

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Education
Advanced Subsidiary Examination
January 2011

Mathematics

MPC2

Unit Pure Core 2

Monday 10 January 2011 9.00 am to 10.30 am

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.

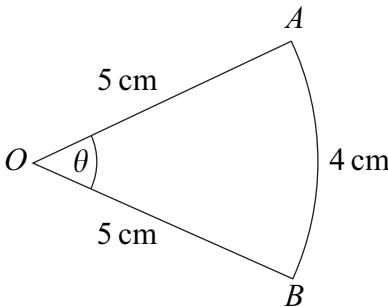
For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
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TOTAL	



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

1 The diagram shows a sector OAB of a circle with centre O and radius 5 cm.

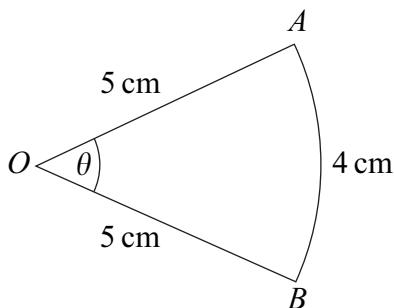


The angle between the radii OA and OB is θ radians.

The length of the arc AB is 4 cm.

(a) Find the value of θ . (2 marks)

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



The length of the arc AB is 4 cm.

- (a)** Find the value of θ . (2 marks)
- (b)** Find the area of the sector OAB . (2 marks)

QUESTION	PART	REFERENCE
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This image shows a blank sheet of white paper designed for handwriting practice. It features a vertical solid black line on the left side, creating a narrow margin. The rest of the page is filled with horizontal dashed black lines, providing guides for letter height and placement. There are no other markings or text on the page.

QUESTION
PART
REFERENCE

Turn over ►



(b) Find the value of x for which $\sqrt{2} \times 2^x = \frac{1}{8}$. (2 marks)

QUESTION	PART	REFERENCE
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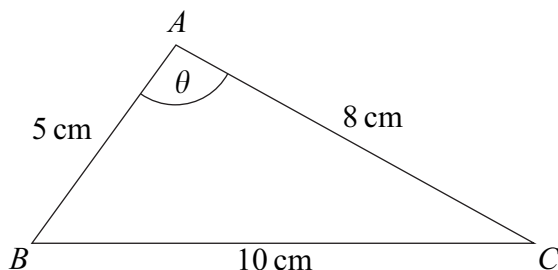
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QUESTION
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REFERENCE

Turn over ►



- 3** The triangle ABC , shown in the diagram, is such that $AB = 5$ cm, $AC = 8$ cm, $BC = 10$ cm and angle $BAC = \theta$.



- (a) Show that $\theta = 97.9^\circ$, correct to the nearest 0.1° . (3 marks)
- (b) (i) Calculate the area of triangle ABC , giving your answer, in cm^2 , to three significant figures. (2 marks)
- (ii) The line through A , perpendicular to BC , meets BC at the point D . Calculate the length of AD , giving your answer, in cm, to three significant figures. (3 marks)

QUESTION
PART
REFERENCE



QUESTION
PART
REFERENCE

Turn over ►



4 (a) Use the trapezium rule with four ordinates (three strips) to find an approximate value for $\int_0^{1.5} \sqrt{27x^3 + 4} \, dx$, giving your answer to three significant figures. (4 marks)

(b) The curve with equation $y = \sqrt{27x^3 + 4}$ is stretched parallel to the x -axis with scale factor 3 to give the curve with equation $y = g(x)$. Write down an expression for $g(x)$. (2 marks)

QUESTION
PART
REFERENCE



QUESTION
PART
REFERENCE

Turn over ►



- (b)** Show that the expansion of

is

where p and q are constants to be found. (4 marks)

- (c)** Hence find $\int \left[(1 + \sqrt{x})^4 - (1 - \sqrt{x})^3 \right] dx$, expressing each coefficient in its simplest form. (4 marks)

QUESTION	PART	REFERENCE
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[illegible]

QUESTION
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Turn over ►



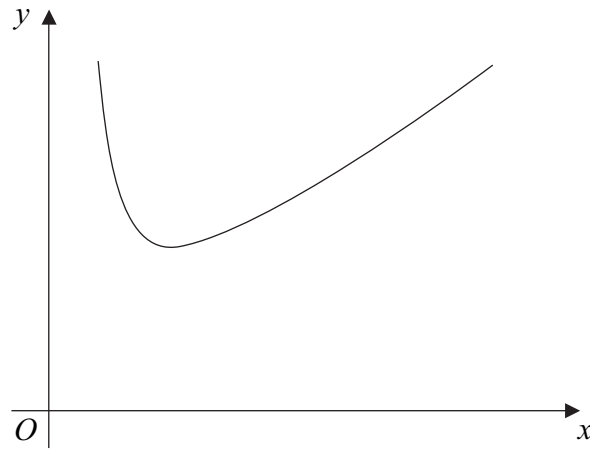
(ii) Find the least value of n such that $u_n > 4 \times 10^{15}$. (3 marks)

QUESTION	PART	REFERENCE
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[illegible]

- 7 A curve C is defined for $x > 0$ by the equation $y = x + 3 + \frac{8}{x^4}$ and is sketched below.



- (a) Given that $y = x + 3 + \frac{8}{x^4}$, find $\frac{dy}{dx}$. (3 marks)
- (b) Find an equation of the tangent at the point on the curve C where $x = 1$. (3 marks)
- (c) The curve C has a minimum point M . Find the coordinates of M . (4 marks)
- (d) (i) Find $\int \left(x + 3 + \frac{8}{x^4} \right) dx$. (3 marks)
- (ii) Hence find the area of the region bounded by the curve C , the x -axis and the lines $x = 1$ and $x = 2$. (2 marks)
- (e) The curve C is translated by $\begin{bmatrix} 0 \\ k \end{bmatrix}$ to give the curve $y = f(x)$. Given that the x -axis is a tangent to the curve $y = f(x)$, state the value of the constant k . (1 mark)

QUESTION
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REFERENCE



[illegible]

[illegible]

[illegible]

- 8 (a)** Given that $2 \log_k x - \log_k 5 = 1$, express k in terms of x . Give your answer in a form not involving logarithms. (4 marks)
- (b)** Given that $\log_a y = \frac{3}{2}$ and that $\log_4 a = b + 2$, show that $y = 2^p$, where p is an expression in terms of b . (3 marks)

QUESTION
PART
REFERENCE



QUESTION
PART
REFERENCE

Turn over ►



- (ii) Hence solve the equation $7 \sin^2 \theta + \sin \theta \cos \theta = 6$ in the interval $0^\circ \leq \theta \leq 360^\circ$, giving your answers to the nearest degree. (4 marks)

QUESTION	PART	REFERENCE
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[illegible]

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