

## Cambridge International AS & A Level

CANDIDATE NAME						
CENTRE NUMBER				CANDIDATE NUMBER		

MATHEMATICS 9709/22

Paper 2 Pure Mathematics 2

February/March 2020

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. Blank pages are indicated.

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[Turn over

Solve the equation $2\sin(\theta + 30^\circ) + 5\cos\theta = 2\sin\theta$ for $0^\circ < \theta < 90^\circ$ .	
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Find the quotient when $4x^3 + 17x^2 + 9x$ is divided by $x^2 + 5x + 6$ , and show that is 18.	the remainder [3]
	•••••
	•••••
	••••••
Hence solve the equation $4x^3 + 17x^2 + 9x - 18 = 0$ .	[3]
	is 18.

3	It is given that $\int_{a}^{3a} \frac{2}{2x - 5} dx = \ln \frac{7}{2}.$
	Find the value of the positive constant $a$ . [6]

<b>4</b> A curve has equalic	4	curve has eq	uation
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$3x^2 - y^2 - 4\ln(2y + 3) = 26.$	
Find the equation of the tangent to the curve at the point $(3, -1)$ .	[6]
	•••••

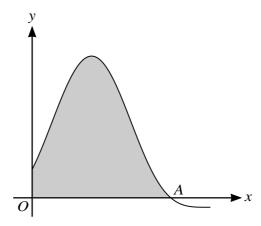
(a)	Sketch, on the same diagram, the graphs of $y =  x + 2k $ and $y =  2x - 3k $ , where k is a postconstant.	itive
	Give, in terms of $k$ , the coordinates of the points where each graph meets the axes.	[3]
<b>(1)</b>		F 4 7
<b>(b)</b>	Find, in terms of $k$ , the coordinates of each of the two points where the graphs intersect.	[4]
		•••••
		•••••

(c)	Find, in terms of $k$ , the largest value of $t$ satisfying the inequality
	$ 2^{t} + 2k  \ge  2^{t+1} - 3k .$ [2]

)	Show that the <i>x</i> -coordinate of <i>P</i> satisfies the equation $x = \sqrt{\frac{75e^{-0.2x}}{15 + x}}$ .

<b>(b)</b>	Use the equation in part (a) to show by calculation that the $x$ -coordinate of $P$ lies between 1.7 and 1.8. [2]
(c)	Use an iterative formula, based on the equation in part (a), to find the <i>x</i> -coordinate of <i>P</i> correct to 4 significant figures. Give the result of each iteration to 6 significant figures. [3]

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The diagram shows part of the curve with equation

$$y = 4\sin^2 x + 8\sin x + 3,$$

where x is measured in radians. The curve crosses the x-axis at the point A and the shaded region is bounded by the curve and the lines x = 0 and y = 0.

(a)	Find the exact $x$ -coordinate of $A$ .	[2]
<b>(b)</b>	Find the exact gradient of the curve at A.	[3]

(c)	Find the exact area of the shaded region. [5]

## **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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