

Please write clearly in block capitals.

Centre number

--	--	--	--	--

Candidate number

--	--	--	--

Surname

Forename(s)

Candidate signature

AS MATHEMATICS

Unit Pure Core 2

Wednesday 23 May 2018

Morning

Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:

- the blue AQA booklet of formulae and statistical tables.

You may use a graphics calculator.

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	



Answer **all** questions.

Answer each question in the space provided for that question.

- 1 (a)** Use the trapezium rule with four ordinates (three strips) to find an approximate value for $\int_0^{\frac{3}{4}} \sqrt{9 - 16x^3} \, dx$. Give your answer to three significant figures.

[4 marks]

- (b)** State how you could obtain a better approximation to the value of the integral using the trapezium rule.

[1 mark]

QUESTION
PART
REFERENCE

Answer space for question 1



2 A curve is defined for $x > 0$ by the equation

$$y = 3x + x^{\frac{3}{2}} - 7$$

(a) Find $\frac{dy}{dx}$.

[2 marks]

(b) The point $P(4, k)$ lies on the curve.

(i) Find the value of the integer k .

[1 mark]

(ii) Find an equation of the normal to the curve at the point P .

[3 marks]

(iii) The normal to the curve at P intersects the x -axis at the point Q . Find the x -coordinate of Q .

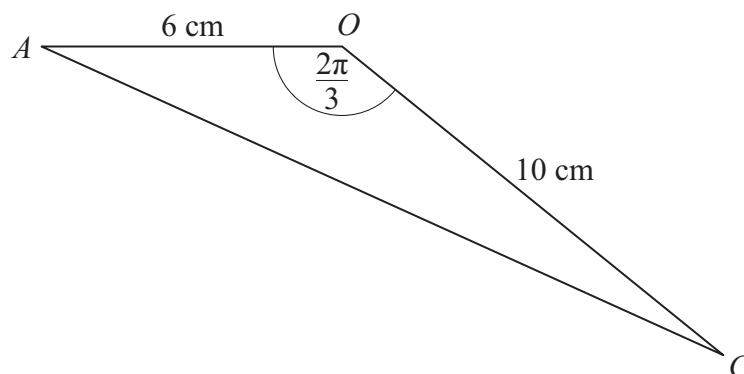
[2 marks]

QUESTION
PART
REFERENCE

Answer space for question 2



- 3 The diagram shows a triangle AOC .

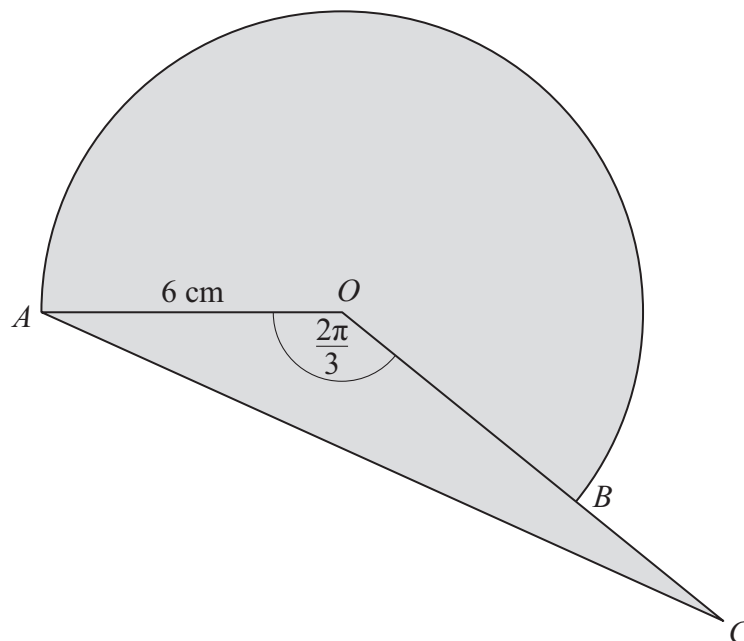


The lengths of AO and OC are 6 cm and 10 cm respectively.

Angle AOC is $\frac{2\pi}{3}$ radians.

- (a) Find the length of AC . [3 marks]

- (b) A circular arc, centre O and radius 6 cm, is drawn from the point A to meet the line OC at the point B as shown in the diagram below.



