

Cambridge International AS & A Level

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	
MATHEMATIC	 S		9709/12
Paper 1 Pure M	athematics 1		May/June 2020
			1 hour 50 minutes
You must answe	er on the question paper.		

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.

You will need: List of formulae (MF19)

- 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 16 pages. Blank pages are indicated.

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[Turn over

1	(a)	Find the coefficient of x^2 in the expansion of $\left(x - \frac{2}{x}\right)^6$.	2]
			•••
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			•••
	(b)	Find the coefficient of x^2 in the expansion of $(2+3x^2)\left(x-\frac{2}{x}\right)^6$.	3]
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2	(a)	Express the equation $3 \cos \theta = 8 \tan \theta$ as a quadratic equation in $\sin \theta$.	3]
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	(b)	Hence find the acute angle, in degrees, for which $3\cos\theta = 8\tan\theta$.	2]
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3

A weather balloon in the shape of a sphere is being inflated by a pump. The volume of the balloon is

(a)	Find the radius of the balloon after 30 seconds.	[
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(b)	Find the rate of increase of the radius after 30 seconds.	
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The <i>n</i> th term of an arithmetic progression is $\frac{1}{2}(3n-15)$.	
Find the value of n for which the sum of the first n terms is 84.	5]
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5	The function	on f is	defined	for x	$\in \mathbb{R}$ by

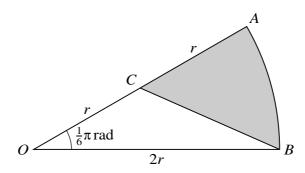
 $f: x \mapsto a - 2x$,

where a is a constant.

Express $ff(x)$ and $f^{-1}(x)$	in terms of a and x .	[4
Given that $ff(x) = f^{-1}(x)$,	find x in terms of a .	[2

a)	Given that the line $y = 2x + 3$ is a tangent to the curve, find the value of k .	[3]
is	now given that $k = 2$.	
	now given that $k = 2$. Express the equation of the curve in the form $y = 2(x + a)^2 + b$, where a and b are hence state the coordinates of the vertex of the curve.	
	Express the equation of the curve in the form $y = 2(x + a)^2 + b$, where a and b are	
	Express the equation of the curve in the form $y = 2(x + a)^2 + b$, where a and b are	
	Express the equation of the curve in the form $y = 2(x + a)^2 + b$, where a and b are	constants, and
	Express the equation of the curve in the form $y = 2(x + a)^2 + b$, where a and b are	
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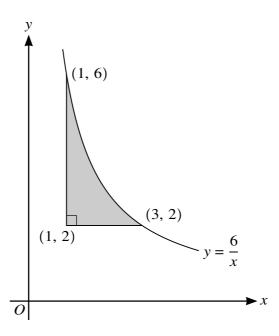


In the diagram, OAB is a sector of a circle with centre O and radius 2r, and angle $AOB = \frac{1}{6}\pi$ radians. The point C is the midpoint of OA.

(a)	Show that the exact length of BC is $r\sqrt{5-2\sqrt{3}}$.	[2]

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8



The diagram shows part of the curve $y = \frac{6}{x}$. The points (1, 6) and (3, 2) lie on the curve. The shaded region is bounded by the curve and the lines y = 2 and x = 1.

Find the volume generated when the shaded region is rotated through 360° about the y-axis . [5]

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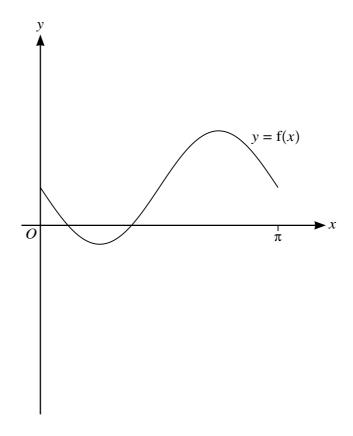
9 Functions f and g are such that

$$f(x) = 2 - 3\sin 2x \quad \text{for } 0 \le x \le \pi,$$

$$g(x) = -2f(x) \quad \text{for } 0 \le x \le \pi.$$

(a)	State the ranges of f and g.	[3]

The diagram below shows the graph of y = f(x).



(b) Sketch, on this diagram, the graph of y = g(x). [2]

The function h is such that

$$h(x) = g(x + \pi) \text{ for } -\pi \le x \le 0.$$

(c) Describe fully a sequence of transformations that maps the curve y = f(x) on to y = h(x). [3]

10	The equation of a curve is $y = 54x - (2x - 7)$)3	
10	The equation of a curve is $y = 54x - (2x - 7)$)3	

(a)	Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$.	[4]
(b)	Find the coordinates of each of the stationary points on the curve.	[3]
(c)	Determine the nature of each of the stationary points.	[2]
(-)		

11 The equation of a circle with centre C is $x^2 + y^2 - 8x + 4y - 5 = 0$.

Fina	the radius o	the circle	e and the c	oordinates o	or C.			
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	P(1, 2) lies					2 . 5		
				to the circle	e at <i>P</i> is 4 <i>y</i> =	= 3x + 5.		
				to the circle	e at <i>P</i> is 4y =	= 3x + 5.		
	that the eq	uation of t	he tangent			= 3 <i>x</i> + 5.		
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The point Q also lies on the circle and PQ is parallel to the x-axis.

(c) Write down the coordinates of Q. [2] The tangents to the circle at P and Q meet at T. (d) Find the coordinates of T. [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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