

CANDIDATE
NAME

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CENTRE
NUMBER

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MATHEMATICS

9709/13

Paper 1 Pure Mathematics 1 (P1)

October/November 2018

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 **20** printed pages.



- 1 Find the coefficient of $\frac{1}{x^3}$ in the expansion of $\left(x - \frac{2}{x}\right)^7$. [3]

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- 2 The function f is defined by $f(x) = x^3 + 2x^2 - 4x + 7$ for $x \geq -2$. Determine, showing all necessary working, whether f is an increasing function, a decreasing function or neither. [4]

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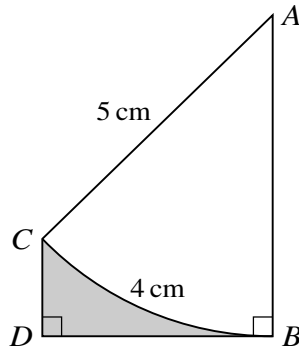
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The diagram shows an arc BC of a circle with centre A and radius 5 cm. The length of the arc BC is 4 cm. The point D is such that the line BD is perpendicular to BA and DC is parallel to BA .

(i) Find angle BAC in radians. [1]

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(ii) Find the area of the shaded region BDC . [5]

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4 Two points A and B have coordinates $(-1, 1)$ and $(3, 4)$ respectively. The line BC is perpendicular to AB and intersects the x -axis at C .

(i) Find the equation of BC and the x -coordinate of C . [4]

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(ii) Find the distance AC , giving your answer correct to 3 decimal places. [2]

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11 (i) Express $2x^2 - 12x + 11$ in the form $a(x + b)^2 + c$, where a , b and c are constants. [3]

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The function f is defined by $f(x) = 2x^2 - 12x + 11$ for $x \leq k$.

(ii) State the largest value of the constant k for which f is a one-one function. [1]

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(iii) For this value of k find an expression for $f^{-1}(x)$ and state the domain of f^{-1} . [4]

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The function g is defined by $g(x) = x + 3$ for $x \leq p$.

- (iv) With k now taking the value 1, find the largest value of the constant p which allows the composite function fg to be formed, and find an expression for $fg(x)$ whenever this composite function exists. [3]

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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.

Lined area with 24 horizontal dotted lines for writing answers.

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