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Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

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ADDITIONAL MATHEMATICS **0606/22**

Paper 2 **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.
- 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

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

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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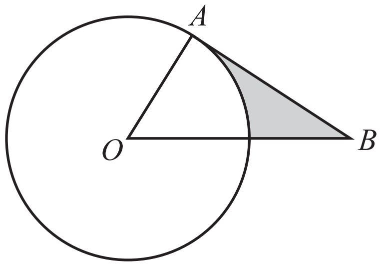

The diagram shows a circle with centre O and radius 5 cm.
The point A lies on the circle.
The point B is such that the line AB is a tangent to the circle.
OB has length 13 cm.

(a) Find angle AOB, giving your answer in radians. [2]

(b) Find the perimeter of the shaded region. [3]

(c) Find the area of the shaded region. [3]

2 **(a)** Find the x-coordinates of the stationary points on the curve $y=\frac{1}{2}(3-2x)(x+2)^2$. [4]

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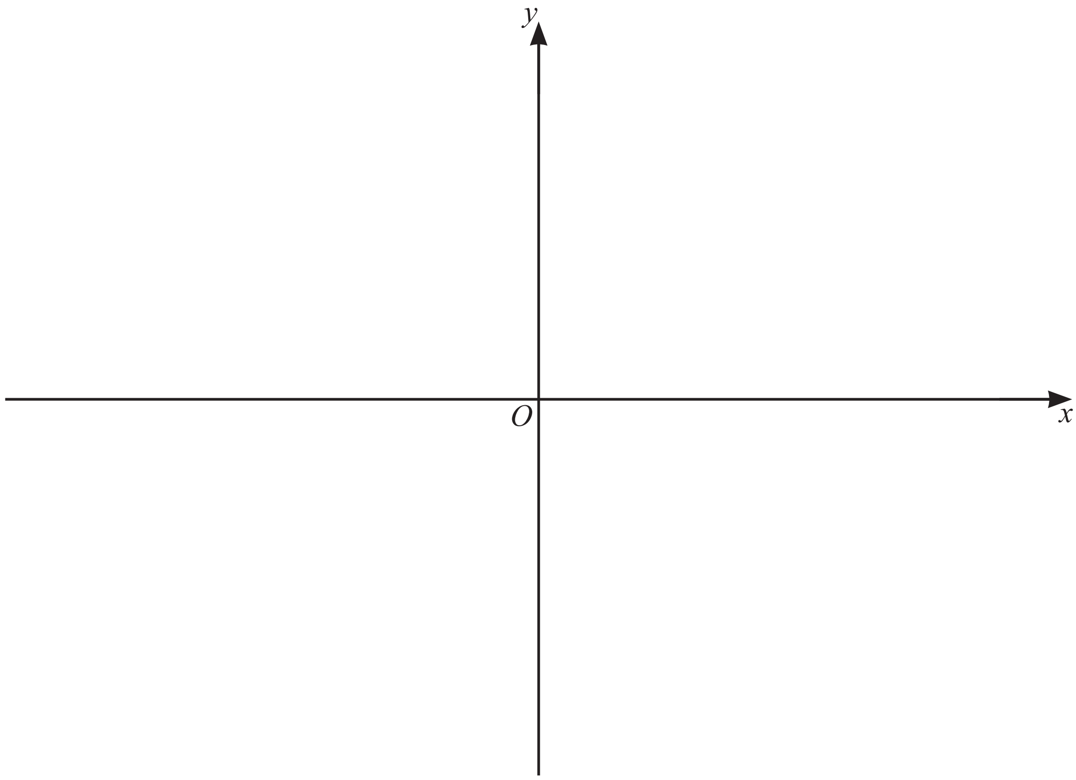
(b) On the axes, sketch the graph of $y = \frac{1}{2}(3-2x)(x+2)^2$ stating the intercepts with the coordinate axes. [3]



(c) Find the values of k for which the equation $\frac{1}{2}(3-2x)(x+2)^2 = k$ has three real and distinct roots. [2]

3 Solve the equation $6x^{\frac{3}{5}}+1=\dfrac{12}{x^{\frac{3}{5}}}$, giving your answers correct to 2 decimal places. [4]

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4 **(a)** A team of 10 players is to be chosen from 15 players.

(i) Find the number of different teams that can be chosen if there are no restrictions. [1]

The 15 players include 3 sisters who must **not** be separated.

(ii) Find the number of different teams that can be chosen. [3]

(b) A 6-digit number is to be formed using the digits 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9.
The 6-digit number cannot start with 0 and all six digits must be different.

Find how many 6-digit numbers can be formed if the 6-digit number is even. [3]

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5 When e^y is plotted against x^2, a straight-line graph with gradient -3 is obtained. The line passes through the point $(4.30, 5.85)$.

(a) Find y in terms of x. [4]

(b) Find the values of x for which y exists. [3]

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6 It is given that $y = \dfrac{\ln(2x^2+1)}{x+2}$.

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

(b) Given that x increases from 2 to $2+h$, where h is small, find the approximate change in y. [2]

(c) Given that y is decreasing by 0.4 units per second, find the corresponding rate of change in x when $x = 2$. [3]

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7 It is given that $f(x) = 2e^x + a$ for $x \geqslant 0$, where a is an integer

and $g(x) = \sqrt{x-1}$ for $x \geqslant 1$.

(a) Find the least value of a so that the function gf exists for all $x \geqslant 0$. [2]

(b) In the case where $a = 5$, solve the equation $gf(x) = 3$.
Give your answer correct to 3 decimal places. [3]

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8 **(a)** Show that $\dfrac{\sin\theta\tan^2\theta}{1+\tan^2\theta}$ can be written as $\sin^3\theta$. [2]

(b) Hence solve the equation $\dfrac{\sin 3x\tan^2 3x}{1+\tan^2 3x}=\dfrac{1}{8}$ for $-180° \leqslant x \leqslant 180°$. [5]

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9 In this question, all lengths are in metres and time is in seconds.

A particle, P, moves in a straight line such that t seconds after passing through a fixed point O its displacement, s, is given by $s = 5\ln(2t+1) - 5t$.

(a) Find the value of t for which P is instantaneously at rest. [4]

(b) Find the distance P travels between $t = 0$ and $t = 2$. [4]

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(c) Find an expression for the acceleration of P in terms of t. [2]

(d) Find the acceleration when $t = 4.5$. [1]

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10 The expansion of $(ax-2)^4\left(1+\frac{b}{x}\right)^3$ is written in descending powers of x.

The first 3 terms of this expansion are $81x^4+999x^3+cx^2$.
It is given that a, b and c are positive integers.

Find the values of a, b and c. [10]

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Continuation of working space for Question 10.

Question 11 is printed on the next page.

11 Solve the equation $\cot(y+1.5)=3$ where y is in radians and $0<y<6$. [4]

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