

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Education
Advanced Subsidiary Examination
June 2010

Mathematics

MPC2

Unit Pure Core 2

Monday 24 May 2010 1.30 pm to 3.00 pm

For this paper you must have:

- the blue AQA booklet of formulae and statistical tables.
- You may use a graphics calculator.

Time allowed

- 1 hour 30 minutes

Instructions

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Write the question part reference (eg (a), (b)(i) etc) in the left-hand margin.
- You must answer the questions in the spaces provided. Do not write outside the box around each page.
- Show all necessary working; otherwise marks for method may be lost.
- Do all rough work in this book. Cross through any work that you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 75.

Advice

- Unless stated otherwise, you may quote formulae, without proof, from the booklet.

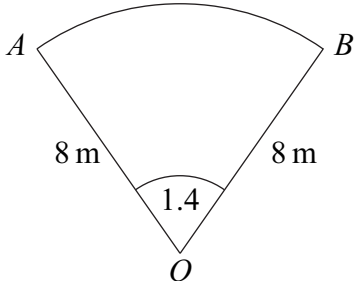
For Examiner's Use	
Examiner's Initials	
Question	Mark
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TOTAL	



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Answer **all** questions in the spaces provided.

1 The diagram shows a sector OAB of a circle with centre O .



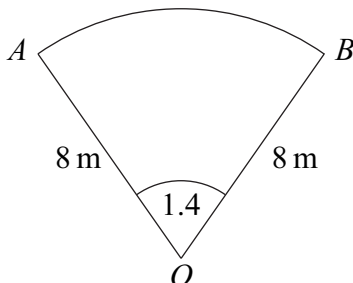
The diagram shows a sector OAB of a circle with center O . The radii OA and OB are both labeled 8 m . The angle AOB is labeled 1.4 radians.

The radius of the circle is 8 m and the angle AOB is 1.4 radians.

(a) Find the area of the sector OAB . (2 marks)

(b) (i) Find the perimeter of the sector OAB . (3 marks)

(ii) The perimeter of the sector OAB is equal to the circumference of a circle of radius $x\text{ m}$. Calculate the value of x to three significant figures. (2 marks)



The radius of the circle is 8 m and the angle AOB is 1.4 radians.

- (a)** Find the area of the sector OAB . (2 marks)
- (b) (i)** Find the perimeter of the sector OAB . (3 marks)
- (ii)** The perimeter of the sector OAB is equal to the circumference of a circle of radius x m. Calculate the value of x to three significant figures. (2 marks)

QUESTION	PART	REFERENCE
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QUESTION
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Turn over ►



2The n th term of a sequence is u_n .

The sequence is defined by

$$u_{n+1} = 6 + \frac{2}{5}u_n$$

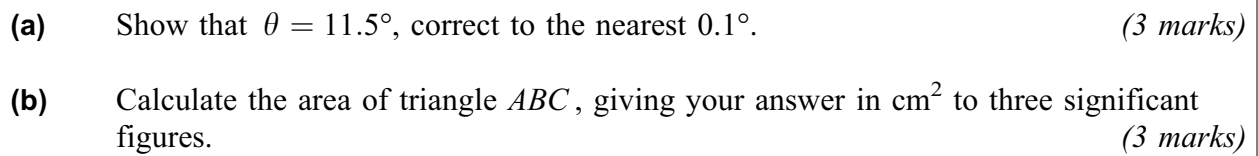
The first term of the sequence is given by $u_1 = 2$.**(a)** Find the value of u_2 and the value of u_3 . (2 marks)**(b)** The limit of u_n as n tends to infinity is L .Write down an equation for L and hence find the value of L . (3 marks)QUESTION
PART
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QUESTION
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REFERENCE

Turn over ►



The triangle ABC , shown in the diagram, is such that $AB = 6$ cm, $BC = 15$ cm, angle $BAC = 150^\circ$ and angle $ACB = \theta$.

