Cambridge Assessment International Education

# Cambridge IGCSE™

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**ADDITIONAL MATHEMATICS** **0606/21**

Paper 2 **October/November 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 $\pi$, 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 $\Delta ABC$

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

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

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

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**1** The polynomial p is such that $\mathrm{p}(x) = x^3 + ax^2 + bx - 2$, where $a$ and $b$ are constants.

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It is given that:

- $x + 2$ is a factor of $\mathrm{p}(x)$
- when $\mathrm{p}(x)$ is divided by $x - 3$ the remainder is 40.

Find the values of $a$ and $b$. [5]

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**2**

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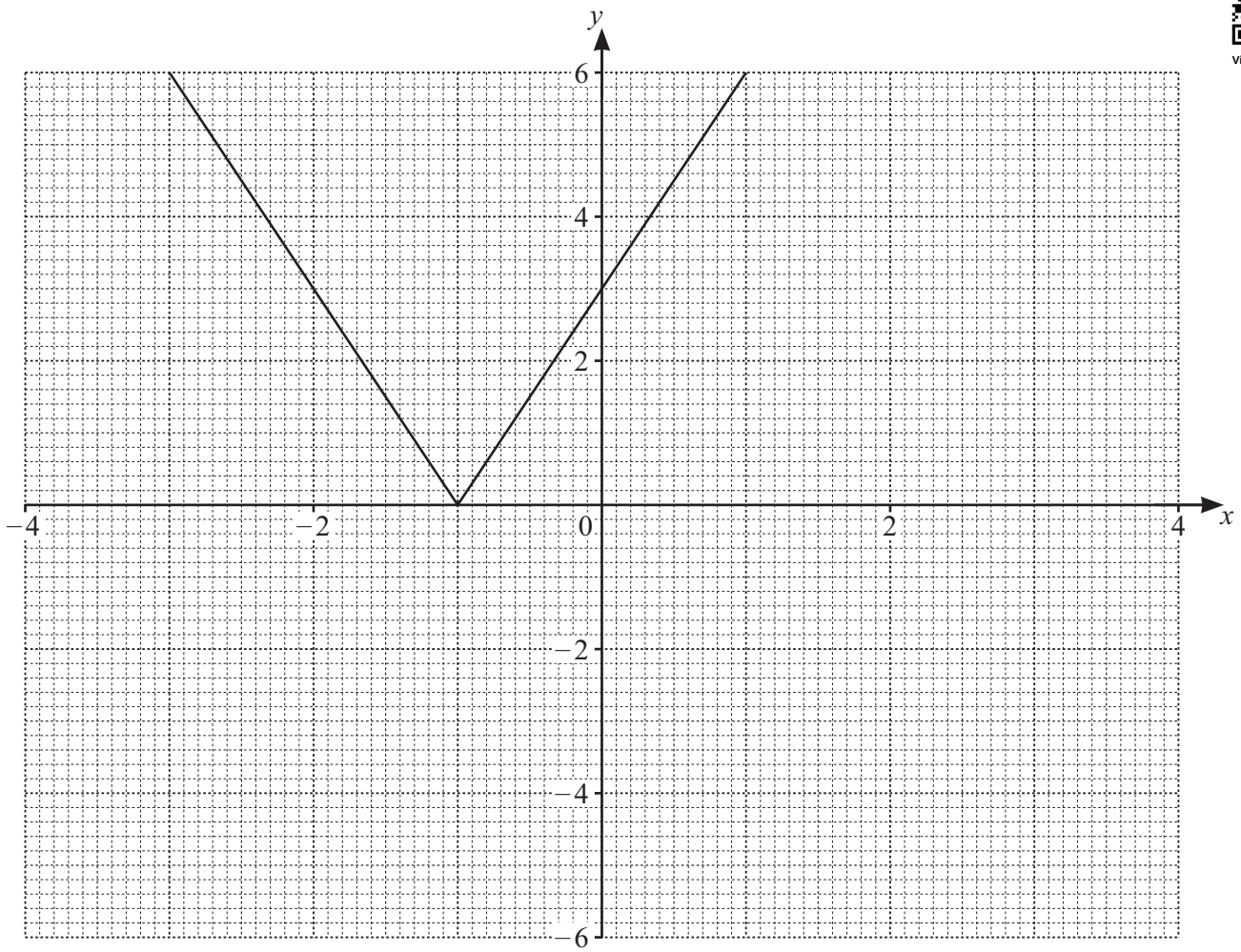


The diagram shows the graph of $y = |3x + 3|$.

Use a graphical method to solve the inequality $|3x + 3| \geqslant |x - 2|$. [3]

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**3** **(a)** 3 men and 3 women are standing in a line.
The 3 men are standing next to each other.

Find how many different arrangements are possible. [2]

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**(b)** In the 13-letter word MULTIBRANCHED, there are 4 vowels, U, I, A and E.

