

Name _____ Index Number _____

121/1
Mathematics
Paper 1
July 2011
2½ Hours

THIKA PROVINCIAL SCHOOLS EXAMINATION
Kenya certificate of secondary education
Mathematics
Paper 1
2½ Hours

Instructions to candidates

1. Write your name and index number in the space provided at the top of this page
2. The paper contains **TWO** sections: **SECTION I** and **SECTION II**
3. Show all the steps in your calculations, giving your answers at each stage in the space below each question.
4. Marks may be given for correct working even if the answer is wrong
5. Non-Programmable silent calculators and KNEC Mathematics tables may be used except where otherwise stated.

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	
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SECTION I (50 MARKS)

Answer **all** questions in this section in the space provided

- 1) Simplify the expression below without using mathematical tables or a calculator (4 marks)

$$\frac{36^{\frac{1}{2}} \times 0.5^2 \times \sqrt{\frac{3}{8}}}{\sqrt{2.4} \times \left(\frac{3}{5}\right)^{\frac{3}{2}}}$$

- 2) Simplify completely (3marks)

$$\frac{(a+2b)^2 - (2a-b)^2}{9b^2 - a^2}$$

- 3) Find the number such that $\frac{1}{4}$ of it added to $4\frac{1}{3}$, the result is the same as when $\frac{1}{3}$ of it is subtracted from $20\frac{2}{3}$ (3 marks)

- 4) Determine the equation of the mirror line which reflects P(-7.4) onto P'(3, 10) giving our answer in the form $ax + by + c = 0$ (3 marks)

- 5) Two of the interior angles of a polygon are 95° and 115° . The rest are 150° each. How many sides does this polygon have? (3 marks)

- 6) Find the range values that satisfy the inequality (2 marks)

$$x - 4 \leq 3x + 2 < 2(x + 5)$$

- 7) The cost of a car outside Kenya is US\$ 4,800. you intend to buy one such car through an agent who deals in Japanese yen. The agent will charge 15% commission on the price of the car and further 72,220 Japanese yen for shipment of the car. How much Kenya shilling will you need to send to the agent to obtain the car, given that

$$1 \text{ US\$} = 117.2 \text{ Japanese yen}$$

$$1 \text{ US\$} = \text{KSH } 72.34$$

(3 marks)

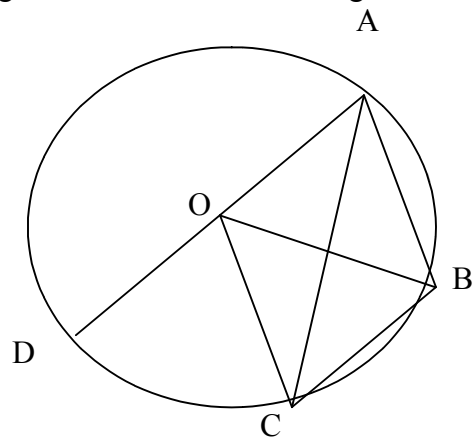
- 8) Solve the simultaneous equations

(3 marks)

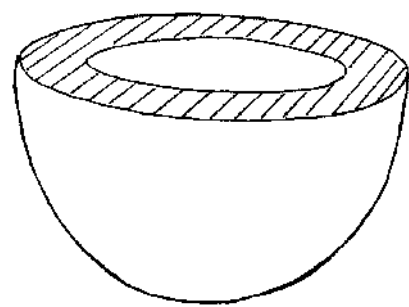
$$\frac{x}{y-1} + \frac{3}{8} = 0$$

$$\frac{x+2y}{x+3} = \frac{2}{7}$$

- 9) In the figure below O is the centre of the circle ABCD and AOD is a straight line. If $AB=BC$ and the angle $DAC = 40^\circ$ calculate angle BAC



- 10) The figure below shows a hemispherical bowl of thickness 1.5 cm. given that the external curved surface area is 509 cm^2 , find the volume of the bowl.
(take $\pi = 3.142$) (4 marks)



