

NAME..... INDEX NO.....

CANDIDATE'S SIGNATURE..... DATE:.....

## GATUNDU SUB COUNTY FORM FOUR 2016 EVALUATION EXAM

121/1

MATHEMATICS

PAPER I

JULY/AUGUST 2016

TIME: 2 ½ HOURS

### INSTRUCTIONS TO CANDIDATES

- (a) Write your name and index number in the spaces provided above
- (b) Sign and write the date of exam in the space provided above.
- (c) This paper consists of two section : section I and section II
- (d) Answer all questions in section I and Only Five questions form section II
- (e) All answers and working must be written on the question paper in the space provided below each question.
- (f) Show all the steps in your calculation.
- (g) Marks may be given for correct working even if the answer is wrong.
- (h) Non –programmable silent electronic calculators and KNEC maths tables may be used except where stated otherwise.

|   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |

### Section II

|    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|
| 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
|    |    |    |    |    |    |    |    |

**GrandTotal**

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## **SECTION 1.**

Answer all questions in the spaces provided below each question in this section.

1. Use logarithms to 4 decimal places to evaluate: (4 Mks)

$$\left[ \frac{0.8741 \times \sqrt{0.1365}}{\text{Log } 92.84} \right]^{1/3}$$

2. A line  $L_1$  passes through the point  $P(-1,2)$  and  $Q(2,-7)$

- (i) Find the equation of a line which is perpendicular to line  $L_1$  and passes through point  $R(5,5)$   
(3 Mks)

- (ii) Find the mid-point of line  $QR$ . (1 Mk)

3. What is the value of  $x$  if; (3 Mks)

$$\frac{27^{x-1}}{3^{2x-1}} = 81^{2x}$$

4. Given that  $\underline{a} = 2\underline{i} - 3\underline{j} + \underline{k}$ ,  $\underline{b} = 3\underline{i} - 4\underline{j} - \underline{k}$  and  $\underline{c} = \underline{j} + 3\underline{k}$  and that  $R = 3\underline{a} - \underline{b} + \underline{c}$  find the magnitude of R correct to 3 significant figures. (3 Mks)

5. Solve the simultaneous inequalities below and state the negative values of x that satisfy the inequalities  $\frac{1}{4}x - 3 \leq x + 2 \leq 21 - 2x$  (3 Mks)

6. A tourist arrived in Kenya from Britain with 9600 UK sterling pounds (UK £). He converted the pounds to Kenya shilling at a commission of 5%. While in Kenya, he spent  $\frac{3}{4}$  of his money. He changed the balance to US dollar after his stay. If he was not charged any commission for the last transaction, using the exchange rates below, calculate to the nearest US dollar he received. (3 Mks)

|             | Buying | Selling |
|-------------|--------|---------|
| 1 US dollar | 63.00  | 63.20   |
| 1 UK £      | 125.30 | 125.95  |

7. Two consecutive odd numbers are such that the difference is thrice the small number and twice the larger number is 21. Find the sum of the numbers. (3 Mks)

8. Two similar container hold  $2000\text{cm}^3$  and 6.75 litres respectively. If the smaller container is 16cm in diameter, what is the radius of the larger container? (3 Mks)

9. A piece of land is shared among 10 people, such that the first one get 3 hectares, the second one gets 4.5 hectares, the third gets 6 hectares, the fourth 7.5 hectares and so on.

(i) How much land does the 10<sup>th</sup> person get? (2 Mks)

(ii) What is the total area of land shared (1 Mk)

10. Given that  $4x^2 - 32x - 20 + k$  is a perfect square find the value of K. (3 Mks)

11. 5kg of maize costing Sh. 32.20 a kilo were mixed with 6kg of beans sh 50 a kilo and 1kg of sorghum costing sh 19.00 a kilo. If the selling price of 1kg of the mixture is sh 48.00, calculate the percentage profit. (3 Mks)

12. The exterior angle of a regular polygon of side 16cm is  $18^\circ$ . Calculate the area of the polygon to 2 d.p (4 Mks)

