

**MURANG'A SOUTH SUB-COUNTY MULTILATERAL EXAMINATION 2016**  
**121/2**  
**MATHEMATICS ALT. A**  
**PAPER 2**  
**JULY / AUGUST 2016**  
**2 ½ HOURS**

**Section 1 (50 marks)**

**Answer ALL questions.**

1. Use mathematical table to evaluate (3mks)  

$$\sqrt[3]{\frac{4.68 \times 0.1324^2}{5 \log 7}}$$
2. Make b the subject of the formula. (3mks)  

$$t = \sqrt{\frac{a-b}{a+ab}}$$
3. Find the integral values of x which satisfy the following pair of simultaneous inequalities. (3mks)  

$$3 - x \leq 1 - \frac{1}{2}x$$

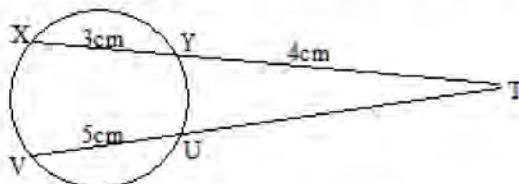
$$-\frac{1}{2}(x - 5) \leq 7 - x$$
4. Find  $(1 - 2x)^6$  up to the term in  $x^3$ . (3mks)  
 Use your expansion to evaluate  

$$0.98^6$$
5. Solve the equation (3mks)  

$$2 \cos 4x = -1 \text{ for } 0 \leq x \leq 180^\circ$$
6. A cold water tap can fill a bath in 9 minutes while a hot water tap can fill it in 6 minutes. The drainage pipe can empty it in 4 minutes. The cold and the hot water taps are left running for 2 minutes after which all the three taps are left running. Find how long it takes to fill the bath. (3mks)
7. Solve for x if: (3mks)  

$$\log_{10}(x^2 - 9) - \log_{10}(x + 3) - 2 = 0$$
8. Write the expression below in surd form and rationalise the denominator. (3mks)  

$$\frac{1 - \cos 60^\circ}{1 + \tan 30^\circ}$$
9. The numbers 8, x and 2 are the first three terms of a G.P. (2mks)  
 i) Find the two possible values of x. (2mks)  
 ii) Find the sum of the first five terms of the G.P if common ratio is negative. (2mks)
10. The data below shows the ages in months at which six babies started walking; 9, 11, 12, 13, 11 and 10. Find the exact value of variance without using a calculator. (3mks)
11. Two variable x and y are such that x varies partly as y and partly as the square root of y. (4mks)  
 Given that  $x = 30$  when  $y = 9$  and  $x = 14$  when  $y = 16$ , find x when  $y = 36$ .
12. The equation of a circle is given as  $x^2 + 2x + y^2 - 16y = 16$  (3mks)  
 Find the radius and the co-ordinates of the centre of the circle. (3mks)
13. A rectangular card measures 3.5cm by 1.4cm. Find the absolute error in the area of the card. (3mks)
14. In the figure, find the length UT. (3mks)



15. An industrialist has 450 litres of a chemical which is 75% pure. He made the chemical by mixing two brands: brand A which is 70% pure and brand B which is 90% pure. Find the amount of the 90% pure chemical used. (3mks)
16. The volume of two similar cylinders are  $2197\text{cm}^3$  and  $343\text{cm}^3$ . If the area of the curved surface of the smaller cylinder is  $98\text{cm}^2$ , find the area of the curved surface of the larger cylinder. (3mks)

**SECTION 2 (5 marks)****Answer any five questions**

17. a)  $y = x^2 + x + 8$

x	0	1	2	3	4	5	6	7	8
y			14		28				80

(2mks)

b) Use the completed table and mid-ordinate rule with 4 ordinates to estimate the area bounded by the curve and lines  $y = 0$ ,  $x = 0$  and  $x = 8$ . (2mks)

c) Use integration method of find the exact area in (b) above. (4mks)

d) Calculate the percentage error in estimating the area using the mid-ordinate rule. (2mks)

