Mathematics I

010

12/11/2019 8:30 AM – 11:30 AM

Rwanda Education Board

ORDINARY LEVEL NATIONAL EXAMINATIONS, 2019

SUBJECT: MATHEMATICS

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 **ONLY THREE** questions. **(45marks)**
4) You may use mathematical instruments and calculators **where necessary.**
5) Use **only** a **blue or black ink pen** 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 (55marks)

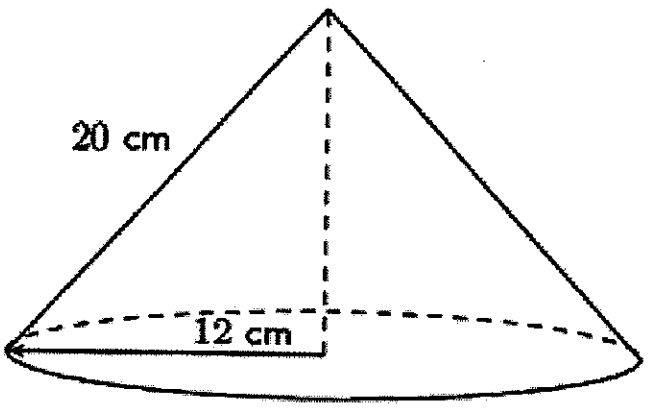
1) Simplify the following: **(3marks)**

$$\frac{2}{\sqrt{3}+2}+\frac{\sqrt{5}}{\sqrt{3}-2}$$

2) Solve in IR **(3marks)**

$$\left\{\begin{matrix}3x-y=4\\-3y+2x=-9\end{matrix}\right\}$$

3) Determine the volume of the following diagram: (Use $\pi = 3.14$) **(4marks)**



4) If set A has 25 subsets; how many elements are there in the set A ? **(2marks)**

5) If two functions $f(x)$ and $g(x)$ are defined as follow;

$f: R \to R \; f(x) = \sqrt{x+1}$

and $g: R \to R: g(x) = \frac{1}{x^2}$

Calculate :

a) $gof(x)$ **(2marks)**

b) $fog(x)$ **(2marks)**

6) A business woman has deposited 3 500 000FRW in a bank for two years at a compound interest rate of 10% per year. Calculate the total amount of money she will receive after 2 years. **(4marks)**

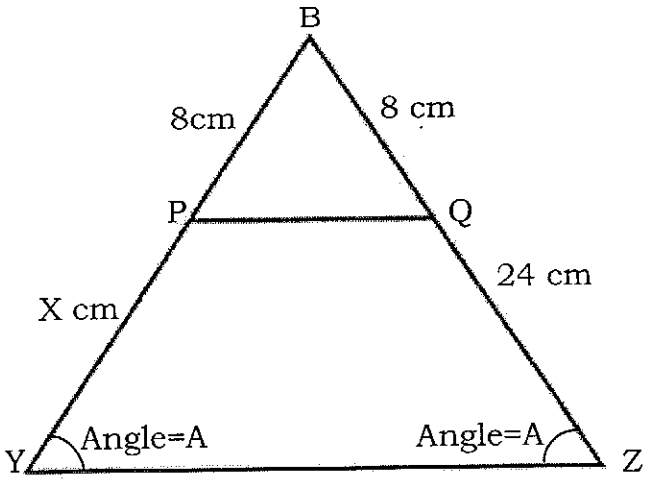
7) Solve in R: $(3^{2x})(9^{x-1}) = 81$ **(3marks)**

8) The length of a rectangular garden is twice its width.
If the perimeter is 72 meters;

i) find the length and the width of the garden. **(3marks)**

ii) find the area of the garden. **(1mark)**

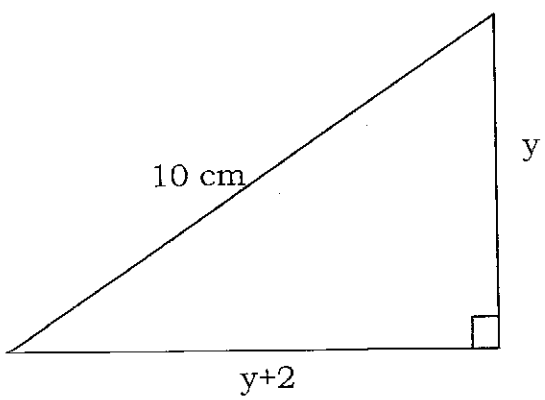
9) Study the figure below. Find the value of X. **(4marks)**



10) Seats for Mathematics, Physics and Biology in a school are in the ratio 5: 7: 8. There is a proposal to increase these seats by 40%, 50% and 75% respectively.

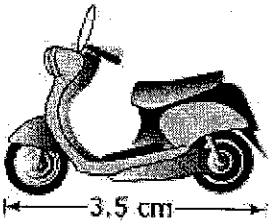
What will be the ratio of increased seats? **(4marks)**

11) a) Solve for y in the figure below. **(3marks)**
b) Find the perimeter of the figure. **(1mark)**



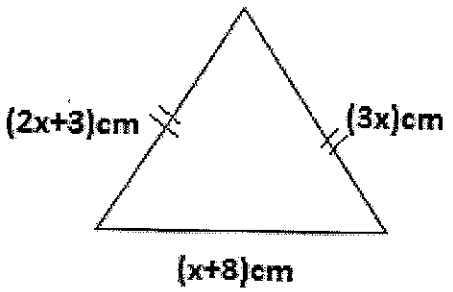
12) a) Change 703_8 to base six. **(2marks)**

b) The following figure represents the diagram of a scooter. Use it to answer the question below:



