



Cambridge IGCSE™

CANDIDATE
NAME

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CENTRE
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ADDITIONAL MATHEMATICS

0606/13

Paper 1

October/November 2021

2 hours

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

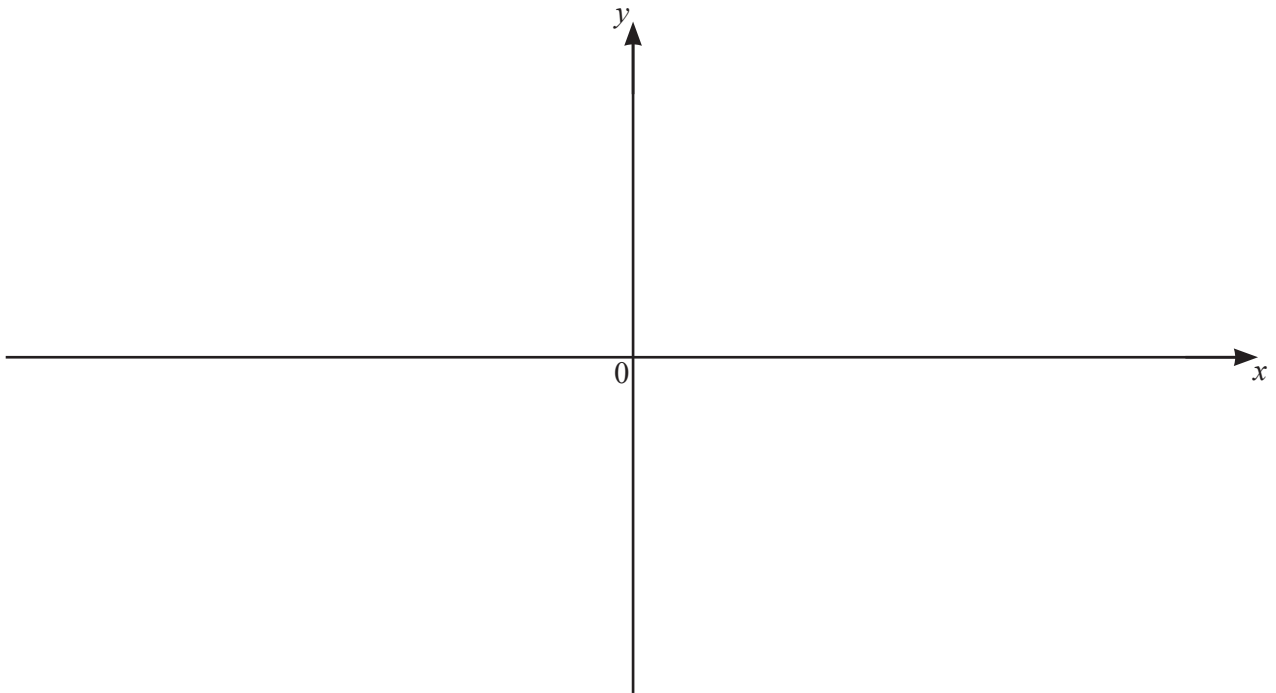
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You must show all necessary working clearly; no marks will be given for unsupported answers from a calculator.
- 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.

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. Any blank pages are indicated.

- 1 On the axes below, sketch the graph of $y = -\frac{1}{4}(2x+1)(x-3)(x+4)$ stating the intercepts with the coordinate axes. [3]



- 2 A particle moves in a straight line such that its velocity, $v \text{ ms}^{-1}$, at time t seconds after passing through a fixed point O , is given by $v = e^{3t} - 25$. Find the speed of the particle when $t = 1$. [2]

- 3 Solve the equation $\cot^2\left(2x - \frac{\pi}{3}\right) = \frac{1}{3}$, where x is in radians and $0 \leq x < \pi$. [5]



- 4 (a) Find the first three terms, in ascending powers of x^2 , in the expansion of $\left(\frac{1}{2} - \frac{2}{3}x^2\right)^8$. Write your coefficients as rational numbers. [3]

- (b) Find the coefficient of x^2 in the expansion of $\left(\frac{1}{2} - \frac{2}{3}x^2\right)^8 \left(2x + \frac{1}{x}\right)^2$. [3]

5 A geometric progression is such that its sum to 4 terms is 17 times its sum to 2 terms. It is given that the common ratio of this geometric progression is positive and not equal to 1.



