

Cambridge International AS & A Level

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MATHEMATICS

9709/01

Paper 1 Pure Mathematics 1

For examination from 2020

SPECIMEN PAPER

1 hour 50 minutes

You must answer on the question paper.

You will need: List of formulae (MF19)

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.
- If additional space is needed, you should use the lined page at the end of this booklet; the question number or numbers must be clearly shown.
- 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 75.
- The number of marks for each question or part question is shown in brackets [].

This document has **22** pages. Blank pages are indicated.

BLANK PAGE

1 The following points

$$A(0, 1), \quad B(1, 6), \quad C(1.5, 7.75), \quad D(1.9, 8.79) \quad \text{and} \quad E(2, 9)$$

lie on the curve $y = f(x)$. The table below shows the gradients of the chords AE and BE .

Chord	AE	BE	CE	DE
Gradient of chord	4	3		

(a) Complete the table to show the gradients of CE and DE . [2]

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(b) State what the values in the table indicate about the value of $f'(2)$. [1]

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2 Functions f and g are defined by

$$f : x \mapsto 3x + 2, \quad x \in \mathbb{R},$$

$$g : x \mapsto 4x - 12, \quad x \in \mathbb{R}.$$

Solve the equation $f^{-1}(x) = gf(x)$.

[4]

[illegible]

- 3** An arithmetic progression has first term 7. The n th term is 84 and the $(3n)$ th term is 245.

Find the value of n .

[4]

[illegible]

- 4 A curve has equation $y = f(x)$. It is given that $f'(x) = \frac{1}{\sqrt{x+6}} + \frac{6}{x^2}$ and that $f(3) = 1$.

Find $f(x)$.

[5]

[illegible]

- 5 (a) The curve $y = x^2 + 3x + 4$ is translated by $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$.

Find and simplify the equation of the translated curve.

[2]

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- (b) The graph of $y = f(x)$ is transformed to the graph of $y = 3f(-x)$.

Describe fully the two single transformations which have been combined to give the resulting transformation.

[3]

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- 6 (a)** Find the coefficients of x^2 and x^3 in the expansion of $(2 - x)^6$. [3]

This image shows a full page of white paper with horizontal dashed lines, typical of primary school handwriting practice paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

This image shows a full page of a worksheet designed for handwriting practice. It consists of approximately 20 horizontal rows. Each row is defined by two parallel dashed lines, creating a series of uniform gaps for writing. The lines are evenly spaced across the entire page, providing a guide for letter height and placement. There is no text or other markings on the page.

- 7 (a) Show that the equation $1 + \sin x \tan x = 5 \cos x$ can be expressed as

$$6 \cos^2 x - \cos x - 1 = 0. \quad [3]$$

[illegible]

[Turn over

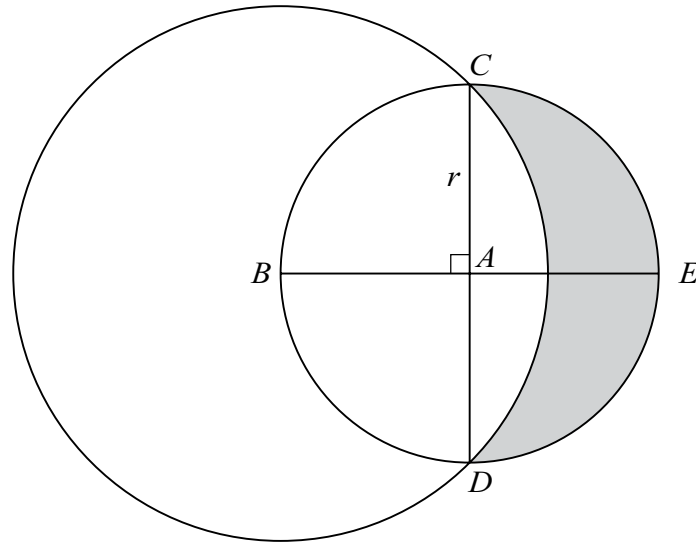
8 A curve has equation $y = \frac{12}{3-2x}$.

(a) Find $\frac{dy}{dx}$. [2]

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

A point moves along this curve. As the point passes through A , the x -coordinate is increasing at a rate of 0.15 units per second and the y -coordinate is increasing at a rate of 0.4 units per second.

(b) Find the possible x -coordinates of A . [4]



The diagram shows a circle with centre A and radius r . Diameters CAD and BAE are perpendicular to each other. A larger circle has centre B and passes through C and D .

- (a) Show that the radius of the larger circle is $r\sqrt{2}$. [1]

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- (b) Find the area of the shaded region in terms of r . [6]

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- 10** The circle $x^2 + y^2 + 4x - 2y - 20 = 0$ has centre C and passes through points A and B .

(a) State the coordinates of C .

[1]

[illegible]

It is given that the midpoint, D , of AB has coordinates $(1\frac{1}{2}, 1\frac{1}{2})$.

(b) Find the equation of AB , giving your answer in the form $y = mx + c$.

[4]

[illegible]

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- (c) Find, by calculation, the x -coordinates of A and B . [3]

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11 The function f is defined, for $x \in \mathbb{R}$, by $f: x \mapsto x^2 + ax + b$, where a and b are constants.

(a) It is given that $a = 6$ and $b = -8$.

Find the range of f .

[3]

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(b) It is given instead that $a = 5$ and that the roots of the equation $f(x) = 0$ are k and $-2k$, where k is a constant.

Find the values of b and k .

[3]

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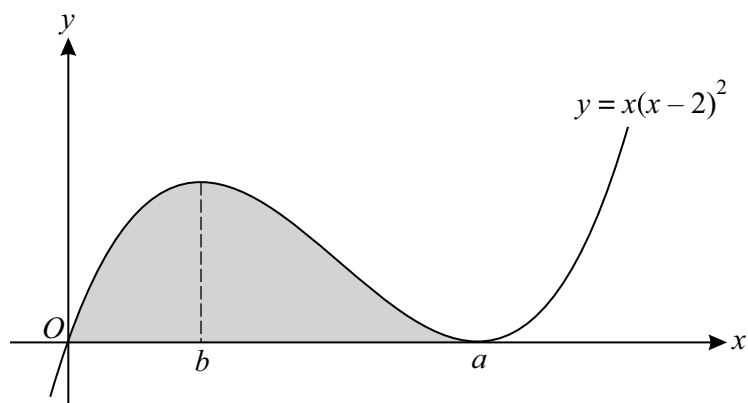
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- [illegible]



(a) State the value of a . [1]

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(b) Calculate the value of b . [4]

[illegible]

- (c) Find the area of the shaded region. [4]

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- (d) The gradient, $\frac{dy}{dx}$, of the curve has a minimum value m .

Calculate the value of m . [4]

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