Name .... Index Number ....

School .... Candidate's Signature ....

121/1 Date ....

MATHEMATICS

Paper 1

2015

2½ hours

MAKUENI COUNTY KCSE 2015 PREPARATORY EXAMINATION

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 the 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) ***Show all the steps in your calculations, giving your answers at each stage in the spaces provided 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.*
(h) ***This paper consists of 19 printed pages.***
(i) ***Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.***
(j) ***Candidates should answer the questions in English.***

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

Sponsored by H.E. Prof. Kivutha Kibwana, Governor, Makueni County.

TURN OVER

SECTION I (50 marks)

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

1. Evaluate without using mathematical tables. (3 marks)

$$\sqrt{\frac{-23-(-17)}{-2}-\frac{15-(-2)(-6)}{-3}}$$

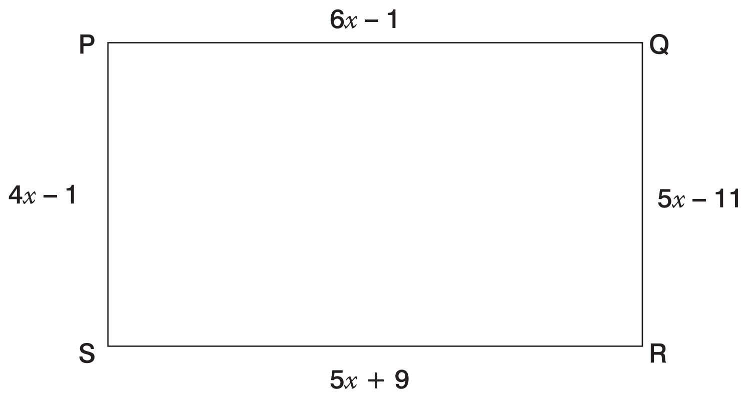
2. Evaluate: (3 marks)

$$\frac{\sqrt{\frac{1}{4}}\text{ of }3\frac{1}{2}+\frac{3}{2}\left(\frac{5}{2}-\frac{2}{3}\right)}{\frac{3}{4}\text{ of }2\frac{1}{2}\div\frac{1}{4}}$$

3. Use tables of squares, square roots and reciprocals to find the value of x given. (3 marks)

$$\frac{1}{x}=\sqrt{\frac{1}{3.591^2}+\frac{2}{1.526}}$$

4. The figure below shows a rectangle PQRS in which all dimensions are given in centimetres. Find the value of x and hence calculate the area of the rectangle. (3 marks)



5. Solve for x if: (4 marks)

$9^{3x+1} - 12 \times 3^{3x} = -3.$

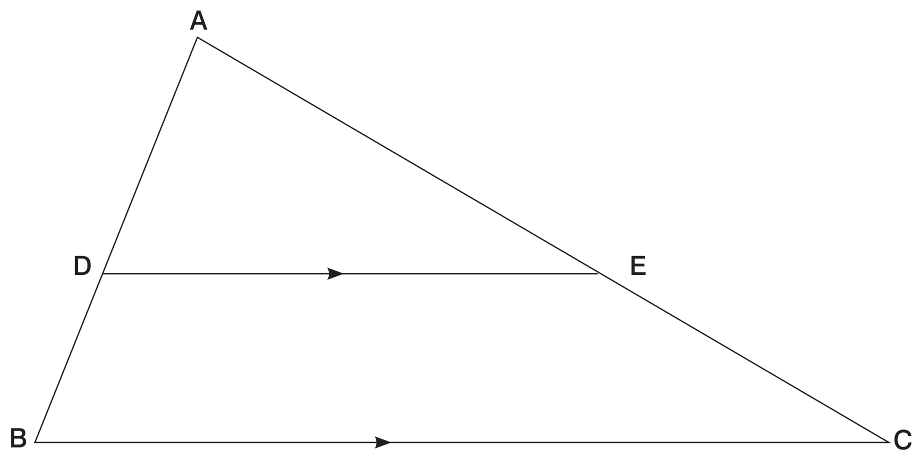
6. (a) Given that the position vectors of points P, Q and R are **p**, **q** and **r**, respectively, and that R is the mid-point of PQ, state the vector equation that relates **p**, **q** and **r**. (2 marks)

(b) If $\mathbf{p} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$ and $\mathbf{q} = \begin{pmatrix} 8 \\ 4 \end{pmatrix}$, find **r** and state the coordinates. (2 marks)

7. A straight line passes through points P(4, 9) and Q(4, –3) and has a double intercept of the form $\frac{x}{a} + \frac{y}{b} = 1$.

