



EAST SPRING SECONDARY SCHOOL

Towards Excellence and Success

Name: ()

Class:

N Level Preliminary Examination 2025 Secondary 4 Normal Academic

**ADDITIONAL MATHEMATICS
PAPER 1**

4051/01

**30 JULY 2025
WEDNESDAY**

**1 hours 45 minutes
1040 – 1225**

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.

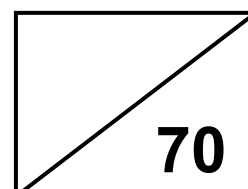
Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the questions.

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 16 printed pages including the cover page.

Setter: Mrs Jan Yap

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 (a) Given that $\sin \theta = \frac{5}{13}$ where $0 \leq \theta \leq \frac{1}{2}\pi$, find the exact value of

(i) $\tan \theta$ [1]
)

(ii) $\sin 2\theta$ [2]
)

- (b) Do not use a calculator in answering this question.
)

State, in terms of π , the principal value of $\cos^{-1}\left(-\frac{\sqrt{2}}{2}\right)$. [1]

2 Factorise $14x^3 + 112$.

[3]

3 Circle C has equation $x^2 + y^2 + 4x - 2y - 20 = 0$.

(a) Find the radius and the coordinates of the centre of the circle. [3]

(b) Hence, show that the centre of the circle lies on the line $y = 7x + 15$. [1]

- 4 Find the range of values of x which satisfies both the inequalities

$$2 - 3x < 7$$

$$x(x+1) < 6$$

[3]

- 5 Express $\frac{x^2 + 4x - 7}{x^2 + x - 12}$ in partial fractions. [4]

- 6 (a) Show that $f(x) = 2x^2 - 6x - 10$ can be written as $f(x) = a(x - b)^2 + c$, where a , b and c are constants to be found. [2]

- (b) Hence, find the co-ordinates of the minimum point. [1]

- (c) Determine if the curve lie completely above or below the x -axis or otherwise. Explain your answer. [1]

7 Do not use a calculator in answering this question.

Solve the equation $\frac{1}{x} + \frac{1}{y} = \frac{1}{z}$, where x, y, z are positive integers, giving your answer in its simplest surd form. [4]

8 (a) Express $9 \sin \theta - 7 \cos \theta$ in the form $R \sin(\theta - \alpha)$, where $R > 0$ and $0^\circ < \alpha < 90^\circ$. [3]

(b) Hence find the maximum and minimum values of $8 \sin \theta - 7 \cos \theta$ and the corresponding values of θ for $0^\circ < \theta < 360^\circ$. [3]

9

A cone of radius r cm and vertical height h cm has volume $V = \frac{1}{3}\pi r^2 h$ and $h = \frac{3}{2}r$.
Find the rate of increase of the height of this cone when the radius is 6 cm and the volume is increasing at a rate of 4π cm³/s.

[6]

1 **(a)** Show $\frac{d}{dx}[(2x+5)\sqrt{4x-5}] = \frac{12x}{\sqrt{4x-5}}$. [2]
0

(b) Hence, evaluate $\int_2^4 \frac{6x}{\sqrt{4x-5}} dx$, giving your answer correct to 2 decimal places. [4]

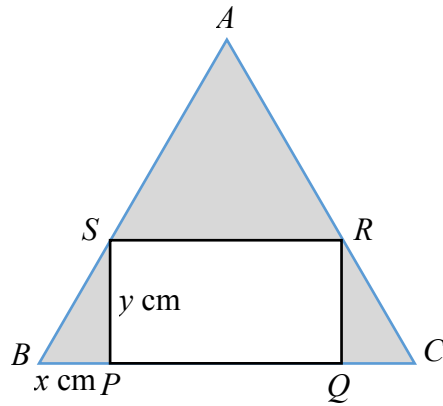
1 Solve $\sec^2 x - 4 \tan x = 6$ for $0 < x < 360^\circ$.
1

[5]

- 1**
2 Calculate the coordinates of the points on the curve $y = \frac{3x^2}{4x-1}$ for which the tangent is parallel to the x -axis. [6]

1
3 Given that $\frac{2\cos^2 x}{1+3\sin^2 x} = \frac{8}{13}$, where $\frac{\pi}{2} < x < \pi$, find the value of $\frac{2\cos x}{1+3\sin x}$. [7]

1
4



The diagram shows an equilateral triangle ABC of sides 6 cm.

$PQRS$ is a rectangle inside triangle ABC such that $BP = QC = x$ cm and $SP = RQ = y$ cm.

- (a) Show that the area of the shaded region, A cm², is given by [3]
 $A = \sqrt{3}(9 - 6x + 2x^2)$.

(b) Given that x can vary, find the stationary value of A . [3]

(c) Determine if this value of A is a maximum or minimum. [2]

--- End of Paper ---