

Name .....

Index Number ..... / .....

121/1

Candidate's Signature .....

MATHEMATICS

Paper 1

Date .....

Oct./Nov. 2009

2½ hours

## THE KENYA NATIONAL EXAMINATIONS COUNCIL

Kenya Certificate of Secondary Education

MATHEMATICS

Paper 1

2½ hours

## Instructions to candidates

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) This paper consists of **TWO** sections: **Section I** and **Section II**.
- (d) Answer **ALL** the questions in **Section I** and **only five** questions from **Section II**.
- (e) All answers and working must be written on the question paper in the spaces provided below each question.
- (f) Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
- (g) Marks may be given for correct working even if the answer is wrong.
- (h) **Non-programmable** silent electronic calculators **and** **KNEC Mathematical tables** may be used except where stated otherwise.
- (i) This paper consists of 23 printed pages.
- (j) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

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

--

© 2009 THE KENYA NATIONAL EXAMINATIONS COUNCIL  
Kenya Certificate of Secondary Education  
MATHEMATICS  
Paper 1  
09110

**SECTION I (50 marks)**

*Answer all the questions in this section in the spaces provided.*

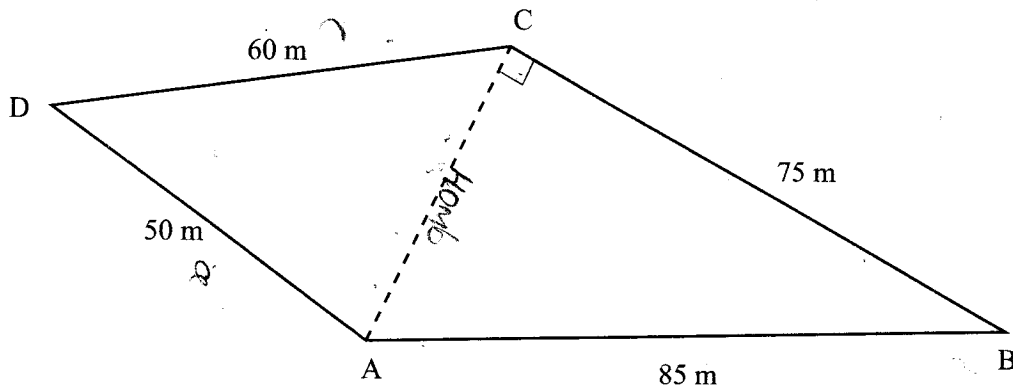
- 1 Without using mathematical tables or calculators, evaluate  $\frac{\sqrt{5184}}{6 \times 18 \div 9 + (5 - 3)}$ . (3 marks)
- 2 Without using a calculator, evaluate,  $\frac{2\frac{1}{4} + \frac{3}{5} \div \frac{5}{6} \text{ of } 2\frac{2}{5}}{1\frac{7}{10}}$ , leaving the answer as a fraction in its simplest form. (3 marks)

- 3 Given that the ratio  $x : y = 2 : 3$ , find the ratio  $(5x - 2y) : (x + y)$ . (3 marks)

- 4 A bus travelling at an average speed of 63 km/h left a station at 8.15 a.m. A car later left the same station at 9.00 a.m. and caught up with the bus at 10.45 a.m. Find the average speed of the car. (3 marks)

- 5 Without using logarithm tables or calculators, evaluate,  $\frac{64^{-\frac{1}{2}} \times 27000^{\frac{2}{3}}}{27^4 \times 3^0 \times 5^2}$ . (4 marks)

- 6 The figure below represents a plot of land ABCD such that  $AB = 85$  m,  $BC = 75$  m,  $CD = 60$  m,  $DA = 50$  m and angle  $ACB = 90^\circ$ .



Determine the area of the plot in hectares correct to two decimal places,

(4 marks)

- 7 A watch which loses a half-minute every hour was set to read the correct time at 05 45 h on Monday. Determine the time, in the 12-hour system, the watch will show on the following Friday at 19 45 h.

(3 marks)

1 min  
2

15 437

- 8 Simplify the expression  $\frac{12x^2 + ax - 6a^2}{9x^2 - 4a^2}$ . (3 marks)

- 9 A line which joins the points A (3, k) and B (-2, 5) is parallel to another line whose equation is  $5y + 2x = 10$ . Find the value of k. (3 marks)

$$\frac{k - 5}{3 - (-2)} = \frac{-5}{5}$$

- 10 The size of an interior angle of a regular polygon is  $6\frac{1}{2}$  times that of its exterior angle. Determine the number of sides of the polygon. (3 marks)

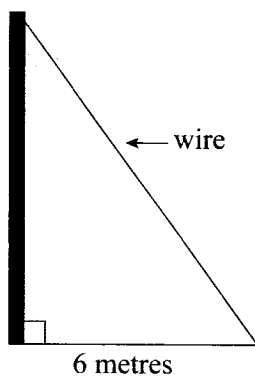
- 11 Line AB shown below is a side of a trapezium ABCD in which angle  $ABC = 105^\circ$ ,  $BC = 4$  cm,  $CD = 5$  cm and CD is parallel to AB.



