



## **Cambridge International Examinations**

Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	
MATHEMATICS			9709/12
Paper 1 Pure Mathe	matics 1 (P1)		February/March 2018
			1 hour 45 minutes
Candidates answer of	n the Question Paper.		
Additional Materials:	List of Formulae (MF9)		

## **READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name in the spaces at the top of this page.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** the questions in the space provided. If additional space is required, you should use the lined page at the end of this booklet. The question number(s) must be clearly shown.

Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.

The use of an electronic calculator is expected, where appropriate.

You are reminded of the need for clear presentation in your answers.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

The total number of marks for this paper is 75.



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ii)	Hence find the coefficient of $x^3$ in the expansion of $(2 + 5x)(1 - 2x)^7$ .	
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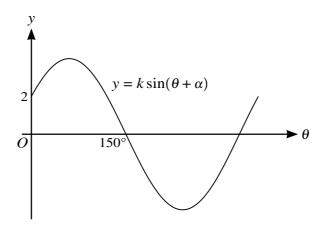
- 3 On a certain day, the height of a young bamboo plant was found to be 40 cm. After exactly one day its height was found to be 41.2 cm. Two different models are used to predict its height exactly 60 days after it was first measured.
  - Model A assumes that the daily amount of growth continues to be constant at the amount found for the first day.
  - Model *B* assumes that the daily percentage rate of growth continues to be constant at the percentage rate of growth found for the first day.

(i)	Using model A, find the predicted height in cm of the bamboo plant exactly 60 days after it was first measured. [2]
(ii)	Using model <i>B</i> , find the predicted height in cm of the bamboo plant exactly 60 days after it was first measured. [3]

(i)	Find the exact value of the $x$ -coordinate of $A$ .	
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(ii)	Find the equation of the perpendicular hisector of $AB$ giving your answer in the form $y = m$	13
(ii)	Find the equation of the perpendicular bisector of $AB$ , giving your answer in the form $y = m$ where $m$ is given exactly and $c$ is an integer.	!X
( <b>ii</b> )		
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(ii)	where <i>m</i> is given exactly and <i>c</i> is an integer.	
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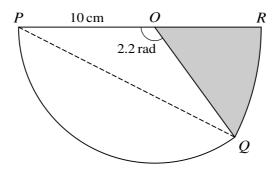
5	(a)	Express the equation $\frac{5+2\tan x}{3+2\tan x} = 1+\tan x$ as a quadratic equation in $\tan x$ and hence so equation for $0 \le x \le \pi$ .	lve the

**(b)** 



The diagram shows part of the graph of $y = k \sin(\theta + \alpha)$ , where $k$ and $\alpha$ are constants and $0^{\circ} < \alpha < 180^{\circ}$ . Find the value of $\alpha$ and the value of $k$ .

6



The diagram shows a sector POQ of a circle of radius 10 cm and centre O. Angle POQ is 2.2 radians. QR is an arc of a circle with centre P and POR is a straight line.

(i)	Show that the length of $PQ$ is 17.8 cm, correct to 3 significant figures.	[2]

Find the perimeter of the shaded region.	[4

7

**(i)** 

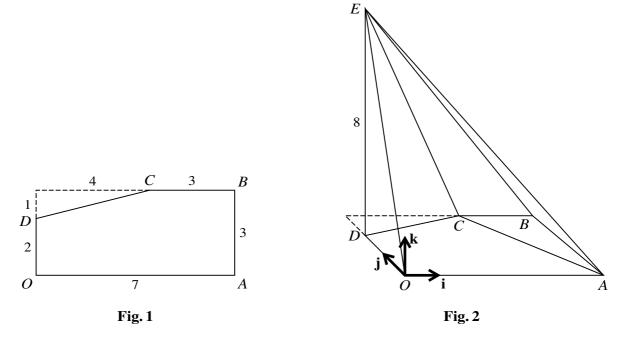


Fig. 1 shows a rectangle with sides of 7 units and 3 units from which a triangular corner has been removed, leaving a 5-sided polygon OABCD. The sides OA, AB, BC and DO have lengths of 7 units, 3 units, 3 units and 2 units respectively. Fig. 2 shows the polygon OABCD forming the horizontal base of a pyramid in which the point E is 8 units vertically above D. Unit vectors  $\mathbf{i}$ ,  $\mathbf{j}$  and  $\mathbf{k}$  are parallel to OA, OD and DE respectively.

Find $C\acute{E}$ and the length of $CE$ .	[3]

(ii)	Use a scalar product to find angle $ECA$ , giving your answer in the form $\cos^{-1}$ and $n$ are integers.	$\left(\frac{m}{\sqrt{n}}\right)$ , where $n$

8	A cı	arve has equation $y = \frac{1}{2}x^2 - 4x^{\frac{3}{2}} + 8x$ .	
	<b>(i)</b>	Find the <i>x</i> -coordinates of the stationary points.	[5]
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(ii)	Find $\frac{d^2y}{dx^2}$ .	[1]
(iii)	Find, showing all necessary working, the nature of each stationary point.	[2]

Find the set of values	s of c for which the cu	rve and the line mee	et.	
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e-coordinate of the point at which the tangent touches the curve.	

10 Functions f and g are defined by

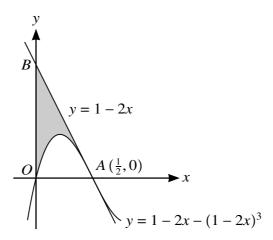
$$f(x) = \frac{8}{x - 2} + 2 \quad \text{for } x > 2,$$

$$g(x) = \frac{8}{x - 2} + 2 \quad \text{for } 2 < x < 4.$$

<b>(i)</b>	(a)	State the range of the function f.						
	<b>(b)</b>	State the range of the function g.	[1]					
	(c)	State the range of the function fg.	[1]					
(ii)	Exp	plain why the function gf cannot be formed.	[1]					
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11



The diagram shows part of the curve  $y = 1 - 2x - (1 - 2x)^3$  intersecting the x-axis at the origin O and at  $A(\frac{1}{2}, 0)$ . The line AB intersects the y-axis at B and has equation y = 1 - 2x.

)	Show that $AB$ is the tangent to the curve at $A$ .	[4]

(ii)	Show that the area of the shaded region can be expressed as $\int_0^{\frac{1}{2}} (1-2x)^3 dx$ .	[2]
(iii)	Hence, showing all necessary working, find the area of the shaded region.	[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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