

Name \_\_\_\_\_

Admission No. \_\_\_\_\_

Candidate's signature \_\_\_\_\_

Date \_\_\_\_\_

**121/1**  
**MATHEMATICS**  
**PAPER 1**  
**JULY/AUGUST 2014**  
**2 ½ HOURS**

**MBOONI EAST SUB – COUNTY T FORM FOUR JOINT EXAMINATION 2014**

*Kenya Certificate of Secondary Education*

**MATHEMATICS**  
**PAPER 1**  
**JULY/AUGUST 2014**  
**2 ½ HOURS**

**INSTRUCTIONS TO CANDIDATES**

1. Write your name, index number and class.
2. The paper contains two sections: Section I and II
3. Answer ALL questions in section I and ONLY FIVE questions from section II.
4. All working and answers must be written on the question paper in the spaces provided below each question.
5. Marks may be awarded for correct working even if the answer is wrong.
6. Negligence and slovenly work will be penalized.
7. Non-programmable silent electronic calculators and mathematical tables are allowed for use.
- 8. This paper consists of 15 printed pages. Candidates should check to ensure that all pages are printed as indicated and 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**

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**SECTION 1 (50 Marks)****Answer ALL questions from this section**

1. Evaluate:  $\frac{\frac{1}{2} \text{ of } 18 \div -3 + 2\frac{1}{2}x - \frac{3}{5}}{\frac{1}{2} + 3\frac{3}{4} \div \frac{3}{4}}$

(3 marks)

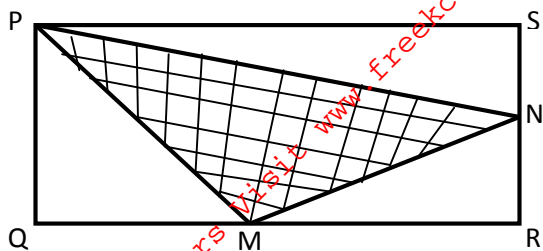
2. A line L passes through point (3, 1) and is perpendicular to the line  $2y = 4x + 5$ . Determine the equation of L (3 marks)

3. Solve the following inequalities and represent the solution on a number line and hence state the integral values of x

$$7x - 4 \leq 9x + 2 < 3x + 14$$

(4 marks)

4. In the figure below PQRS is a rectangle in which PS = 10Kcm and PQ = 6Kcm M and N are midpoints of QR and RS respectively. Find the area of the shaded part. (4 marks)



5. A seven sided polygon has three of its angles equal to  $\theta$  and the other angles are  $(2\theta - 30)$ ,  $(\theta + 28)$ ,  $3(\theta - 4)$  and  $(126 - \theta)$ . Calculate the value of  $\theta$  (3 marks)

6. Solve for x in the equation. (3 marks)

$$\frac{81^{2x} \times 27^x}{9^x} = 729$$

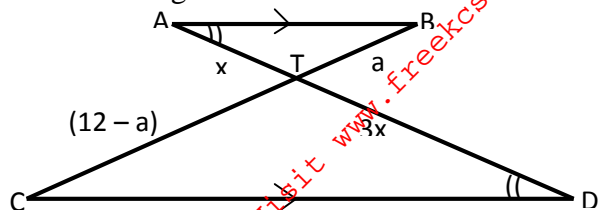
7. The GCD and LCM of three numbers are 3 and 1008 respectively. If two of the numbers are 48 and 72, find the least possible value of the third number. (3 marks)

8. Mr. Waweru needs to import a car from Japan where cost is USD 5000 outside Kenya. He intends to buy the car through an agent who deals in Japanese yen. The agent will charge him 20% commission on the price of the car and further 80,325 Japanese yen for shipment of the car. How many Kenya shillings will he need to send to the agent to obtain the car given that?  
1USD = 105.00 yen and 1USD = KSh. 63.00

(3 marks)

9. Two containers have base area of  $750\text{cm}^2$  and  $120\text{cm}^2$  respectively. Calculate the volume of the larger container in litres given that the volume of the smaller container is  $400\text{cm}^3$ . (3 marks)