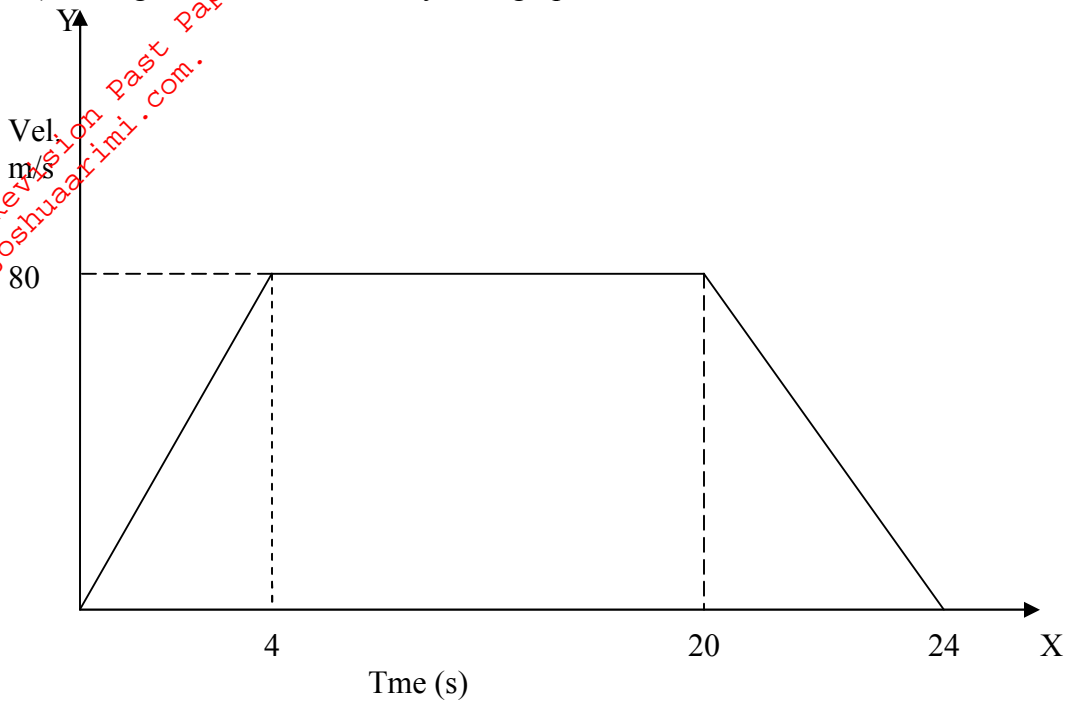
11) A container of height 90 cm had a capacity of 4.5 litres. What is the height of a similar container of volume 90 m^3 (3 marks)

12) Solve for X

$$25^{\frac{1}{2}x} + 5^{2x-1} \times 25 = 26 \quad (3 \text{ marks})$$

13) The gradient of a line L through points A(2x, 4) and B(-1, x) is $\frac{1}{7}$. Find the equation of the line perpendicular to L passing through B (3 marks)

14) The figure below is a velocity time graph of a car



a) Find the total distance traveled by the car

(1 mark)

b) Calculate the deceleration of the car

(2 marks)

- 15) The ratio of boys' to girls in a certain school is 6:5 in form one. In form two the boys are $\frac{1}{3}$ more than in form one and girls are a $\frac{1}{4}$ more than in form one. The number of form two is 78 more than form one. Find the number of students in form one (3 marks)

- 16) A contractor was to finish a piece of work in 80 days. He employed 150 workers to work 6 hours a day. After 30 days he found out that only a quarter of the work had been done. How many more workers did he require to finish the work in time? (3 marks)

Section II (50 marks)

Answer only five questions in this section in the spaces provided

17) A cold water tap can fill a bath in 3 minutes while a hot tap can fill in 5 minutes.

