



EAST SPRING SECONDARY SCHOOL

Towards Excellence and Success

Name:()

Class:

N Level Preliminary Examination 2025 Secondary 4 Normal Academic

ADDITIONAL MATHEMATICS (SYLLABUS A)
Paper 2

4051/02

1 AUGUST 2025
FRIDAY

1 hour 45 minutes
1005 – 1150

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number in the spaces provided above,
and on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.

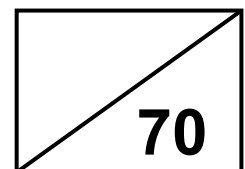
Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.

The use of an approved scientific calculator is expected, where appropriate.

You are reminded of the need for clear presentation in your answers.

The number of marks is given in brackets [] at the end of each question or part question.

The total number of marks for this paper is 70.



This question paper consists of **17** printed pages including the cover page.

Setter: Ms Mindy Yue

Mathematical Formulae**1. ALGEBRA***Quadratic Equation*

For the equation $ax^2 + bx + c = 0$,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

2. TRIGONOMETRY*Identities*

$$\sin^2 A + \cos^2 A = 1$$

$$\sec^2 A = 1 + \tan^2 A$$

$$\operatorname{cosec}^2 A = 1 + \cot^2 A$$

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$$

$$\sin 2A = 2 \sin A \cos A$$

$$\cos 2A = \cos^2 A - \sin^2 A = 2 \cos^2 A - 1 = 1 - 2 \sin^2 A$$

$$\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$$

Formulae for $\triangle ABC$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A.$$

$$\Delta = \frac{1}{2} bc \sin A.$$

- 1** Solve the simultaneous equations.

$$x - y = 1,$$

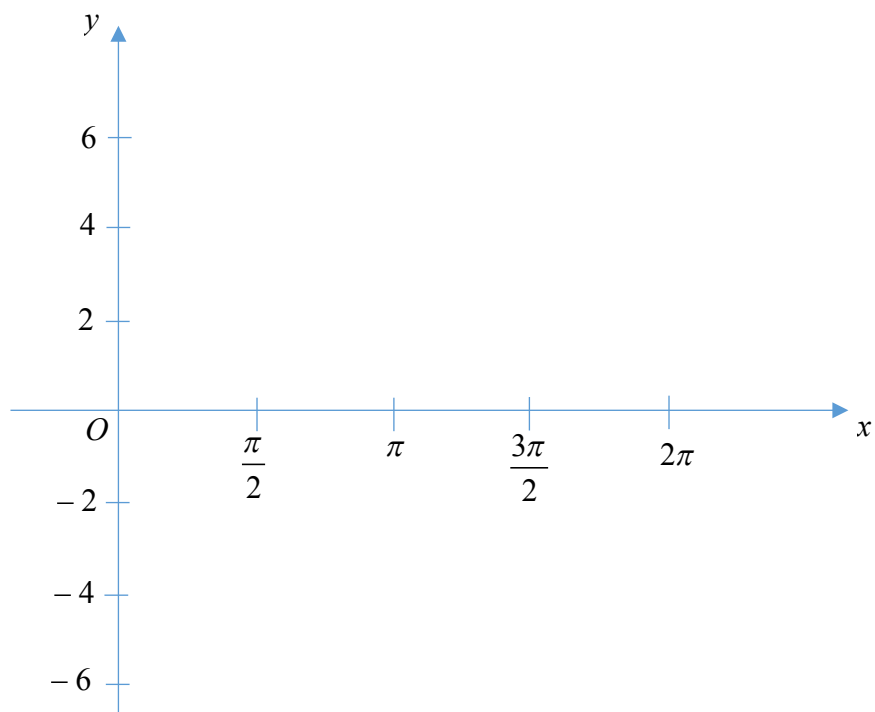
$$x^2 + y^2 = 7 - xy.$$

[5]

- 2 (a) A cosine graph with equation $y = a \cos bx + c$, where x is in degrees, has period 180° and has a minimum value of -4 and a maximum value of 2 .

Find the values of the integers a , b and c .
[3]

- (b) Sketch, on the axes below, the graph of the curve $y = 4 \sin 2\theta - 1$ for $0 \leq \theta \leq 2\pi$. [3]



- 3** **(a)** Find the range of values of p for which $y = x^2 + (x+2)p + 5$ is always positive for all real values of p .
[4]

- (b)** James claims that the curve $y = x^2 - 3x - 1$ is always positive.
By using your answer in **(a)**, justify whether his claim is correct. [1]

4 A cubic curve has stationary points at $(-2, -3)$ and $(2, a)$, where a is a constant.

(a) Explain why $\frac{dy}{dx} = k(x^2 - 4)$, where k is a constant.
[2]

(b) Given that the curve passes through $(-1, 2)$, determine its equation. [6]

(iii Find the value of a .
) [1]

5 In triangle TUX , $TU = \sqrt{5} + 1$ cm and $TX = 3\sqrt{5} - 2$ cm.

(i) Given that the area of the triangle TUX is 6 cm^2 , find the value of $\sin XTU$, giving

your answer in the form of $\frac{a + b\sqrt{5}}{c}$ where a , b and c are integers. [6]

(ii) Hence or otherwise, calculate the possible values of angle XTU .
[1]

- 6** The function $f(x)$ is defined by $f(x) = x^3 + px^2 + qx - 12$ for all real x . Given that $x - 3$ is a factor of $f(x)$ and that when $f(x)$ is divided by $x + 2$ the remainder is 10.