Using a ruler and a pair of compasses only:

- (a) complete the trapezium; (3 marks)  
(b) locate point T on line AB such that angle  $ATD = 90^\circ$ . (1 mark)

- 12 An electric pole is supported to stand vertically on a level ground by a tight wire. The wire is pegged at a distance of 6 metres from the foot of the pole as shown.

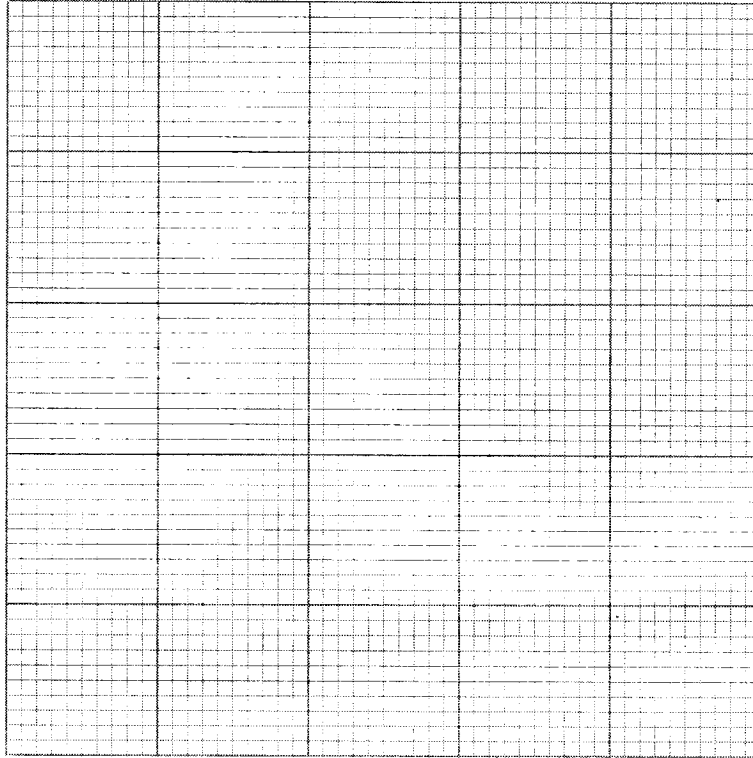


The angle which the wire makes with the ground is three times the angle it makes with the pole. Calculate the length of the wire to the nearest centimetre. (3 marks)

- 13 Solve the equation:  $\sin(3x + 30^\circ) = \frac{\sqrt{3}}{2}$ , for  $0^\circ \leq x \leq 90^\circ$ . (4 marks)

- 14 The diagonals of a rhombus PQRS intersect at T. Given that  $P(2, 2)$ ,  $Q(3, 6)$  and  $R(-1, 5)$ :  
(a) draw the rhombus PQRS on the grid provided;

(1 mark)



- (b) state the coordinates of T.

(1 mark)

- 15 Abdi sold a radio costing Ksh 3 800 at a profit of 20%. He earned a commission of  $22\frac{1}{2}\%$  on the profit. Find the amount he earned.

(2 marks)

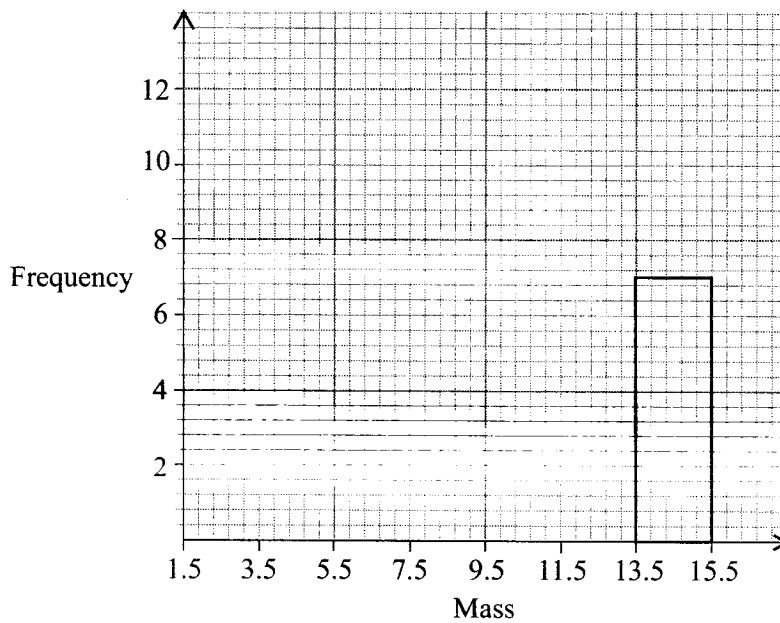


- 16 The following data was obtained for the masses of certain animals.

