* 0000800000001 *

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

* 0 3 4 5 3 5 1 9 8 4 *

ADDITIONAL MATHEMATICS **0606/12**

Paper 1 Non-calculator **February/March 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.

DC (CE/SG) 346699/1

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

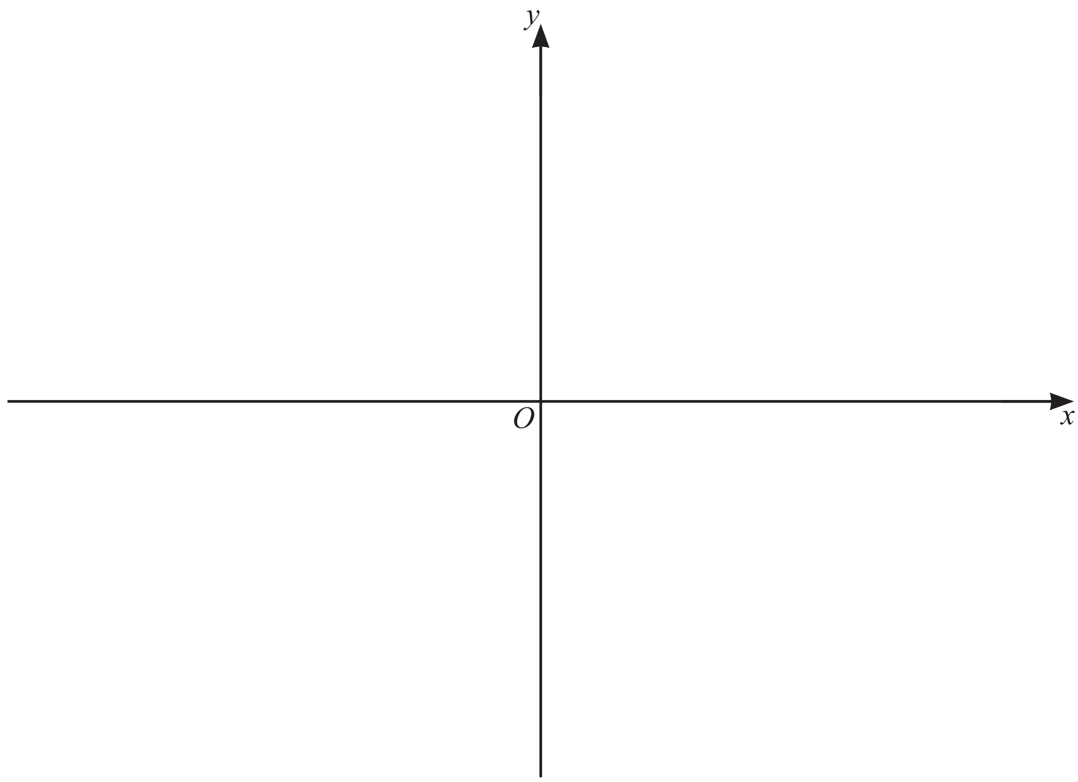
$$\sin^2 A+\cos^2 A=1$$
$$\sec^2 A=1+\tan^2 A$$
$$\operatorname{cosec}^2 A=1+\cot^2 A$$

Formulas for ΔABC

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

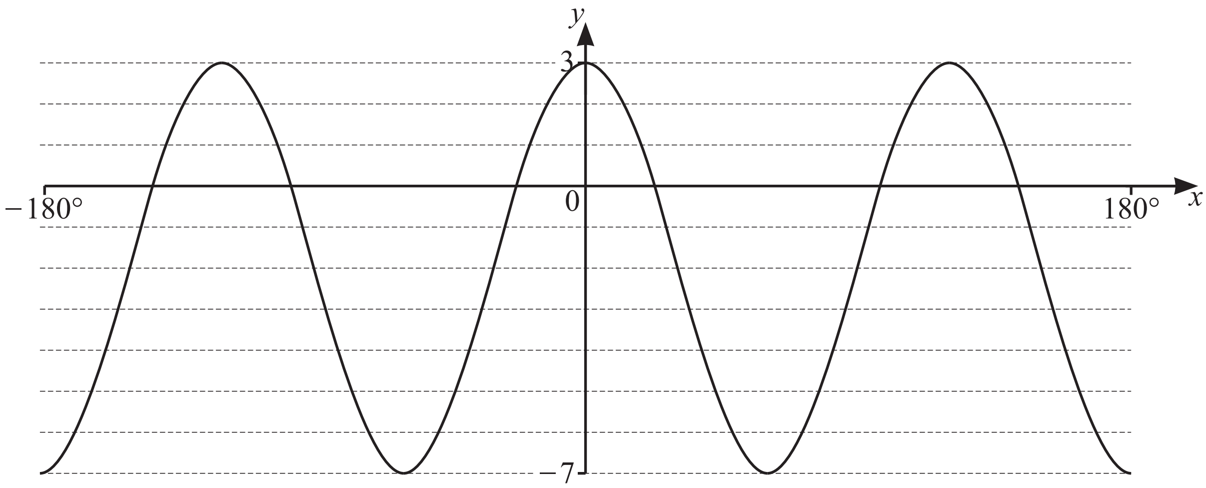
Calculators must **not** be used in this paper.

