ANGLICAN HIGH SCHOOL
SECONDARY 4
PRELIMINARY EXAMINATIONS

2026S4

CANDIDATE NAME

CLASS **INDEX NUMBER**

ADDITIONAL MATHEMATICS
4049/01
Paper 1

21 August 2026
2 hours 15 minutes

Candidates answer on Question Paper.
No Additional Matèrials are required.

READ THESE INSTRUCTIONS FIRST

Write your class, index number and full name on the front cover of your paper.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** the 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 90.

For Examiners' Use:

Question	1	2	3	4	5	6	7	8	9	10
Marks										
Question	11	12	13	14	15					

Clarity/Logic	Accuracy/Precision	Units		
				90

1 **(a)** Express $7-6x-3x^2$ in the form of $a(x+b)^2+c$ where a, b, and c are constants. [2]

(b) Hence, find the range of values of the constant h for which the equation $7-6x-3x^2=h$ does not have two distinct roots. [2]

2 A solid cylinder has a radius of $(3+\sqrt{2})$ cm. The volume of the cylinder is $\pi(32+13\sqrt{2})$ cm^3. Without using a calculator, express the total surface area of the cylinder in the form of $2\pi(a+b\sqrt{2})$, where a and b are constants. [7]

S

3 Solve the equation $3\sec^2\theta + 11\tan\theta = 7$ where $0 \le \theta \le 2\pi$. 6.28 [4]

4 Solve the equation $216^x = \dfrac{5}{\sqrt{6^x}}$. [4]

5 Find the range of values of the constant k for which the line $y = kx + 1$ does not intersect the curve $y = x^2 - 3kx + 1 - 2k$. [5]

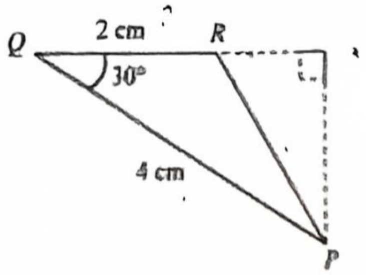
6 The line $x-2y+7=0$ cuts the curve $3x^2+2y^2=35$ at the points A and B.

(a) Find the coordinates of A and of B. [5]

(b) Find the area of triangle OAB, where O is the origin. [2]

26

7 The diagram shows a triangle PQR in which $PQ = 4$ cm, $QR = 2$ cm and $\angle PQR = 30°$.



The point S lies on the line QR produced such that $\angle PSR = 90°$.

(a) Express PR^2 in the form $a + b\sqrt{3}$, where a and b are constants. [2]

(b) Show that $\angle PRS = \tan^{-1}\left(\dfrac{\sqrt{3}+1}{2}\right)$. [4]

8 **(a)** The term independent of x in the expansion of $\left(2x^2+\frac{p}{x}\right)^{12}$, where p is a positive constant, is 7920. Find the value of p. [4]

(b) Using your value of p, find the coefficient of the term in x^3 in the expansion of $\left(1+x^4\right)\left(2x^2+\frac{p}{x}\right)^{12}$. [4]

9 Given that $f(x) = 7\cos^2 x - 3\sin^2 x$, where $0 \le x \le \pi$

(a) express $f(x)$ in the form of $a\cos 2x + b$, where a and b are constants. [3]

(b) state the greatest and least values of $f(x)$, [2]

(c) state the period and amplitude of $f(x)$. [2]

(d) Sketch the graph of $y = f(x)$ for $0 \le x \le \pi$. [2]

10 **(a)** Prove that $\dfrac{\cos\theta}{1-\sin\theta}-\dfrac{1}{\cos\theta}=\tan\theta$. [4]

(b) Hence solve the equation $\dfrac{\cos\theta}{1-\sin\theta}-\dfrac{1}{\cos\theta}=2\sin\theta$ for $180°\leq\theta\leq 360°$. [4]

11 A triangular prism has its base an equilateral triangle of side x cm and a height of y cm. The total surface area of the prism is 30 cm^2.

(a) Show that $y = \dfrac{60 - \sqrt{3}x^2}{6x}$. [2]

(b) Hence show that the volume, V cm^3, is given by the equation $V = \dfrac{5\sqrt{3}x}{2} - \dfrac{x^3}{8}$. [1]

(c) Given that x can vary, find the stationary value of V and determine its nature. [4]

N

12 Given that $y = \ln\left(\cos^5 x\right)$, where $\frac{-\pi}{2} < x < \frac{\pi}{2}$, without finding any coordinates of the stationary points, explain clearly why the curve only has maximum points. [3]

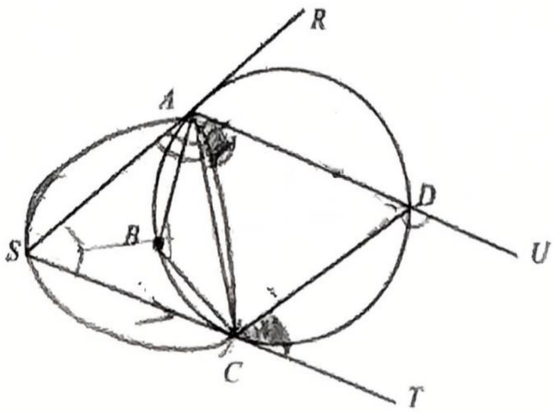
13 The gradient function of a curve is given by $\frac{\mathrm{d}y}{\mathrm{d}x} = 3\sin\left(3x - \frac{\pi}{2}\right) + \frac{\pi}{(x-\pi)^2}$. This curve passe through the point $(2\pi, 4)$. Find the equation of the curve. [5]

14 The equation of a curve is $y=(x-2)\sqrt{4x+1}$ where $x>-\frac{1}{4}$.

(a) Show that $\frac{\mathrm{d}y}{\mathrm{d}x}=\frac{3(2x-1)}{\sqrt{4x+1}}$ [3]

(b) Hence find the range of values of x for which the function $y=(x-2)\sqrt{4x+1}$ is decreasing. [3]

15 The diagram shows a quadrilateral, $ABCD$, inscribed in a circle. The lines SAR and TCS are tangents to the circle at A and C respectively. The lines ADU and SCT are parallel



(a) Prove that angle ACD = angle ASC [2]

(b) Prove that angle ABC = angle UDC [2]

(c) Given that A, S and C lie on a circle, and B is the centre of this circle, prove that the triangle ASC is equilateral. [3]