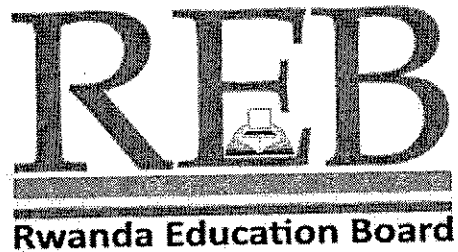


Mathematics I

010

11/11/ 2015 08.30AM - 11.30AM



ORDINARY LEVEL NATIONAL EXAMINATIONS, 2015

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 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 any **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. **Marks will not be awarded for the answer without all working steps.**

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

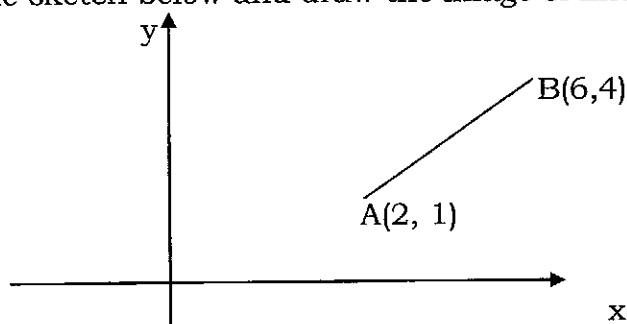
- 1) Given that $a*b = 2b + a - 1$, evaluate $4*(3*5)$. **(3marks)**
- 2) Given that $a = -2$, $b = 3$ and $c = -1$, calculate the value of $\frac{4a^2 - ac^3}{b + c}$ **(3marks)**
- 3) Calculate the magnitude of the vector $\vec{x} = \begin{pmatrix} 24 \\ -7 \end{pmatrix}$. **(3marks)**
- 4) Given that y is inversely proportional to x^2 and that $y = 4$ when $x = 2$, calculate the value of y when $x = \frac{1}{2}$. **(3marks)**
- 5) Find the equation of a line which passes through points $(1, 2)$ and $(3, 6)$. **(3marks)**
- 6) Solve in the set of real numbers, R : $\frac{25}{9}x^2 - \frac{9}{4} = 0$ **(3marks)**
- 7) If $135_n = 75_{ten}$, find the value of n . **(4marks)**
- 8) Given that vectors $\vec{a} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$, $\vec{b} = \begin{pmatrix} 2 \\ -7 \end{pmatrix}$ and $\vec{c} = \begin{pmatrix} -10 \\ 21 \end{pmatrix}$;
(a) Find vector $2\vec{a} + \vec{b}$ **(2marks)**
(b) If $m\vec{a} + n\vec{b} = \vec{c}$, find the value of m and n . Show all your working. **(3marks)**
- 9) In the figure below,
(a) show that $\triangle ABC$ is similar to $\triangle BDC$. **(2marks)**
-
- (b) Calculate x . **(2marks)**
- 10) The sum of two numbers is at most 48. If one number is two times the other, find the maximum possible values of the two numbers. **(4marks)**
- 11) (a) Simplify completely without using a calculator:
$$\left(2^{-3} \times 16^{\frac{1}{2}}\right) \div \left(81^{\frac{3}{4}} \times 27^{-\frac{1}{3}}\right)$$
 (3marks)
- (b) Find x if $3^x \div 3^2 = 27$ **(2marks)**

- 12) Three students share n frw in the ratio 3 : 4 : 5 . If the smallest share is 60,000frw, find:
- (a) The amount n. (2marks)
- (b) the two other shares. (2marks)

- 13) It is given that $f(x) = \frac{k}{x+2}$ and $f(6) = 6$. Find $f(-14)$. (4marks)

- 14) A line with gradient 3 passes through the point A (-2,-3). Find out:
- (a) The equation of the line. (2marks)
- (b) The coordinates of points where the line cuts the x-axis. (1mark)

- 15) Copy the sketch below and draw the image of line AB;



- (a) Under a reflection in y – axis. (2marks)
- (b) Under a translation $T = \begin{pmatrix} -2 \\ -1 \end{pmatrix}$ (2marks)

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

- 16) (a) The table below shows the direct variation between time and distance covered by a man travelling at a constant speed.

Time(t) in hours	1	4	5	6
Distance (d) in km	4	16		

- (i) Copy and complete the table. (8marks)
- (ii) Plot d against t on the graph.
- (iii) Determine the gradient of the graph.
- (iv) Write the equation relating d and t. (3marks)
- (b) A vector comprises points A(2, 3) and B(1, 6). Another vector perpendicular to the vector AB passes through points A(2,3) and P(x, y). Find the coordinates of point P. (4marks)
- (c) A line L1 passes through points P (2, 1) and Q (-1,-4). Another line L2 passes through point (3,-6). If the lines L1 and L2 are parallel, find the equation of L2.

- 17) The polynomial $p(x) = x^3 - 5x^2 + bx + a$ is divisible by $(x + 1)$ and leaves a remainder of 6 when it is divided by $(x - 1)$.

- (a) Find the values of the coefficients a and b .
 (b) Hence solve $p(x) = 0$.

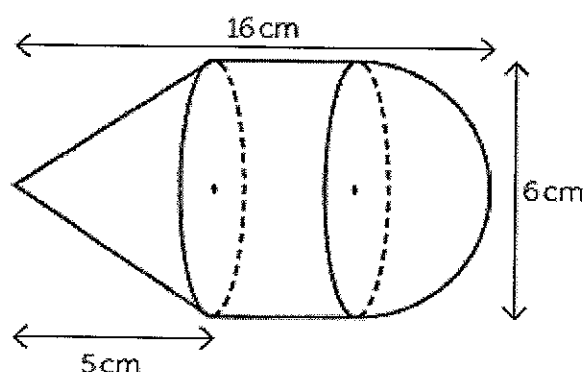
(10marks)
(5marks)

- 18) (a) The internal radius of a cylindrical water tank is 60cm. The depth of water in the tank is 1.40m. Calculate the volume of the water. Express the answer in litres. Use $\pi = 22/7$.

(3marks)

- (b) Find the surface area and volume of the figure below.
 (use $\pi = 3.14$)

(8marks)



- (c) A path 15m long and 12m wide is to be covered with square tiles of side 20cm.

(3marks)
(1mark)

- Calculate: (i) the number of tiles needed.
 (ii) the cost of tiles if 1 tile costs 400frw.

- 19) In a class of 36 students, 23 like Mathematics, 15 like Physics and 13 like Chemistry. 7 students like Mathematics and Physics, 9 like Mathematics and Chemistry and 6 like Physics and Chemistry. Two of the students do not like any of the subjects.

- (a) Represent this information on a Venn diagram. Find the number of students who like all the three subjects.

(11marks)

- (b) How many students like only one of the three subjects?

(4marks)

- 20) The table below shows the marks of 51 students in sciences test.

10	20	12	23	13	21	14	32	18	30	36	40	37	46	38	31	41	44
32	42	48	44	39	35	48	40	34	41	37	47	34	49	50	43	16	52
45	51	58	57	59	56	55	60	53	62	64	54	65	68	76			

- (a) Make a grouped frequency table for marks starting with 10-19

(12marks)

- (b) Calculate the mean mark.

(2marks)

- (c) What is the modal class?

(1mark)