

CANDIDATE
NAME

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MATHEMATICS

9709/11

Paper 1 Pure Mathematics 1 (P1)

May/June 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 **19** printed pages and **1** blank page.



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- 1 (i) Find the first three terms in the expansion, in ascending powers of x , of $(1 - 2x)^5$. [2]

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- (ii) Given that the coefficient of x^2 in the expansion of $(1 + ax + 2x^2)(1 - 2x)^5$ is 12, find the value of the constant a . [3]

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- 2 A point is moving along the curve $y = 2x + \frac{5}{x}$ in such a way that the x -coordinate is increasing at a constant rate of 0.02 units per second. Find the rate of change of the y -coordinate when $x = 1$. [4]

This image shows a full page of primary-ruled paper. It features multiple sets of horizontal dashed lines spaced evenly down the page, providing a guide for handwriting practice. The lines are thin and black, set against a plain white background. There are no margins, text, or other markings on the page.

- 3** A curve is such that $\frac{dy}{dx} = \frac{12}{(2x+1)^2}$. The point (1, 1) lies on the curve. Find the coordinates of the point at which the curve intersects the x -axis. [6]

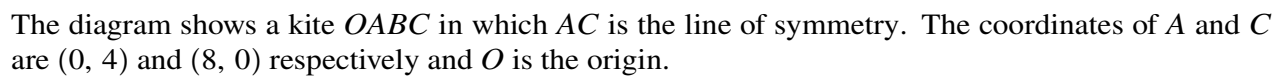
This image shows a single page of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

4 (i) Prove the identity $(\sin \theta + \cos \theta)(1 - \sin \theta \cos \theta) \equiv \sin^3 \theta + \cos^3 \theta$. [3]

[illegible]

(ii) Hence solve the equation $(\sin \theta + \cos \theta)(1 - \sin \theta \cos \theta) = 3 \cos^3 \theta$ for $0^\circ \leq \theta \leq 360^\circ$. [3]

[illegible]

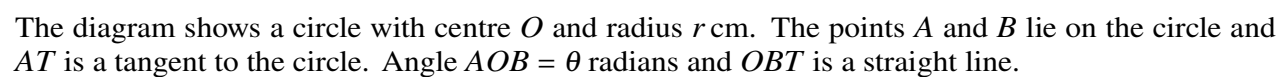


[4]

This image shows a full page of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page, providing a template for handwriting practice. There are no margins, text, or other markings on the page.

[3]

[illegible]



- [illegible]

- (ii)** In the case where $r = 3$ and $\theta = 1.2$, find the perimeter of the shaded region. [4]

[illegible]

$$\overrightarrow{OA} = \begin{pmatrix} 1 \\ -3 \\ 2 \end{pmatrix}, \quad \overrightarrow{OB} = \begin{pmatrix} -1 \\ 3 \\ 5 \end{pmatrix} \quad \text{and} \quad \overrightarrow{OC} = \begin{pmatrix} 3 \\ 1 \\ -2 \end{pmatrix}.$$

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- This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.

- 8** (a) A geometric progression has a second term of 12 and a sum to infinity of 54. Find the possible values of the first term of the progression. [4]

[illegible]

- (b) The n th term of a progression is $p + qn$, where p and q are constants, and S_n is the sum of the first n terms.

(i) Find an expression, in terms of p , q and n , for S_n . [3]

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(ii) Given that $S_4 = 40$ and $S_6 = 72$, find the values of p and q . [2]

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9 Functions f and g are defined for $x \in \mathbb{R}$ by

$$f : x \mapsto \frac{1}{2}x - 2,$$

$$g : x \mapsto 4 + x - \frac{1}{2}x^2.$$

(i) Find the points of intersection of the graphs of $y = f(x)$ and $y = g(x)$. [3]

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(ii) Find the set of values of x for which $f(x) > g(x)$. [2]

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(iii) Find an expression for $fg(x)$ and deduce the range of fg .

[4]

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The function h is defined by $h : x \mapsto 4 + x - \frac{1}{2}x^2$ for $x \geq k$.

(iv) Find the smallest value of k for which h has an inverse.

[2]

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10 The curve with equation $y = x^3 - 2x^2 + 5x$ passes through the origin.

(i) Show that the curve has no stationary points.

[3]

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(ii) Denoting the gradient of the curve by m , find the stationary value of m and determine its nature.

[5]

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- [illegible]

[illegible]

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