

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.

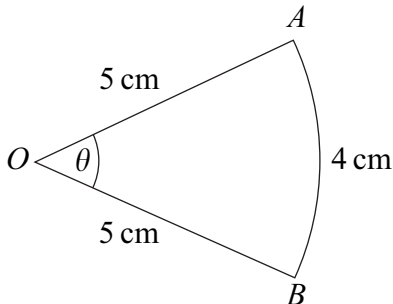
For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
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9	
TOTAL	



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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.

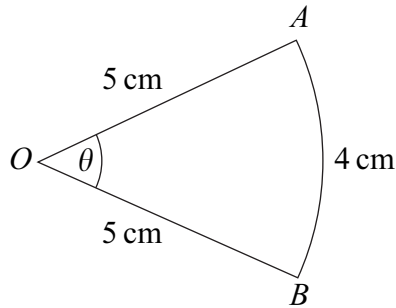


The angle between the radii OA and OB is θ radians.

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 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)

QUESTION	PART	REFERENCE
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[illegible]

QUESTION
PART
REFERENCE

Turn over ►



2 (a) Write down the values of p , q and r given that:

(i) $8 = 2^p$; (1 mark)

(ii) $\frac{1}{8} = 2^q$; (1 mark)

(iii) $\sqrt{2} = 2^r$. (1 mark)

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

QUESTION
PART
REFERENCE



QUESTION
PART
REFERENCE

Turn over ►



A triangle with vertices A , B , and C . The side lengths are $AB = 5\text{ cm}$, $AC = 8\text{ cm}$, and $BC = 10\text{ cm}$. The angle at vertex A is labeled θ .

- (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
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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



[illegible]

- (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)

[illegible]

[illegible]

[illegible]

[illegible]

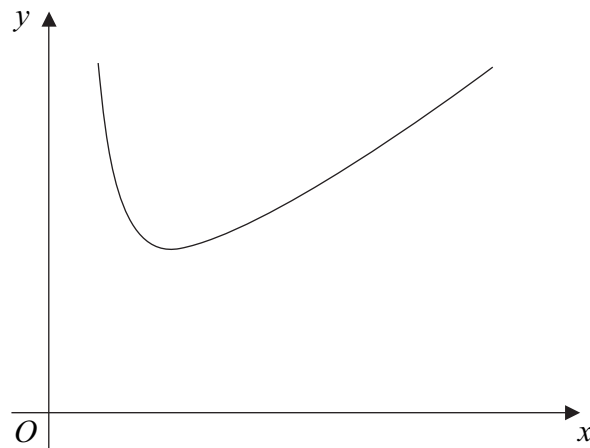
(ii) Find the least value of n such that $u_n > 4 \times 10^{15}$. (3 marks)

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 ►



- (b) (i)** Given that

$$7 \sin^2 \theta + \sin \theta \cos \theta = 6$$

show that

$$\tan^2 \theta + \tan \theta - 6 = 0 \quad (3 \text{ marks})$$

- (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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This image shows a blank sheet of white paper designed for handwriting practice. It features a series of horizontal dashed lines spaced evenly down the page. A single vertical solid line runs parallel to the left edge, creating a narrow margin. The rest of the page is open space between the dashed lines, intended for writing practice.

[illegible]

QUESTION
PART
REFERENCE**END OF QUESTIONS**

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