13. Express in surd form and simplify by rationalizing the denominator; (3 Mks)

$$\frac{1 + \cos 30^\circ}{1 - \sin 60^\circ}$$

14. Without using tables or a calculator evaluate. (2 Mks)

$$\frac{3.8 \times 0.016}{10 \times 0.0076}$$

15. Three men working 8 hours daily can complete a piece of work in 5 days. Find how long it will take 10 men working 6 hours a day to complete the same work. (3 Mks)

16. Given the equation  $m = \frac{1}{4} (3h^2 + 8ah + 3a^2)$  Calculate the exact value of  $m$ , when  $h = 20$  and  $a = -5$ . (3 Mks)

## **SECTION 11.**

Answer any 5 questions in this section.

17. A teacher paid Ksh 1,200 for some packets of coloured pieces of chalk and paid the same amount for some packets of white pieces of chalk. The price of a packet of the white pieces was Ksh 10 less than that of coloured pieces. The teacher got 4 more packets of the white pieces than the packets of the coloured pieces.

(a) Taking  $x$  to be the number of packets of the coloured pieces that the teacher bought.

(i) Find an expression for the price per packet of each type of the pieces of chalk. (2 Mks)

(ii) Form an equation in  $x$  and hence determine the number of packets of the coloured and white pieces of chalk the teacher bought. (5 Mks)

(b) The teacher sold all the packets at the same price per packet making a profit of  $28\frac{1}{3}\%$ . Calculate the selling price of each packet. (3 Mks)

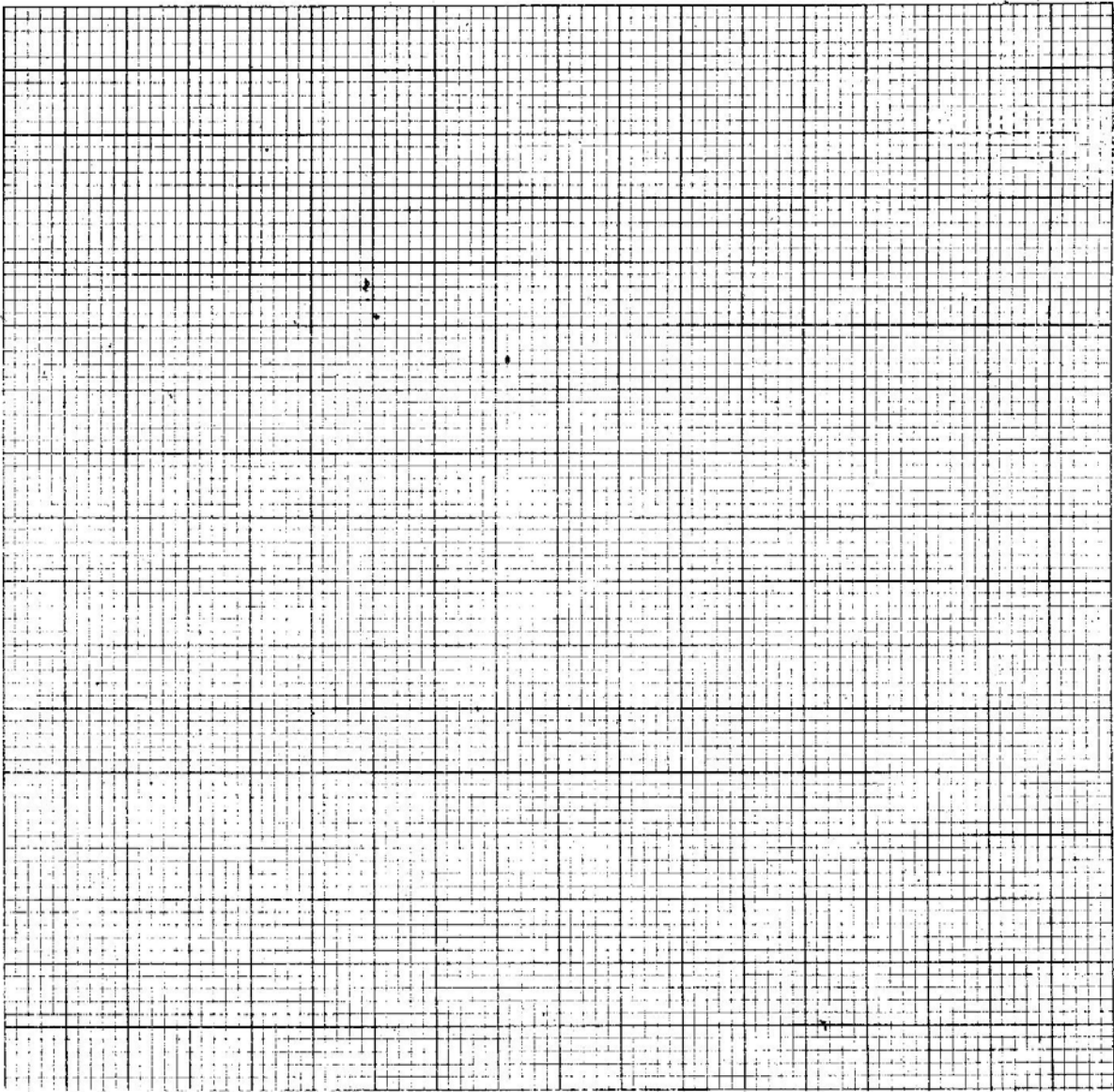
18. (a) Complete the table below for the function.

