



Cambridge O Level

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ADDITIONAL MATHEMATICS

4037/11

Paper 1 Non-calculator

May/June 2025

2 hours

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- Calculators must **not** be used in this paper.
- You must show all necessary working clearly.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [].

This document has **16** pages.



List of formulas

Equation of a circle with centre (a, b) and radius r .

$$(x - a)^2 + (y - b)^2 = r^2$$

Curved surface area, A , of cone of radius r , sloping edge l .

$$A = \pi r l$$

Surface area, A , of sphere of radius r .

$$A = 4\pi r^2$$

Volume, V , of pyramid or cone, base area A , height h .

$$V = \frac{1}{3} Ah$$

Volume, V , of sphere of radius r .

$$V = \frac{4}{3} \pi r^3$$

Quadratic equation

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

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

Binomial theorem

$$(a + b)^n = a^n + \binom{n}{1} a^{n-1} b + \binom{n}{2} a^{n-2} b^2 + \dots + \binom{n}{r} a^{n-r} b^r + \dots + b^n,$$

where n is a positive integer and $\binom{n}{r} = \frac{n!}{(n-r)!r!}$

Arithmetic series

$$u_n = a + (n-1)d$$

$$S_n = \frac{1}{2} n(a + l) = \frac{1}{2} n\{2a + (n-1)d\}$$

Geometric series

$$u_n = ar^{n-1}$$

$$S_n = \frac{a(1-r^n)}{1-r} \quad (r \neq 1)$$

$$S_\infty = \frac{a}{1-r} \quad (|r| < 1)$$

Identities

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

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

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

Formulas for $\triangle ABC$

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

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

$$\Delta = \frac{1}{2} ab \sin C$$





Calculators must **not** be used in this paper.

- 1 (a) Given that $\overrightarrow{PQ} = \begin{pmatrix} -3 \\ 7 \end{pmatrix}$ and $4\overrightarrow{PR} = \begin{pmatrix} -2 \\ 8 \end{pmatrix}$, find $\overrightarrow{RQ}$. [2]

- (b) The vectors $\mathbf{a}$, $\mathbf{b}$ and $\mathbf{c}$ are such that $\mathbf{a} = \alpha\mathbf{i} + 6\mathbf{j}$, $\mathbf{b} = 4\mathbf{i} + \beta\mathbf{j}$ and $\mathbf{c} = (2\alpha + 5\beta)\mathbf{i} + 20\mathbf{j}$, where α and β are scalars.

Given that $\mathbf{c} = 3\mathbf{a} - 2\mathbf{b}$, find the values of α and β . [3]





2 Solve the inequality $(3 - x)(5x + 8) \geq 9 - 3x$.

[4]

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3 Point A has coordinates $(3, -1)$.

A circle has equation $(x-4)^2 + (y+3)^2 = 5$.

(a) Show that A lies on the circumference of the circle.

[1]

(b) Given that AB is a diameter of the circle, find the coordinates of B .

[2]

(c) Find the equation of the tangent to the circle at A .

[3]





4 (a) Solve the equation $x^{\frac{1}{3}} - x^{\frac{1}{6}} = 2$.

[4]

(b) Solve the simultaneous equations

$$\begin{aligned}\lg(x+2y) &= 0 \\ x^2 + 4xy + y &= 1.\end{aligned}$$

[5]



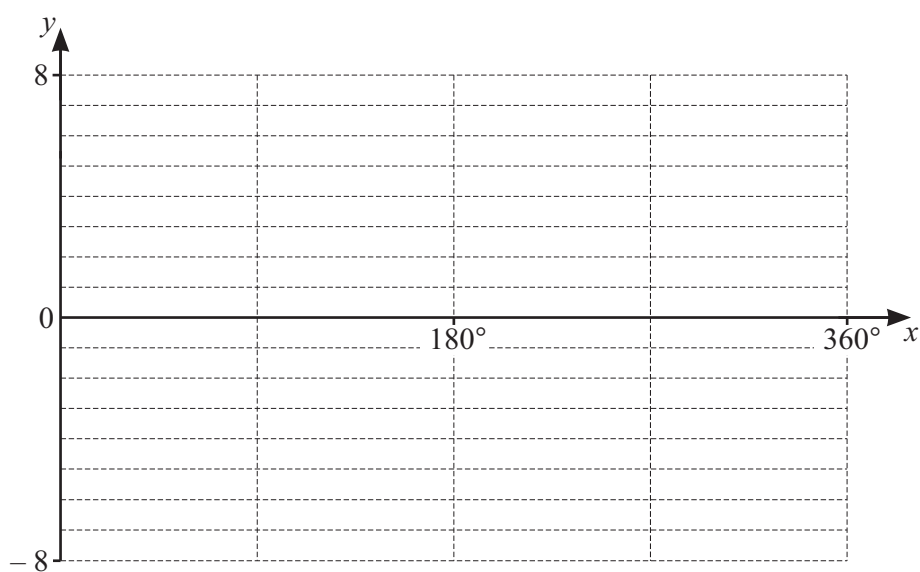


5 (a) Solve the equation $5|2x-1|+8=23$.