1 **(a)** On the axes, sketch the graphs of $y = 4|x-1|$ and $y = |3x+2|$, stating the intercepts with the axes. [3]



(b) Solve the inequality $4|x-1| \leqslant |3x+2|$. [4]

2



The diagram shows the curve $y = a\cos bx + c$ for $-180° \leqslant x \leqslant 180°$.
It is given that a, b and c are integers.

Find the values of a, b and c. [3]

3 The point A has coordinates $(-3, 6)$.
The point B has coordinates $(7, -8)$.

Given that the line AB is the diameter of a circle, find the equation of the circle. [4]

4 The polynomial p is given by $p(x) = a^2x^3 + 2ax^2 + ax + 2$, where a is a positive integer.
It is given that $2x + 1$ is a factor of $p(x)$.

(a) Find the value of a. [3]

(b) Hence factorise $p(x)$. [2]

(c) Hence show that the equation $p(x) = 0$ has only one real root. [1]

5 **(a)** Write $2x^2 - 2x + 3$ in the form $a(x+b)^2 + c$, where a, b and c are constants. [3]

It is given that $f(x) = 2x^2 - 2x + 3$, for $x \leqslant p$.

(b) Write down the greatest value of p for which f has an inverse. [1]

(c) Using this value of p, write down the range of f. [1]

(d) Using this value of p, find an expression for f^{-1}. [3]

6 It is given that $\tan\theta = \frac{\sqrt{5}}{5}$ and $180° < \theta < 360°$.

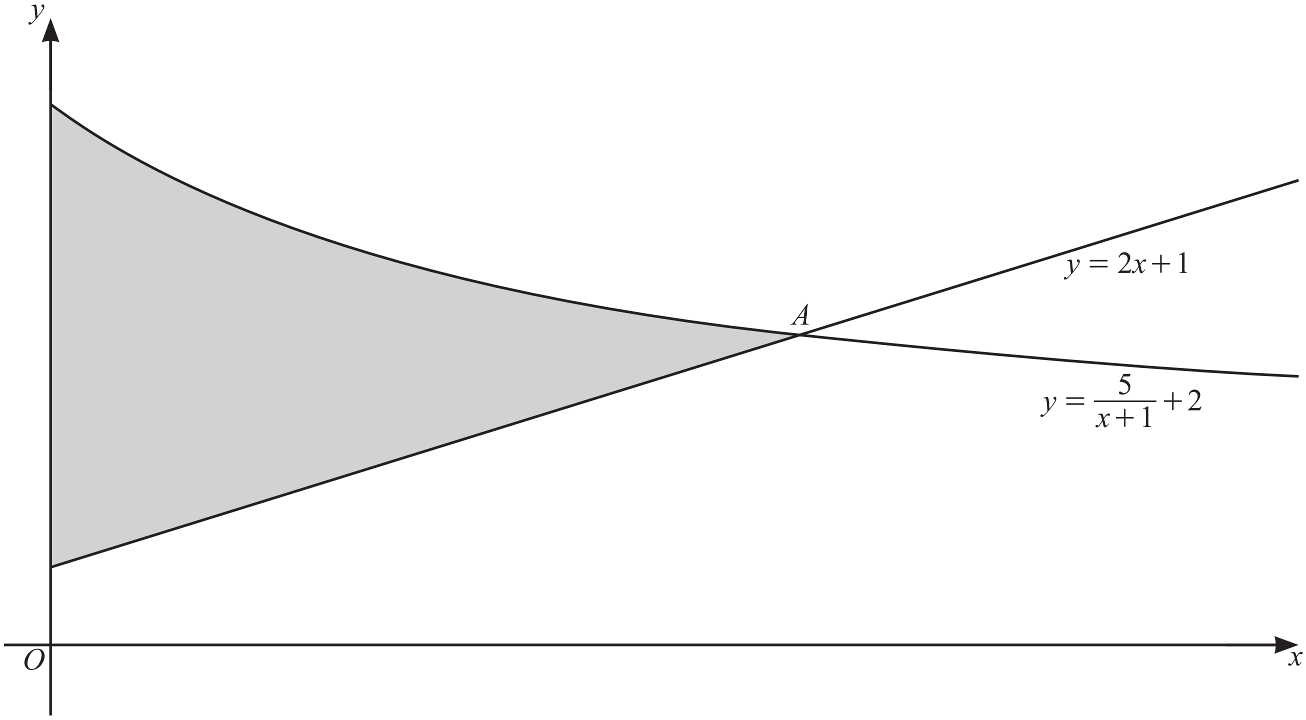
(a) Find the value of $\cos\theta$. [2]

