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Cambridge Assessment International Education

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CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

8958280038

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 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.

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

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

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

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$
$$a^2 = b^2 + c^2 - 2bc\cos A$$
$$\Delta = \frac{1}{2}ab\sin C$$

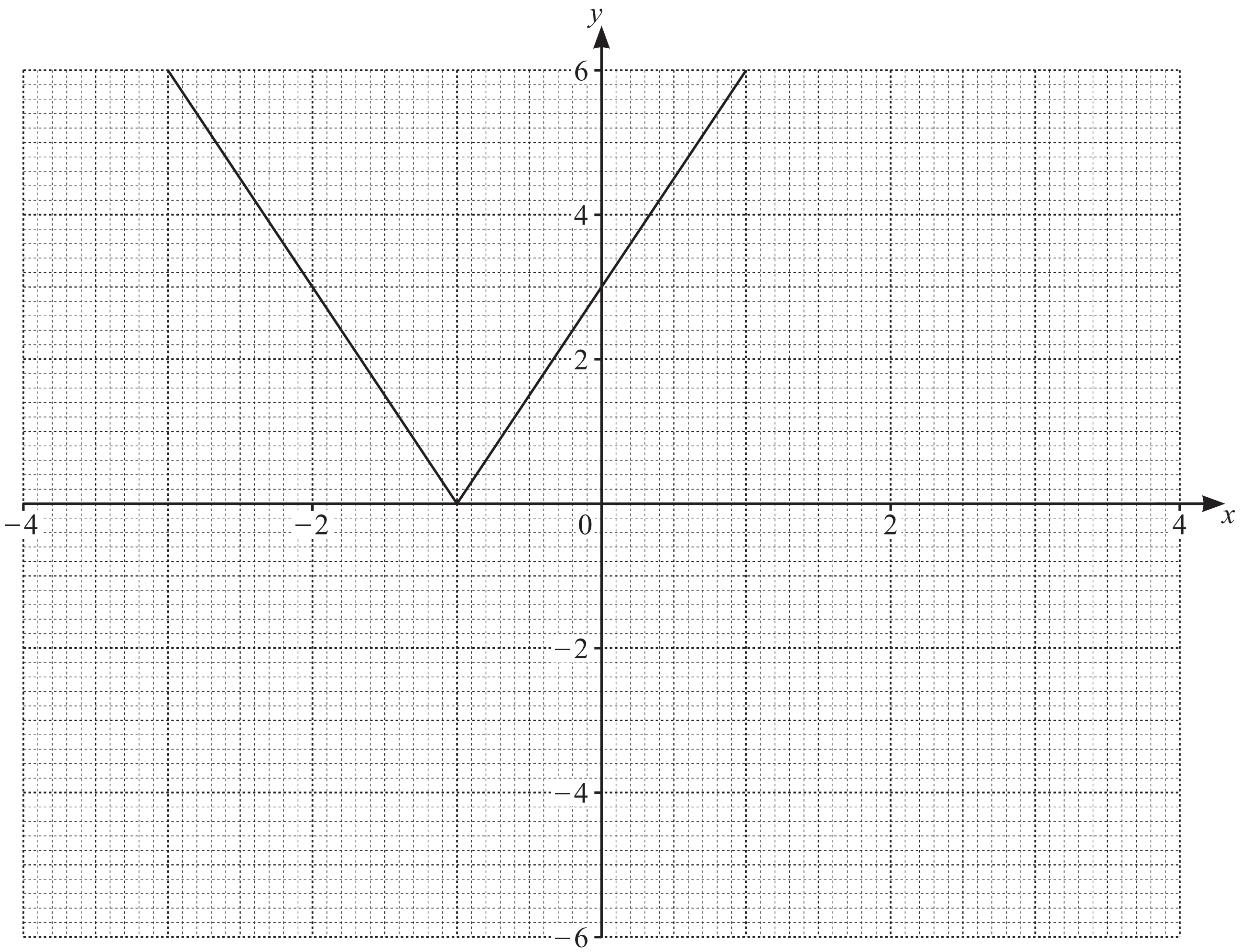
1 The polynomial p is such that $p(x) = x^3 + ax^2 + bx - 2$, where *a* and *b* are constants.

It is given that:

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

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

2



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

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

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]

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

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]

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

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

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]

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

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]

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

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

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]

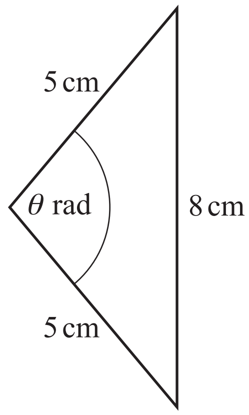
(ii) Find the time when P is at rest. [3]

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]

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

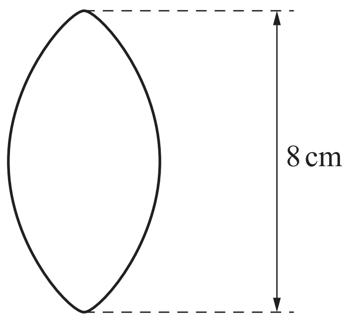
9 **(a)**



The diagram shows an isosceles triangle.

Find the value of θ in radians. [2]

(b)



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]

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

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 $A = 2\pi r^2 + \dfrac{660}{r}$. [3]

(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]

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]

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

Question 13 is printed on the next page.

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