[3]

(b) On the axes, sketch the graph of $y=5\sin x-2$ for $0^\circ \leq x \leq 360^\circ$.

[2]





6 A curve has equation $y = \left(\frac{x^2 - 1}{x^2 + 1} \right)^4$.

(a) Show that $\frac{dy}{dx}$ can be written as $\frac{Ax(x^2 - 1)^3}{(x^2 + 1)^5}$, where A is a positive integer to be found. [5]



(b) (i) Show that the curve has stationary points where $x = -1$, $x = 0$ and $x = 1$.

[1]

(ii) Use the first derivative test to determine which two stationary points have the same nature and state whether they are maximum or minimum points.

[2]





7 Solutions to this question by accurate drawing will not be accepted.

Find the x -coordinates of the points where the curve $y = (2x - 9)(x^2 + 5) + 42$ cuts the x -axis. [6]





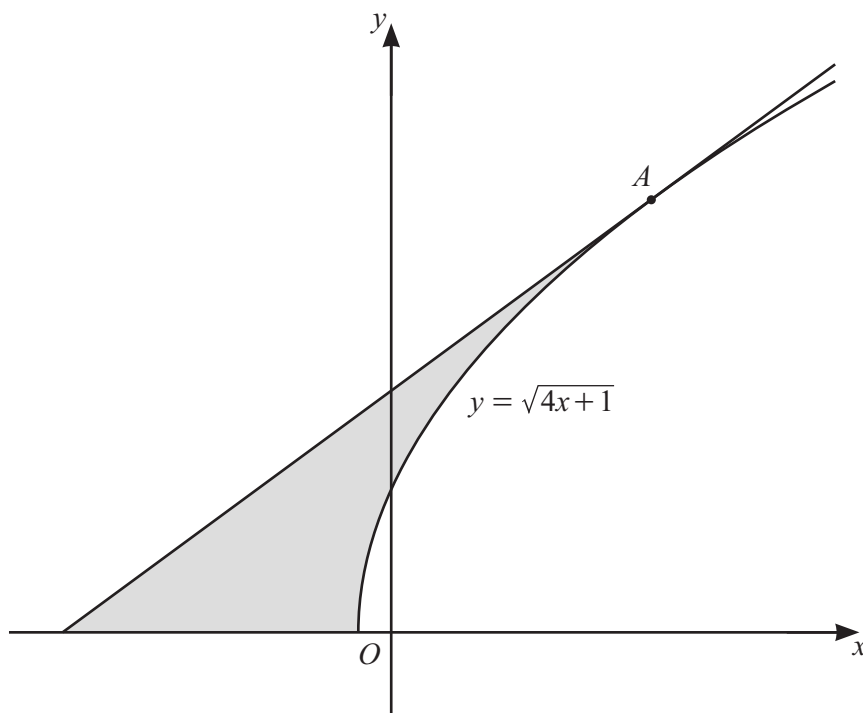
8 (a) Write down the set of values of x for which $\log_5(12x-4)$ exists.

[1]

(b) Solve the equation $\log_5(12x-4) = \frac{6}{\log_x 125} + 1$.

[6]





The point A with x -coordinate 2 lies on the curve $y = \sqrt{4x + 1}$.
The diagram shows part of this curve and the tangent to the curve at A .

Find the area of the shaded region enclosed by the curve, the tangent and the x -axis.

[10]





Continuation of working space for Question 9.





- 10 (a) Given that $0 \leq \theta < \frac{\pi}{2}$, show that $\frac{\sin \theta}{\sqrt{\operatorname{cosec}^2 \theta - 1}} + \frac{1}{\sqrt{1 + \tan^2 \theta}}$ can be written as $\sec \theta$. [4]

- (b) Given that $\sec x = \alpha$, where $\frac{3\pi}{2} < x \leq 2\pi$, find $\sin x$ in terms of α . [3]



- 11 An arithmetic progression has common difference d .
The 3rd term of this progression is 10.

- (a) Write down expressions for the 1st term and the 2nd term of this progression.
Give your answers in terms of d only.

[2]

- (b) When each of the first 3 terms is squared, the sum of these squares is 140 .
There are two possible values for d .

Using your answer to part (a), find the sum of the first 200 terms of the progression with the smaller value of d .

[7]

Question 12 is printed on the next page.





12 In this question $n \geq 6$.

Use an algebraic method to show that ${}^nC_5 - {}^{n-1}C_5$ can be written as ${}^{n-1}C_4$.

[4]

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