

Name.....

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

Candidate's Signature.....

Date.....

121/2

MATHEMATICS

Paper 1

JULY/AUGUST 2013

2 ½ hours

SUBUKIA DISTRICT JOINT ASSESSMENT

Kenya Certificate of Secondary Education

MATHEMATICS

Paper 1

2 ½ hours

Instructions to Candidates

1. Write your name and index number in the spaces provided above.
2. Sign and write the date of examination in the spaces provided above.
3. This paper consists of **TWO** sections: **Section I** and **Section II**.
4. Answer **ALL** the questions in **Section I** and **only five** questions from **Section II**.
5. All answers and working must be written on the question paper in the spaces provided below each question.
6. Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
7. Marks may be given for correct working even if the answer is wrong.
8. **Non-programmable** silent electronic calculators **and** KNEC Mathematical tables may be used except where stated otherwise.
9. This paper consists of **13** printed pages.
10. 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

--

SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION

1. Evaluate

$$\frac{3/5 - 1\frac{2}{5} \div 1\frac{3}{4} \text{ of } 2\frac{1}{3}}{12/17 \text{ of } (1\frac{3}{4} - 5/8 \times 2/3)}$$

(3marks)

2. Find the value of x in the following equations:  $(\frac{9}{36})^{-2x} = (\frac{1}{32})^{3x-4}$  (4marks)

3. Two lines  $L_1$  and  $L_2$  intersect at a point P.  $L_1$  passes through the points (-4,0) and (0,6). Given that  $L_2$  has the equation:  $y = 2x - 2$ , find, by calculation, the coordinates of P.

(3 marks)

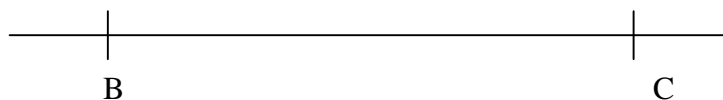
4. The length of a rectangle is  $(3x + 1)$  cm, its width is 3 cm shorter than its length. Given that the area of the rectangle is  $28\text{cm}^2$ , find its length (3 marks)

5. Simplify the expression  $\frac{15a^2b - 10ab^2}{3a^2 + 5ab + 2b^2}$  (3 marks)

6. that  $x$  is an acute angle and  $\cos x = \frac{2\sqrt{5}}{5}$ , find without using mathematical tables or a calculator,  $\tan (90 - x)^0$ . (3 marks)

7. Two matrices  $A$  and  $B$  are such that  $A = \begin{bmatrix} k & 4 \\ 3 & 2 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 2 \\ 3 & -4 \end{bmatrix}$   
Given that the determinant of  $AB = 10$ , find the value of  $k$ . (3 marks)

8. Line BC below is a side of a triangle ABC and also a side of a parallelogram BCDE.



Using a ruler and a pair of compasses only construct:

- (i) The triangle ABC given that  $\angle ABC = 120^\circ$  and  $AB = 6\text{cm}$  (1mark)
- (ii) The parallelogram BCDE whose area is equal to that of the triangle ABC and point E is on line AB (3marks)

9. Water and ethanol are mixed such that the ratio of the volume of water to that of ethanol is 3: 1. Taking the density of water as  $1\text{ g/cm}^3$  and that of ethanol as  $1.2\text{g/cm}^3$ , find the mass in grams of 2.5 litres of the mixture. ( 3 marks)

10. A Kenyan bureau buys and sells foreign currencies as shown below

	Buying (In Kenya shillings)	Selling In Kenya Shillings
1 Hong Kong dollar	9.74	9.77
100 Japanese Yen	75.08	75.12

A tourists arrived in Kenya with 105 000 Hong Kong dollars and changed the whole amount to Kenyan shillings. While in Kenya, she pent Kshs 403 897 and changed the balance to Japanese Yen before leaving for Tokyo. Calculate the amount, in Japanese Yen that she received.

(3 marks)

11. Point T is the midpoint of a straight line AB. Given the position vectors of A and T are  $i - j + k$  and  $2i + 1\frac{1}{2}k$  respectively, find the position vector of B in terms of  $i$ ,  $j$  and  $k$ .  
(3marks)

12. Solve the following inequalities and represent the solutions on a single number line:

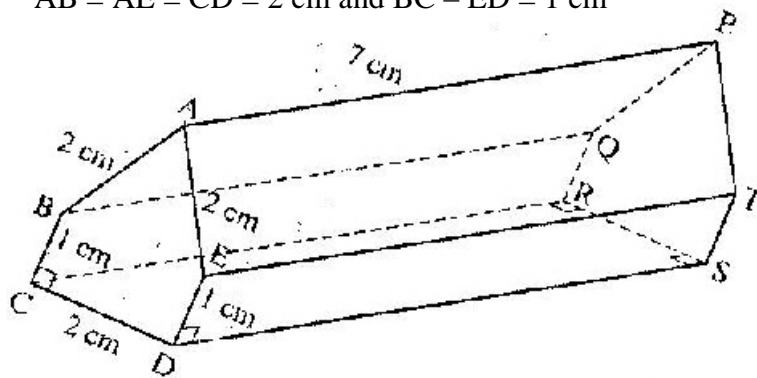
$$3 - 2x < 5$$
$$8 - 3x + 4$$

(3marks)