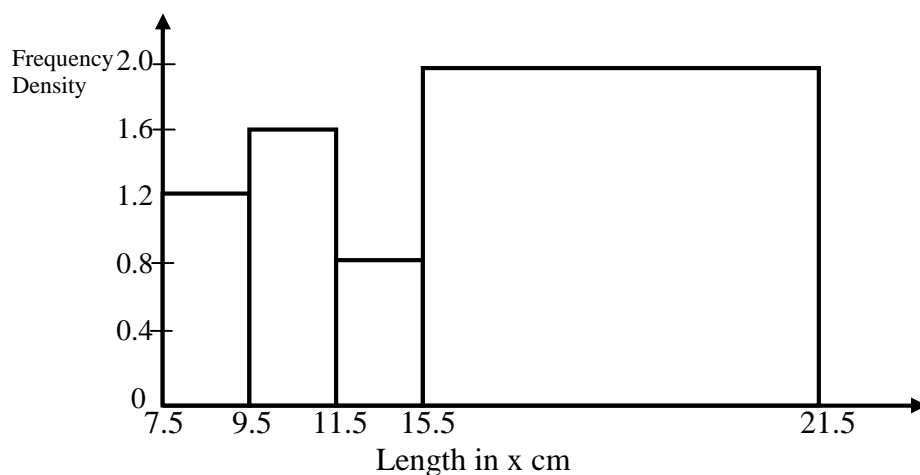
10. The figure below  $AB \parallel CD$ ,  $AD$  and  $BC$  intersect at  $T$ . Given that  $AT:TD = 1:3$  and  $CB = 12\text{cm}$ . Calculate the length of  $TB$ . (3 marks)



11. Use a calculator to work out. (3 marks)

$$\left(\frac{34^3 - 257}{97 \times 1243}\right)^{\frac{1}{4}}$$

12. The figure below shows a histogram.



Fill in the table below the missing frequencies.

Length in x cm	Frequency
$7.5 \leq x \leq 9.5$	12
$9.5 \leq x \leq 11.5$	
$11.5 \leq x \leq 15.5$	
$15.5 \leq x \leq 21.5$	

13. Solve for x:  $(\text{Log}_2 x) \text{Log}_2 x^3 = 4$

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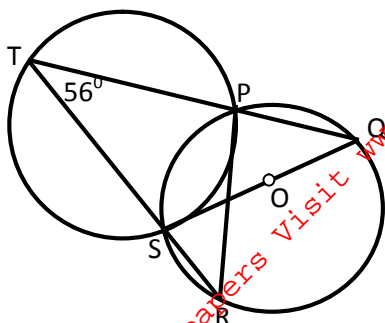
14. Mutua bought 8 pairs of trousers and six shirts at Sh. 4160. Had he bought twice as many shirts and half as many trousers, he would have saved Sh. 160. Find the cost of each item. (3 marks)

15. Simplify the following expression.

$$\frac{x-3}{x+3} - \frac{3x-9}{x^2-9}$$

(3 marks)

16. In the figure below O is the centre of circle PQRS.  $\angle PTS = 56^\circ$  and  $\angle PQS = 28^\circ$  and TPQ is a straight line.



Find: (a)  $\angle TSP$

(1 mark)

(b)  $\angle PRQ$

(1 mark)

**SECTION II (50 marks)**

17. Three partners Mutua, Muthoka and Mwikali contributed Sh. 600,000, Sh. 400,000 and Sh. 800,000 respectively to start a business of a matatu plying Mbumbuni – Machakos route. The matatu carries 14 passengers with each paying Sh. 250. The matatu makes two round trips each day and ever full. Each day

Sh. 6000 is used to cover running costs and wages.

(a) Calculate their net profit per day.

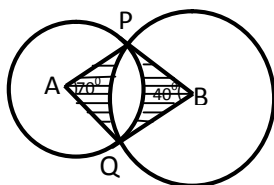
(2 marks)

(b) The matatu works for 25 days per month and is serviced every month at a cost of KSh.10, 000. Calculate their monthly profit in June. (1 mark)

(c) The three partners agreed to save 40% of the profit, 24% to be shared in the ratio of their contribution. Calculate Muthoka's share in the month of July (4 marks)

(d) The matatu developed mechanical problems and they decided to sell it through an agent who charged a commission of 5% on selling price. Each partner received KSh. 475,000 from the agent after he had taken his commission. Determine the price at which the agent sold the matatu. (3 marks)

18. The diagram below shows two circles centre A and B which intersect at point P and Q. Angle  $PBQ = 40^\circ$  and angle  $PAQ = 70^\circ$ , and  $PA = AQ = 8\text{cm}$ .



Use the diagram to calculate to two d.p

(a) The length PQ

(2 marks)



(b) The length PB

(c) Area of minor segment of circle centre A

(2 marks)

(d) Area of minor segment of circle centre B

(2 marks)

(e) The area of shaded region.

