitude where P and Q lie. (2 marks)

b) The distance of P and Q measured along the parallel of latitude. (2 marks)

c) (i) find the length of the straight line joining PQ (2 marks)

(ii) Find the distance between P and Q along the same latitude in nautical miles.

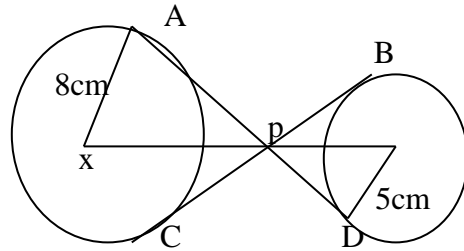
(iv) If an aircraft took 30min to fly from P to Q, Calculate its speed in knots. (2 marks)

21. a) Use the trapezium rule to estimate the area between the curve  $y = 3x^2 + 1$ , lines  $x=1$  and  $x=3$  and x-axis. Use five ordinates. (5 marks)

b) Using integration method find the exact area under a curve  $y=3x^2 + 1$  (3 marks)

d) Find the percentage error in estimating the area. (2 marks)

22. A Borehole pump has two pulleys which has a cross over connecting belt internally as shown below centres x and y of radii 5cm and 8cm respectively. The distance between them is 25cm.



Calculate:

a) the length AD (2 marks)

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b) Angle AXY (2 marks)

c) The total length of the belt. (6 marks)

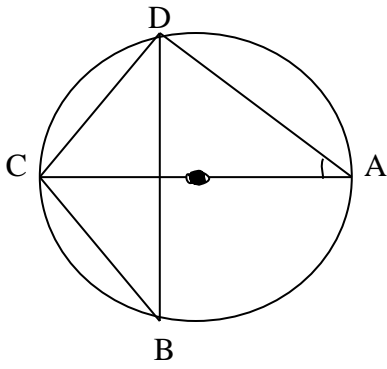
23. Mr. Mark Opilo wishes to take student from wonderful mixed secondary school for a tour. The total number of pupils to be taken should not exceed 60. Each girl must contribute sh.10,000 and each boy sh.15,000 and money to be contributed must not exceed sh.120,000. If this trip is to be successful the number of boys must conditionally be greater than girls.

a) Write down five inequalities to represent this information taking the number of boys and girls to be x and y respectively. (4 marks)

b) Represent the above information on the graph paper provided. (4 marks)

c) What is the optimum number of boys and girls to be taken in order to be minimise cost. (2 mark)

24. In the figure below  $O$  is the centre of the circle and angle  $OAD$  is  $25^\circ$ . Calculate angle  $BCD$  (4 marks)



b) In the figure below  $TP$  and  $TQ$  are tangents to the circle and  $PR$  is parallel to  $TQ$ . Find the angle marked  $a, b, c$  and  $d$ . (6 marks)