13. Solve the equation  $\log(x+24) - 2\log 3 = \log(9-2x) + 2$

(3marks)

14. The figure below represents a prism of length 7 cm  
 $AB = AE = CD = 2$  cm and  $BC = ED = 1$  cm



Draw the net of the prism

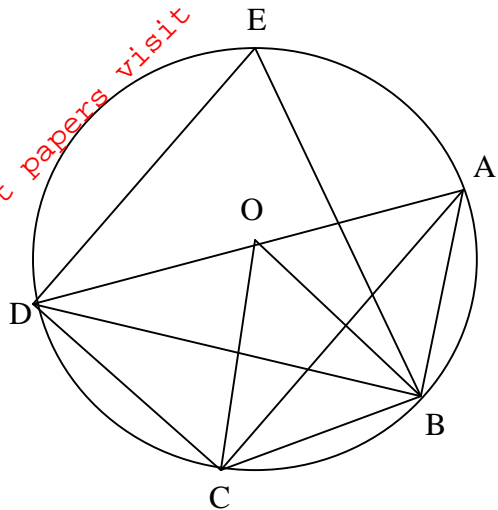
( 3 marks)

15. The marked price of a car in a dealer's shop was Kshs 450,000. Wekesa bought the car at 7% discount. The dealer still made a profit of 13%. Calculate the amount of money the dealer had paid for the car. (3 marks)

16. The size of each interior angle of a regular polygon is four times the size of the exterior angle. Find the number of sides of the polygon. (3 marks)

**SECTION B: ANSWER ANY FIVE QUESTIONS IN THIS SECTION**

17. In the figure below DA is a diameter of the circle ABCDE centre O, radius 10cm.  
 $AB=BC$  and angle  $DAC=36^\circ$



- a) Giving reasons, find the size of the angle;
- |       |      |         |
|-------|------|---------|
| (i)   | CDB; | (2mks)  |
| (ii)  | DBC  | (2mks): |
| (iii) | DOC  | (2mks)  |
| (iv)  | OCA  | (2mks)  |
| (v)   | DEB  | (2mks)  |



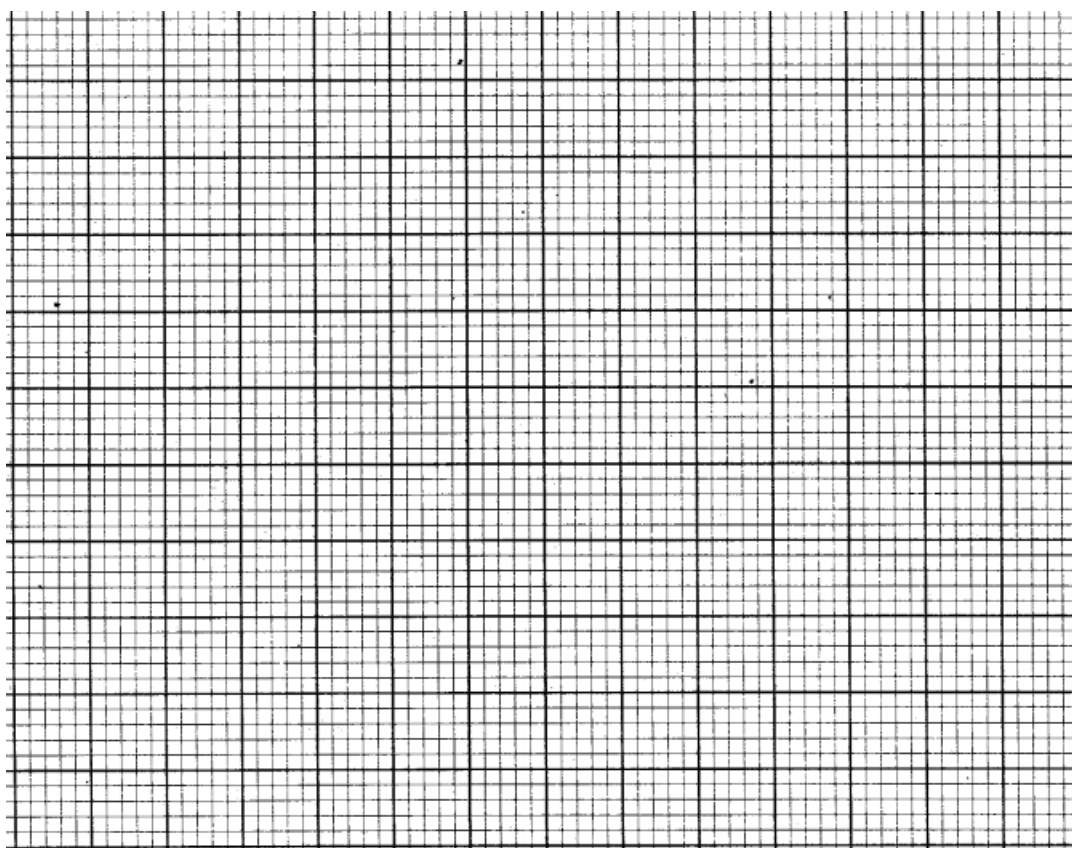
18. (a) Complete the table below for the missing values of  $y$ , correct to 1 decimal place.  
(2 marks)

