

Mathematics I

010

25/07/2023 8:30 AM – 11.30 AM



ORDINARY LEVEL NATIONAL EXAMINATIONS, 2022-2023

SUBJECT: MATHEMATICS I

DURATION: 3 HOURS

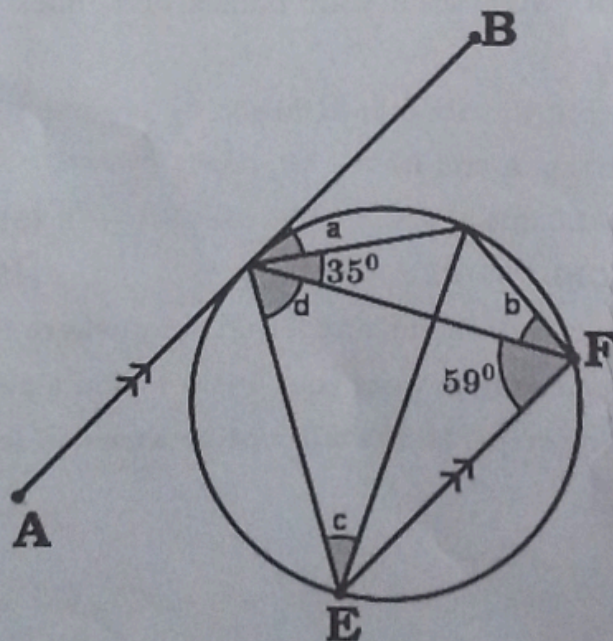
INSTRUCTIONS:

- 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 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.**

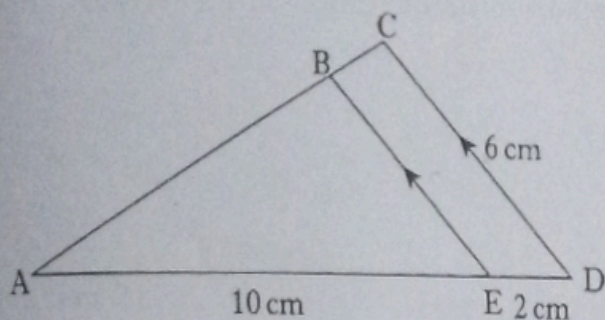
SECTION A: ATTEMPT ALL QUESTIONS (55 marks)

- 1) Without using a calculator, evaluate : $7.2 \times (3.75^2 - 1.25^2)$ (3 marks)
- 2) Simplify $\frac{x^2 - 4x + 4}{x^2 - 4}$ (3 marks)
- 3) Rationalize the denominator of the expression $\frac{5}{\sqrt{3} - \sqrt{2}}$ (3 marks)
- 4) Given the vector $\vec{u} = \begin{pmatrix} 5 \\ 3 \end{pmatrix}$ and $\vec{v} = \begin{pmatrix} -7 \\ -13 \end{pmatrix}$, find the components of:
 - a) $\frac{1}{2}(\vec{u} + \vec{v})$ (2 marks)
 - b) $4\vec{u} - \vec{v}$ (3 marks)
- 5) Solve for x in the equation $4x - \frac{3x+1}{2} - \frac{7x+9}{3} = 0$ (5 marks)
- 6) Solve the following system by elimination method :

$$\begin{cases} 3x - 6y = 24 \\ 5x + 4y = 12 \end{cases}$$
 (4 marks)
- 7) Find the value of the polynomial $\frac{5}{6}p^2q - 2p + q - 4r$ if $p=12$, $q=7$ and $r=9$ (3 marks)
- 8) In the diagram below, the segments AB and EF are parallel. Find the angles marked by letters **a**, **b**, **c** and **d**. (4 marks)



- 9) In the diagram shown below, the lines BE and CD are parallel.



Calculate the length of BE

(3 marks)

- 10) Given that $235_x = 95_{10}$. Find the value of x .

(4 marks)

- 11) If 720,000 FRW is invested for 9 months at an annual simple interest rate of 15%.

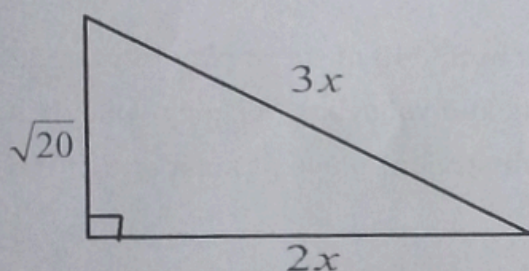
- a) How much interest will be earned?

(2 marks)

- b) What is the amount of investment after 9 months?

(2 marks)

- 12) Find the value of x in the triangle below.



(3 marks)

- 13) State the formula of probability for:

- a) Mutually exclusive events.

(1 mark)

- b) Independent events.

(1 mark)

- 14) The sum of three consecutive integers is 21. Find the integers.

(5 marks)

- 15) Given the functions $f(x) = 5x$ and $g(x) = 2x - 2$,

Find:

- a) $f \circ g(x)$

(2 marks)

- b) $g \circ f(x)$

(2 marks)

SECTION B: ATTEMPT THREE QUESTIONS ONLY (45 marks)

16) The table below shows the marks obtained by students of senior 3 in a certain school.

70	62	55	40	90
68	70	64	68	62
64	40	68	79	62
62	64	90	55	98
55	68	62	64	62

a) Construct a frequency table.

(6 marks)

b) Find the median mark.

(3 marks)

c) Find the mode mark.

(3 marks)

d) Find the mean mark.

(3 marks)

17) The expression $P(x) = 2x^3 + ax^2 + bx + 6$ is exactly divisible by $x - 2$, and on division by $x + 1$ gives a remainder of -12 .

a) Calculate the values of a and b .

(8 marks)

b) Factorize completely the expression $P(x)$.

(4 marks)

c) Hence solve the equation $P(x) = 0$

(3 marks)

18) In a certain school there are 87 students in S3. 43 of these play tennis, 42 play football, 47 play volleyball, 15 play tennis and volleyball, 17 play volleyball and football, 21 play tennis and football. Each student plays at least one of the three games.

a) Represent this information in a venn diagram.

(9 marks)

b) Find the number of students who play all the three games.

(4 marks)

c) Find the number of students who play two of these games only.

(2 marks)

19) The points $A(-5, 3.5)$, $B(1, 0.5)$ and $C(-6, -6)$ are the vertices of a triangle.

a) Find the lengths of AB , AC and BC .

(6 marks)

b) Show that ABC is an isosceles triangle.

(4 marks)

c) Find the midpoint, P , of AB .

(3 marks)

d) Find the length of PC .

(2 marks)

20) $A(2, 4)$, $B(6, 4)$ and $C(7, 2)$ are the vertices of a triangle. Find the image of the triangle under reflection in the line:

(15 marks)

a) x -axis, labelling them as A' B' C' .

b) y -axis, labelling them as A'' B'' C'' .

c) Write down the coordinates for each image.

4
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