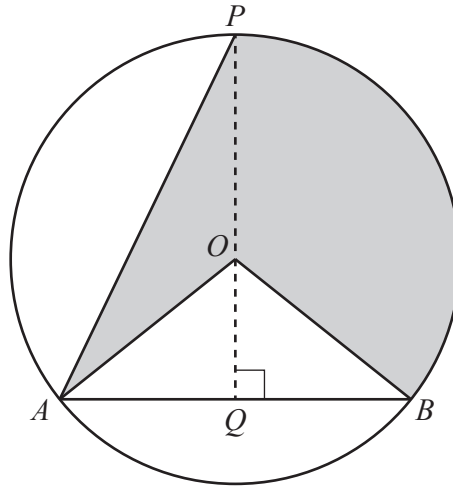
(a) Find the common ratio of this geometric progression. [3]

(b) Given that the 6th term of the geometric progression is 64, find the first term. [2]

(c) Explain why this geometric progression does not have a sum to infinity. [1]

- 6 (a) A 5-digit number is made using the digits 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. No digit may be used more than once in any 5-digit number. Find how many such 5-digit numbers are odd and greater than 70 000. [3]

- (b) The number of combinations of n objects taken 3 at a time is 2 times the number of combinations of n objects taken 2 at a time. Find the value of n . [4]

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The diagram shows a circle, centre O , radius 10 cm. The points A , B and P lie on the circumference of the circle. The chord AB is of length 14 cm. The point Q lies on AB and the line PQ is perpendicular to AB .

(a) Show that angle POA is 2.366 radians, correct to 3 decimal places. [2]

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

(c) Find the perimeter of the shaded region.

[5]

8 The curves $y = x^2 + x - 1$ and $2y = x^2 + 6x - 2$ intersect at the points A and B .



(a) Show that the mid-point of the line AB is $(2, 9)$.

[5]

The line l is the perpendicular bisector of AB .

(b) Show that the point $C(12, 7)$ lies on the line l .

[3]

- (c) The point D also lies on l , such that the distance of D from AB is two times the distance of C from AB . Find the coordinates of the two possible positions of D . [4]

9 When e^{2y} is plotted against x^2 , a straight line graph passing through the points (4, 7.96) and (2, 3.76) is obtained.



(a) Find y in terms of x .

[5]

(b) Find y when $x = 1$.

[2]

(c) Using your equation from **part (a)**, find the positive values of x for which the straight line exists.

[3]

- 10** A curve with equation $y = f(x)$ is such that $\frac{d^2y}{dx^2} = (2x + 3)^{-\frac{1}{2}} + 5$ for $x > 0$. The curve has gradient
7 10 at the point $\left(3, \frac{19}{2}\right)$.

(a) Show that, when $x = 11$, $\frac{dy}{dx} = 52$. [5]

(b) Find $f(x)$. [4]

11 A curve has equation $y = \frac{(x^2 - 5)^{\frac{1}{3}}}{x + 1}$ for $x > -1$.

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(a) Show that $\frac{dy}{dx} = \frac{Ax^2 + Bx + C}{3(x+1)^2(x^2-5)^{\frac{2}{3}}}$ where A , B and C are integers.

[6]

(b) Find the x -coordinate of the stationary point on the curve. [2]

(c) Explain how you could determine the nature of this stationary point. [2]
[You are not required to find the nature of this stationary point.]