[illegible]

[illegible]

4 (a) The expression $\left(1 - \frac{1}{x^2}\right)^3$ can be written in the form

$$1 + \frac{p}{x^2} + \frac{q}{x^4} - \frac{1}{x^6}$$

Find the values of the integers p and q . (2 marks)

(b) (i) Hence find $\int \left(1 - \frac{1}{x^2}\right)^3 dx$. (4 marks)

(ii) Hence find the value of $\int_{\frac{1}{2}}^1 \left(1 - \frac{1}{x^2}\right)^3 dx$. (2 marks)

QUESTION
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QUESTION
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Turn over ►



The first term of the series is 10 and its sum to infinity is 50.

- (ii) Find the second term of the series. (2 marks)

(i) Find the common difference of the arithmetic series. (3 marks)

- (ii) The n th term of the arithmetic series is u_n . Find the value of $\sum_{n=1}^{40} u_n$. (4 marks)

QUESTION	PART	REFERENCE
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6 A curve C has the equation

$$y = \frac{x^3 + \sqrt{x}}{x}, \quad x > 0$$

(a) Express $\frac{x^3 + \sqrt{x}}{x}$ in the form $x^p + x^q$. (3 marks)

(b) (i) Hence find $\frac{dy}{dx}$. (2 marks)

(ii) Find an equation of the normal to the curve C at the point on the curve where $x = 1$. (4 marks)

(c) (i) Find $\frac{d^2y}{dx^2}$. (2 marks)

(ii) Hence deduce that the curve C has no maximum points. (2 marks)

QUESTION
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[illegible]

- 7 (a)** Sketch the graph of $y = \cos x$ in the interval $0 \leq x \leq 2\pi$. State the values of the intercepts with the coordinate axes. (2 marks)

- (b) (i)** Given that

$$\sin^2 \theta = \cos \theta (2 - \cos \theta)$$

prove that $\cos \theta = \frac{1}{2}$. (2 marks)

- (ii)** Hence solve the equation

$$\sin^2 2x = \cos 2x (2 - \cos 2x)$$

in the interval $0 \leq x \leq \pi$, giving your answers in radians to three significant figures. (4 marks)

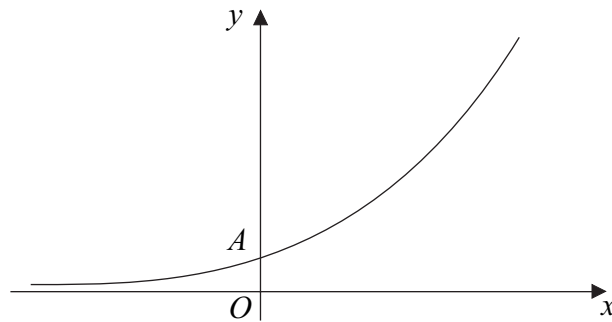
QUESTION
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8

The diagram shows a sketch of the curve $y = 2^{4x}$.



The curve intersects the y -axis at the point A .

(a) Find the value of the y -coordinate of A . (1 mark)

(b) Use the trapezium rule with six ordinates (five strips) to find an approximate value for $\int_0^1 2^{4x} dx$, giving your answer to two decimal places. (4 marks)

(c) Describe the geometrical transformation that maps the graph of $y = 2^{4x}$ onto the graph of $y = 2^{4x-3}$. (2 marks)

(d) The curve $y = 2^{4x}$ is translated by the vector $\begin{bmatrix} 1 \\ -\frac{1}{2} \end{bmatrix}$ to give the curve $y = g(x)$.

The curve $y = g(x)$ crosses the x -axis at the point Q . Find the x -coordinate of Q . (4 marks)

(e) (i) Given that

$$\log_a k = 3 \log_a 2 + \log_a 5 - \log_a 4$$

show that $k = 10$. (3 marks)

(ii) The line $y = \frac{5}{4}$ crosses the curve $y = 2^{4x-3}$ at the point P . Show that the x -coordinate of P is $\frac{1}{4 \log_{10} 2}$. (3 marks)

QUESTION
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There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

