Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

ADDITIONAL MATHEMATICS **0606/23**

Paper 2 **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.
- You should use a scientific calculator where appropriate.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

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.

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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. $A = \pi rl$

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

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

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 ΔABC

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

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

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

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1 Solve the inequality $(x+2)(4x-5) \leqslant 0$. [2]

View solution

2 Given that $y = \dfrac{4x^3 - 5}{x^2}$, show that $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ can be written as $\dfrac{2(2x^3+5)}{x^3}$. [3]

View solution

3 Variables x and y are such that when $\sqrt{y}$ is plotted against x^3 a straight line graph passing through the points (2, 5) and (10, 21) is obtained.

Find y in terms of x. [4]

View solution

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4 The function f is defined by $\mathrm{f}(x) = 2x - 1$ for $x \in \mathbb{R}$.

(a) Explain why the function f^2 can be formed. [1]

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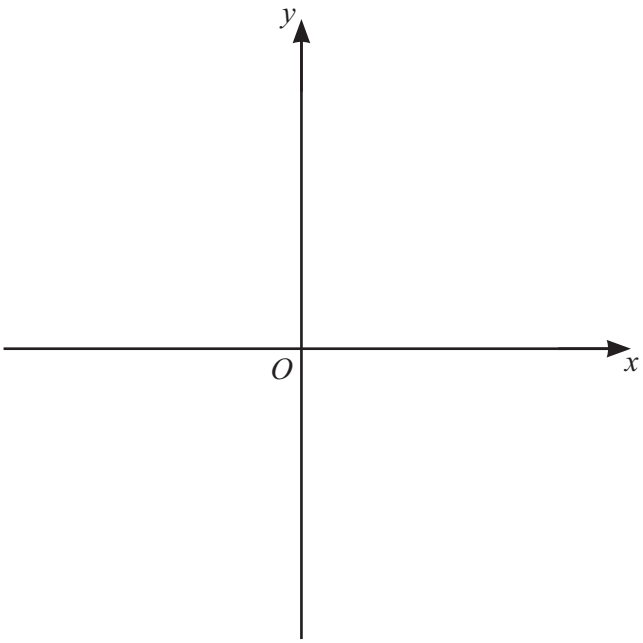
(b) On the axes, sketch the graph of $y = \left|\mathrm{f}^2(x)\right|$.
State any intercepts with the coordinate axes. [4]

View solution



(c) It is given that $\left|\mathrm{f}^2(x)\right| \leqslant ax + b$ for $-1 \leqslant x \leqslant 3$ and for **no other** values of x.

View solution

Find the values of a and b. [3]

5 In this question, all angles are in radians.

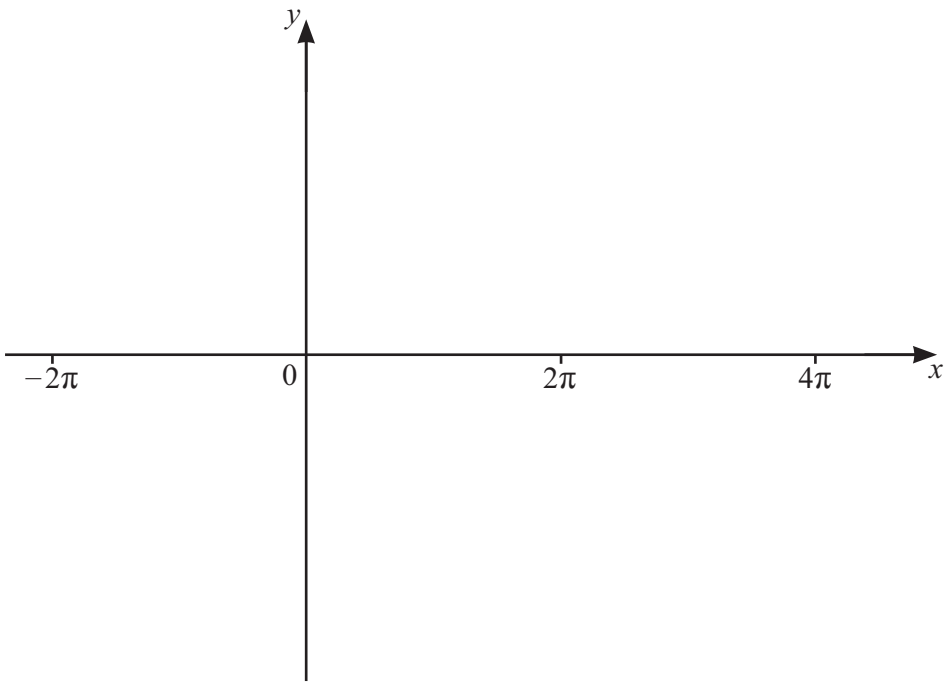
(a) Write down the period of $5\tan\left(\frac{x}{4}\right)+1$. [1]