X	$0^{\circ}$	$30^{\circ}$	$60^{\circ}$	$90^{\circ}$	$120^{\circ}$	$150^{\circ}$	$180^{\circ}$	$210^{\circ}$	$240^{\circ}$
$2 \cos (\frac{1}{2}X - 30^{\circ})$			2.00		1.73			0.52	
$2 \cos 2X^{\circ}$				-2.00			2.00		-1.00

- (b) On the same axes, draw the graphs of  $y = 2 \cos (\frac{1}{2}X - 30^{\circ})$  and  $y = 2 \cos 2X^{\circ}$  for  $0^{\circ} \leq X \leq 240^{\circ}$ .

Take the scale 1 cm for  $30^{\circ}$  on the x-axis 1 cm for 0.5 units on the y-axis

(5 marks)



- (c) Use the graph to solve the equations:

(i)  $2 \cos (\frac{1}{2}X - 30^{\circ}) = 1.1$

(ii)  $\cos 2X^{\circ} - \cos (\frac{1}{2}X - 30^{\circ}) = 0$

(3 marks)

19. A bus left Mombasa and traveled towards Nairobi at an average speed of 60km/hr. after 2½ hours; a car left Mombasa and traveled along the same road at an average speed of 100km/ hr. If the distance between Mombasa and Nairobi is 500km, Determine

(a) (i) The distance of the bus from Nairobi when the car took off

( 2 marks)

(ii) The distance the car travelled to catch up with the bus

(4 marks)

(b) Immediately the car caught up with the bus, the car stopped for 25 minutes. Find the new average speed at which the car traveled in order to reach Nairobi at the same time as the bus.

( 4 marks)

