

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Education
Advanced Subsidiary Examination
January 2013

Mathematics

MPC2

Unit Pure Core 2

Monday 14 January 2013 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 each question in the space provided for that question. If you require extra space, use an AQA supplementary answer book; do **not** use the space provided for a different question.
- 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.
- You do not necessarily need to use all the space provided.

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	



J A N 1 3 M P C 2 0 1

Answer space for question 1

[illegible]

- 2 (a)** Use the trapezium rule with five ordinates (four strips) to find an approximate value for

$$\int_1^5 \frac{1}{x^2 + 1} dx$$

giving your answer to three significant figures.

(4 marks)

- (b) (i)** Find $\int \left(x^{-\frac{3}{2}} + 6x^{\frac{1}{2}} \right) dx$, giving the coefficient of each term in its simplest form.

(3 marks)

- (ii)** Hence find the value of $\int_1^4 \left(x^{-\frac{3}{2}} + 6x^{\frac{1}{2}} \right) dx$.

(2 marks)

QUESTION
PART
REFERENCE

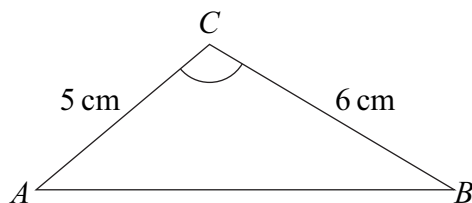
Answer space for question 2



Answer space for question 2

[illegible]

- 3 The diagram shows a triangle ABC .



The lengths of AC and BC are 5 cm and 6 cm respectively.

The area of triangle ABC is 12.5 cm^2 , and angle ACB is **obtuse**.

- (a) Find the size of angle ACB , giving your answer to the nearest 0.1° . (3 marks)
- (b) Find the length of AB , giving your answer to two significant figures. (3 marks)

QUESTION
PART
REFERENCE

Answer space for question 3



QUESTION
PART
REFERENCE**Answer space for question 3****Turn over ►**

4

Given that

$$\log_a N - \log_a x = \frac{3}{2}$$

express x in terms of a and N , giving your answer in a form not involving logarithms.

(3 marks)

QUESTION
PART
REFERENCE

Answer space for question 4



QUESTION
PART
REFERENCE

Answer space for question 4

Area for writing the answer to question 4, consisting of multiple horizontal lines.

Turn over ►



- 5** The point $P(2, 8)$ lies on a curve, and the point M is the only stationary point of the curve.

The curve has equation $y = 6 + 2x - \frac{8}{x^2}$.

- (a) Find $\frac{dy}{dx}$. (3 marks)
- (b) Show that the normal to the curve at the point $P(2, 8)$ has equation $x + 4y = 34$. (3 marks)
- (c) (i) Show that the stationary point M lies on the x -axis. (3 marks)
- (ii) Hence **write down** the equation of the tangent to the curve at M . (1 mark)
- (d) The tangent to the curve at M and the normal to the curve at P intersect at the point T . Find the coordinates of T . (2 marks)

QUESTION
PART
REFERENCE

Answer space for question 5



QUESTION
PART
REFERENCE**Answer space for question 5****Turn over ►**

Answer space for question 5

[illegible]

Answer space for question 5

[illegible]

6 (a) A geometric series begins $420 + 294 + 205.8 + \dots$

(i) Show that the common ratio of the series is 0.7. (1 mark)

(ii) Find the sum to infinity of the series. (2 marks)

(iii) Write the n th term of the series in the form $p \times q^n$, where p and q are constants. (2 marks)

(b) The first term of an arithmetic series is 240 and the common difference of the series is -8 .

The n th term of the series is u_n .

(i) Write down an expression for u_n . (1 mark)

(ii) Given that $u_k = 0$, find the value of $\sum_{n=1}^k u_n$. (4 marks)

QUESTION
PART
REFERENCE

Answer space for question 6



Answer space for question 6

[illegible]

- 7 (a)** Describe a geometrical transformation that maps the graph of $y = 4^x$ onto the graph of $y = 3 \times 4^x$. (2 marks)
- (b)** Sketch the curve with equation $y = 3 \times 4^x$, indicating the value of the intercept on the y -axis. (2 marks)
- (c)** The curve with equation $y = 4^{-x}$ intersects the curve $y = 3 \times 4^x$ at the point P . Use logarithms to find the x -coordinate of P , giving your answer to three significant figures. (5 marks)

QUESTION
PART
REFERENCE

Answer space for question 7



Answer space for question 7

This image shows a full page of primary-ruled paper. It features a vertical solid line on the left side, creating a narrow margin. The rest of the page is filled with horizontal dashed lines, providing a guide for letter height in handwriting practice. There are no other markings or text on the page.

8 (a) Expand $\left(1 + \frac{4}{x}\right)^2$.

(1 mark)

(b) The first four terms of the binomial expansion of $\left(1 + \frac{x}{4}\right)^8$ in ascending powers of x are $1 + ax + bx^2 + cx^3$. Find the values of the constants a , b and c . (4 marks)

(c) Hence find the coefficient of x in the expansion of $\left(1 + \frac{4}{x}\right)^2 \left(1 + \frac{x}{4}\right)^8$. (4 marks)

QUESTION
PART
REFERENCE

Answer space for question 8



Answer space for question 8

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

- 9 (a)** Write down the two solutions of the equation $\tan(x + 30^\circ) = \tan 79^\circ$ in the interval $0^\circ \leq x \leq 360^\circ$. (2 marks)
- (b)** Describe a single geometrical transformation that maps the graph of $y = \tan x$ onto the graph of $y = \tan(x + 30^\circ)$. (2 marks)
- (c) (i)** Given that $5 + \sin^2 \theta = (5 + 3 \cos \theta) \cos \theta$, show that $\cos \theta = \frac{3}{4}$. (5 marks)
- (ii)** Hence solve the equation $5 + \sin^2 2x = (5 + 3 \cos 2x) \cos 2x$ in the interval $0 < x < 2\pi$, giving your values of x in radians to three significant figures. (3 marks)

QUESTION
PART
REFERENCE

Answer space for question 9



Answer space for question 9

This image shows a blank sheet of white paper designed for handwriting practice or primary-level writing. It features a solid black vertical line on the left side, creating a narrow margin. The rest of the page is filled with evenly spaced, horizontal dashed lines. There are no other markings, text, or illustrations on the page.

Answer space for question 9

[illegible]

Answer space for question 9

END OF QUESTIONS



There are no questions printed on this page

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