If the diagram of the scooter is drawn to a scale of 1:20, find the actual length of the scooter. **(2marks)**

13) Study the figure below and answer the following questions:

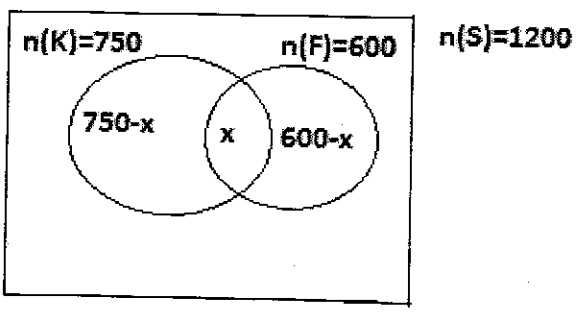


a) Find the value of X **(2 marks)**

b) What is the length of each side of the triangle above? **(1mark)**

c) Find the perimeter of the figure. **(1mark)**

14) All 1200 students (**S**) at a certain school learn Kinyarwanda(**K**) French (**F**) or both. Using the following Venn diagram;



a) Calculate the number of students who learn both languages. **(2marks)**

b) Calculate the number of students who learn Kinyarwanda only. **(1mark)**

c) Calculate the number of students who learn French only. **(1mark)**

15) It is given that vectors $\vec{a} = \begin{pmatrix} 6 \\ 8 \end{pmatrix}$, $\vec{b} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$ and $\vec{c} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$

i) Find $2(\vec{a} + \vec{b} - \vec{c})$ **(1mark)**

ii) Determine the value of $|\vec{a}| + |\vec{b}|$ **(3marks)**

SECTION B : Attempt only three questions (45marks)

16) A primary school had 1200 students enrolled in 2013 and 1500 students in 2016. If the student population P ; grows as a linear function of time t, where t is the number of years after 2013.

a) How many students will be enrolled in the school in 2020? **(9marks)**

b) Find a linear function that relates the student population to the time t. **(6marks)**

17) a) The cost of producing X tools by a company is given by the function $C(x) = 1200x + 5500$ in FRW

i) What is the cost of 100 tools? **(2marks)**

ii) What is the cost of 101 tools? **(2marks)**

iii) Find the difference between the cost of 101 and 100 tools. **(3marks)**

iv) Find the slope of the graph. **(2marks)**

v) Interpret the slope. **(3marks)**

b) Given $f(x) = 2x^2 + 4x - 3$,

find $f(2a+3)$ **(3marks)**

18) a) Out of 34 students in a class , 20 did Kinyarwanda Test and 18 did French test. The number of students who did both tests is twice that of those who did none of the Tests.

Using a Venn diagram, find the number of students who did:

i) Tests for both subject. **(2marks)**

ii) None of the subject tests **(2marks)**

iii) Only one test of a subject. **(2marks)**

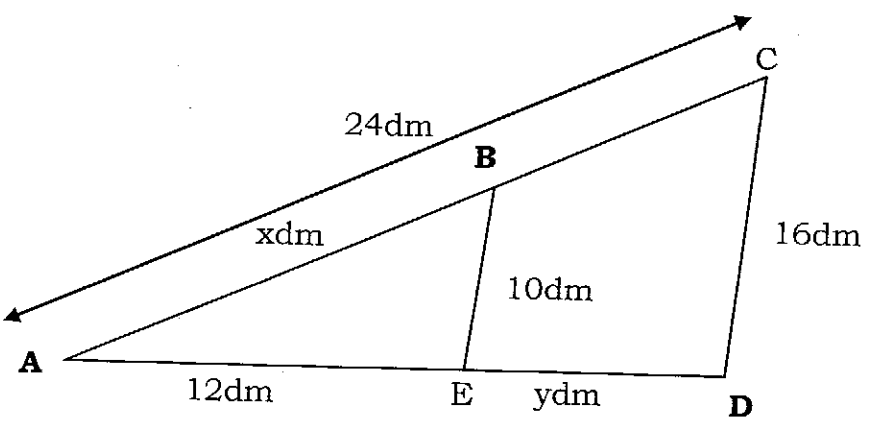
b) If f is the function defined in $R \to R : f(x) = 2x^2 + 1$; find the inverse of the function f **(3marks)**

c) Given the points $A(-1,3)$ and $B(-2,5)$

i) Calculate the slope of the line passing through the points A and B **(2marks)**

ii) Find the equation of the line that passes through the points A and B **(4marks)**

19. a) Study the figure below then find the value of x and y **(6marks)**



b) Consider the points $A(5,2)$; $B(3,-1)$ and $C(7,-3)$

find

i) BA and BC **(4marks)**

ii) Show if BA and BC are orthogonal **(2marks)**

Explain your answer. **(1marks)**

c) Find the value of $\vec{a} = (0,t)$ and $\vec{b}$ if $\vec{a}$ and $\vec{b}$ are orthogonal. **(2marks)**

20)The following data represent the marks of S3 Students in a Chemistry test.

18	20	20	20	20	21	20	17	19	20
13	18	22	26	20	19	22	15	18	27
16	23	24	17	25	24	16	20	26	15
21	17	23	16	21	17	26	16	23	19

i) Construct a grouped frequency distribution table with 5 classes by completing the table below. **(8marks)**

Marks classes	**Midpoint**	**Frequency**	$f(x)$	**Cumulative frequency**
13-15	14	3		
16-..				
25-27		5		
		$\sum f =$	$\sum fx =$	

ii) How many students did the chemistry test? **(1marks)**

iii) Calculate the mean marks. **(2marks)**

iv) What is the modal class of the distribution? Explain your answer. **(2marks)**

v) Determine the median of the distribution. **(2marks)**

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