

Please write clearly in block capitals.

Centre number

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Candidate number

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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



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

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]

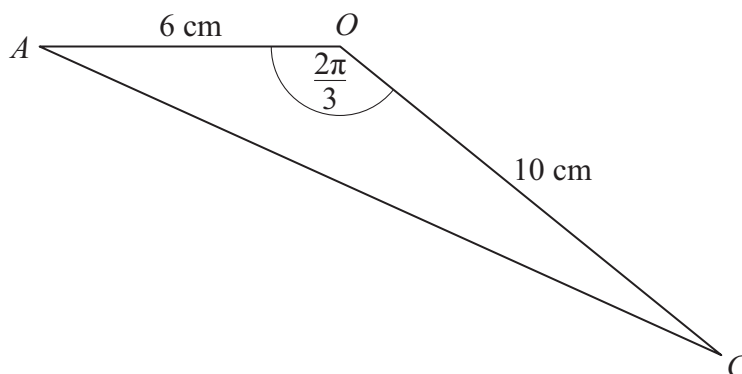
QUESTION
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Answer space for question 2



QUESTION
PART
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- 3 The diagram shows a triangle AOC .



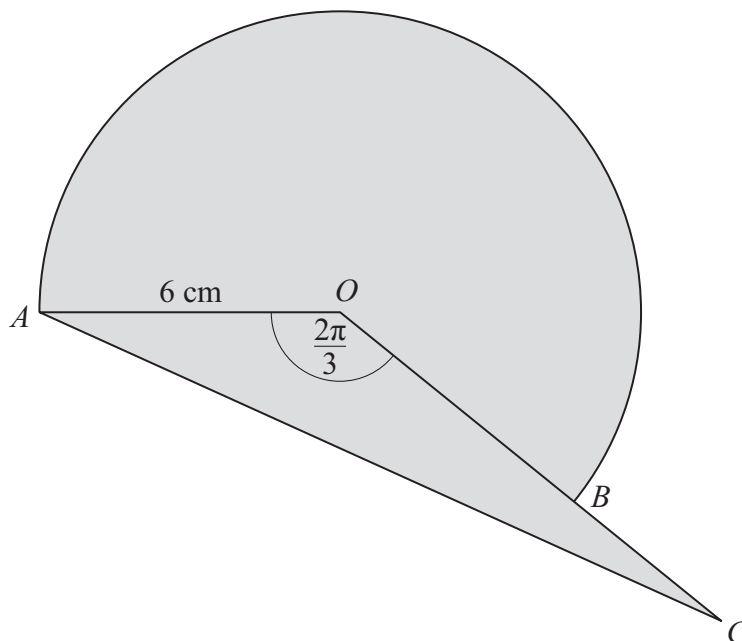
The lengths of AO and OC are 6 cm and 10 cm respectively.

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]



Answer space for question 3

[illegible]

QUESTION
PART
REFERENCE**Answer space for question 3**

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

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



QUESTION
PART
REFERENCE**Answer space for question 4****Turn over ►**

- 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



[illegible]

Turn over ►



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

[illegible]

Turn over ►



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



[illegible]

Turn over ►



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
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REFERENCE

Answer space for question 8



[illegible]

Turn over ►



- 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
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Turn over ►



[illegible]

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