

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Education
Advanced Subsidiary Examination
June 2015

Mathematics

MPC2

Unit Pure Core 2

Wednesday 20 May 2015 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	
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TOTAL	



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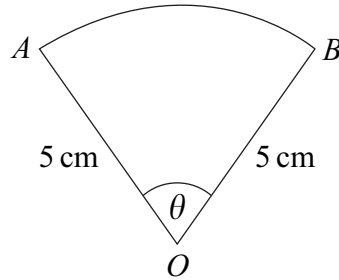
P88272/Jun15/E3

MPC2

Answer **all** questions.

Answer each question in the space provided for that question.

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



The angle AOB is θ radians and the area of the sector is 15 cm^2 .

Find the **perimeter** of the sector.

[4 marks]

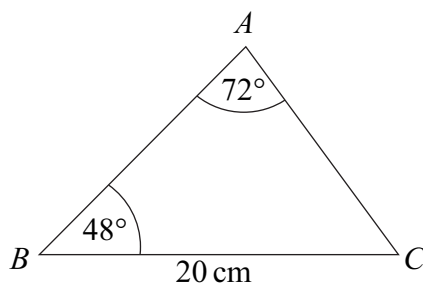
QUESTION
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REFERENCE

Answer space for question 1



QUESTION
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REFERENCE**Answer space for question 1****Turn over ►**

- 2 The diagram shows a triangle ABC .



The size of angle BAC is 72° and the size of angle ABC is 48° . The length of BC is 20 cm.

- (a) Show that the length of AC is 15.6 cm, correct to three significant figures. **[3 marks]**

- (b) The midpoint of BC is M . Calculate the length of AM , giving your answer, in cm, to three significant figures. **[4 marks]**

QUESTION
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Answer space for question 2



QUESTION
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3 The first term of an infinite geometric series is 48. The common ratio of the series is 0.6.

(a) Find the third term of the series.

[2 marks]

(b) Find the sum to infinity of the series.

[2 marks]

(c) The n th term of the series is u_n . Find the value of $\sum_{n=4}^{\infty} u_n$.

[3 marks]

QUESTION
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Answer space for question 3



QUESTION
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- 4** A curve is defined for $x > 0$. The gradient of the curve at the point (x, y) is given by

$$\frac{dy}{dx} = \frac{2}{x^2} - \frac{x}{4}$$

- (a)** Find $\frac{d^2y}{dx^2}$.

[3 marks]

- (b)** The curve has a stationary point M whose y -coordinate is $\frac{5}{2}$.

- (i)** Find the x -coordinate of M .

[2 marks]

- (ii)** Use your answers to parts **(a)** and **(b)(i)** to show that M is a maximum point.

[1 mark]

- (iii)** Find the equation of the curve.

[4 marks]

QUESTION
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Answer space for question 4



QUESTION
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The limit of u_n as n tends to infinity is 20.

- [5 marks]**

- [1 mark]**

Answer space for question 5

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Answer space for question 5

[illegible]

- 6 (a)** Solve the equation $\sin(x + 0.7) = 0.6$ in the interval $-\pi < x < \pi$, giving your answers in radians to two significant figures.

[3 marks]

- (b)** It is given that $5 \cos^2 \theta - \cos \theta = \sin^2 \theta$.

- (i)** By forming and solving a suitable quadratic equation, find the possible values of $\cos \theta$.

[4 marks]

- (ii)** Hence show that a possible value of $\tan \theta$ is $2\sqrt{2}$.

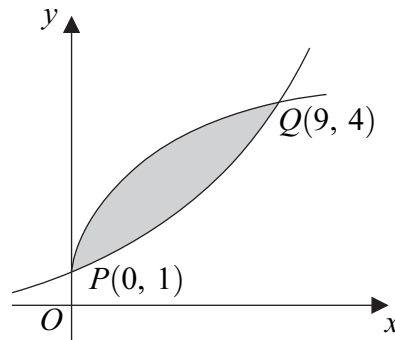
[3 marks]

QUESTION
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Answer space for question 6

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- 7 The diagram shows a sketch of two curves.



The equations of the two curves are $y = 1 + \sqrt{x}$ and $y = 4^{\frac{x}{9}}$.

The curves meet at the points $P(0, 1)$ and $Q(9, 4)$.

- (a) (i) Describe the geometrical transformation that maps the graph of $y = \sqrt{x}$ onto the graph of $y = 1 + \sqrt{x}$.

[2 marks]

- (ii) Describe the geometrical transformation that maps the graph of $y = 4^x$ onto the graph of $y = 4^{\frac{x}{9}}$.

[2 marks]

- (b) (i) Given that $\int_0^9 \sqrt{x} \, dx = 18$, find the value of $\int_0^9 (1 + \sqrt{x}) \, dx$.

[1 mark]

- (ii) Use the trapezium rule with five ordinates (four strips) to find an approximate value for $\int_0^9 4^{\frac{x}{9}} \, dx$. Give your answer to one decimal place.

[4 marks]

- (iii) Hence find an approximate value for the area of the shaded region bounded by the two curves and state, with an explanation, whether your approximation will be an overestimate or an underestimate of the true value for the area of the shaded region.

[3 marks]

QUESTION
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Answer space for question 7



Answer space for question 7

[illegible]

Answer space for question 7

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8

The point A lies on the curve with equation $y = x^{\frac{1}{2}}$. The tangent to this curve at A is parallel to the line $3y - 2x = 1$. Find an equation of this tangent at A .

[5 marks]

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Answer space for question 8

Answer space for question 8

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9 (a) Use logarithms to solve the equation $2^{3x} = 5$, giving your value of x to three significant figures. **[2 marks]**

(b) Given that $\log_a k - \log_a 2 = \frac{2}{3}$, express a in terms of k . **[4 marks]**

(c) (i) By using the binomial expansion, or otherwise, express $(1 + 2x)^3$ in ascending powers of x . **[3 marks]**

(ii) It is given that

$$\log_2[(1 + 2n)^3 - 8n] = \log_2(1 + 2n) + \log_2[4(1 + n^2)]$$

By forming and solving a suitable quadratic equation, find the possible values of n .

[5 marks]

QUESTION
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Answer space for question 9



QUESTION
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Answer space for question 9

[illegible]

QUESTION
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Answer space for question 9

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END OF QUESTIONS



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ANSWER IN THE SPACES PROVIDED**

