

Mathematics I

010

09/07 /2025 8:30 AM – 11.30 AM

SUBJECT: MATHEMATICS I

DURATION: 3 HOURS

Names:
Index number:

S3 QUESTIONS and ANSWERS BOOKLET

**ORDINARY LEVEL NATIONAL EXAMINATIONS,
2024-2025**

Instructions to candidates:

- 1) Write your names and index number on the answer booklet as they appear on your registration form.
- 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)**

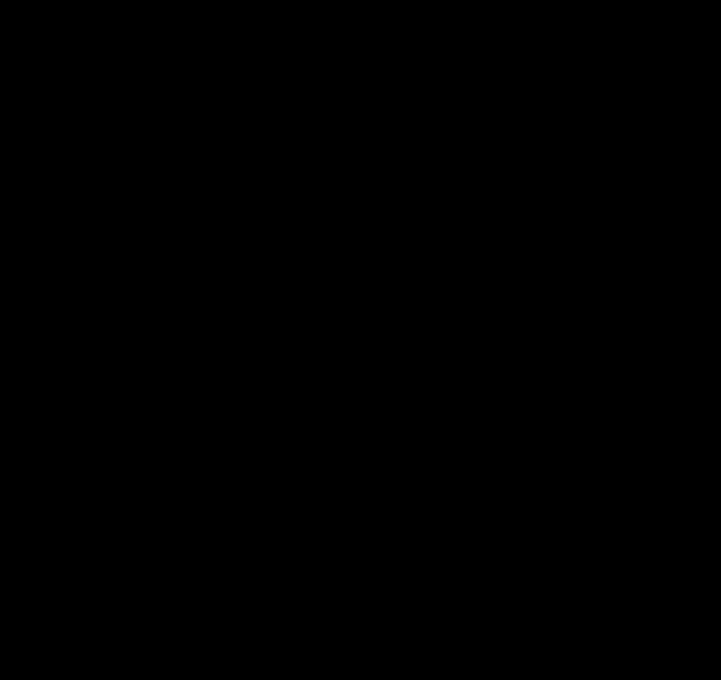
Section B: Attempt **ONLY THREE** questions.
(45 marks)

- 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 where it is necessary.**

FOR EXAMINER'S USE ONLY

Questions	Marks	Questions	Marks
1		16	
2		17	
3		18	
4		19	
5		20	
6		21	
7		22	
8		23	
9		24	
10		25	
11		26	
12		27	
13		28	
14		29	
15		30	

TOTAL MARKS...../100



Section A: Attempt all questions. (55 marks).

- 1) Suppose a set has $4^{(n-3)}$ subsets and n is the number of elements in a set.
How many elements are in this set? **(3 marks)**
Circle the correct answer.
A: 6
B: 4
C: 3
D: 1
- 2) Find the image of the function $f(x) = |-x^2 + 3|$, defined on the following domain:
 $\{-2, -1, 0, 1, 2\}$. **(3 marks)**
Circle the correct answer:
A: $\{1, 2, 3, 4, 7\}$
B: $\{1, 2, 3\}$
C: $\{3, 4, 7\}$
D: $\{-1, 2, 3\}$
- 3) An arc subtends an angle of 135° at the centre of a circle of radius 21cm.
(Use $\pi = \frac{22}{7}$). Find the length of the given arc and circle the letter that
corresponds to the best answer:
A: 24.75 cm
B: 49.50 cm
C: 82.50 cm
D: 132 cm
The length of this arc is **(4 marks)**

4) Work out and fill in the missing numeral.

(3 marks)

$$(1010111)_2 + (1101)_2 = (\dots\dots\dots)_{10}$$

5) You are given $f(x) = \frac{x(2x+3) - (2x+3)(x-3)}{2x+3}$,

a) Simplify completely $f(x)$ and circle its simplified form.

(2 marks)

A: $f(x) = 2x + 3$

B: $f(x) = 2x - 3$

C: $f(x) = 3$

D: $f(x) = -3$

b) Calculate $f(7)$ using the simplified form of $f(x)$.

Circle the correct answer.

(2 marks)

A: $f(7) = -3$

B: $f(7) = 14$

C: $f(7) = 7$

D: $f(7) = 3$

5) In regard to quadratic equation, state whether each of the following expressions is **true** or **false**. **(5 marks)**

a) $3x^2 + 9\sqrt{x} - 7 = 0$

b) $(x+2)^2 = 2(x+3)$

c) $x^2 + 3x = -(1-3x)^2$

d) $(x+2)(x-1) = x^2 - 2x - 3$

e) $x^3 - x^2 + 2x + 1 = (x+1)^3$

7) List three types of correlation in statistics. **(3 marks)**

8) Solve the following pair of simultaneous equations: $0.6x - 0.1y = -1$ and $-4x - 0.5y = 2$

Circle the correct answer. **(3 marks)**

Solution is: A: $\{(7, 52)\}$

B: $\{(-1, 4)\}$

C: $\{(4, -1)\}$

D: $\{(1, -4)\}$

9) If the x – intercept and y -intercept of a straight line are $\frac{2}{3}$ and $\frac{3}{4}$ respectively, then find the equation of the straight line.

Circle the correct answer.

