

MATHEMATICS

Date: 12/June/2024
Period: 8:30a.m-11:30a.m



END OF TERM III EXAMINATIONS QUESTION PAPER

GRADE SENIOR TWO
OPTION ORDINARY LEVEL

DURATION: 3 HOURS

MARKS: CAMIS

INSTRUCTIONS

- 1) This paper consists of **two** sections.
Section A: Attempt **all** questions. (55 marks)
Section B: Attempt **three** questions only. (45 marks)
- 2) You may use mathematical instruments and a calculator **where necessary**.
- 3) Use a **blue or black ink pen only** to write your answers and a **pencil** to draw diagrams.
- 4) Show clearly all the working steps. **Marks will not be awarded for the answer without all working steps.**

SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION. (55 marks)

1) Simplify: $\sqrt{\frac{36}{81}}$ **(3 marks)**

2) Write each of the following in its simplest index form.

a) 16 **(2 marks)**

b) 49 **(2 marks)**

3) Given $f(x) = 3x^4 + 5x^3 - 36$, evaluate $f(-2)$. **(5 marks)**

4) Calculate the value of x in the equation $x^2 - 25 = 0$ **(4 marks)**

5) Given the function $f(x) = x^2(x - 4) - 9(x - 4)$,

a) Factorise completely. **(2 marks)**

b) Solve the equation $x^2(x - 4) - 9(x - 4) = 0$ **(3 marks)**

6) The sum of two numbers is 10, and their difference is 6.

Find these numbers. **(5 marks)**

7) Give an example of simultaneous equation. **(2 marks)**

8) Express the ratio 54:63 in its simplest form. **(3 marks)**

9) Find out whether a triangle with height is 16cm and base 11cm and hypotenuse is 18 cm is right-angled. **(5 marks)**

10) Write the notation of magnitude of a vector. **(2 marks)**

11) Answer with true or False. **(4 marks)**

a) In parallel projection on a line, all images are formed on that line.

b) In orthogonal projection, the projection meets the line of projection at 125° .

c) The orthogonal projection preserves ratios of corresponding line segments and ratio of corresponding projections.

d) In orthogonal projection, the projection meets the line of projection at 90° .

12) Define the term "Isometry". **(2 marks)**

13) Define the term “mode” in statistics. **(2 marks)**

14) Determine the mode of the following given data: 71, 71,73,71,73,
75,72, 75, 73, 75,76, 76, 75, 72, 78, 79, 75, 78, 79, 75, 71,73,75,
75, 75, 76. **(4 marks)**

15) Solve $2^{2x+3} = 8$ **(5 marks)**

SECTION B: ATTEMPT ANY THREE QUESTIONS.

16) Solve the inequality: $\frac{3-x}{x+2} > 4$ **(15 marks)**

17) Given that $A = \begin{pmatrix} k \\ -1 \end{pmatrix}$, $B = \begin{pmatrix} 5k - 32 \\ 3r - 16 \end{pmatrix}$ and $A = B$;

a) Find the values of k and r. **(9 marks)**

b) Using the values of k and r obtained in a) above, verify
if vector A is equal to vector B. **(6 marks)**

18) The vertices of a quadrilateral are A (2, 3), B (2, 2), C (4, -1) and D (2, -1).
Without drawing:

a) find the image of the quadrilateral under reflection in line $y = 0$ **(8 marks)**

b) then reflect the image in the line $y = -x$. **(7 marks)**

19) The lengths of 40 sticks were measured to the nearest cm and grouped
data as shown below.

Length	4-8	9-13	14-18	19-23	24-28	29-33
Frequency	2	4	7	14	8	5

a) Construct the frequency table of the data. **(12 marks)**

b) Find the mean length. **(3 marks)**

20) When a die is tossed, what are the likelihoods of getting the following
events?

i) 1 or 2

(5 marks)

ii) 2 or 3 or 4

(5 marks)

iii) 3 or 5

(5 marks)

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END OF TERM III EXAMINATIONS, MARKING GUIDE

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ANSWER 1

$$\sqrt{\frac{36}{81}} = \frac{\sqrt{36}}{\sqrt{81}} = \frac{6}{9} = \frac{2}{3} \quad \text{1 mark each step} \quad \text{(3 marks)}$$

ANSWER 2

$$\text{a) } 16 = 4 \times 4 = 4^2 = 2^4 \quad \text{2marks}$$

$$\text{b) } 49 = 7 \times 7 = 7^2 \quad \text{2marks}$$

ANSWER 3

$$f(-2) = 3(-2)^4 + 5(-2)^3 - 36 \quad \text{2marks}$$

$$f(-2) = 3 \times 16 - 5 \times 8 - 36 \quad \text{1 mark}$$

$$f(-2) = 48 - 40 - 36 \quad \text{1 mark}$$

$$f(-2) = 8 - 36 = -28 \quad \text{1 mark}$$

ANSWER 4

$$x^2 - 25 = 0$$

$$(x-5)(x+5)=0 \quad \text{2 marks}$$

$$x=5 \quad \text{1mark} \quad \text{or} \quad x=-5 \quad \text{1mark}$$

ANSWER 5

$$\text{Solution: } x^2(x-4) - 9(x-4)$$

$$\text{Factorise: } x^2(x-4) - 9(x-4)$$

$$=(x^2 - 9)(x - 4)$$

$$=(x-3)(x+3)(x-4) \quad \text{1mark}$$

$$\text{Solve } x^2(x-4) - 9(x-4) = 0 \quad \text{1 mark}$$

Therefore, $(x-3)(x+3)(x-4) = 0$;

$$(x-3) = 0 ; (x+3) = 0; (x-4) = 0 \quad \text{1mark}$$

Final solution, $x_1 = 3$ / **1mark**; $x_2 = -3$ / **1mark**, $x_3 = 4$ / **1mark**

