

456/2

Mathematics

Paper 2

Time:  $2\frac{1}{2}$  hours

## UCE Mock Examination

**2017**

*Instructions:*

- (i) *Attempt all questions in section A and NOT more than five questions from Section B.*
- (ii) *All Section B questions carry equal marks.*
- (iii) *All the necessary calculations must be done on the same sheet of paper as the rest of the answer. Therefore, no paper shall be given for rough work.*
- (iv) *Graph paper shall be provided.*
- (v) *Silent, non-programmable calculators may be used*

## Section A(40 marks)

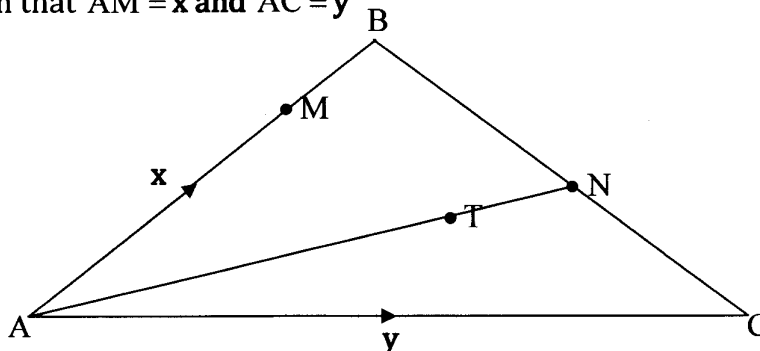
1. Find the LCM and HCF of 12, 15 and 8.
2. Find the value of  $\log_3 27 - \frac{1}{2} \log_3 \frac{1}{9} + \log_3 81$ .
3. Find the equation of the perpendicular bisector of the line joining points  $(-1, 2)$  and  $(4, 7)$ .
4. Given that  $f(x) = 3x - 5$ , find  $f^{-1}(10)$ .
5. Sets A and B are such that  $n(A) = 7$ ,  $n(A \cup B) = 12$  and  $n(\epsilon) = 13$ , where  $\epsilon$  is the universal set.
  - (i) Draw a Venn diagram to represent the given information.
  - (ii) Find  $n(A \cap B)$ .
6. Express  $\frac{7}{2\sqrt{3} - \sqrt{5}}$  in the form  $a\sqrt{b} + c$ , where a, b and c are integers.
7. The position vectors of P and Q are  $\begin{pmatrix} 1 \\ 3 \end{pmatrix}$  and  $\begin{pmatrix} 5 \\ 1 \end{pmatrix}$  respectively. If point M is on PQ such that  $PQ : PM = 2 : 1$ . Determine the position vector of M.
8. A 5% discount is allowed on a sale of a coloured T.V. What was the marked price if a customer paid Shs.760,000?
9. On a map, a forest of area  $75\text{km}^2$  is represented by  $12\text{cm}^2$ , find the representative fraction of the map.
10. A car covered  $60\text{km}$  at a speed of  $30\text{kmh}^{-1}$ , and then the next  $80\text{km}$  were covered in  $1\frac{1}{2}$  hrs. what was the average speed for the whole journey?

## Section B (60 marks)

*Do not answer more than 5 questions from this section.*

11. (a) Line T passes through points  $(-2,3)$  and  $(4,5)$ . Find the equation of line T.  
 (b) If the equation of line R is  $y + 2x = 6$ , find the coordinates of the point of intersection of line T and R.  
 (c) Determine the y- intercepts for lines R and T. Hence find the area enclosed between the 2 lines and the y - axis.
12. (a) Given that  $213_n = 351_n$  where n is a base find n.  
 (b) Given that  $f(x) = \frac{3x-1}{4}$  and  $g(x) = \frac{x+2}{3}$ , determine the values of x for which  $fg(x) = \frac{x^2 + 4x + 1}{12}$ .
13. (a) Draw a graph of  $y = 2x^2 - x - 3$  for  $-3 \leq x \leq 3$ .  
 (b) Use your graph to solve (i)  $2x^2 - x - 3 = 0$  (ii)  $x^2 - 3x + 2 = 0$   
 (c) State the minimum value of  $2x^2 - x - 3$ .

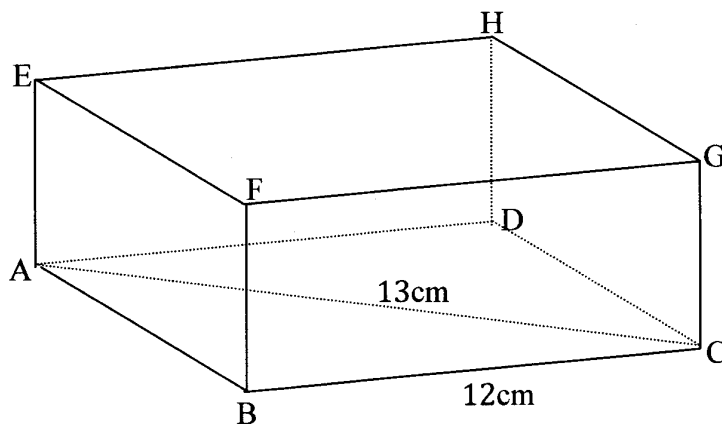
14. Below is a triangle ABC. Points M and N are on AB and BC respectively such that  $AM:MB = 1:2$  and  $BN = 3NC$ . and T lies on AN such that  $AT = \frac{2}{3} AN$ . Given that  $\overrightarrow{AM} = \mathbf{x}$  and  $\overrightarrow{AC} = \mathbf{y}$



- (a) Express the following vectors in terms of  $\mathbf{x}$  and  $\mathbf{y}$ ;  
 (i)  $\overrightarrow{AB}$  (ii)  $\overrightarrow{BC}$  (iii)  $\overrightarrow{BN}$  (iv)  $\overrightarrow{AN}$   
 (b) Show that points M, T and C are collinear.

15. A group of 40 people communicated using networks of either MTN (M) Airtel(A) or Warid(W). 26 used MTN of whom 9 used M and A, 5 used only M and W. The number that used Airtel was equal those who used Warid and of those 14 used A and W. 6 used all the networks.
- (a) Represent this information in a Venn diagram.
- (b) How many (i) used Airtel?  
(ii) did not use Warid?
- (c) What is the probability that a member chosen at random from the group uses only one network?

16. The figure below is a cuboid with square faces ABFE and DCGH.  $\overline{BC} = 12\text{cm}$  and  $\overline{AC} = 13\text{cm}$



- Calculate ;(a) lengths (i)  $\overline{BF}$   
(ii)  $\overline{BH}$
- (b) the angle between  $\overline{BH}$  and ABCD  
(c) the angle between AFH and ABFE

17. In an organization the following allowances are not taxed.

Transport	Shs. 40,000 per month
Medical	Shs. 180,000 per annum
Electricity	Shs. 20,000 per month
Insurance	Shs. 120,000 per annum
Housing	Shs. 65,000 per month

Below is tax the structure for the organization;

Taxable Income	Rate(%)
150,001 – 300,000	10
300,001 – 500,000	15
500,001 – 750,000	20
Above 750,000	30

Given that James paid Shs. 64,900 of tax.

Find;

- (a) total monthly allowances
- (b) James's gross salary.
- (c) the percentage of the gross that goes to tax.