

Write your name here

Surname

Other names

**Pearson Edexcel**  
**International**  
**Advanced Level**

Centre Number

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Candidate Number

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# Core Mathematics C12

## Advanced Subsidiary

Tuesday 10 January 2017 – Morning

**Time: 2 hours 30 minutes**

Paper Reference

**WMA01/01**

**You must have:**

Mathematical Formulae and Statistical Tables (Blue)

Total Marks

**Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.**

### Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B). Coloured pencils and highlighter pens must not be used.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- When a calculator is used, the answer should be given to an appropriate degree of accuracy.

### Information

- The total mark for this paper is 125.
- 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.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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**(Total 7 marks)**

- $$x^2 + y^2 - 8x + 4y - 12 = 0$$

(a) the coordinates of  $C$ ,

(2)

- (b) the exact value of  $r$ .

(2)

The circle cuts the  $y$ -axis at the points  $A$  and  $B$ .

- (c) Find the coordinates of the points  $A$  and  $B$ .

(3)

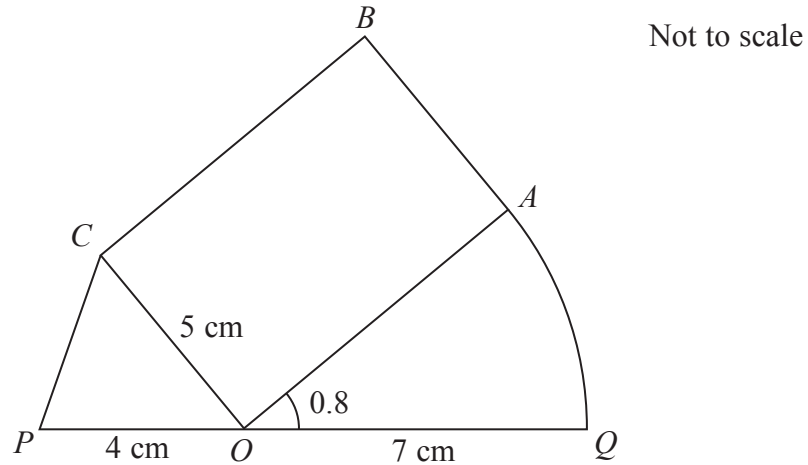
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**(Total 7 marks)**

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3.



**Figure 1**

The shape  $POQABCP$ , as shown in Figure 1, consists of a triangle  $POC$ , a sector  $OQA$  of a circle with radius 7 cm and centre  $O$ , joined to a rectangle  $OABC$ .

The points  $P$ ,  $O$  and  $Q$  lie on a straight line.

$PO = 4$  cm,  $CO = 5$  cm and angle  $AOQ = 0.8$  radians.

- (a) Find the length of arc  $AQ$ . (2)
- (b) Find the size of angle  $POC$  in radians, giving your answer to 3 decimal places. (2)
- (c) Find the perimeter of the shape  $POQABCP$ , in cm, giving your answer to 2 decimal places. (4)

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**Question 3 continued**

**Q3**

**(Total 8 marks)**



4. An arithmetic series has first term  $a$  and common difference  $d$ .

Given that the sum of the first 9 terms is 54

- (a) show that

$$a + 4d = 6$$

(2)

Given also that the 8th term is half the 7th term,

- (b) find the values of  $a$  and  $d$ .

(4)

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Q4

**(Total 6 marks)**

**Turn over**



$$y = \log_3 x$$

(i)  $\log_3\left(\frac{x}{9}\right)$

(ii)  $\log_3 \sqrt{x}$

(3)

$$2\log_3\left(\frac{x}{9}\right) - \log_3\sqrt{x} = 2$$

(4)