(b) Find the value of $\sin\theta$. [1]

(c) Find the value of $\sec\theta + \cot\theta$.

Give your answer in the form $\frac{a+b\sqrt{c}}{\sqrt{5}}$, where a, b and c are integers. [2]

7



The diagram shows part of the curve $y = \frac{5}{x+1} + 2$ and part of the line $y = 2x + 1$ intersecting at the point A.

(a) Find the coordinates of A. [4]

(b) Find the exact area of the shaded region. [6]

8 The first term of a geometric progression is 10.
This geometric progression has a positive common ratio r.

The first term of an arithmetic progression is also 10.
This arithmetic progression has a negative common difference d.

The second term of the geometric progression is the same as the fourth term of the arithmetic progression.
The third term of the geometric progression is the same as the sixth term of the arithmetic progression.

(a) Find the values of r and d. [6]

(b) Determine whether the geometric progression has a sum to infinity. [1]

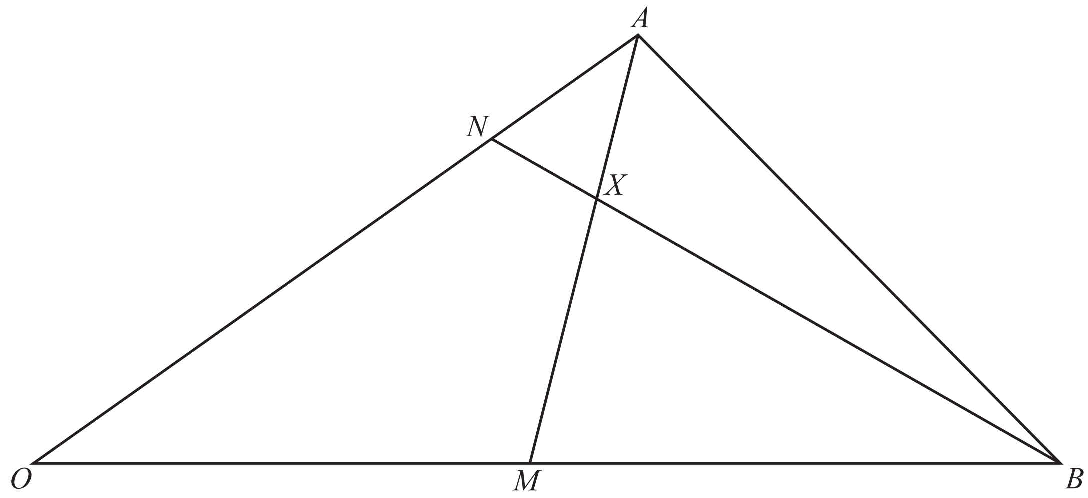
9 Solve the equation $\log_2(x+1) - 4\log_{(x+1)}2 = 3$. [5]

10 The point P lies on the curve $y=(5x+2)^{\frac{2}{3}}$.
The x-coordinate of P is 5.
The normal to the curve at P intersects the line $x+y=11$ at the point Q.
The point R is the reflection of Q in the tangent to the curve at P.

Find the coordinates of R. [9]

Continuation of working space for Question 10.

11



In the diagram, $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.
The point M is the midpoint of OB.
The point N is such that $\overrightarrow{ON} = 3\overrightarrow{NA}$.
The lines BN and AM intersect at the point X.
$\overrightarrow{BX} = \lambda\overrightarrow{BN}$, where λ is a constant.
$\overrightarrow{MX} = \mu\overrightarrow{MA}$, where μ is a constant.

(a) Find $\overrightarrow{OX}$ in terms of **a**, **b** and λ. [3]

(b) Find $\overrightarrow{OX}$ in terms of **a**, **b** and μ. [2]

(c) Hence find the values of λ and μ. [4]

Question 12 is printed on the next page.

12 It is given that $y = xe^{3x+2}$.

(a) Find $\frac{dy}{dx}$. [3]

(b) Hence find $\int xe^{3x+2}dx$. [4]