

NAME.....INDEX

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121/1  
MATHEMATICS  
PAPER 1  
JULY / AUGUST, 2010  
2½ HOURS

# LAICOMET

## Kenya Certificate of Secondary Education 2010

121/1  
MATHEMATICS  
PAPER 1  
JULY / AUGUST 2010

### INSTRUCTIONS TO CANDIDATES

1. Write your name and index number in the spaces provided at the top of this page.
2. This paper consists of two sections: Section I and Section II.
3. Answer all questions in section I and any five questions from Section II.
4. Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
5. Marks may be given for correct working even if the answer is wrong.
6. Non-programmable silent electronic calculators and KNEC Mathematical tables may be used.

### For Examiner's Use Only

#### SECTION I

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

#### SECTION II

| 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | Total |
|----|----|----|----|----|----|----|----|-------|
|    |    |    |    |    |    |    |    |       |

Grand  
Total

*This paper consists of 16 pages. Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.*

### **SECTION I (50 MARKS)**

**Answer all questions in this section**

1. Work out  $\frac{8 \div 2 + 12 \times 9 - 4 \times 6}{56 \div 7 \times 2}$  (2mks)

2. A squared brass plate is 2mm thick and has a mass of 1.05kg. The density of brass is 8.4g/cm. Calculate the length of the plate in centimeters. (3mks)

3. Make P the subject of the formula in  $x = \sqrt{\frac{y(p-y)}{p-1}}$  (3mks)

4. Solve for x and y in. (4mks)

$$2^{2x-3y} = 16$$

$$5^{x-2y} = 1$$

5. The straight line passing through the point (-3,-4) is perpendicular to the line whose equation is  $2y+3x=1$  and intersect the x-axis and y-axis at points P and Q respectively. Find the length of PQ. (4mks)

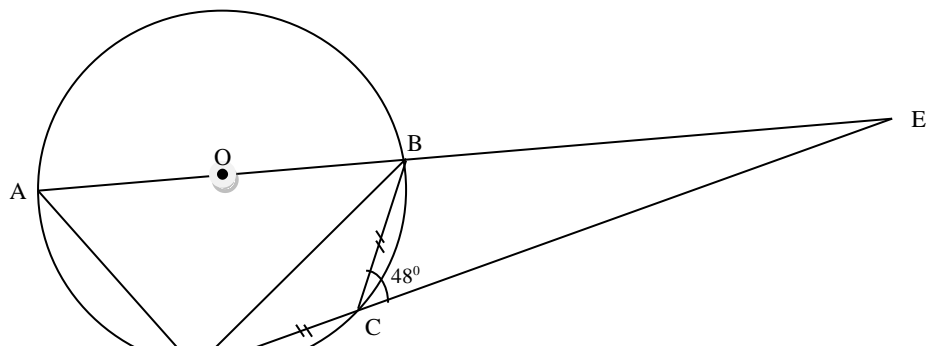
6. The angle of elevation of the top of the tower from the foot of a building is  $63.51^\circ$ . The angle of depression of the top of the building from the top of the tower is  $18.43^\circ$ . The building and the tower are 30m apart. Find

a) The height of the tower (1mk)

b) The height of the building (2mks)

7. Simplify  $\frac{2y^2 - xy - x^2}{2x^2 - 2y^2}$  (3mks)

8. In the figure below ABCD is a circle with centre O. AB and DC meet at a point E outside the circle.  $DC = BC$  and  $\angle BCE = 48^\circ$



Find the angles

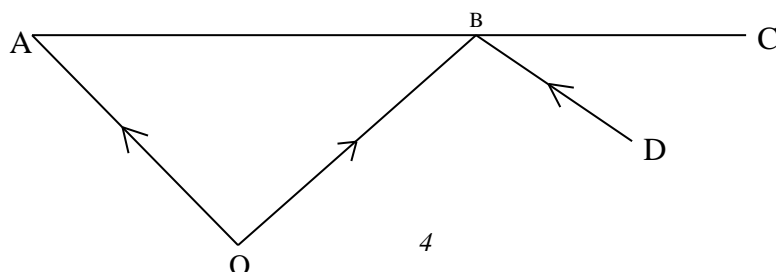
a)  $\angle BAD$  (1mk)

b)  $\angle BDC$  (1mk)

c)  $\angle BEC$  (1mk)

9. The population of elephants in Kenya's game reserves is 40,000 at present. If their population increase is estimated to be 30% every 10 years, calculate their population in 30 years time to the nearest 10. (3mks)

10. In the figure below  $\underline{OA} = \underline{a}$ ,  $\underline{OB} = \underline{b}$  and  $DB$  is parallel to  $OA$ .  $C$  is on  $AB$  extended such that  $AB:BC = 2:1$  and that  $OA = 3DB$ .