The drain pipe can empty the bath in $3\frac{3}{4}$ minutes. The two taps and the drain pipe are fully open for 2 minutes, after which the drain pipe is closed.

a) What fraction of the bath is filled after the first two minutes (3 marks)

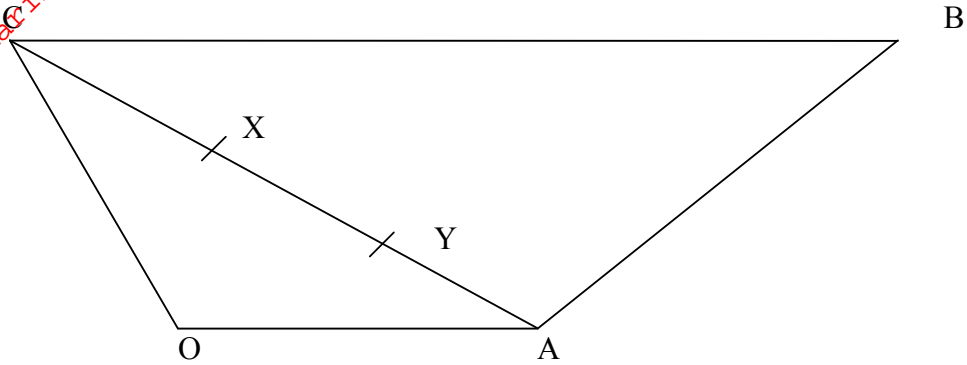
b) How many more seconds are required for the bath to be completely filled?
(3 minutes)

c) Given that the cold water tap delivers water at the rate of $200 \text{ cm}^3/\text{s}$
Determine:

I. The capacity of the bath in litres (2 marks)

II. The late of flow of the hot water tap (2 marks)

18) The figure below shows a trapezium OABC $\underline{OA} = \underline{a}$, $\underline{OC} = \underline{c}$ and $\underline{CB} = 3\underline{a}$



a) X and Y are point on AC such that $AX: XC = 1:2$ and $4AY = AC$. Find the following vectors in terms of \underline{a} and \underline{c}

I. \underline{AY}

II. \underline{OY}

III. \underline{OX}

b) Show that O, Y and B are collinear

19) A passenger train traveling at 25 km/hr is moving in the same direction as the truck traveling at 30 km/hr . The railway line runs parallel to the road and the track takes $1\frac{1}{2}$ to overtake the train completely

a) Given that the truck is 5 metres long determine the length of the train in metres (6 marks)

b) The track and the train continue moving parallel to each other at the original speeds. Calculate the distance between them after 4 minutes and 48 seconds after the track overtake the train (2 marks)

c) The track stopped 45 minutes after overtaking the train. How long did the train take to catch up with the truck: (2 marks)

20) Three points A, B and C are on the same horizontal ground. A is 40 m due north of B and C is 60 m due east of B. A vertical post stands 10 m tall at D on a bearing of 45° from B. If the angle of elevation of the top of the post from point B is 30° . Find

a) The distance of the post from B (2 marks)

b) The distance of the post from

I. A (3 marks)

II. C (3 marks)

c) The angle of elevation of the top of the post from A (2 marks)

21) Given that $x - y = 3$ and $3x + y = 17$ find without solving for x and y

I. $x^2 - 2xy + y^2$ (2 marks)

II. $9x^2 + 6xy + y^2$ (2 marks)

III. $3x^2 - 2xy - y^2$ (3 marks)

b) Solve the simultaneous equations

$$\begin{aligned} x - y &= 2 \\ x^2 - y^2 &= 10 \end{aligned} \quad (3 \text{ marks})$$

22) Chege went to buy tiles for his floor which is more than 15m long and more than 8 m wide. He found that square tiles of length 16 cm or 18cm or 20 cm could fit exactly on his floor.

