

CANDIDATE
NAME

--

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--

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.



Kambridge Math & Physics
kambridgemp.com

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

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (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]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- 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]

Cambridge Math & Physics

kambridgemp.com

- 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]

Cambridge Math & Physics

kambridgemp.com

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

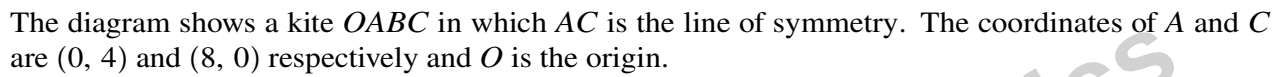
Cambridge Math & Physics

kambridgemp.com

(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]

Cambridge Math & Physics

kanbridgemp.com

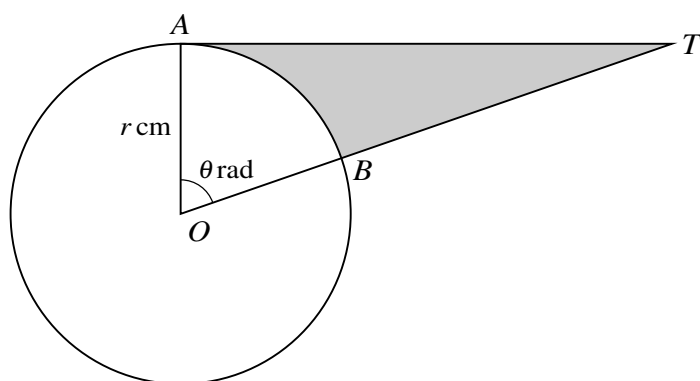


- [4]

Cambridge Math & Prep
kamdemp.com

Cambridge Math & Physics

kambridgemp.com



The diagram shows a circle with centre O and radius r cm. The points A and B lie on the circle and AT is a tangent to the circle. Angle $AOB = \theta$ radians and OBT is a straight line.

- (i) Express the area of the shaded region in terms of r and θ . [3]

Cambridge Math & Physics

Cambridge Math & Physics

kambridgemp.com

7 Relative to an origin O , the position vectors of the points A , B and C are given by

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

(i) Find $\overrightarrow{AC}$.

[1]

(ii) The point M is the mid-point of AC . Find the unit vector in the direction of $\overrightarrow{OM}$.

[3]

- (iii) Evaluate $\overrightarrow{AB} \cdot \overrightarrow{AC}$ and hence find angle BAC .

[4]

Kambridge Math & Physics
kambridgemp.com

A blank sheet of white paper with ten horizontal dotted lines spaced evenly apart, intended for writing or drawing.

- 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]

Cambridge Math & Physics

kambridgemp.com

- (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]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

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

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

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]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

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

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

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

[4]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

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]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

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]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

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

[5]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(iii) Showing all necessary working, find the area of the region enclosed by the curve, the x -axis and the line $x = 6$.

Kambridge Math & Physics

kambridgemp.com

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.