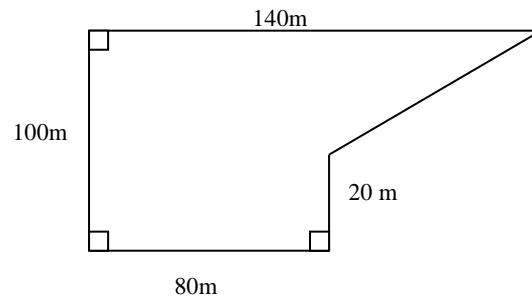
a) Express the vector BC in terms of **a** and **b**. (1mk)

b) Show by vector methods that the points O, D and C are collinear. (3mks)

11. The top of a table is a regular hexagon. Each side of the hexagon measures 50.0cm  
Find the maximum percentage error in calculating the perimeter of the top of the  
table (3mks)

12. Find the area under the graph of  $y = x^2 + x$  between  $x = 1$  and  $x = 3$ . Using the mid  
ordinate rule with two trapezia. (3mks)

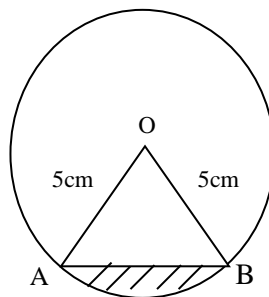
13. The figure below shows the shape of Kamau's farm with dimensions shown in meters



Find the area of Kamau's farm in hectares

(3mks)

14.



The diagram above represents a circle centre o of radius 5cm. The minor arc AB subtends an angle of  $120^\circ$  at the centre. Find the area of the shaded part. (3mks)

15. Evaluate without using mathematical tables.

(3mks)

$$2\log 5 - \frac{1}{2}\log 16 + 2\log 40$$

16. The purchase price of a TV consists of sh.4600 deposit and 8 equal monthly installments of sh.840. Given that the carrying charge is sh.2800. Find the cash price

(3mks)

## **SECTION II (50 MARKS)**

**Answer only five questions from this section**

17. Three business partners Asha, Ogola and Jane contributed ksh.60,000, ksh.85,000 and ksh.105,000 respectively. They agreed to put 25% of the profit back into the business each year. They also agreed to put aside 40% of the remaining profit to cater for taxes and insurance. The rest of the profit would then be shared among the partners in the ratio of their contributions. At the end of the first year the business realized a gross profit of ksh.225,000.

a) Calculate the amount of money Jane received more than Asha at the end of the year (5mks)

b) Ogola further invested ksh.25,000 into the business at the beginning of the second year. Given that the gross profit at the end of the second year increased in the ratio of 10:9 and that 40% of it was shared, calculate Ogola's share of the profit at the end of the second year (5mks)

18. The attendance at a party consisted of 35 men, a number of women and some children. The number of women was one and a half times that of the children present.

a) If there were a total of 65 participants, how many women attended the party? (2mks)



- b) During the party, each child took one bottle of soda, the men took two bottles each while some women took two and others three. Given that five crates each containing 24 bottles of soda were consumed, how many women took two bottles of soda? (6mks)

- c) Each crate of soda was bought for sh.432 plus a deposit of sh.10 per bottle incase it broke. How much money did the party organizers pay at the soda depot? (2mks)

19. a) Complete the table below by filling in the blank spaces

|                  |      |       |     |       |      |     |          |      |     |    |      |      |      |
|------------------|------|-------|-----|-------|------|-----|----------|------|-----|----|------|------|------|
| x                | -90  | -75   | -60 | -45   | -30  | -15 | $\theta$ | 15   | 30  | 45 | 60   | 75   | 90   |
| $3\cos 2x - 1$   | -40  | -3.6  |     | -1.0  | 0.5  | 1.6 |          | 1.6  | 0.5 |    | -2.5 | -3.6 | -4.0 |
| $2\sin(2x + 30)$ | -1.0 | -1.73 |     | -1.73 | -1.0 | 0   |          | 1.73 | 2.0 |    | 1.0  | 0    | -1.0 |