Determine:

a) The least dimension of his floor (5 marks)

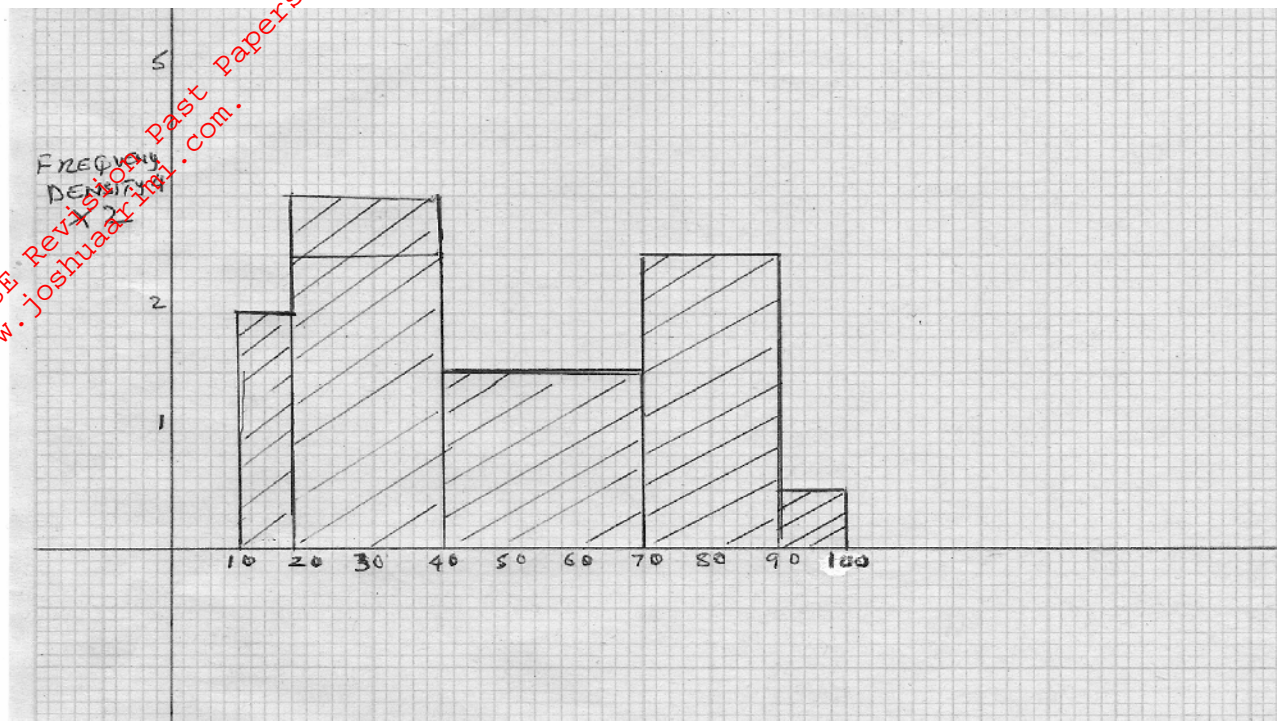
b) The least number of tiles of each length he can use for his floor (3 marks)

c) The cost of fitting the 20cm tiles on the floor above given that the formula for calculating the cost is

$$c = 2000 + \frac{4000n}{l^2}$$

Where n is the number of tiles and L is the length (2 marks)

23) The histogram represent marks obtained by candidates in an examination



a) Fill the table below for the frequency (4 marks)

class	frequency
$10 \leq x \leq 20$	
$20 \leq x \leq 40$	
$40 \leq x \leq 70$	15
$70 \leq x \leq 90$	
$90 \leq x \leq 100$	

b) Estimate the median (3 marks)

c) Find the range of marks for the middle 38 candidates (3 marks)

24) A rectangular tank whose internal dimensions are 2.4m by 2.5m by 3.7 m is two thirds full of juice

a) Calculate the volume of the juice in litres (3 marks)

b) The juice is packed in small packets in a shape of right pyramid with equilateral triangles sides of 20 cm. The height of each packet is 15 cm. full packet are sold at ksh 50 per packet:

calculate

I. The volume of juice in cm^3 of each packet to the nearest whole number (3 marks)

II. The number of full packet of juice (2 marks)

III. The amount of money realized from the sale of juice (2 marks)