View solution

(b) On the axes, sketch the graph of $y = 5\tan\left(\frac{x}{4}\right)+1$ for $-2\pi \leqslant x \leqslant 4\pi$.

State the intercept with the y-axis.
Show clearly the positions of any asymptotes. [3]

View solution



6 **(a)** Five of the digits 1 2 3 4 5 6 7 8 9 are used to make a 5-digit number.

Find how many ways this can be done when the 5-digit number is greater than 50 000. [2]

View solution

View solution

(b) In a group of 13 people, 7 have red hair and 6 have brown hair.

(i) The 13 people stand in line for a photograph.
No person with red hair is standing next to another person with red hair.

Find the number of different ways this can be done. [2]

View solution

(ii) Chris chooses 5 people from this group.

Find the number of ways Chris can do this if at least 1 person chosen has brown hair. [2]

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7 **(a)** Find the term independent of x in the expansion of $\left(x^2 - \frac{3}{x^4}\right)^{15}$. [2]

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(b) In the expansion of $(1+ax)^9$ the coefficient of x^3 is 7 times the coefficient of x^2.

View solution

Given that a is a positive constant, find the value of a. [3]

8 **(a)** It is given that $y = e^{3x+2} \tan x$.

Use calculus to find the approximate change in y as x increases from 0.1 to $0.1 + h$, where h is small. [5]

View solution

(b) A curve is such that $\frac{dy}{dx} = \sin(3x + \pi)$.

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The curve passes through the point $\left(\frac{\pi}{9}, \frac{4}{3}\right)$.

Find the exact y-coordinate of the point on the curve where $x = \frac{5\pi}{12}$. [4]

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9 **(a)** The 1st term of an arithmetic progression is 9.
The last term of this progression is 159.
The sum of all the terms is 2604.

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The 12th term of this arithmetic progression is the 1st term of a geometric progression.
The 8th term of this arithmetic progression is the 2nd term of the geometric progression.

Find the sum of the first 6 terms of the geometric progression. [7]

(b) A different geometric progression has 1st term $\sin\theta$.
The common ratio of this progression is $\cos\theta$ where $45° \leqslant \theta \leqslant 135°$.

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(i) Show that this progression has a sum to infinity. [1]

(ii) Show that this sum to infinity can be written as $\operatorname{cosec}\theta + \cot\theta$. [4]

View solution

10 In this question, time is in seconds.

View solution

(a) At time $t = 0$, particle P starts from the point with position vector $-30\mathbf{j}$.
P travels with speed $58\,\text{ms}^{-1}$ in the direction $20\mathbf{i} + 21\mathbf{j}$.

Find the position vector of P at time t. [3]

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(b) Also at time $t = 0$, particle Q starts from the point with position vector $-10\mathbf{i} + 18\mathbf{j}$.

Q travels with speed $75\,\text{ms}^{-1}$ at an angle α above the positive x-axis, where $\tan\alpha = \frac{7}{24}$.

Find the position vector of Q at time t. [4]

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(c) Determine whether P and Q collide. [2]

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11 Given that $\dfrac{{}^{n+1}\mathrm{P}_5}{437} = {}^{n}\mathrm{P}_3$, use an algebraic method to find the value of n. [4]

View solution

12 The function f is defined by $f(x) = 15\cos^2(3x + 1.5) + 7\sin(3x + 1.5) - 13$ for $-0.3 \leqslant x \leqslant 0.5$, where x is in radians.

(a) Solve the equation $f(x) = 0$. [5]

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(b) Find the x-coordinates of the two stationary points on the curve $y = \mathrm{f}(x)$. [5]

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Question 13 is printed on the next page.

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13 Solve the equation $64^{x+\frac{1}{3}} + 2^{3x} - 3 = 0$. [4]

View solution

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