(a) Find the value of each of the constants p and q , [4]

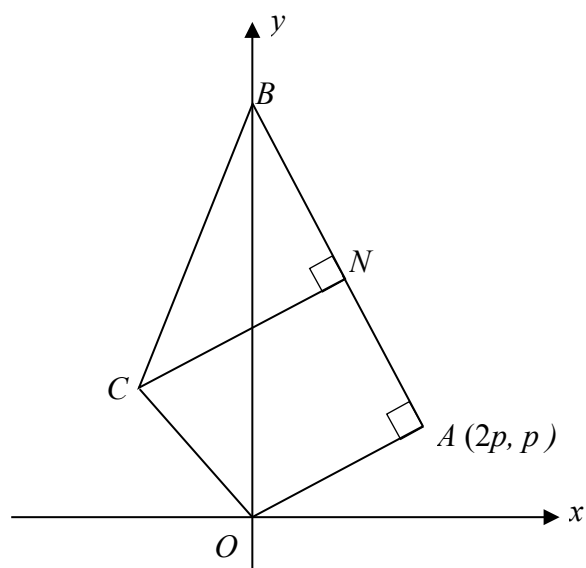
(b) Express $f(x)$ as the product of linear factors.

[3]

7 (a) Prove that $\sin x(\operatorname{cosec} x - 1)(1 + \sin x) = \cos^2 x$. [3]

(b) Hence, solve the equation $\sin 2x(\operatorname{cosec} 2x - 1)(1 + \sin 2x) = 1$, for $0 < x < 2\pi$ radians.
Give your answers in the form $k\pi$, where k is a rational number. [5]

- 8 The diagram shows a quadrilateral $OABC$ with $A(2p, p)$ and the length of OA is $\sqrt{245}$ units.
 AB is perpendicular to OA and B lies on the y -axis. N is the mid-point of AB .



- (a) Show that $p = 7$.

[2]

(b) Calculate the gradient of OA .

[1]

It is given that C lies on the perpendicular bisector of AB and the equation of OC is $y = -2x$.

(c) Find the equation of AB .

[2]

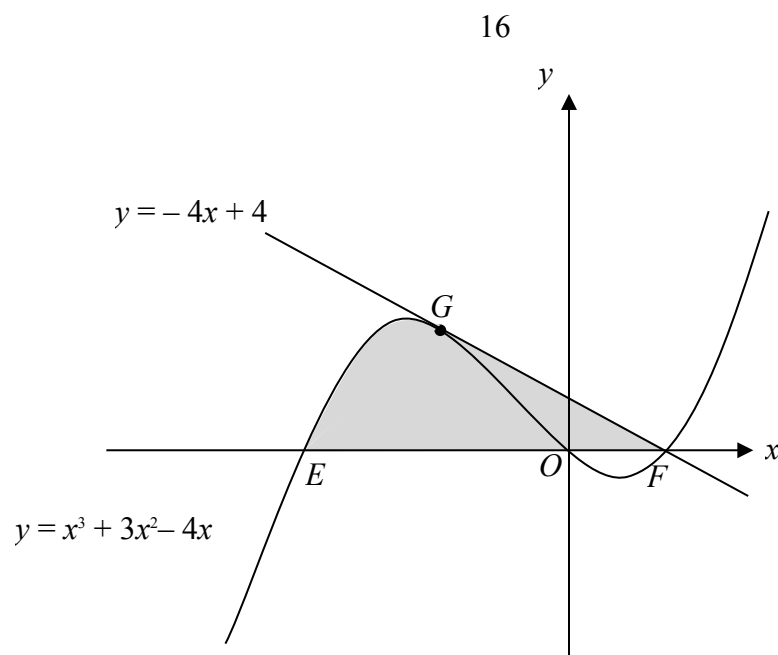
(d) Find the coordinates of C .

[4]

- (e) Find the area of quadrilateral $OABC$.

[2]

- 9 The diagram shows the curve $y = x^3 + 3x^2 - 4x$ cuts the x axis at points O , E and F . The line $y = -4x + 4$ is the tangent to the curve at point G which meets the curve again at F .



(a) Find the coordinates of E and F .

[4]

(b) Find the gradient function of the curve.

[1]

- (c) Hence, show that the x -coordinate of G is -2 .
[3]

- (d) Calculate the area of the shaded region.

[4]

--- End of Paper ---