

## Cambridge International AS & A Level

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		

MATHEMATICS 9709/21

Paper 2 Pure Mathematics 2

October/November 2023

1 hour 15 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 50.
- The number of marks for each question or part question is shown in brackets [].

This document has 12 pages.

Find the exact value of $\sin(\theta + 60^{\circ})$ .	[3]

Find the gradient of the curve at the point for which $x = \frac{1}{3}\pi$ .	[5

	Find $\int_{4}^{10} \frac{4}{2x-5} dx$ , giving your answer in the form $\ln a$ , where $a$ is an integral $a$ .	
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) ]	Find the exact value of $\int_4^{10} e^{2x-5} dx$ .	
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[2]

(a) Sketch, on the same diagram, the graphs of y = |3x - 5| and y = 2x + 7.

<b>(b)</b>	Solve the equation $ 3x - 5  = 2x + 7$ .	[3
(c)	Hence solve the equation $ 3^{y+1} - 5  = 2 \times 3^y + 7$ , giving your answ figures.	ver correct to 3 significan

5	The	polyn	omial	p(x)	is	defined	by
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$$p(x) = 6x^3 + ax^2 + bx - 20,$$

where a and b are constants. It is given that (x + 2) is a factor of p(x) and that the remainder is -11 when p(x) is divided by (x + 1).

	Find the values of $a$ and $b$ .	
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(a)	Show that $\csc \theta (3 \sin 2\theta + 4 \sin^3 \theta) = 4 + 6 \cos \theta - 4 \cos^2 \theta$ .	[
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(b)	Solve the equation	
( <b>D</b> )	$\csc \theta (3\sin 2\theta + 4\sin^3 \theta) + 3 = 0$	
	for $-\pi < \theta < 0$ .	[
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(c)	Find $\int \csc \theta (3\sin 2\theta + 4\sin^3 \theta) d\theta$ . [3]

)	Find the exact value of $p$ .	
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<b>(b)</b>	Show that $q = \sqrt[3]{2 + 18 \ln 3 - q}$ . [2]
(c)	Show by calculation that the value of $q$ lies between 2.5 and 3.0. [2]
(d)	Use an iterative formula, based on the equation in (b), to find the value of $q$ correct to 4 significant figures. Give the result of each iteration to 6 significant figures. [3]

## **Additional Page**

If you use the following lined page to complete the answer(s) to any question(s), the question number(s) must be clearly shown.

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