(2 marks)

19. (a) (i) Fill the table below for the function.

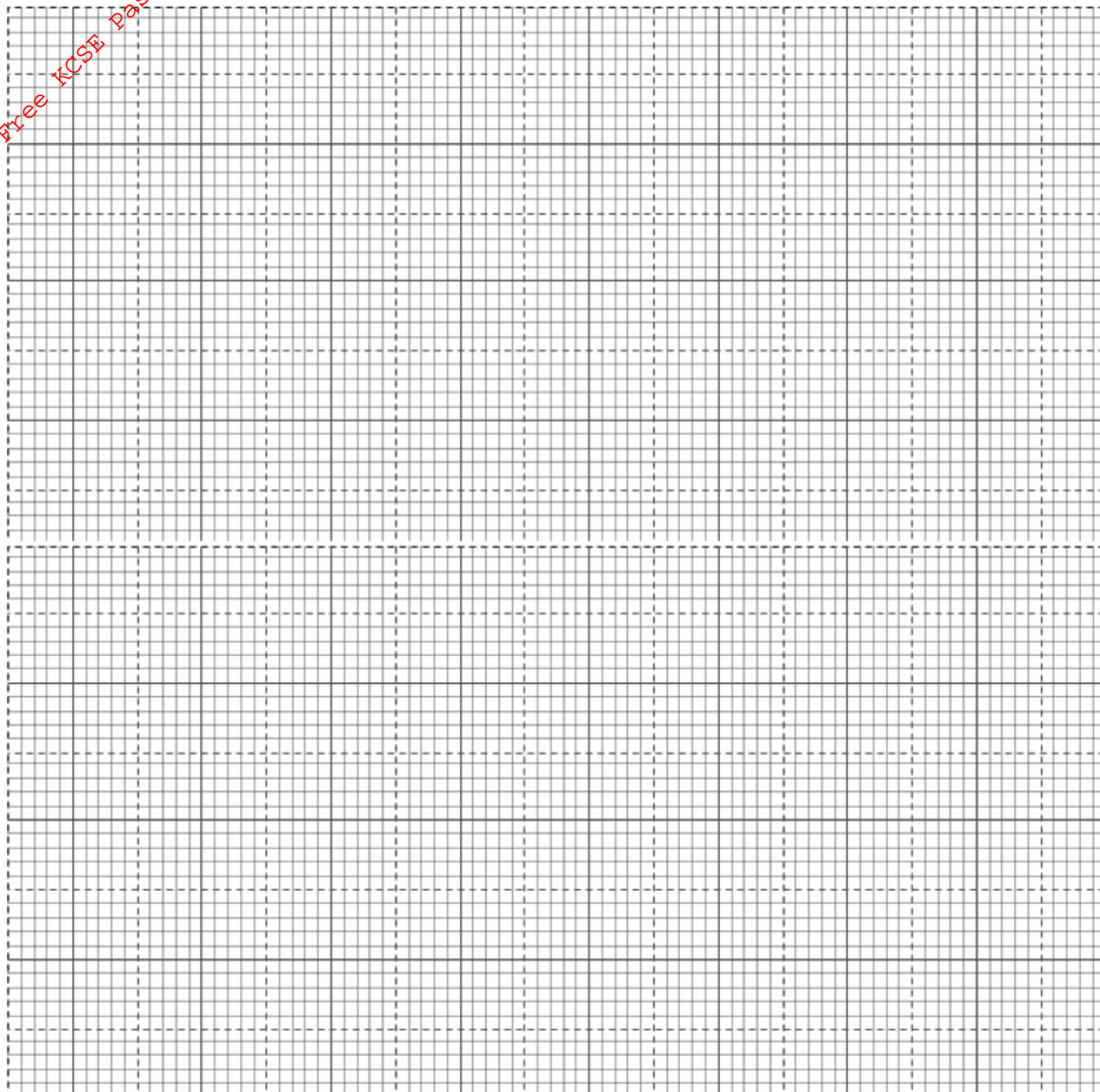
$$y = 2x^2 + 5x - 12 \text{ for } -8 \leq x \leq 4$$

(2 marks)

x	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4
$2x^2$	128					18				2			32
$5x$	-40					-15				5			20
-12	-12					-12				-12			-12
y	76					-9				-5			40

(ii) Using the table, draw the graph of the function  $y = 2x^2 + 5x - 12$ . Use the scale 1cm to 1 unit on the x-axis and 1cm for 10 units for the y – axis

(4 marks)



(b) Use the graph drawn above to solve the following equations.