$$Y = 3x^2 - 2x - 1 \text{ for } -3 \leq x \leq 4$$

|   |    |    |    |   |   |   |   |   |
|---|----|----|----|---|---|---|---|---|
| X | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| y |    | 15 |    |   |   | 7 |   |   |

(2 Mks)

(b) Draw the graph of  $y = 3x^2 - 2x - 1$  on the grid provided below. (3 Mks)

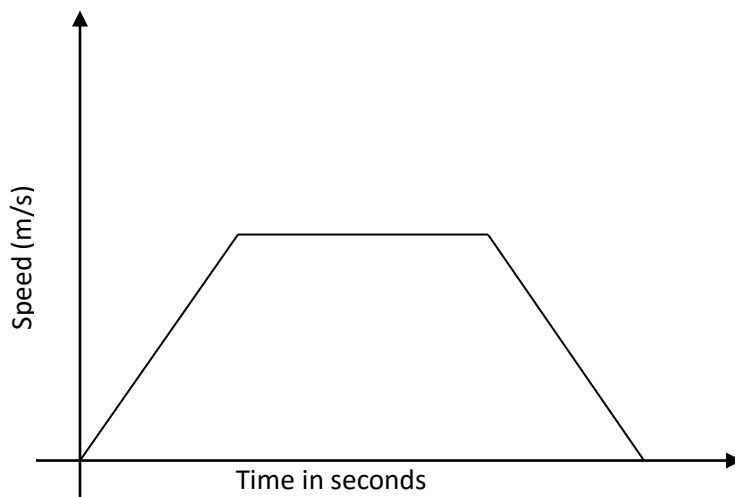




(c) Draw the line  $y = 3x + 1$  on the same axes, hence find the values of  $x$  for which  $y = 3x + 1$  and  $Y = 3x^2 - 2x - 1$  are equal

(d) Write down a simplified quadratic equation whose roots are the solutions of the simultaneous equations in (c) above.

