

## Cambridge International AS & A Level

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		

MATHEMATICS 9709/12

Paper 1 Pure Mathematics 1

October/November 2023

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 [ ].

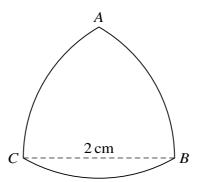
This document has 20 pages.

Find the value of the	constant a.		[4

	$\frac{1}{6}\pi$ +	$\tan^{-1}(4x) = -\cot^{-1}(4x)$	$s^{-1}(\frac{1}{2}\sqrt{3}).$		[2]
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(a)	Find the equation of the normal to the curve at $P$ .	[2]
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<b>(b)</b>	Find the equation of the curve.	[4]

3



The diagram shows the shape of a coin. The three arcs AB, BC and CA are parts of circles with centres C, A and B respectively. ABC is an equilateral triangle with sides of length 2 cm.

(a)	Find the perimeter of the coin.	[2]
		•••••
		•••••
<b>(b)</b>	Find the area of the face <i>ABC</i> of the coin, giving the answer in terms of $\pi$ and $\sqrt{3}$ .	[4]

(a)	Find the value of $\theta$ .	

b	e answ
the form $\frac{b}{\sqrt{c}-1}$ , where b and c are integers to be found.	
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The equation of a curve is $y = x^2 - 8x + 5$ .						
Find the coordinates of the minimum point of the curve.						
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every is stratched by a factor of 2 normalist to the very and then translated by $\begin{pmatrix} 4 \end{pmatrix}$						
curve is stretched by a factor of 2 parallel to the y-axis and then translated by $\binom{4}{1}$ . Find the coordinates of the minimum point of the transformed curve.						
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Find the equation of the transformed curve. Give the answer in the fora, $b$ and $c$ are integers to be found.	[-

7	(a)	Verify the identity $(2x-1)(4x^2+2x-1) \equiv 8x^3-4x+1$ . [1]
	(b)	Prove the identity $\frac{\tan^2 \theta + 1}{\tan^2 \theta - 1} = \frac{1}{1 - 2\cos^2 \theta}$ . [3]

$\frac{\tan^2\theta + 1}{\tan^2\theta - 1} = 4\cos\theta,$					
	for $0^{\circ} \le \theta \le 180^{\circ}$ .				
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**8** Functions f and g are defined by

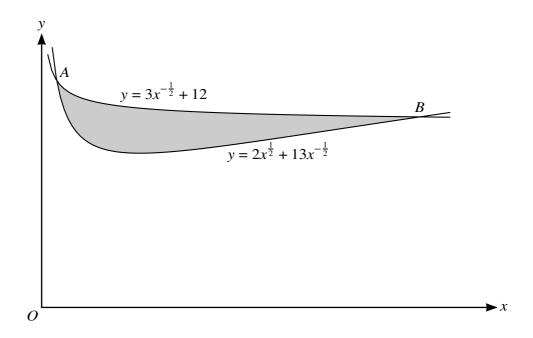
$$f(x) = (x+a)^2 - a \text{ for } x \le -a,$$
  
$$g(x) = 2x - 1 \text{ for } x \in \mathbb{R},$$

where a is a positive constant.

F1nc	d an expression for $f^{-1}(x)$ .	[3
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<b>(;</b> )	State the demain of the function f <sup>-1</sup>	F1
(1)	State the domain of the function $f^{-1}$ .	[1
(ii)	State the range of the function $f^{-1}$ .	[1

)	Given that $a = \frac{7}{2}$ , solve the equation $gf(x) = 0$ .	[3]
		••••••
		••••••

9



The diagram shows curves with equations  $y = 2x^{\frac{1}{2}} + 13x^{-\frac{1}{2}}$  and  $y = 3x^{-\frac{1}{2}} + 12$ . The curves intersect at points A and B.

Find the coordinates of $A$ and $B$ .	[4]

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10	The	equation of a curve is $y = f(x)$ , where $f(x) = (4x - 3)^{\frac{5}{3}} - \frac{20}{3}x$ .
	(a)	Find the <i>x</i> -coordinates of the stationary points of the curve and determine their nature. [6]

State the set of values for which the function f is increasing.	••••••					
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11

1)	Given that $p < 10$ , find the value of $p$ .	[4

A circle passes through the points A, B and C.

Find the equation of the circle.	[3]
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Find the equation of the tangent to the circle at $C$ , giving the answer in the form $dx + ey + y$ where $d$ , $e$ and $f$ are integers.	c = 0, [3]
	[3]
where $d$ , $e$ and $f$ are integers.	[3]
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## **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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