Mass ( $x$ kg)	Frequency
$1.5 \leq x < 5.5$	16
$5.5 \leq x < 7.5$	20
$7.5 \leq x < 13.5$	18
$13.5 \leq x < 15.5$	14

Complete the histogram on the grid provided below.

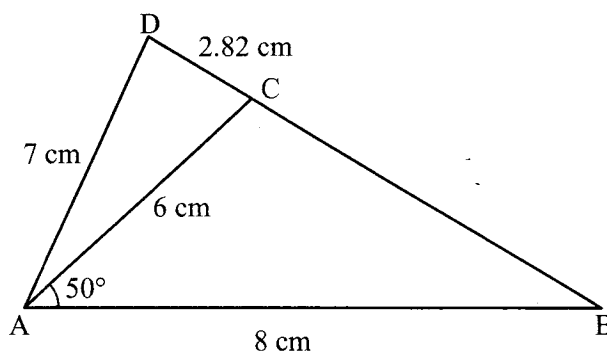
(3 marks)



**SECTION II (50 marks)**

Answer only **five** questions in this section in the spaces provided.

- 17 In the figure below (not drawn to scale),  $AB = 8$  cm,  $AC = 6$  cm,  $AD = 7$  cm,  $CD = 2.82$  cm and angle  $CAB = 50^\circ$ .



Calculate, to 2 decimal places:

- (a) the length BC;

(2 marks)

- (b) the size of angle ABC;

(3 marks)

(c) the size of angle CAD;

(3 marks)

(d) the area of triangle ACD.

(2 marks)

- 18 The marks scored by a group of pupils in a mathematics test were as recorded in the table below.

Marks	Frequency
0 – 9	1
10 – 19	2
20 – 29	4
30 – 39	7
40 – 49	10
50 – 59	16
60 – 69	20
70 – 79	6
80 – 89	3
90 – 99	1

- (a) (i) State the modal class. (1 mark)
- (ii) Determine the class in which the median mark lies. (2 marks)
- (b) Using an assumed mean of 54.4, calculate the mean mark. (7 marks)

19 A school planned to buy  $x$  calculators for a total cost of Ksh 16 200. The supplier agreed to offer a discount of Ksh 60 per calculator. The school was then able to get three extra calculators for the same amount of money.

(a) Write an expression in terms of  $x$ , for the:

(i) original price of each calculator; (1 mark)

(ii) price of each calculator after the discount. (1 mark)

(b) Form an equation in  $x$  and hence determine the number of calculators the school bought. (5 marks)

(c) Calculate the discount offered to the school as a percentage. (3 marks)

20 The position vectors of points A and B with respect to the origin O, are  $\begin{pmatrix} -8 \\ 5 \end{pmatrix}$  and  $\begin{pmatrix} 12 \\ -5 \end{pmatrix}$  respectively. Point M is the midpoint of AB and N is the midpoint of OA.

(a) Find:

(i) the coordinates of N and M; (3 marks)

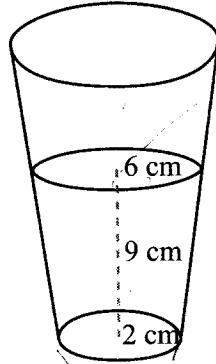
(ii) the magnitude of NM. (3 marks)

(b) Express vector **NM** in terms of **OB**. (1 mark)

(c) Point P maps onto P' by a translation  $\begin{pmatrix} -5 \\ 8 \end{pmatrix}$ . Given that

$\mathbf{OP} = \mathbf{OM} + 2\mathbf{MN}$ , find the coordinates of P'. (3 marks)

- 21 A glass, in the form of a frustum of a cone, is represented by the diagram below. The glass contains water to a height of 9 cm. The bottom of the glass is a circle of radius 2 cm while the surface of the water is a circle of radius 6 cm.



