

# Mathematics I

## 010

21/11/2017 08.30AM – 11.30AM

# YEAR 2017

## ORDINARY LEVEL NATIONAL EXAMINATIONS, 2017

SUBJECT: MATHEMATICS I

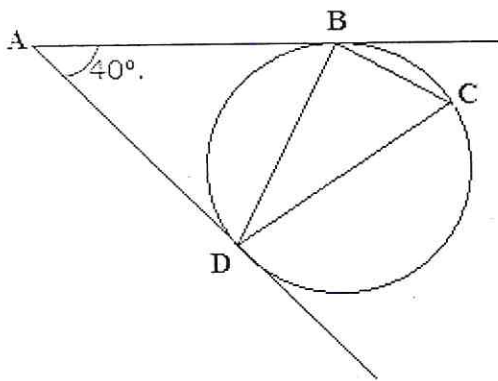
DURATION : 3 HOURS

### INSTRUCTIONS:

1. Write your names and index number on the answer booklet as they appear on your registration form and **DO NOT** write your names and index number on additional answer sheets of paper if provided.
2. Do not open this question paper until you are told to do so.
3. This paper has **TWO** sections **A** and **B**.  
**SECTION A:** Attempt **ALL** questions. (55 marks)  
**SECTION B:** Attempt **ONLY THREE** questions (45 marks)
4. You may use mathematical instruments and calculators **where necessary**.
5. Use a **blue or black ink pen** only to write your answer and a **pencil** to draw diagrams.
6. Show clearly all the working steps. **Marks will not be awarded for the answer without all working steps.**

**SECTION A: ATTEMPT ALL QUESTIONS.****(55 MARKS)**

- 1) Solve the following equation:  $3(x - 1) - (x + 9) = 0$ . (3 marks)
- 2) Find  $n$  given that:  $45_n = 41_{ten}$ . (3 marks)
- 3) Solve for  $x$ :  $2x^3 = 54$ . (3 marks)
- 4) Given that  $a = 3$ ,  $b = -2$  and  $c = 4$ , find the value of  $ab^2 - bc + ac$ . (3 marks)
- 5) The interest on a loan is 24% per annum. How much is a loan that bears interest of 6,000 Frw after one year? (3 marks)
- 6) The area of a trapezium is  $24\text{cm}^2$ . Its height is  $x$  and its parallel sides are  $(2x)\text{cm}$  and  $(x + 7)\text{cm}$ . Find the value of  $x$ . (4 marks)
- 7) A number ( $P$ ) is increased by 80%. The new number is then increased by 60% giving a final result of 144. Find the original number ( $P$ ). (4 marks)
- 8) In the figure below  $\overline{AB}$  and  $\overline{AD}$  are tangents to the circle.  $CD$  is a diameter and angle  $DAB = 40^\circ$ . Find angle  $BCD$ . (4 marks)



- 9) It is given that  $g(x) = 3(x + 2)$  and  $f(x) = 3x + 2$ . Find  $gf(4)$ . (4 marks)
- 10) If  $y$  is inversely proportional to  $x$  and  $y = 40$  when  $x = 3$ , find  $y$  when  $x = 2.5$ . (4 marks)
- 11) The exterior angles of a pentagon measure respectively  $y^\circ$ ,  $60^\circ$ ,  $75^\circ$ ,  $y^\circ$  and  $85^\circ$ . Find the value of  $y^\circ$ . (4 marks)
- 12) Solve the following simultaneous equations:  
 $8x + y = 21$   
 $5x - 4y = -10$  (4 marks)
- 13) Find the equation of the line with gradient 5 and passing through the point  $(1, 9)$ . (4 marks)

- (b) Find the mode age. (1 mark)
- (c) Determine the median age. (3 marks)
- (d) Calculate the mean age. (2 marks)

19) (a) Use vectors  $\vec{a} = \begin{bmatrix} -5 \\ 12 \end{bmatrix}$ ,  $\vec{b} = \begin{bmatrix} 3 \\ 6 \end{bmatrix}$  and  $\vec{c} = \begin{bmatrix} -4 \\ -2 \end{bmatrix}$  to determine:

- (i)  $\vec{a} + \vec{b} - \vec{c}$ . (2 marks)
- (ii) The modulus of  $\vec{a}$ . (3 marks)

(b) K(4, 7), L (2, 3) and M (4, -1) are three vertices of a rhombus KLMN.

- (i) Use the vectors to prove that triangle KLM is an isosceles triangle. (3 marks)
- (ii) Find the coordinates of N. (2 marks)

(c) Show that the points P(-3, -2), Q(3, 1) and R(5, 2) are collinear. (3 marks)

(d) Vectors  $\vec{s} = \begin{bmatrix} 7 \\ 4 \end{bmatrix}$  and  $\vec{t} = \begin{bmatrix} 21 \\ r \end{bmatrix}$  are parallel. Find the value of r. (2 marks)

20. The vertices of triangles STV are S(0, 2), T(0, 5) and V(0, 3). In the same Cartesian plane, draw:

(a) The triangle STV. (6 marks)

(b) (i) The triangle S' T' V', the image of triangle STV under reflection in y - axis. (3 marks)

(ii) The triangle S'' T'' V'', image of triangle STV under a rotation about the origin through  $-90^\circ$ . (3 marks)

(iii) The triangle S''' T''' V''', image of triangle STV under translation,  $T = \begin{bmatrix} 1 \\ 3 \end{bmatrix}$ . (3 marks)

*(Use the graph in your answer booklet to answer this question).*