

CANDIDATE
NAME

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CENTRE
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MATHEMATICS

9709/13

Paper 1 Pure Mathematics 1 (P1)

May/June 2019

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 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.

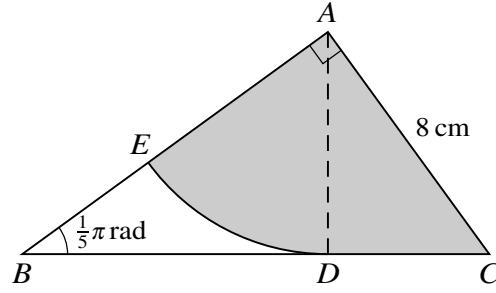
At the end of the examination, fasten all your work securely together.

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.

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

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The diagram shows triangle ABC which is right-angled at A . Angle $ABC = \frac{1}{5}\pi$ radians and $AC = 8$ cm. The points D and E lie on BC and BA respectively. The sector ADE is part of a circle with centre A and is such that BDC is the tangent to the arc DE at D .

(i) Find the length of AD . [3]

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(ii) Find the area of the shaded region. [3]

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- 4 The function f is defined by $f(x) = \frac{48}{x-1}$ for $3 \leq x \leq 7$. The function g is defined by $g(x) = 2x - 4$ for $a \leq x \leq b$, where a and b are constants.

- (i) Find the greatest value of a and the least value of b which will permit the formation of the composite function gf . [2]

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It is now given that the conditions for the formation of gf are satisfied.

- (ii) Find an expression for $gf(x)$. [1]

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- (iii) Find an expression for $(gf)^{-1}(x)$. [2]

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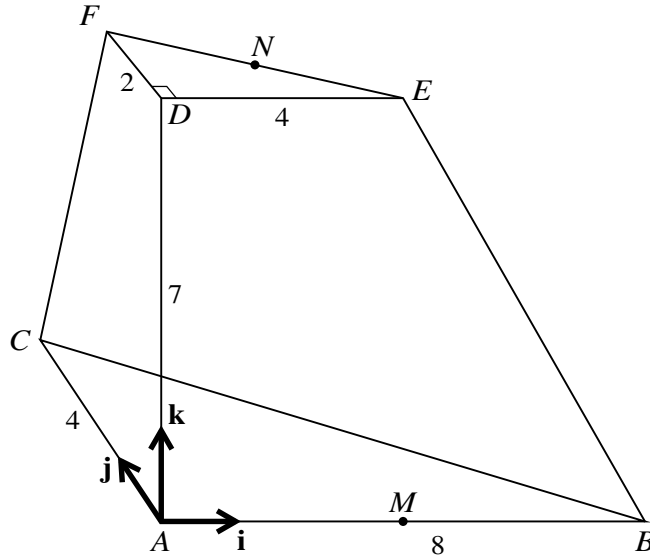
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The diagram shows a solid figure $ABCDEF$ in which the horizontal base ABC is a triangle right-angled at A . The lengths of AB and AC are 8 units and 4 units respectively and M is the mid-point of AB . The point D is 7 units vertically above A . Triangle DEF lies in a horizontal plane with DE , DF and FE parallel to AB , AC and CB respectively and N is the mid-point of FE . The lengths of DE and DF are 4 units and 2 units respectively. Unit vectors \mathbf{i} , \mathbf{j} and \mathbf{k} are parallel to \overrightarrow{AB} , \overrightarrow{AC} and \overrightarrow{AD} respectively.

(i) Find \overrightarrow{MF} in terms of \mathbf{i} , \mathbf{j} and \mathbf{k} . [1]

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(ii) Find \overrightarrow{FN} in terms of \mathbf{i} and \mathbf{j} . [1]

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(iii) Find \overrightarrow{MN} in terms of \mathbf{i} , \mathbf{j} and \mathbf{k} . [1]

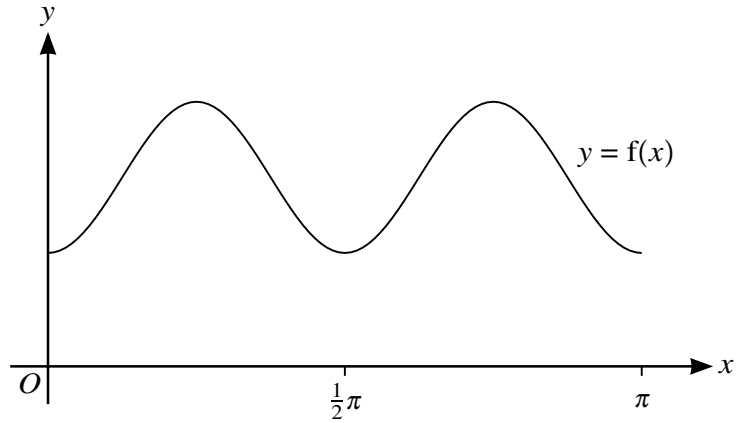
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The function $f : x \mapsto p \sin^2 2x + q$ is defined for $0 \leq x \leq \pi$, where p and q are positive constants. The diagram shows the graph of $y = f(x)$.

(i) In terms of p and q , state the range of f . [2]

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(ii) State the number of solutions of the following equations.

(a) $f(x) = p + q$ [1]

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(b) $f(x) = q$ [1]

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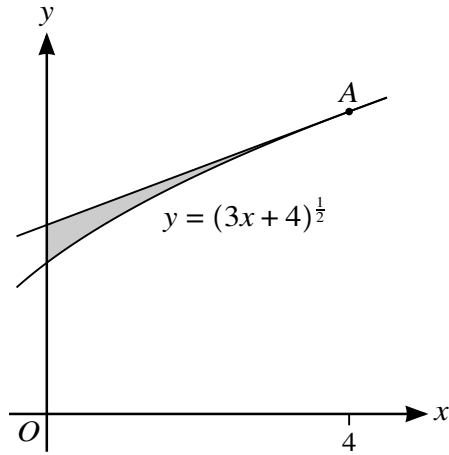
(c) $f(x) = \frac{1}{2}p + q$ [1]

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The diagram shows part of the curve with equation $y = (3x + 4)^{\frac{1}{2}}$ and the tangent to the curve at the point A. The x -coordinate of A is 4.

(i) Find the equation of the tangent to the curve at A. [5]

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