Cambridge International AS & A Level

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		

MATHEMATICS 9709/11

Paper 1 Pure Mathematics 1

May/June 2022

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.

Express $x^2 - 8x + 11$ in the form $(x + p)^2 + q$ where p and q are constants.	
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Hence find the exact solutions of the equation $x^2 - 8x + 11 = 1$	
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Find the sum of the first 50 terms of the progression.	[.
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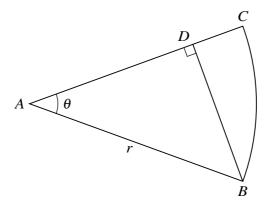
3	The	e coefficient of x^4 in the expansion of $\left(2x^2 + \frac{k^2}{x}\right)^5$ is a. The coefficient of x^2 in the expansion of						
	$(2kx-1)^4 \text{ is } b.$							
	(a)	Find a and b in terms of the constant k . [3]						

)	Given that $a + b = 216$, find the possible values of k .	[3]		

	Prove the identity $\frac{\sin^3 \theta}{\sin \theta - 1} - \frac{\sin^2 \theta}{1 + \sin \theta} = -\tan^2 \theta (1 + \sin^2 \theta).$
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(b)	Hence solve the equation
	$\frac{\sin^3 \theta}{\sin \theta - 1} - \frac{\sin^2 \theta}{1 + \sin \theta} = \tan^2 \theta (1 - \sin^2 \theta)$
	$\frac{1}{\sin \theta - 1} - \frac{1}{1 + \sin \theta} = \tan^{2} \theta (1 - \sin^{2} \theta)$
	for $0 < \theta < 2\pi$.

5



The diagram shows a sector ABC of a circle with centre A and radius r. The line BD is perpendicular to AC. Angle CAB is θ radians.

(a)	Given that $\theta = \frac{1}{6}\pi$, find the exact area of <i>BCD</i> in terms of <i>r</i> . [3]

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6	The function	f is defined	as follows

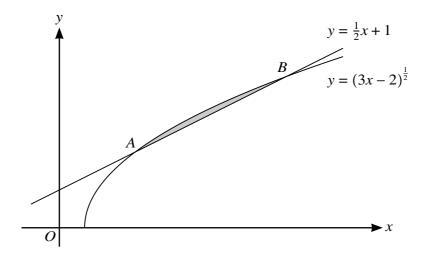
rs:

$$f(x) = \frac{x^2 - 4}{x^2 + 4}$$
 for $x > 2$.

(a)	Find an expression for $f^{-1}(x)$.	[3]

(b)	Show that 1 –	$\frac{8}{x^2 + 4}$ can be	expressed as	$\frac{x^2 - 4}{x^2 + 4}$ and	hence state the	e range of f.	[4]
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(c)	Explain why the	he composite f	function ff ca	nnot be forr	med.		[1]
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7



The diagram shows the curve with equation $y = (3x - 2)^{\frac{1}{2}}$ and the line $y = \frac{1}{2}x + 1$. The curve and the line intersect at points A and B.

Find the coordinates of A and B .	[4]

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a)	The curve $y = \sin x$ is transformed to the curve $y = 4\sin(\frac{1}{2}x - 30^\circ)$.
	Describe fully a sequence of transformations that have been combined, making clear the order in which the transformations are applied. [5]

Find the exact solutions of the equation $4\sin(\frac{1}{2}x - 30^\circ) = 2\sqrt{2}$ for $0^\circ \le x \le 360^\circ$.

(a)	Find the coordinates of the centre of the circle and the radius. Hence find the coordinates of the lowest point on the circle.

circle at t	wo distinct po	oints.						
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10	The	equation of a curve is such that $\frac{d^2y}{dx^2} = 6x^2 - \frac{4}{x^3}$. The curve has a stationary point at $\left(-1, \frac{9}{2}\right)$.
	(a)	Determine the nature of the stationary point at $\left(-1, \frac{9}{2}\right)$. [1]
	(b)	Find the equation of the curve. [5]

~	Show that the curve has no other stationary points.	
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	A point A is moving along the curve and the y -coordinate of A is increasing at a rate oper second.	f 5 u
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