

Write your name here	
Surname	Other names
Centre Number	Candidate Number
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Edexcel IGCSE	
<h1 style="margin: 0;">Further Pure Mathematics</h1> <h2 style="margin: 0;">Paper 2</h2>	
Tuesday 21 June 2011 – Morning Time: 2 hours	Paper Reference 4PM0/02
Calculators may be used.	Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided
– *there may be more space than you need.*

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Check your answers if you have time at the end.

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6/6/6/6



Turn over ►

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Answer all ELEVEN questions
Write your answers in the spaces provided
You must write down all stages in your working

1 Evaluate $\sum_{n=6}^{20} (2n-3)$

(3)

(Total for Question 1 is 3 marks)



- 2 A particle is moving along a straight line. At time t seconds, $t \geq 0$, the displacement, s metres, of the particle from a fixed point of the line is given by $s = t^3 + 2t^2 - 3t + 6$

Find the value of t for which the particle is moving with velocity 12 m/s.

(4)

(Total for Question 2 is 4 marks)



[illegible]

(Total for Question 3 is 6 marks)





[illegible]

(Total for Question 4 is 6 marks)



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(Total for Question 5 is 6 marks)



6

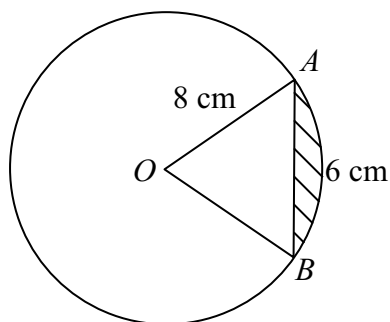


Figure 1

Figure 1 shows a circle, centre O , with radius 8 cm. The arc AB has length 6 cm.

- (a) Find, in radians, the size of angle AOB . (2)
- (b) Find the area of the sector AOB . (2)
- (c) Find, to 3 significant figures, the area of the shaded segment. (3)



[illegible]

(Total for Question 6 is 7 marks)



7

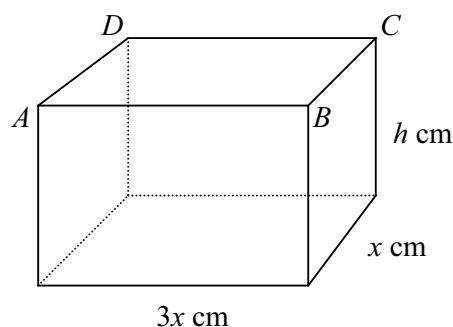


Figure 2

A rectangular box has length $3x$ cm, width x cm and height h cm, as shown in Figure 2. The top of the box, $ABCD$, is open. The volume of the box is 30 cm^3 and the total external surface area of the box is $S \text{ cm}^2$.

(a) Show that $S = 3x^2 + \frac{80}{x}$ (4)

Given that x can vary,

(b) find, to 3 significant figures, the minimum value of S . (5)

(c) Verify that your answer to part (b) does give the minimum value for S . (2)

[illegible]

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This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting or typing. There are no margins, text, or other markings on the page.

[illegible]

(Total for Question 7 is 11 marks)



- (4)

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[illegible]

[illegible]

[illegible]

(Total for Question 8 is 11 marks)



- 9 (a) Expand $\left(1 - \frac{3x}{4}\right)^{\frac{1}{3}}$ in ascending powers of x up to and including the term in x^3 , simplifying your terms as far as possible. (3)

- (b) Expand $\left(1 + \frac{3x}{4}\right)^{-\frac{1}{3}}$ in ascending powers of x up to and including the term in x^3 , simplifying your terms as far as possible. (3)

- (c) Write down the range of values of x for which both of your expansions are valid. (1)

- (d) Expand $\left(\frac{4-3x}{4+3x}\right)^{\frac{1}{3}}$ in ascending powers of x up to and including the term in x^3 , simplifying your terms as far as possible. (3)

- (e) Hence obtain an estimate, to 3 significant figures, of

$$\int_0^{0.5} \left(\frac{4-3x}{4+3x}\right)^{\frac{1}{3}} dx \quad (4)$$



[illegible]

[illegible]

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(Total for Question 9 is 14 marks)



(a) find

(i) the value of $\alpha^2 + \beta^2$

(ii) the value of $\alpha^4 + \beta^4$

(5)

(b) Show that $\alpha - \beta = 2\sqrt{7}$

(3)

(c) Factorise completely $\alpha^4 - \beta^4$

(2)

(d) Hence find the exact value of $\alpha^4 - \beta^4$

(2)

Given that $\beta^4 = A + B\sqrt{7}$ where A and B are positive constants

(e) find the value of A and the value of B .

(2)

[illegible]

This image shows a full page of white paper with horizontal dotted lines, resembling notebook paper. The lines are evenly spaced and run across the width of the page. There is no handwriting or other markings on the paper.



[illegible]

This image shows a full page of a document template. It consists of a series of evenly spaced, horizontal dotted lines running across the width of the page. The background is plain white, and there are no margins, headers, or footers visible. This type of template is commonly used for handwriting practice or as a guide for letter height in digital typography.

(Total for Question 10 is 14 marks)



$$f(x) = x^2 + 6x + 8$$

Given that $f(x)$ can be expressed in the form $(x + A)^2 + B$ where A and B are constants,

(a) find the value of A and the value of B .

(3)

(b) Hence, or otherwise, find

(i) the value of x for which $f(x)$ has its least value

(ii) the least value of $f(x)$.

(2)

The curve C has equation $y = x^2 + 6x + 8$

The line l , with equation $y = 2 - x$, intersects C at two points.

(c) Find the x -coordinate of each of these two points.

(4)

(d) Find the x -coordinate of the points where C crosses the x -axis.

(2)

(Parts (e) and (f) follow on page 30 and 31)

[illegible]

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Turn over for parts (e) and (f)



Question 11 continued

The curve C has equation $y = x^2 + 6x + 8$ and the line l has equation $y = 2 - x$

In the space below,

(e) sketch, on the same axes, the curve C and the line l .

(2)

(f) Find the area of the finite region bounded by the curve C and the line l .

(5)



[illegible]

[illegible]

TOTAL FOR PAPER IS 100 MARKS