- (i) Show that the length of the arc AB , shown in the diagram, is 25.1 cm, correct to three significant figures. [3 marks]

- (ii) Find the area of the shaded region bounded by the arc AB and the lines BC and CA . Give your answer to the nearest cm^2 . [4 marks]



<small>QUESTION PART REFERENCE</small>	Answer space for question 3



4 (a) The arithmetic series $23 + 32 + 41 + 50 + \dots + 2714$ has 300 terms.

The n th term of the series is u_n .

(i) Write down the common difference of the series.

[1 mark]

(ii) Find the value of u_{100} .

[2 marks]

(iii) Find the value of $\sum_{n=100}^{300} u_n$.

[3 marks]

(b) A geometric series has first term 24 . The first term and the fourth term of this series have a sum equal to -57 .

(i) Find the common ratio of the series.

[2 marks]

(ii) State whether the series has a sum to infinity. Give a reason to justify your answer.

[1 mark]

QUESTION
PART
REFERENCE

Answer space for question 4



5 (a) The expression $(3 + 2x^2)^3$ can be written in the form

$$27 + ax^2 + bx^4 + cx^6$$

By using the binomial expansion, or otherwise, find the values of the coefficients a , b and c .

[3 marks]

(b) Given that $\frac{1}{x^4} = x^n$, write down the value of n .

[1 mark]

(c) (i) Find $\int \frac{(3 + 2x^2)^3}{x^4} dx$.

[4 marks]

(ii) Hence find the value of $\int_1^3 \frac{(3 + 2x^2)^3}{x^4} dx$.

[2 marks]

QUESTION
PART
REFERENCE

Answer space for question 5



- 6** The n th term of a sequence is u_n .
- The sequence is defined by $u_{n+1} = pu_n + q$, where p and q are constants.
- The second term of the sequence is 121. The third term of the sequence is 100.
- The limit of u_n as n tends to infinity is 16.
- Find the value of the fourth term of the sequence.

[5 marks]QUESTION
PART
REFERENCE**Answer space for question 6**

7 (a) (i) Express $\log_b(6x) - \log_b 18$ as a single term.

[1 mark]

(ii) Solve the equation

$$\log_b(x + 4) = \log_b(6x) - \log_b 18 + \log_b(x - 1)$$

where b is a positive constant.

[4 marks]

(b) (i) Given that $\log_m n = k$, express n in terms of m and k .

[1 mark]

(ii) Given that $p \log_8 x^2 = \log_2(x^2 \sqrt{x})$, find the value of the constant p .

[4 marks]

QUESTION
PART
REFERENCE

Answer space for question 7



8 (a) Given that

$$9 \sin^2 \theta - 2 \sin \theta \cos \theta = 8$$

show that

$$(\tan \theta - 4)(\tan \theta + 2) = 0$$

[3 marks]

(b) Hence solve the equation

$$9 \sin^2 2x - 2 \sin 2x \cos 2x = 8$$

in the interval $0^\circ \leq x \leq 180^\circ$, giving your values of x to the nearest degree.

[4 marks]

QUESTION
PART
REFERENCE

Answer space for question 8



9 (a) (i) Describe the geometrical transformation that maps the graph of $y = 2^x$ onto the graph of $y = 2^{2x}$. **[2 marks]**

(ii) Describe the single geometrical transformation that maps the graph of $y = 2^x - 15$ onto the graph of $y = 2^{x+3} - 15$. **[2 marks]**

(b) The curve C_1 has equation $y = 2^{2x}$. The curve C_2 has equation $y = 2^{x+3} - 15$.
The curves C_1 and C_2 intersect at the points A and B .

(i) Given that $u = 2^x$, express 2^{x+3} in terms of u . **[1 mark]**

(ii) Find the gradient of the line AB , giving your answer in the form $\frac{p}{\log_2 q}$. **[6 marks]**

QUESTION
PART
REFERENCE

Answer space for question 9



There are no questions printed on this page

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



There are no questions printed on this page

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

Copyright information

For confidentiality purposes, from the November 2015 examination series, acknowledgements of third party copyright material will be published in a separate booklet rather than including them on the examination paper or support materials. This booklet is published after each examination series and is available for free download from www.aqa.org.uk after the live examination series.

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders may have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements. If you have any queries please contact the Copyright Team, AQA, Stag Hill House, Guildford, GU2 7XJ.

Copyright © 2018 AQA and its licensors. All rights reserved.

