



**Cambridge International Examinations**  
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

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**MATHEMATICS**

**9709/13**

Paper 1 Pure Mathematics 1 (P1)

**May/June 2017**

**1 hour 45 minutes**

Candidates answer on 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.  
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.

This document consists of **19** printed pages and **1** blank page.



2 The common ratio of a geometric progression is  $r$ . The first term of the progression is  $(r^2 - 3r + 2)$  and the sum to infinity is  $S$ .

(i) Show that  $S = 2 - r$ . [2]

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(ii) Find the set of possible values that  $S$  can take. [2]

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- 4 Relative to an origin  $O$ , the position vectors of points  $A$  and  $B$  are given by

$$\vec{OA} = \begin{pmatrix} 5 \\ 1 \\ 3 \end{pmatrix} \quad \text{and} \quad \vec{OB} = \begin{pmatrix} 5 \\ 4 \\ -3 \end{pmatrix}.$$

The point  $P$  lies on  $AB$  and is such that  $\vec{AP} = \frac{1}{3}\vec{AB}$ .

- (i) Find the position vector of  $P$ . [3]

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- (ii) Find the distance  $OP$ . [1]

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- (iii) Determine whether  $OP$  is perpendicular to  $AB$ . Justify your answer. [2]

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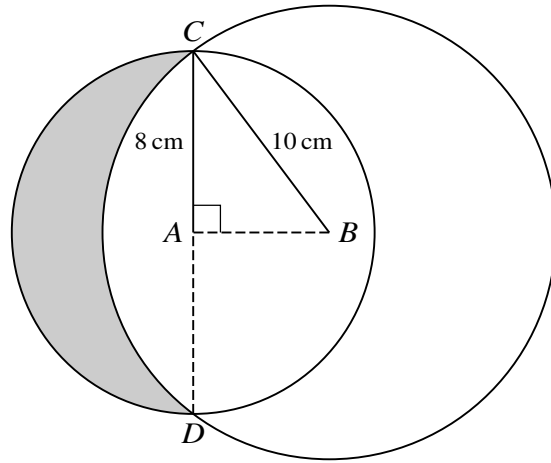






A series of horizontal dotted lines for writing.

7



The diagram shows two circles with centres  $A$  and  $B$  having radii 8 cm and 10 cm respectively. The two circles intersect at  $C$  and  $D$  where  $CAD$  is a straight line and  $AB$  is perpendicular to  $CD$ .

- (i) Find angle  $ABC$  in radians. [1]

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- (ii) Find the area of the shaded region. [6]

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A series of 20 horizontal dotted lines for writing.

8  $A(-1, 1)$  and  $P(a, b)$  are two points, where  $a$  and  $b$  are constants. The gradient of  $AP$  is 2.

(i) Find an expression for  $b$  in terms of  $a$ . [2]

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(ii)  $B(10, -1)$  is a third point such that  $AP = AB$ . Calculate the coordinates of the possible positions of  $P$ . [6]

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10 (a)

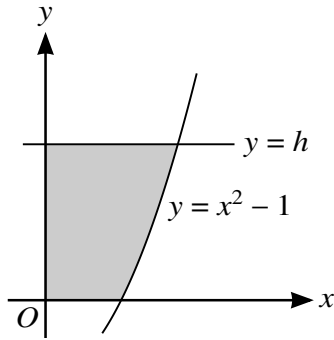


Fig. 1

Fig. 1 shows part of the curve  $y = x^2 - 1$  and the line  $y = h$ , where  $h$  is a constant.

- (i) The shaded region is rotated through  $360^\circ$  about the **y-axis**. Show that the volume of revolution,  $V$ , is given by  $V = \pi(\frac{1}{2}h^2 + h)$ . [3]

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- (ii) Find, showing all necessary working, the area of the shaded region when  $h = 3$ . [4]

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11 The function  $f$  is defined for  $x \geq 0$ . It is given that  $f$  has a minimum value when  $x = 2$  and that  $f''(x) = (4x + 1)^{-\frac{1}{2}}$ .

(i) Find  $f'(x)$ . [3]

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It is now given that  $f''(0)$ ,  $f'(0)$  and  $f(0)$  are the first three terms respectively of an arithmetic progression.

(ii) Find the value of  $f(0)$ . [3]

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