- (a) Calculate the volume of the water in the glass. (3 marks)

- (b) When a spherical marble is submerged into the water in the glass, the water level rises by 1 cm. Calculate:

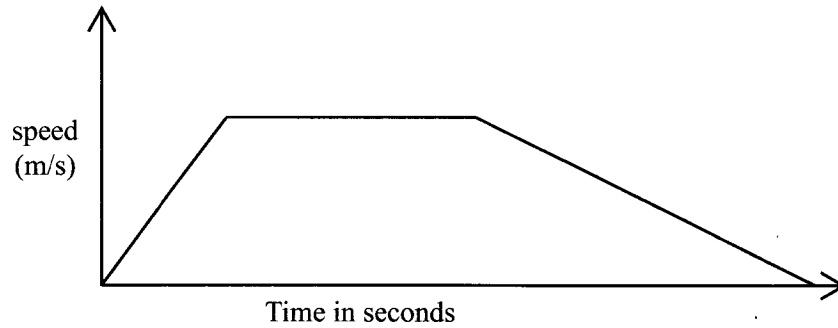
- (i) the volume of the marble; (4 marks)



(ii) the radius of the marble.

(3 marks)

- 22 The diagram below shows the speed-time graph for a train travelling between two stations. The train starts from rest and accelerates uniformly for 150 seconds. It then travels at a constant speed for 300 seconds and finally decelerates uniformly for 200 seconds.



Given that the distance between the two stations is 10 450 m, calculate the:

- (a) maximum speed, in Km/h, the train attained; (3 marks)

- (b) acceleration; (2 marks)

19.

(c) distance the train travelled during the last 100 seconds;

(2 marks)

(d) time the train takes to travel the first half of the journey.

(3 marks)

- 23 Three points P, Q and R are on a level ground. Q is 240 m from P on a bearing of  $230^\circ$ . R is 120 m to the east of P.
- (a) Using a scale of 1 cm to represent 40 m, draw a diagram to show the positions of P, Q and R in the space provided below. (2 marks)

(b) Determine:

(i) the distance of R from Q;

(2 marks)

(ii) the bearing of R from Q.

(2 marks)

(c) A vertical post stands at P and another one at Q. A bird takes 18 seconds to fly directly from the top of the post at Q to the top of the post at P.

Given that the angle of depression of the top of the post at P from the top of the post at Q is  $9^\circ$ , calculate:

(i) the distance, to the nearest metre, the bird covers;

(2 marks)

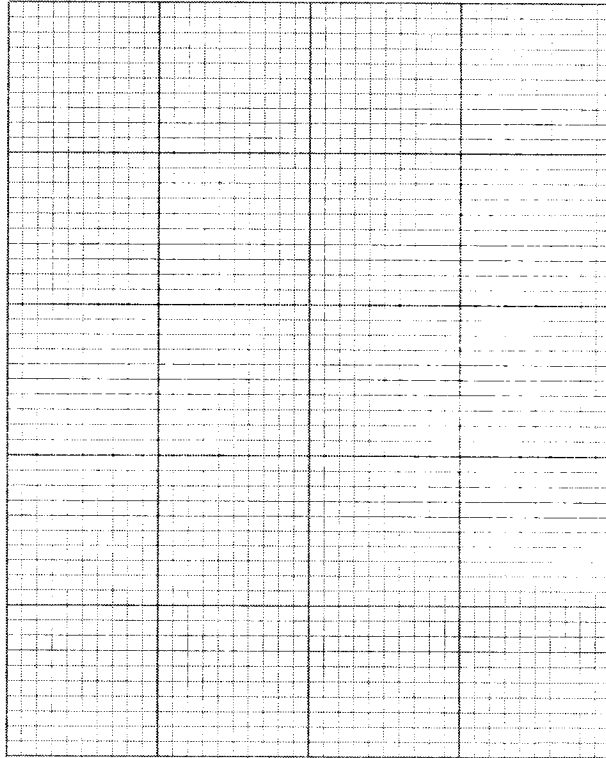
(ii) the speed of the bird in Km/h.

(2 marks)

- 24 (a) On the grid provided, draw a graph of the function

$$y = \frac{1}{2}x^2 - x + 3 \text{ for } 0 \leq x \leq 6.$$

(3 marks)



- (b) Calculate the mid-ordinates for 5 strips between  $x = 1$  and  $x = 6$ , and hence use the mid-ordinate rule to approximate the area under the curve between  $x = 1$ ,  $x = 6$  and the  $x$ -axis. (3 marks)

- (c) Assuming that the area determined by intergration to be the actual area, calculate the percentage error in using the mid-ordinate rule. (4 marks)

**THIS IS THE LAST PRINTED PAGE**

© 2009 **THE KENYA NATIONAL EXAMINATIONS COUNCIL**  
*Kenya Certificate of Secondary Education*  
**MATHEMATICS**  
*Paper 1*  
09110