Write the equation in the form $y = Mx + C$ and determine the values of a and b. (4 marks)

8. In the triangle ABC shown below, DE is parallel to BC. If AE = 3 cm and EC = 2 cm, determine the ratio of the area of the triangle ADE to that of triangle ABC. (2 marks)



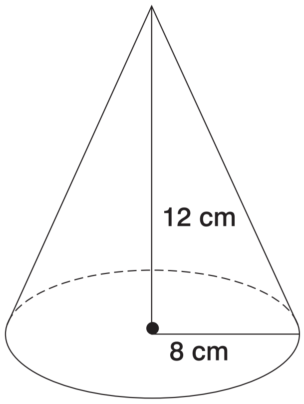
9. A Kenyan bank buys and sells foreign currencies as shown below.

	Buying (Ksh)	Selling (Ksh)
1 Hong Kong Dollar	9.74	9.77
1 South African Rand	12.03	12.11

A tourist arrived in Kenya with 105,000 Hong Kong Dollars and changed the whole amount to Kenya Shillings. While in Kenya he spent Ksh 403,879 and changed the balance to South African Rand before leaving for South Africa. Calculate the amount he received. (3 marks)

10. If $\tan x = \frac{12}{5}$, find the value of $\frac{\sin x + 2\cos x}{1 - \sin x}$. (3 marks)

11. The figure below shows a solid cone of base radius 8 cm and height 12 cm.



Calculate to one decimal place:

(a) the slant height of the cone. (1 mark)

(b) the total surface area of the cone. (2 marks)

12. Given the inequalities $3 - 2x < x \leq \frac{2x + 5}{3}$:

(a) solve the inequalities. (2 marks)

(b) list all the integral values of x that satisfy the combined inequality in (a) above. (1 mark)

13. The sum of the interior angles of an n-sided polygon is 1440°. Find the value of n and deduce the name of the polygon. (3 marks)

14. Solve for x in the equation

$2 + \log_7 (3x - 4) = \log_7 98.$ (3 marks)

15. Security light poles have been erected along both sides of a street in Wote town. The poles are 50 m apart along the left-hand side of the road while they are 80 m apart along the right-hand side. At one end of the road the poles are directly opposite each other. How many poles will be erected by the time the poles are directly opposite each other at the end of the road? (3 marks)

16. Find the equation of the normal to the curve $x^2 = 4y$ at (6, 9) leaving your answer in the form $ax + by = c$. (3 marks)

SECTION II (50 marks)

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

17. Mary bought three brands of tea A, B and C. The prices of the three brands were sh 25, sh 30 and sh 45 per kilogram, respectively. She mixed the three brands in the ratio of 5:2:1, respectively. After selling the mixture, she made a profit of 20%.

(a) How much profit did she make per kilogram of the mixture? (4 marks)

(b) After one year the cost price of each brand increased by 10%.

(i) For how much did she sell one kilogram of the mixture to make a profit of 15%? Give your answer to the nearest 5 cents. (3 marks)

(ii) What would have been her percentage profit if she sold one kilogram of the mixture at sh 45? (3 marks)

18. A rectangle OABC has vertices O(0, 0), A(2, 0), B(2, 3) and C(0, 3). O'A'B'C' is the image of OABC under a translation T= $\begin{pmatrix} 0 \\ 4 \end{pmatrix}$. O''A''B''C'' is the image of O'A'B'C' under a transformation given by the matrix M = $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$.