- b) On the grid provided, draw on the same set of axes the graphs of  $y = 3 \cos 2x - 1$  and  $y = 2 \sin(2x + 30^\circ)$  for  $-90^\circ \leq x \leq 90^\circ$ . Using a scale of 1 cm for  $15^\circ$  on axis and 2 cm for 1 unit on the y-axis (5mks)

# grid

c) State the period of  $y = 3 \cos 2x - 1$  (1mk)

d) Solve the equation  $2 \sin(2x + 30^\circ) - 3 \cos 2x + 1 = 0$  (2mks)

20. a) Using a ruler and a pair of compasses only to construct a trapezium ABCD such that  $AB = 12 \text{ cm}$ ,  $\angle DAB = 60^\circ$ ,  $\angle ABC = 75^\circ$  and  $AD = 7 \text{ cm}$  (5mks)

- b) From the point D drop a perpendicular to the line AB to meet the line at E.  
measure DE hence calculate the area of the trapezium (5mks)

21. The table below shows marks scored by 50 candidates in an examination

| Marks            | 10 - 19 | 20 - 29 | 30 - 39 | 40 - 49 | 50 - 59 | 60 - 69 | 70 - 79 | 80 - 89 | 90 - 99 |
|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| No of candidates | 4       | 8       | 10      | t       | 6       | 4       | 3       | 2       | 1       |

- a) Find the value of t in the above table (1mk)

- b) State the modal class (1mk)

c) Calculate the median

(3mks)

d) Calculate the mean of the data

(5mks)

22. A transformation represented by the matrix  $\begin{pmatrix} -2 & 1 \\ 1 & 2 \end{pmatrix}$  maps P(0,0), Q(2,0), R(2,3)

and S(0,3) onto P', Q', R', S'

a) On the grid provided draw the quadrilateral PQRS and P'Q'R'S' (4mks)

# grid

b) (i) Determine the area of PQRS

(1mk)

(ii) Hence or otherwise find the area of P'Q'R'S'

(2mks)

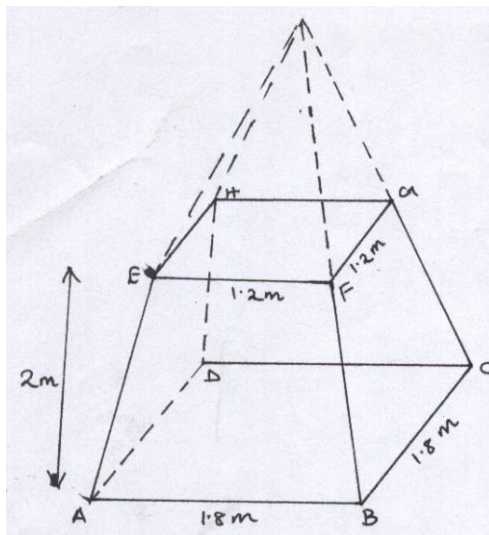
c) A transformation represented by the matrix  $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$  maps  $P'Q'R'S'$  onto  $P''Q''R''S''$ . Determine the matrix of transformation that would map  $P''Q''R''S''$  onto  $PQRS$  (3mks)

23. A plane leaves an airport P at 1030 hrs and flies due north at 800 km/h. After 2 hours of flight it turns and flies due west at the same speed and reached airport Q at 1415hrs

a) Use scale drawing with a scale of 1 cm for 200km to find the shortest distance between the two airports (3mks)

- b) Measure and state the bearing of Q from P (1mk)
- c) If the local time at P is 1300hrs when it reached Q, find the local time at Q when it landed at Q. (2mks)
- d) If the plane started the return journey at 1700hrs and flew directly to P, if the arrival time at P was 1940hrs, determine the plane's average speed to the nearest kilometer. (3mks)

24. A lampshade is made by cutting off the top part of a square-based pyramid VABCD as shown in the figure below. The base and the top of the lampshade have sides of length 1.8m and 1.2m respectively. The height of the lampshade is 2m



Calculate

a) The volume of the lampshade (4mks)

b) The total surface area of the slant surfaces (4mks)

c) The angle at which the face BCGF makes with the base ABCD. (2mks)