| Mathematics I |
| 010 |
| 21/11/2017   08.30 AM - 11.30 AM |

REB
Rwanda Education Board
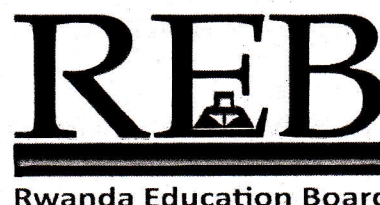
# ORDINARY LEVEL NATIONAL EXAMINATIONS, 2017

SUBJECT: MATHEMATICS I

DURATION: 3 HOURS

INSTRUCTIONS:

1) Write your name 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 paper until you are told to do so.

3) This paper has **TWO** sections: **A** and **B**.

   SECTION A: Attempt **ALL** questions.   **(55marks)**

   SECTION B: Attempt **ONLY THREE** questions.   **(45marks)**

4) You may use mathematical instruments and calculators **where necessary.**

5) Use a **blue or black ink pen only** to write your answers 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: $3(x - 1) - (x + 9) = 0$.   **(3marks)**

2) Find n given that: $45_n = 41_{ten}$.   **(3marks)**

3) Solve for x: $2x^3 = 54$.   **(3marks)**

4) Given that $a = 3$, $b = -2$ and $c = 4$,
   find the value of: $ab^2 - bc + ac$.   **(3marks)**

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?   **(3marks)**

6) The area of a trapezium is $24cm^2$. Its height is x and its parallel
   sides are $(2x)cm$ and $(x + 7)cm$. Find the value of x.   **(4marks)**

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).   **(4marks)**

8) In the figure below $\overline{AB}$ and $\overline{AD}$ are tangents to the circle.
   CD is a diameter and angle DAB = 40^0. Find angle BCD.   **(4marks)**
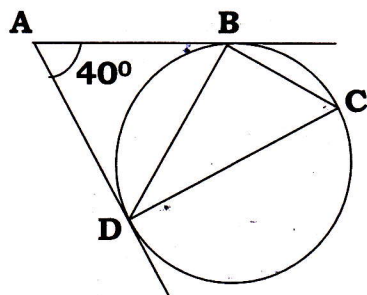
9) It is given that $g(x) = 3(x + 2)$ and $f(x) = 3x + 2$. Find gf(4).   **(4marks)**

10) If **y** is inversely proportional to **x** and **y** = 40 when **x** = 3,
    find **y** when **x** = 2.5.   **(4marks)**

11) The exterior angles of a pentagon measure respectively y^0, 60^0,
    75^0, y^0, and 85^0. Find the value of y^0.   **(4marks)**

12) Solve the following simultaneous equations :
    $8x + y = 21$
    $5x - 4y = -10$ **(4marks)**

13) Find the equation of the line with gradient 5 and passing
    through the point (1, 9).   **(4marks)**

14) Solve the following inequality:

$\dfrac{1}{3}x - (x + 1) \geq 2$. **(4marks)**

15) In a class of 50 students, 40 like Mathematics (M) and 25 like Science (S). Some students (X) like both subjects and 2 do not like any of the two subjects. How many students like both Mathematics and Science? **(4marks)**

SECTION B: ATTEMPT THREE QUESTIONS ONLY. (45 MARKS)

16) Factorize completely: $P(x) = 6x^3 - 5x^2 - 12x - 4$ and hence find the values of x when $P(x) = 0$. **(15marks)**

17) The curved surface of a cylindrical tin is $628cm^2$ and its height is 10cm. $\pi = 3.14$.
Find:
(a) the radius of the circular base. **(4marks)**
(b) the total surface area of the tin . **(5marks)**
(c) the volume of the tin . **(2marks)**
(d) the largest number of tins which will fill the box of length = 80cm, width = 60cm and height = 40cm . **(4marks)**

18) The following table gives the ages of 73 students and the frequency.

Ages in years , x	14	15	16	17	18	19	20
Frequency, f	5	9	13	11	12	15	8

(a) Copy the table below and complete it. **(9marks)**

Age, x	Frequency, f	fx	Cumulative frequency
14			
15			
16			
17			
18			
19			
20	$\sum f =$	$\sum fx =$	

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

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

   (i) $\vec{a} + \vec{b} - \vec{c}$.   **(2marks)**

   (ii) the modulus of $\vec{a}$.   **(3marks)**

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

   (i) Use vectors to prove that triangle KLM is an isosceles
       triangle.   **(3marks)**

   (ii) Find the coordinates of N.   **(2marks)**

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

   (d) Vectors $\vec{s} = \begin{pmatrix} 7 \\ 4 \end{pmatrix}$ and $\vec{t} = \begin{pmatrix} 21 \\ r \end{pmatrix}$ are parallel.

   Find the value of r.   **(2marks)**

20) The vertices of triangle STV are S(0, 2), T(0, 5) and V(0, 3).
    In the same Cartesian plane, draw:
    (a) The triangle STV .   **(6marks)**

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

    (ii) The triangle S"T"V", image of triangle STV under a rotation
         about the origin through -90⁰.   **(3marks)**

    (iii) The triangle S'''T'''V''', image of triangle STV under

    translation, T = $\begin{pmatrix} 1 \\ 3 \end{pmatrix}$.   **(3marks)**

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