

Cambridge International AS & A Level

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		

MATHEMATICS 9709/13

Paper 1 Pure Mathematics 1

October/November 2020

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 [].

(a)	Express $x^2 + 6x + 5$ in the form $(x + a)^2 + b$, where a and b are constants.	
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(b)	The curve with equation $y = x^2$ is transformed to the curve with equation $y = x^2$	+6x+5.
(b)	The curve with equation $y = x^2$ is transformed to the curve with equation $y = x^2$ Describe fully the transformation(s) involved.	+ 6 <i>x</i> + 5.
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2

The	e function f is defined by $f(x) = \frac{2}{(x+2)^2}$ for $x > -2$.	
(a)	Find $\int_{1}^{\infty} f(x) dx$.	[3]
(b)	The equation of a curve is such that $\frac{dy}{dx} = f(x)$. It is given that the point curve.	(-1, -1) lies on the
	Find the equation of the curve.	[2]

Solve the equation $3 \tan^2 \theta + 1 = \frac{2}{\tan^2 \theta}$ for $0^\circ < \theta < 180^\circ$.	[5]

3

A curve has equation $y = 3x^2 - 4x + 4$ and a straight line has equation $y = mx + m - 1$, where m is a constant.							
Find the set of values of m for which the curve and the line have two distinct points of intersection. [5]							

5

In the expansion of $(a + bx)^7$, where a and b are non-zero constants, the coefficients of x, x^2 and x^4

Find the value of	$f(\frac{a}{b})$.			
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The	e function f is defined by $f(x) = \frac{2x}{3x-1}$ for $x > \frac{1}{3}$.	
(a)	Find an expression for $f^{-1}(x)$.	[3]
(b)	$\frac{2}{x}$	
(6)	Show that $\frac{2}{3} + \frac{2}{3(3x-1)}$ can be expressed as $\frac{2x}{3x-1}$.	[2]
(6)	Show that $\frac{1}{3} + \frac{1}{3(3x-1)}$ can be expressed as $\frac{1}{3x-1}$.	[2]
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(1)	Show that $\frac{1}{3} + \frac{1}{3(3x-1)}$ can be expressed as $\frac{1}{3x-1}$.	[2]
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	Show that $\frac{1}{3} + \frac{1}{3(3x-1)}$ can be expressed as $\frac{1}{3x-1}$. State the range of f.	

The first and second terms of an arithmetic progression are $\frac{1}{\cos^2 \theta}$ and $-\frac{\tan^2 \theta}{\cos^2 \theta}$, respectively, where

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	$\theta < \frac{1}{2}\pi$. Show that the common difference is $-\frac{1}{\cos^4 \theta}$.			[4]
(a)	Show that the common difference is $-\frac{1}{\cos^4 \theta}$.			[+]
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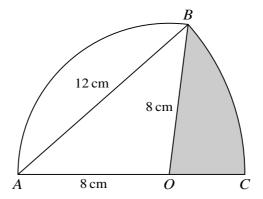
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[3]

8	The equation of a curve is $y = 2x + 1 + 1$	$\frac{1}{2x+1}$	for $x > -\frac{1}{2}$
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2x + 1	

•	$\frac{\mathrm{d}y}{\mathrm{d}x}$ and $\frac{\mathrm{d}^2}{\mathrm{d}x}$. <u></u>								
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In the diagram, arc AB is part of a circle with centre O and radius 8 cm. Arc BC is part of a circle with centre A and radius 12 cm, where AOC is a straight line.

(a)	Find angle <i>BAO</i> in radians.	[2]

b)	Find the area of the shaded region.	[4]
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c)	Find the perimeter of the shaded region.	[3]
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	14							
10	A cı	arve has equation $y = \frac{1}{k}x^{\frac{1}{2}} + x^{-\frac{1}{2}} + \frac{1}{k^2}$ where $x > 0$ and k is a positive constant.						
	(a)	It is given that when $x = \frac{1}{4}$, the gradient of the curve is 3.						
		Find the value of k .	[4]					
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(b)	It is given instead that $\int_{\frac{1}{4}k^2}^{k^2} \left(\frac{1}{k} x^{\frac{1}{2}} + x^{-\frac{1}{2}} + \frac{1}{k^2} \right) dx = \frac{13}{12}.$
	Find the value of k . [5]

	A circle with centre C has equation $(x-8)^2 + (y-4)^2 = 100$.						
(a)	Show that the point $T(-6, 6)$ is outside the circle.	[3					
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	Show that the angle between one of the tangents and CT is exactly 45° .	[2					
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The two tangents touch the circle at A and B.

)	Find the equation of the line AB, giving your answer in the form $y = mx + c$.	[4]
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)	Find the x -coordinates of A and B .	[3]
)		
)		[3]
)	Find the <i>x</i> -coordinates of <i>A</i> and <i>B</i> .	[3]
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))	Find the <i>x</i> -coordinates of <i>A</i> and <i>B</i> .	[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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