**Question 5 continued**

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Question 5 continued

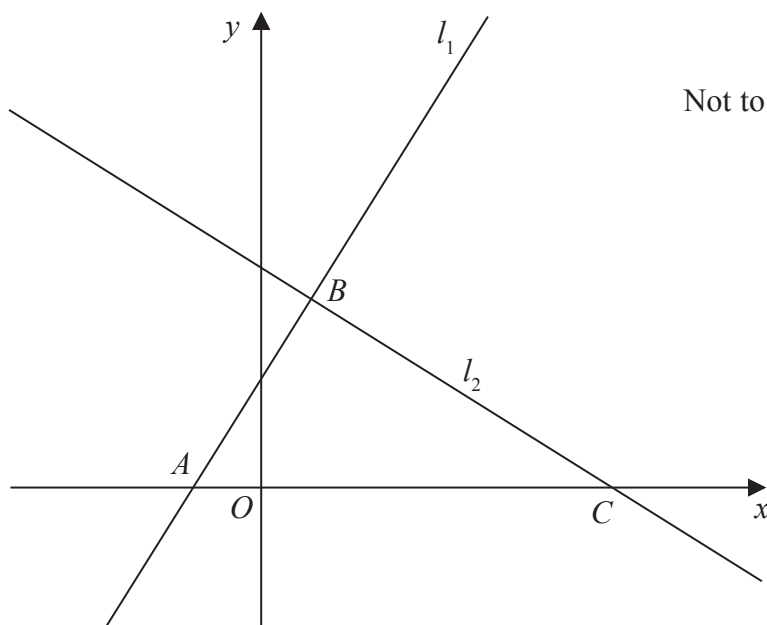
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Q5

(Total 7 marks)



Not to scale



### Figure 2

The straight line  $l_1$  has equation  $2y = 3x + 5$

The line  $l_1$  cuts the  $x$ -axis at the point  $A$ , as shown in Figure 2.

- (a) (i) State the gradient of  $l_1$
- (ii) Write down the  $x$  coordinate of point  $A$ .
- (3)**

Another straight line  $l_2$  intersects  $l_1$  at the point  $B$  with  $x$  coordinate 1 and crosses the  $x$ -axis at the point  $C$ , as shown in Figure 2.

Given that  $l_2$  is perpendicular to  $l_1$

- (b) find an equation for  $l_2$  in the form  $ax + by + c = 0$ , where  $a$ ,  $b$  and  $c$  are integers, (5)
- (c) find the exact area of triangle  $ABC$ . (3)

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Question 6 continued

Handwriting practice area with 25 horizontal lines.





**(Total 11 marks)**

**Turn over**



$$\int \frac{2 + 4x^3}{x^2} dx$$

(4)

$$\int_2^4 \left( \frac{4}{\sqrt{x}} + k \right) dx = 30$$

(5)

**Question 7 continued**

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**(Total 9 marks)**



8.

$$f(x) = 2x^3 - 5x^2 - 23x - 10$$

- (a) Find the remainder when  $f(x)$  is divided by  $(x - 3)$ .

(2)

- (b) Show that  $(x + 2)$  is a factor of  $f(x)$ .

(2)

- (c) Hence fully factorise  $f(x)$ .

(4)

- (d) Hence solve

$$2(3^{3t}) - 5(3^{2t}) - 23(3^t) = 10$$

giving your answer to 3 decimal places.

(2)

[illegible]

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Question 8 continued

Lined area for writing the answer to Question 8.





[illegible]

**Q8**





Question 9 continued

Handwriting practice area with 25 horizontal lines.



**(Total 8 marks)**

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$$1 + 4x + px^2$$

(a) Find the value of  $a$ . (2)

(b) Find the value of  $p$ . (2)

(c) Find the value of  $q$ . (2)

**Question 10 continued**

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Question 10 continued

Lined area for writing the answer to Question 10.





**(Total 6 marks)**

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(i) Solve, for  $0 \leq x < 2\pi$ ,

$$3 \cos^2 x + 1 = 4 \sin^2 x$$

(5)

$$5 \sin(\theta + 10^\circ) = \cos(\theta + 10^\circ)$$

(5)

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**Question 11 continued**

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Question 11 continued

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Question 11 continued

Q11

(Total 10 marks)





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Question 12 continued

Q12

(Total 11 marks)



13. (a) On separate axes sketch the graphs of

(i)  $y = c^2 - x^2$

(ii)  $y = x^2(x - 3c)$

where  $c$  is a positive constant.

Show clearly the coordinates of the points where each graph crosses or meets the  $x$ -axis and the  $y$ -axis.

(5)

(b) Prove that the  $x$  coordinate of any point of intersection of

$$y = c^2 - x^2 \text{ and } y = x^2(x - 3c)$$

where  $c$  is a positive constant, is given by a solution of the equation

$$x^3 + (1 - 3c)x^2 - c^2 = 0$$

(2)

Given that the graphs meet when  $x = 2$

(c) find the exact value of  $c$ , writing your answer as a fully simplified surd.

(4)

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Question 13 continued

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Question 13 continued

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Q13

(Total 11 marks)





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Question 14 continued

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**(Total 9 marks)**

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**Question 15 continued**

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Q15

Question 15 continued

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(Total 5 marks)

TOTAL FOR PAPER: 125 MARKS

END

