

Mathematics I

010

23/07 /2024 8:30 AM – 11.30 AM



ORDINARY LEVEL NATIONAL EXAMINATIONS, 2023-2024

SUBJECT: MATHEMATICS I

DURATION: 3 HOURS

Instructions to candidates:

- 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 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. **(55 marks)**

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

- 4) You may use mathematical instruments and a calculator **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) Given set A such that $A = \{1; 2; 4; 5; 6; 7; 10; 12\}$:

Complete with ($\in$ or $\notin$) the following.

(4 marks)

- a) 2..... A
- b) 3 A
- c) 8 A
- d) 10..... A

- 2) Work out the following without using a calculator.

(3 marks)

$$23,97 + 2 (11.4 - 6.03) - 7.8 =$$

- 3) Add the following algebraic fractions and simplify.

(3 marks)

$$\frac{2}{a^2 - 4a + 4} + \frac{5}{a - 2} =$$

- 4) Convert 514_8 to base 9 and fill in the missing number

(4 marks)

$$514_8 = \dots \dots \dots_9$$

- 5) Rationalize the denominator $\frac{\sqrt{2}}{\sqrt{5} + \sqrt{3}}$.

(3 marks)

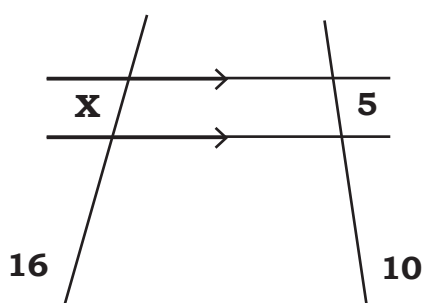
- 6) A cylindrical fuel tank has a radius of 2 m. Its height is 6 m.

Calculate its volume.

(3 marks)

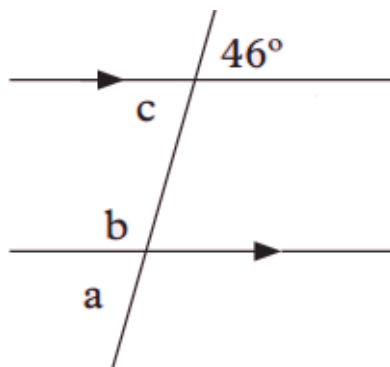
- 7) In the figure below, find the value of x.

(3 marks)



- 8) a) Write the formula of probability for mutually exclusive events **(2 marks)**
b) What is a sample space in a probability? **(2 marks)**

- 9) Calculate the angles marked with letters **a**, **b** and **c** in the following figure: **(3 marks)**



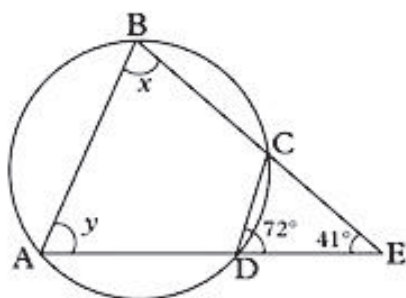
- 10) Solve the simultaneous equations: $\begin{cases} 4x - 18 = -10y \\ 5x - 6 = 4y \end{cases}$ **(4 marks)**
- 11) A rectangle with a length of 8 cm and width of 4 cm is enlarged by a scale factor of 3. What are the new dimensions? **(3 marks)**
- 12) Choose the solutions set of the following quadratic equation: $3x^2 - x - 24 = 0$ **(3 marks)**
- a) $\{-3, 8\}$
- b) $\{\frac{8}{3}, 3\}$
- c) $\{3, -\frac{8}{3}\}$
- 13) A right triangle has a hypotenuse of 12 cm long. If one of the two shorter sides is 8 cm long,
- a) Find the length of the third side.
Give your answer to the nearest centimetres. **(3 marks)**
- b) Calculate the area of the triangle. **(2 marks)**

- 14) Given the points **A** and **B** on Cartesian Plane such that **A** $(-2, 5)$ and **B** $(4, -3)$, find the equation of the line through the points **A** and **B**.

(5 marks)

- 15) Find the values of angles **x** and **y** in the figure below.

(5 marks)



Section B: Attempt three questions only (45 marks)

- 16) Given that $Q(x) = 2x^3 - 5x^2 - 9x + 18$

a) Determine $Q(-2)$

(4 marks)

b) Factorise completely $Q(x)$

(6 marks)

c) Solve the equation $Q(x) = 0$

(5 marks)

- 17) Out of 17 teachers in a school, 10 teach Economics and 9 teach Mathematics. The number of teachers who teach both subjects is twice that of those who teach none of the subjects. With the aid of a Venn diagram, find the number of teachers that teach:

a) None of the subject.

(9 marks)

b) Both subjects.

(3 marks)

c) Only one subject.

(3 marks)

- 18) The table below shows the ages in years of 81 students.

Ages (years)	14	15	16	17	18	19	20
Frequency	12	8	10	21	9	11	10

- a) Complete the frequency table below.

(8 marks)

Age(x)	Frequency(f)	fx
14	12	168
	$\Sigma f = \dots\dots\dots$	$\Sigma fx = \dots\dots\dots$

- b) Write the mode age.

(2 marks)

- c) Find the median age.

(3 marks)

- d) Calculate the mean age.

(2 marks)

- 19) A man invested 10 000Frw at 10% compounded interest.

- a) Find the interest for the 1st year.

(3 marks)

- b) Calculate the amount after 2nd year.

(8 marks)

- c) Find the total amount of money accumulated after 3years.

(4 marks)

- 20) a) Show that points A (-4, 3), B (-1, 1) and C (-2, 5) are collinear or not.

(2 marks)

- b) A triangle ABC is such that A (-4, 3), B (-1, 1) and C (-2, 5).

- i) Find the co-ordinates of its image A'B'C' after a translation by the

$$\text{vector } \vec{u} = \begin{pmatrix} 6 \\ 2 \end{pmatrix}.$$

(2 marks)

ii) The image $A'B'C'$ of ABC in (i) above is then translated by the vector

$$\vec{v} = \begin{pmatrix} -2 \\ -5 \end{pmatrix}.$$

Find the co-ordinates of the new image $A''B''C''$. **(2 marks)**

iii) Calculate $\vec{u} + \vec{v}$ and then find the image of the triangle ABC

after translation by the vector $\vec{u} + \vec{v}$. **(4 marks)**

iv) Compare the images found in (ii) and (iii) above.

What can you conclude? **(2 marks)**

v) Plot ABC and its images on the same Cartesian plane. **(3 marks)**

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