(4 marks)

A: $9x + 8y - 6 = 0$

B: $9x + 8y + 6 = 0$

C: $8x + 9y - 6 = 0$

D: $9x - 8y - 6 = 0$

10) Circle the correct answer: the domain of definition of

$$q: R \rightarrow R: q(x) = \frac{9x^2 + 4 - 12x}{36x^2 - 24x} \text{ is:}$$

(3 marks)

$$A: R - \left\{ \frac{2}{3} \right\}$$

$$B: R - \{0\}$$

$$C: R - \left\{ 0, \frac{2}{3} \right\}$$

$$D: R - \left\{ 0, \frac{3}{2} \right\}$$

11) Points A, B and C of a number line are such that $\overline{AB} = -5$ and $\overline{AC} = 4$.

Fill in the following:

a) $\overline{BA} = \dots\dots\dots$

(1 mark)

b) $\overline{BB} = \dots\dots\dots$

(1 mark)

c) $\overline{BC} = \dots\dots\dots$

(2 marks)

12) The lengths of sides of four triangles are shown below. For each one, state if it is right-angled (**YES**) or not (**NO**). **(4 marks)**

- a) $AB=24$ cm, $BC=10$ cm and $AC=26$ cm.
- b) $DE=6$ cm, $EF=12$ cm and $FD=13$ cm.
- c) $JK=16$ mm, $KL=34$ mm and $LJ=30$ mm.
- d) $MN=25$ cm, $NO=20$ cm and $OM=15$ cm.

13) A rectangular based fish aquarium has a base measuring 62 cm by 130 cm. The amount of glass needed to construct the aquarium is $23,420\text{ cm}^2$. Find the height of the aquarium and circle the correct answer. **(4 marks)**

- A: 80 cm
- B: 40 cm
- C: 20 m
- D: 10 cm

14) For a), b) and c) below, circle the correct answers.

If a card is drawn from a pack of 52 playing cards, the probability that it is:

a) Red is:

(1 mark)

A: $\frac{1}{52}$

B: $\frac{1}{13}$

C: $\frac{1}{2}$

D: 1

b) Not a club, is:

(1 mark)

A: 0

B: 1

C: $\frac{1}{13}$

D: $\frac{3}{4}$

c) Green is:

(1 mark)

A: 0

B: $\frac{1}{4}$

C: 1

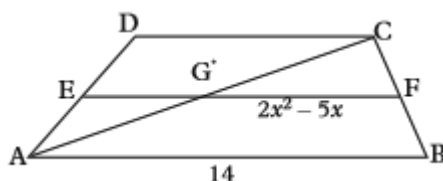
D: 1.1

- 15) The median of the following observations: 8, 11, 13, 15, $x+1$, $x+3$, 30, 35, 40, 43 arranged in ascending order is 22.
Find the value of x . **(5 marks)**

Section B: Attempt any three questions only (45 marks).

- 16) a) SAVESON invested 80,000 Frw for 3 years in a savings account. He gets a 5% per annum compound interest. How much money will SAVESON have in the savings account at the end of 3 years? **(9 marks)**
- b) 40 people consume 200 kg of rice in 30 days. In how many days will 30 people consume 500 kg of rice? **(6 marks)**
- 17) Given that $P(x) = x^3 - x^2 - 14x + 24 = (x - 2)(ax^2 + bx + c)$
- a) Determine the values of a, b and c. **(5 marks)**
- b) Factorize completely $P(x)$. **(5 marks)**
- c) Solve $P(x) = 0$. **(5 marks)**
- 18) Given that vectors $\vec{u} = \begin{pmatrix} 5 \\ x-1 \end{pmatrix}$ and $\vec{v} = \begin{pmatrix} 3 \\ 3-x \end{pmatrix}$, find the values of x , if:
- a) $\vec{u}$ is perpendicular to $\vec{v}$. **(5 marks)**
- b) $\vec{u}$ is parallel to $\vec{v}$. **(5 marks)**
- c) $\vec{u}$ is equal to $\vec{v}$. **(5 marks)**

- 19) In the trapezium ABCD below, $FG' = (2x^2 - 5x) \text{ cm}$ and $AB = 14 \text{ cm}$. FG' is parallel to AB , points E and F are the midpoints of AD and BC respectively.



- a) Find the values of x that can balance the conditions of the parallel sides.
(9 marks)
- b) If the area of the trapezium is 60 cm^2 and its height is 6 cm , find EF .
(6 marks)
- 20) $A(0,4), B(0,0)$ and $C(4,4)$ are vertices of triangle ABC .
(5 marks)
- a) Draw triangle ABC on a Cartesian plane.
(5 marks)
- b) Find the coordinates of vertices A', B' and C' , images of vertices A, B and C under central symmetry about the origin.
Draw triangle $A'B'C'$ on the same Cartesian plane as that of triangle ABC .
(3 marks)
- c) Find the coordinates of A'', B'' and C'' , images of A, B and C under a reflection in line $x = 5$.
Draw triangle $A''B''C''$ on the same Cartesian plane.
(4 marks)
- d) A translation T maps $A(0,4)$ to $A'''(-3,6)$.
(i) Find T .
(ii) Determine the coordinates of B''' and C''' , images of $B(0,0)$ and $C(4,4)$ under the translation T .
(iii) Draw triangle $A'''B'''C'''$ on the same Cartesian plane.
(3 marks)

Space in which to answer the chosen 3 questions from Section B

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