ANSWER 6

$x+y=10$ and $x-y=6$

$$\begin{cases} x + y = 10 \\ x - y = 6 \end{cases}$$

$x+y=10$ (1)

$x-y=6$ (2)

In (2) $x-y=6$ **0.5 marks**

$X=6+y$ (3) **0.5 marks**

We replace equation (3) into equation (1)

Then, $6+y+y=10$ **0.5 marks**

$6+2y=10$

$2y=10-6$ **0.5 marks**

$2y=4$

$y=\frac{4}{2}$

$y=2$ **1 mark**

We replace the value of y into (2)

$x-2=6$

$x=8$ **1 mark**

Therefore $(x, y) = (8,2)$ **1 mark**

ANSWER 7

Example of simultaneous equations

2marks

$$\begin{cases} ax - by = -1 \\ 2x - 6y = -2 \end{cases}$$

ANSWER 8

$$54:63 = \frac{54:9}{63:9} = \frac{6}{7}$$

2marks

ANSWER 9

The two shorter sides are 11 cm and 16 cm in length. The sum of the squares of their lengths is $11^2 + 16^2 = 121 + 256 = 377$. **2 marks**

The square of the length of the longest side is $18^2 = 324$ **1mark**

Now $11^2 + 16^2 \neq 18^2$ **1mark**

Therefore, **the triangle is not right-angled** **1mark**

ANSWER 10

The magnitude of vector denoted by $||v||$ or $|v|$ **2marks**

ANSWER 11

- a) True **1mark**
- b) False **1 mark**
- c) True **1 mark**
- d) True **1 mark**

ANSWER 12

Isometry is a transformation which preserves shapes, appearance, size and area of the object. **(2 marks)**

ANSWER 13

Mode is the number that appears most often. **(2 marks)**

ANSWER 14

(2 marks)

Number	Frequency
71	4
72	2
73	4
75	9
76	3
78	2
7	2

In table above 75 has the highest frequency (9). Thus, 75 is the mode and 9 is the **modal frequency**. **(2 marks)**

ANSWER 15

$$2^{2x+3} = 8$$

$$\Leftrightarrow 2^{2x+3} = 2^3 / 1mark$$

$$\Leftrightarrow 2x+3 = 3 / 1mark$$

$$\Leftrightarrow 2x = 3 - 3 / 1$$

$$\Leftrightarrow 2x = 0 / 1$$

$$\Leftrightarrow x = 0 / 1mark$$

Answer 16.

$\frac{3-x}{x+2} > 4$, to solve this follows:

$$\frac{3-x}{x+2} > 4 \Leftrightarrow \frac{3-x}{x+2} - 4 > 0 / \dots\dots\dots 2marks$$

$$\Leftrightarrow \frac{3-x-4(x+2)}{x+2} > 0 / \dots\dots\dots 2marks$$

$$\Leftrightarrow \frac{3-x-4x-8}{x+2} > 0 / \dots\dots\dots 2marks$$

$$\Leftrightarrow \frac{-5x-5}{x+2} > 0 / \dots\dots\dots 2marks$$

$$\Leftrightarrow -5x-5 = 0 \text{ and } x+2 = 0$$

$$\Leftrightarrow \mathbf{x = -1} \quad \mathbf{0.5 marks} \quad \text{and} \quad \mathbf{x = -2} \quad \mathbf{0.5 marks}$$

a. Table of signs: **5marks**

x	$-\infty$		-2		-1		$+\infty$
$-5x-5$	+	+	+	+	0	-	-
$x+2$	-	-	0	+	+	+	+
$\frac{-5x-5}{x+2}$	$-\infty$	-	-	+	+	0	-
							$+\infty$

S

b. $S =]-2, -1[$ / **1 mark**

ANSWER 17

a) If $A=B$, $A = \begin{pmatrix} k \\ -1 \end{pmatrix}$; $B = \begin{pmatrix} 5k-32 \\ 3r-16 \end{pmatrix}$

$\begin{pmatrix} k \\ -1 \end{pmatrix} = \begin{pmatrix} 5k-32 \\ 3r-16 \end{pmatrix}$ **1 mark**

$\Leftrightarrow \begin{cases} k = 5k-32 \\ -1 = 3r-16 \end{cases}$ **2 marks**

$\Leftrightarrow \begin{cases} 32 = 5k-k \\ -1+16 = 3r \end{cases}$ **2 marks**

$\Leftrightarrow \begin{cases} 32 = 4k \\ 15 = 3r \end{cases} \Leftrightarrow \begin{cases} k = \frac{32}{4} \\ r = \frac{15}{3} \end{cases}$ **2 marks**

$\Leftrightarrow \begin{cases} k = 8 \\ r = 5 \end{cases}$ **2 marks**

b) If $k=8$ and $r=5$,

then, $A = \begin{pmatrix} k \\ -1 \end{pmatrix} = \begin{pmatrix} 8 \\ -1 \end{pmatrix}$ **2 marks**