(i)  $2x^2 + 5x - 12 = 0$

(2 marks)

(ii)  $3 - 7x - 3x^2 = 0$

(2 marks)

20. A country bus left Emali at 11.45 a.m. and travelled towards Mombasa at an average speed of 80km/hr. A Nissan matatu left Emali at 1.15 p.m on the same day and travelled along the same road at an average speed of 120km/hr. The distance between Emali and Mombasa is 400km.

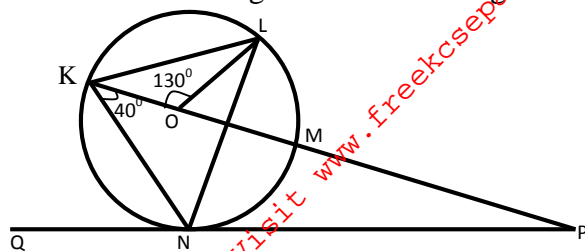
(a) Determine the time of the day when the Nissan matatu overtook the bus.

(5 marks)

(b) Both vehicles continue towards Mombasa at their original speeds. Find how long the matatu had to wait at Mombasa before the bus arrived.

(5 marks)

21. In the figure below, K,L,M and N are points on the circumference of the circle centre O. The points K, O, M and P are on a straight line. PN is tangent to the circle at N.  $\angle KOL = 130^\circ$  and  $\angle MKN = 40^\circ$ .



Stating the reason in each case, find the values of the following angles,

(a)  $\angle MLN$  (2 marks)

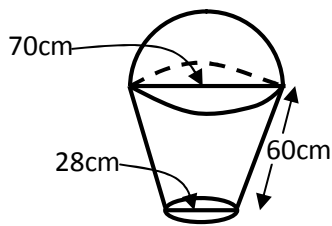
(b)  $\angle OLN$  (2 marks)

(c)  $\angle LNP$  (2 marks)

(d)  $\angle MPN$  (2 marks)

(e)  $\angle KNQ$  (2 marks)

22. The figure below shows a model of a solid in the shape of a frustum of a cone with a hemispherical top.



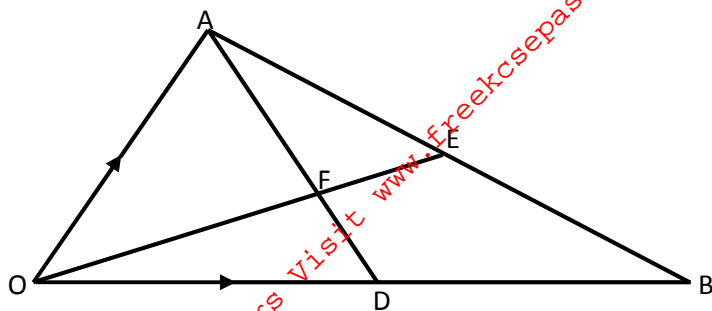
The diameter of the hemispherical top is 70cm and is equal to the diameter of the top of the frustum. The frustum has a base diameter of 28cm and a slant height of 60cm.

(a) Calculate the area of the hemispherical surface. ( 1mark)

(b) Calculate the slant height of the cone from which the frustum was cut. (4marks)

(c) Calculate the total surface area of the model (5 marks)

23. In the figure, E is the midpoint of AB and  $OD:OB = 2:5$  and F is the point of intersection of OE and AD.



Given that  $\vec{OA} = \vec{a}$  and  $\vec{OB} = \vec{b}$ , Express in terms of  $\vec{a}$  and  $\vec{b}$

(a) (i)  $\vec{OE}$  (1 mark)

(ii)  $\vec{AD}$  (1 mark)

(b) Given further that  $\vec{AF} = t\vec{AD}$  and  $\vec{OF} = h\vec{OE}$  where  $t$  and  $h$  are scalars, find the values of  $t$  and  $h$  (5 marks)

(c) Show that the points O, F and E are collinear (3 marks)

24. The displacement  $S$  metres of a body moving along a straight line after  $t$  seconds is given by

$$S = -2t^3 + \frac{3}{2}t^2 + 3t$$

(a) Find its initial acceleration.

(3 marks)

(b) Calculate:

(i) The time when the body was momentarily at rest.

(3 marks)

(ii) Its displacement by the time it comes to rest momentarily

(2 marks)

(c) Calculate the maximum velocity attained

(2 marks)