

Cambridge International AS & A Level

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		

MATHEMATICS 9709/13

Paper 1 Pure Mathematics 1

October/November 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 [].

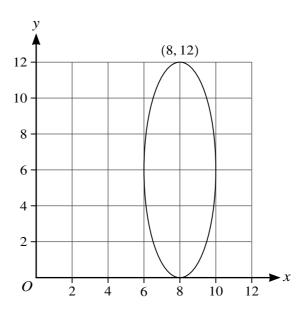
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(a)	Express $f(x)$ in the form $-2(x+a)^2 + b$, where a and b are integers.	[2]
(1)		ra:
(b)	Find the range of f.	[1]
(c)	Find an expression for $f^{-1}(x)$.	[3]
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3	(a)	Find the first three terms in ascending powers of x of the expansion of $(1 + 2x)^5$.	[2]
			•••••
	(b)	Find the first three terms in ascending powers of x of the expansion of $(1 - 3x)^4$.	[2]
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	(c)	Hence find the coefficient of x^2 in the expansion of $(1 + 2x)^5(1 - 3x)^4$.	[2]
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Find the rate of cm per minute	of increase of .	the depth of	of the wate	r when the	depth is 4	m, giving	your ans	swer i [5
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5



The diagram shows a curve which has a maximum point at (8, 12) and a minimum point at (8, 0). The curve is the result of applying a combination of two transformations to a circle. The first transformation applied is a translation of $\begin{pmatrix} 7 \\ -3 \end{pmatrix}$. The second transformation applied is a stretch in the y-direction.

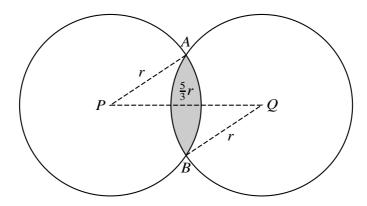
(a)	State the scale factor of the stretch.	[1]
(b)	State the radius of the original circle.	[1]
(c)	State the coordinates of the centre of the circle after the translation has been completed the stretch is applied.	but before [2]
(d)	State the coordinates of the centre of the original circle.	[2]

6	It is given that $\alpha = \cos^{-1}(\frac{8}{17})$.
	Find, without using the trigonometric functions on your calculator, the exact value of $\frac{1}{\sin \alpha} + \frac{1}{\tan \alpha}$. [5]

7	The second of $f(x)$ is seen in the $f'(x)$	-3
/	The curve $y = I(x)$ is such that $I(x) =$	
	The curve $y = f(x)$ is such that $f'(x) =$	$(x+2)^4$

(a)	The tangent at a point on the curve where $x = a$ has gradient $-\frac{16}{27}$.	
	Find the possible values of a .	[4]
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)	Find $f(x)$ given that the curve passes through the point $(-1, 5)$.	[3]
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The diagram shows two identical circles intersecting at points A and B and with centres at P and Q. The radius of each circle is r and the distance PQ is $\frac{5}{3}r$.

(a)	Find the perimeter of the shaded region in terms of r .	[4]

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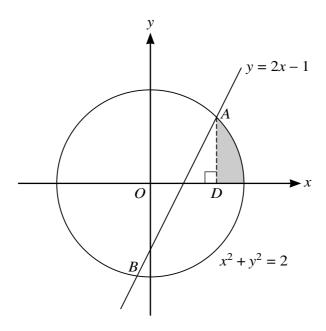
I	Find the sum to infinity of the progression.	
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The second term of the geometric progression is equal to the second term of an arithmetic progression.

The	third term of the geometric progression is equal to the fifth term of the same arithmetic progression	n.
(b)	Find the sum of the first 21 terms of the arithmetic progression.	[6]
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10

(a)



The diagram shows the circle $x^2 + y^2 = 2$ and the straight line y = 2x - 1 intersecting at the points A and B. The point D on the x-axis is such that AD is perpendicular to the x-axis.

Find the coordinates of A .	[4]

Find the volume of revolution when the shaded region is rotated through 360° above your answer in the form $\frac{\pi}{a}(b\sqrt{c}-d)$, where a, b, c and d are integers.		
Give your unswer in the re	$\frac{1}{a}(a,b,c)$ and $\frac{1}{a}(a,b,c)$ and $\frac{1}{a}(a,b,c)$	
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Find an exact expression	for the perimeter of the shaded region.	
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(a)	Given that AC and BC are equal in length, find the value	ue of the fraction p .	
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(b)	It is now given instead that AC is perpendicular to BC at (i) Find the value of p .	and that p is an integer.	
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(b)		and that p is an integer.	
(b)			
(b)	(i) Find the value of p.		
(b)	(i) Find the value of p.		
(b)	(i) Find the value of p.		
(b)	(i) Find the value of p.		

(ii)	Find the equation of the circle which passes through A, B and C, giving your answer in the form $x^2 + y^2 + ax + by + c = 0$, where a, b and c are constants. [4]

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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