19. The diagram below shows the velocity time graph for a train travelling between two stations. The train starts from rest and accelerates uniformly for 150 seconds. It then travel at constant speed for 300 sec and finally decelerates uniformly for 200 sec. Given that the distance between the two stations is 10450m, calculate;



(a) The maximum speed in km/h the train attained. (3 Mks)

(b) The acceleration. (2 Mks)

(c) Distance the train travelled during the last 100 seconds. (2 Mks)

(d) Time the train takes to travel the first half of the journey. (3 Mks)

20. (a) Using a ruler and a pair of compasses only construct a rhombus ABCD such that AB = 6cm and angle ABC =  $135^\circ$  (4 Mks)

(b) Drop a perpendicular from C to AB, extended meeting at N. Measure BN and CN. (3 Mk)

(c) Bisect  $\angle DAB$ , let the two bisector meet at M measure MA. (1 Mk)

(e) Determine the area of triangle ABM. (2 Mks)

21. (a) Two matrices P and Q are such that  $P = \begin{pmatrix} k & 4 \\ 3 & 2 \end{pmatrix}$  and  $Q = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ . Given that the determinant of  $PQ = 4$ , find the value of k. (3 Mks)

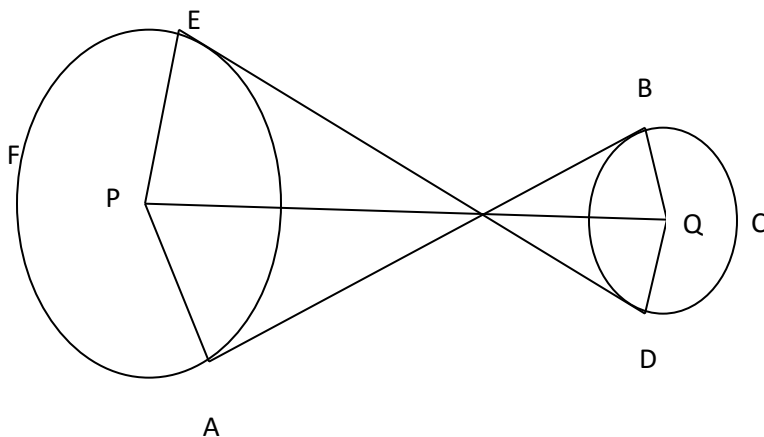
(b) Find  $M^{-1}$  the inverse of matrix  $M = \begin{bmatrix} 5 & 6 \\ 7 & 9 \end{bmatrix}$  (2 Mks)

(c) Omondi bought 5 plates and 6 mugs for a total of ksh 2440. Ali bought 7 plates and 9 mugs for a total of Ksh 3560.

(i) Form a matrix equation to represent the above information. (2 Mks)

(ii) Use matrix method to find out price of plates and that of mugs. (3 Mks)

22. The figure below shows two pulleys whose centers are 30cm apart connected by belt ABCDEF. The pulley center P has a radius of 13cm and the pulley center Q has a radius of 4cm.



Calculate:-

(a) The length AB. (2 Mks)

(b) The reflex angles EPA and BQD. (2 Mks)

(c) The arc length AFE and BCD. (4 Mks)

(d) The total length of the belt. (2 Mks)

23. The displacement  $s$  metres of a moving particle after  $t$  seconds is given by  $s = 2t^3 - 5t^2 + 4t + 2$

Determine:-

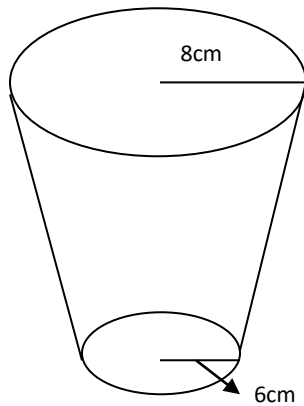
(a) The velocity of the particle when  $t = 2$ . (3 Mks)

(b) The value of  $t$  when the particle is momentarily at rest. (3 Mks)

(c) The displacement when the particle is momentarily at rest. (3 Mks)

(d) The acceleration of the particle when  $t = 5$ . (2 Mks)

24. A pail is in shape of a container frustrum with base radius 6cm and top radius 8cm. The slant height of the pail is 30cm as shown below. The pail is full of water.



(a) Calculate the volume of water. (6 Mks)

- (b) All the water is poured into cylindrical container of circular radius 7cm; if the cylinder has the height of 35cm, calculate the surface area of the cylinder which is not in contact with water.  
(4 Mks)