(a) Draw the rectangles OABC, O'A'B'C' and O''A''B''C'' on the grid provided. (6 marks)

(b) Use your diagram to find the centre of rotation which maps OABC onto O''A''B''C''. (2 marks)

(c) Find the coordinates of O'''A'''B'''C''', the image of O'A'B'C', under a reflection in the line $y=-x$. (2 marks)

19. (a) Complete the table below for the function $y = x^2 + 5x - 3$ for $-6 \leq x \leq 1$. (2 marks)

x	-6	-5	-4	-3	-2	-1	0	1
y		-3	-7		-9		-3	3

(b) Draw the graph of $y = x^2 + 5x - 3$ for $-6 \leq x \leq 1$.

Use the scale: Vertical axis–1 cm represents 1 unit (3 marks)

Horizontal axis–1 cm represents 1 unit

(c) (i) State the equation of the line of symmetry for the graph. (1 mark)

(ii) Use your graph to solve the equations:

(a) $x^2 + 5x - 3 = 0$ (1 mark)

(b) $x^2 + 4x - 2 = 0$ (2 marks)

(c) $x^2 + 5x - 3 = -3$ (1 mark)

20. A matatu left Eldoret at 7.45 a.m. and travelled towards Nairobi at an average speed of 60 km/h. A saloon car left Eldoret at 9.15 a.m. on the same day and travelled along the same road at an average speed of 120 km/h. The distance between Eldoret and Nairobi is 360 km.

(a) Determine the time of the day when the saloon car overtook the bus. (6 marks)

(b) Both vehicles continued towards Nairobi at their original speed. How long had the saloon car waited in Nairobi before the matatu arrived? (4 marks)

21. The table below shows the distribution of marks scored by 100 candidates in an examination.

Marks	1–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100
No. of Candidates	2	5	8	19	24	18	10	6	5	3

(a) State the modal class. (1 mark)

(b) Calculate the mean. (4 marks)

(c) Calculate the median mark. (4 marks)

(d) Find the difference between mean and median. (1 mark)

22. Two planes S and T leave airport A at the same time. S flies on a bearing of 60° at 750 km/h while T flies on a bearing of 210° at 900 km/h.

(a) Using a scale of 1 cm to represent 200 km/h, draw a diagram to show the position of the planes after 2 hours. (6 marks)

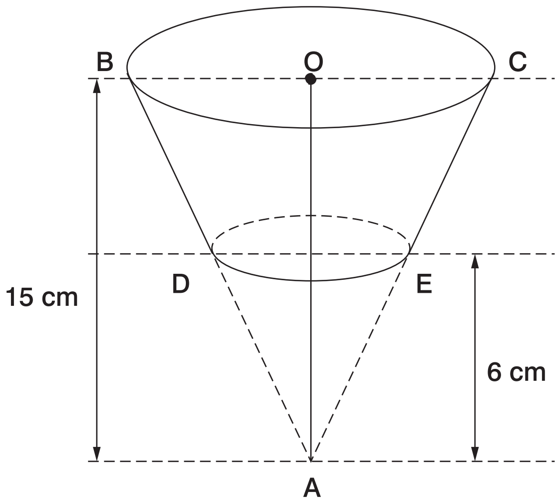
(b) Use your diagram to determine:

(i) the actual distance between the two planes. (2 marks)

(ii) the bearing of T from S. (1 mark)

(iii) the bearing of S from T. (1 mark)

23. The figure below shows a cone with a vertex at A and diameter 13 cm. The cone is cut off along DE as shown below.



(a) Find the vertical height AO. (2 marks)

(b) Find the volume of the frustrum. (4 marks)

(c) Find the curved surface area of the frustrum. (4 marks)

24. A particle P moves in a straight line such that t seconds after passing a fixed point Q, its velocity is given by the equation $v = 2t^2 - 10t + 12$. Find:

(a) the value of t when P is instantaneously at rest. (3 marks)

(b) an expression for the distance moved by P after t seconds. (2 marks)

(c) the total distance travelled by P in the first 3 seconds after passing point Q. (2 marks)

(d) the distance of P from Q when acceleration is zero. (3 marks)