18. The probability that Hilda, Lucy and Caroline will be late for breakfast on any one morning are  $\frac{1}{3}$  and  $\frac{1}{5}$  respectively. Using a probability tree diagram or otherwise, find the probability that:

i) None of them will be late. (2mks)

ii) Only one of the them will be late. (3mks)

iii) At least one of them will be late. (3mks)

iv) At most one of them will be late. (2mks)

19. The position of two towns are  $A(30^\circ S, 20^\circ W)$  and  $B(30^\circ S, 80^\circ E)$ . Find

a) the difference in longitude between the two towns. (1mk)

b) the distance between A and B along the parallel of latitude in

i) km (Take  $\pi = 22/7$ ) and radius of earth = 6370km. (3mks)

ii) nm (2mks)

c) find local time in town B when it is 1.45p.m in town A. (4mks)

20. A number of nurses working at Afya Health Centre decided to raise sh 144 000 to buy a plot of land. Each person was to contribute the same amount. Before the contributions were collected, five of the nurses retired. This meant that the remaining contributors had to pay more to meet the target.

a) If there were n nurses originally, find the expression of the increase in contribution per person. (3mks)

b) If the increase in the contribution per person was sh 2 400, find the number of nurses originally at the health centre. (3mks)

c) How much would each person have contributed if the five people had not retired. (2mks)

d) Find the percentage increase per person because of the retirement. (2mks)

21. A farmer has at least 50 acres of land on which he plans to plant potatoes and cabbages. Each acre of potatoes requires 6 men and each acre of cabbages requires 2 men. The farmer has 240 men available and he must plant at least 10 acres of potatoes. The profit on potatoes is Ksh 1 000 per acre and on cabbages is Ksh 1 200 per acre. If he plants x acres of potatoes and y acres of cabbages.

a) Write down three inequalities in x and y to describe this information. (3mks)

b) Represent these inequalities graphically. (4mks)

c) Use your graph to determine the number of acres for each crop which will give maximum profit and hence find the maximum profit. (3mks)

22. The cost of a minibus was sh 950 000. It depreciated in value by 5% per year for the first two years and by 15% per year for the subsequent years.

a) Calculate the value of the minibus after 5 years. (3mks)

b) After 5 years, the minibus was sold through a dealer at 25% more than it's value to Mr. Owino. If the dealers' sale price was to be taken as it's value after depreciation, calculate the average monthly rate of depreciation for the 5 years.

23. The quadrilateral ABCD is such that  $A(-5, -3)$ ,  $B(-4, 0)$ ,  $C(-3, -4)$  and  $D(-4, -2)$ a) If matrix  $T = \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$  maps ABCD onto  $A'B'C'D'$ , determine the co-ordinates of  $A'B'C'D'$  (2mks)

b) On the grid provided draw

i) ABCD and it's image  $A'B'C'D'$ . (2mks)ii)  $A''B''C''D''$  the image of  $A'B'C'D'$  under the reflection on the line  $y - x = 0$  (3mks)c) Find a single matrix that maps ABCD to  $A''B''C''D''$ . (2mks)

d) Describe the transformation fully. (1mk)

24. a) Complete the table below for the function  $y = x^3 + 3x^2 - 4x - 12$  for  $-4 \leq x \leq 2$ .

x	-4	-3.5	-3	-2.5	-2	-1.5	-1	-0.5	0	0.5	1.5	2
y	-4.1			1.1	0	-2.6		-9.4		-13.1	-7.9	

(2 mks)

b) On the grid provided draw the graph of  $y = x^3 + 3x^2 - 4x - 12$  for  $-4 \leq x \leq 2$ . (3mks)

c) Use your graph to find the roots of the following equation.

i)  $x^3 + 3x^2 - 4x - 12 = 0$  (1mk)ii)  $6 + 5x - 3x^2 - x^3 = 0$  (3mks)iii)  $x^3 + 3x^2 - 4x - 12 = -5$  (1mk)