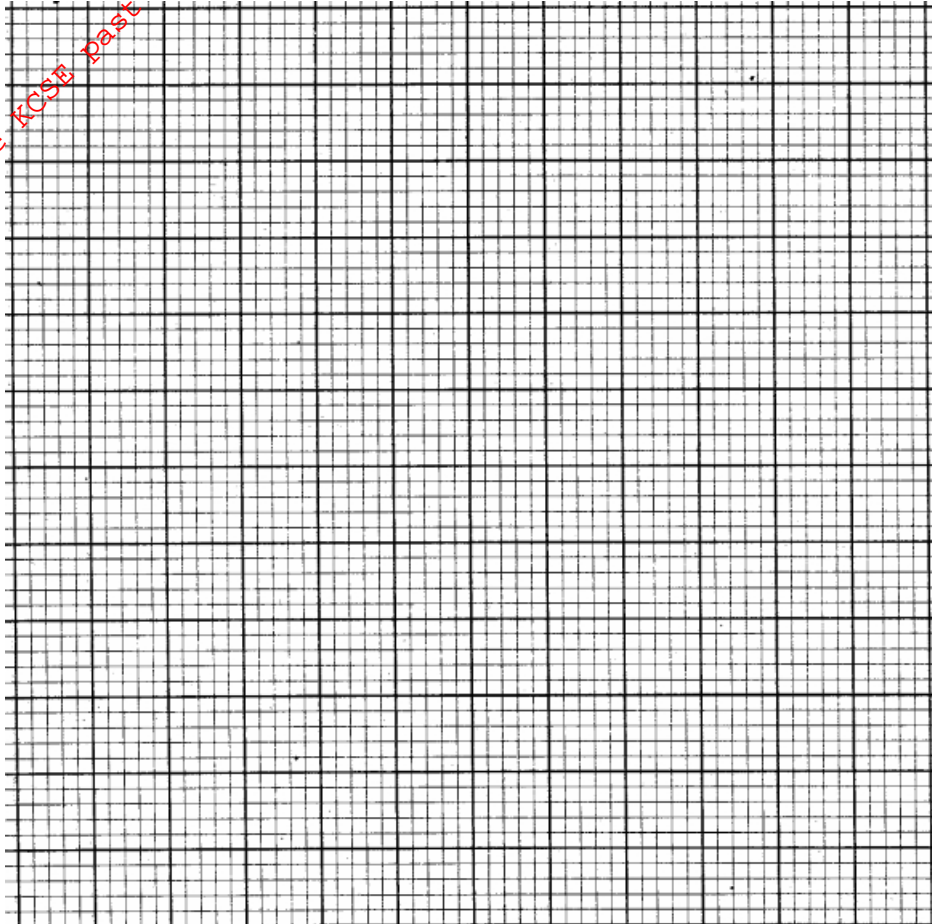
/

20. The coordinates of triangle PQR are P(-1, 3), Q (-3, 4) and R (-2, 1). Draw triangle PQR (1mks)

a) Draw  $\triangle P'Q'R'$  the image of PQR under a rotation of  $+90^\circ$  about (0, 0). (2mks)

b) Draw  $\triangle P''Q''R''$  the image of  $\triangle P'Q'R'$  under a reflection in the line  $y = -x$ . (2mks)

c) Draw  $\triangle P'''Q'''R'''$  the image of  $\triangle P''Q''R''$  under a rotation of  $-90^\circ$  about (0, 0) (2mks)



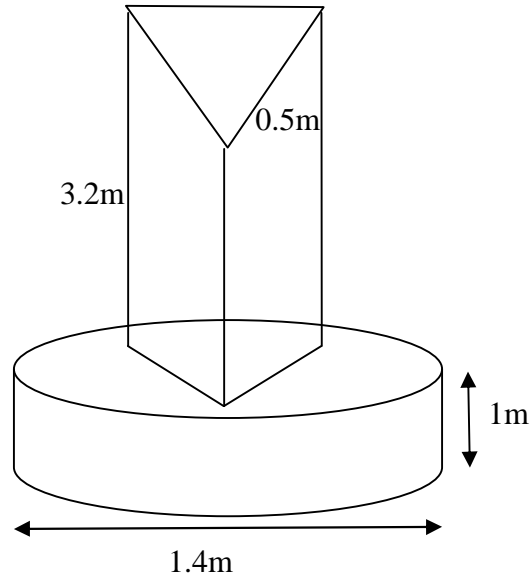
d) Describe a single transformation that maps  $\triangle PQR$  onto  $\triangle P'''Q'''R'''$  (2mks)

e) Calculate the area of the quadrilateral  $Q''Q'''Q'$ . (1mks)

- 21.. a) Using trapezoidal rule estimate the area under the curve  $Y = \frac{1}{2}x^2 - 2$  for  $0 \leq x \leq 6$ .  
use six strips. (5mks)

- b) (i) Assuming that the area determined by integration to is the actual area, calculate  
the percentage error in using the trapezoidal rule. (5 mks)

22. The diagram below represents a pillar made of cylindrical and regular tetrahedral parts. The diameter and height of the cylindrical part are 1.4m and 1m respectively. The side of the regular tetrahedral face is 0.5m and its height is 3.2m.



- a) Calculate the volume of the :
- i) Cylindrical part (2marks)
- ii) Tetrahedral part (3marks)

b) An identical pillar is to be built but with a hollow cylindrical region whose cross-section radius is 0.2m. The hollow region extends from top of the tetrahedral part to the base of the cylindrical part.

(i) Calculate the volume of the pillar (3marks)

(ii) The density of the material to be used to make the pillar is  $2.7\text{g/cm}^3$ . Calculate the mass of the new pillar. (2marks)

23. Four towns P, R, T and S are such that R is 80km directly to the north of P and T is on a bearing of  $290^\circ$  from P at a distance of 65km. S is on a bearing of  $330^\circ$  from T and a distance of 30 km.

Using a scale of 1cm to represent 10km, make an accurate scale drawing to show the relative position of the towns.

(4marks)

Find:

(a) The distance and the bearing of R from T (3marks)

(b) The distance and the bearing of S from R (2marks)

(c) The bearing of P from S (1mark)

24. A cylindrical water tank can be filled to a depth of 2.1 metres by a pipe P in 2 hrs.

Pipe Q takes 7hrs to fill the tank to the same depth. Pipe R can empty this amount of water in 6hrs.

(a) i) Starting with an empty tank, P runs alone for one hour. How many centimeters deep will the water in the tank be?

(2 marks)

ii) Having run for an hour in (i) above, Pipe P continues to run for additional 20 minutes after which it's turned off. The remaining two pipes are left open with pipe R left to run for 4 hours while pipe Q runs for 2 hours. What will the depth of water in the tank be?

(4marks)

b) If the tank was initially 6.5m full and the three pipes are open, how long will it take to fill the tank such that only a third of the initial height of the tank remains empty?

(4 marks)