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7 different letters are selected from these 13 letters.

Find how many different selections are possible if the selection includes at least 2 vowels. [3]

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**4** **(a)** Show that $\frac{1-\sin x}{\cos x}+\frac{\cos x}{1-\sin x}=2\sec x$. [3]

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**(b)** Hence solve the equation $\frac{1-\sin\frac{\theta}{2}}{\cos\frac{\theta}{2}}+\frac{\cos\frac{\theta}{2}}{1-\sin\frac{\theta}{2}}=3$ for $0° \leqslant \theta \leqslant 720°$. [3]

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

A circle has centre (4, 2) and meets the $x$-axis at $(-2, 0)$.

**(a)** Find the equation of the circle. [2]

View solution

**(b)** Find, in exact form, the coordinates of the points where the circle meets the $y$-axis. [3]

View solution

**6** Variables $x$ and $y$ are such that when $\ln y$ is plotted against $x$ a straight-line graph is obtained. The line passes through the points $(1, \ln 15)$ and $(2, \ln 75)$.

Show that $y = Ab^x$ where $A$ and $b$ are integers to be found. [4]

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**7** Show that the curve $y = x - \ln(x^2 + 2x)$ has exactly one stationary point.

Find the $x$-coordinate of this point. [6]

View solution

**8** In this question, the units are metres and seconds.

A particle $P$ is travelling in a straight line through a fixed point $O$.
At time $t$ its acceleration, $a$, is given by $a = (2t-3)^2$, where $t \geqslant 0$.

When $t = 3$, $P$ has a velocity of 6.

**(a) (i)** Find an expression for the velocity, $v$, of $P$ at time $t$. [3]


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**(ii)** Find the time when $P$ is at rest. [3]


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When $t = \frac{5}{2}$, the displacement of $P$ from $O$ is 4.

**(iii)** Find the displacement of $P$ from $O$ when $t = 3$. [4]

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**(b)** Use calculus to find the approximate change in $v$ when $t$ increases from $\frac{5}{2}$ by the small amount 0.02. [3]

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**9 (a)**

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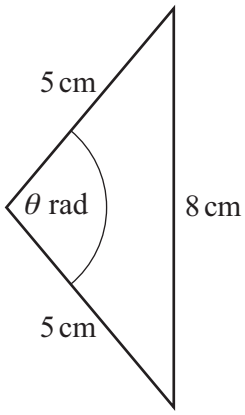
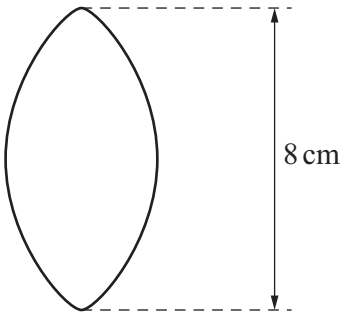



The diagram shows an isosceles triangle.

Find the value of $\theta$ in radians. [2]

**(b)**

View solution




This diagram shows a shape made of two arcs.
Each arc is part of a circle with radius 5 cm.
The height of the shape is 8 cm.

Use your answer to **part (a)** to find

**(i)** the perimeter of the shape [2]

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**(ii)** the area of the shape. [3]

View solution

View solution

**10** In this question $a$, $b$ and $n$ are constants.

When $5(2+ax)^n$ is written in ascending powers of $x$, the first three terms are $640+b^2x+30\,240x^2$.

Find the value of $a$ and the possible values of $b$. [5]

**11** A cylinder has radius $r$ cm and height $h$ cm.
The total surface area, including the two ends, is $A\,\text{cm}^2$.
The volume of the cylinder is $330\,\text{cm}^3$.

**(a)** Show that $A = 2\pi r^2 + \frac{660}{r}$. [3]

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**(b)** Given that $r$ can vary, find the value of $r$ that gives a stationary value for $A$ and show that this value is a minimum. [5]

View solution

**12** In this question, the $x$- and $y$-directions are east and north respectively. The units are metres and seconds.
Boat $A$ starts from the origin $O$ and moves with constant speed $5\sqrt{3}\,\text{ms}^{-1}$ on a bearing of 030°.
After 100 seconds boat $B$ starts from point $P$, which has position vector $\begin{pmatrix} 0 \\ 1000 \end{pmatrix}$.
Boat $B$ moves with constant speed $10\,\text{ms}^{-1}$ on a bearing of 060°.

**(a)** Find the velocity of each boat in vector form. [2]

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**(b)** Show that the two boats will collide. [5]

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**Question 13 is printed on the next page.**

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**13** Solve the equation $2\sin^3\theta = 3\sin\theta\cos\theta$ for $-\frac{\pi}{2} \leqslant \theta \leqslant \frac{\pi}{2}$. [6]

View solution

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