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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

Wednesday 11 October 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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1. The line  $l_1$  has equation

$$8x + 2y - 15 = 0$$

- (a) Find the gradient of  $l_1$

(1)

The line  $l_2$  is parallel to the line  $l_1$  and passes through the point  $\left(-\frac{3}{4}, 16\right)$ .

- (b) Find the equation of  $l_2$  in the form  $y = mx + c$ , where  $m$  and  $c$  are constants.

(3)

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Question 1 continued

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Q1

(Total 4 marks)



2. The point  $P(2, 3)$  lies on the curve with equation  $y = f(x)$ .

State the coordinates of the image of  $P$  under the transformation represented by the curve with equation

(a)  $y = f(x + 2)$  (1)

(b)  $y = -f(x)$  (1)

(c)  $2y = f(x)$  (1)

(d)  $y = f(x) - 4$  (1)

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Question 2 continued

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Q2

(Total 4 marks)



3. (a) Express  $\frac{x^3 + 4}{2x^2}$  in the form  $Ax^p + Bx^q$ , where  $A$ ,  $B$ ,  $p$  and  $q$  are constants. (3)

- (b) Hence find

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

simplifying your answer.

(3)

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**Question 3 continued**

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**(Total 6 marks)**

**Q3**







Question 4 continued

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Q4

(Total 6 marks)



Figure 2 shows a sketch of part of the curve with equation

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

**(3)**

(b) Use the answer to part (a) to find the exact coordinates of  $P$ . (5)

Question 5 continued

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Q5

(Total 8 marks)



- (2)

- (2)

(3)

Question 6 continued

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(Total 7 marks)

Q6



7.

$$g(x) = 2x^3 + ax^2 - 18x - 8$$

Given that  $(x + 2)$  is a factor of  $g(x)$ ,

- (a) show that  $a = -3$

(2)

- (b) Hence, using algebra, fully factorise  $g(x)$ .

(4)

Using your answer to part (b),

- (c) solve, for  $0 \leq \theta < 2\pi$ , the equation

$$2 \sin^3 \theta - 3 \sin^2 \theta - 18 \sin \theta = 8$$

giving each answer, in radians, as a multiple of  $\pi$ .

(3)



**Question 7 continued**

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Question 7 continued

Lined area for writing the answer to Question 7.





**Question 7 continued**

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**Q7**

**(Total 9 marks)**





Question 8 continued

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Q8

(Total 6 marks)



9. (a) Given that  $a$  is a constant,  $a > 1$ , sketch the graph of

$$y = a^x, \quad x \in \mathbb{R}$$

On your diagram show the coordinates of the point where the graph crosses the  $y$ -axis. (2)

The table below shows corresponding values of  $x$  and  $y$  for  $y = 2^x$

$x$	-4	-2	0	2	4
$y$	0.0625	0.25	1	4	16

- (b) Use the trapezium rule, with all of the values of  $y$  from the table, to find an approximate value, to 2 decimal places, for

$$\int_{-4}^4 2^x \, dx \quad (4)$$

- (c) Use the answer to part (b) to find an approximate value for

(i)  $\int_{-4}^4 2^{x+2} \, dx$

(ii)  $\int_{-4}^4 (3 + 2^x) \, dx \quad (4)$

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Question 9 continued

Lined area for writing the answer to Question 9.

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Question 9 continued

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Lined area for writing the answer to Question 9.

Q9

(Total 10 marks)



10.

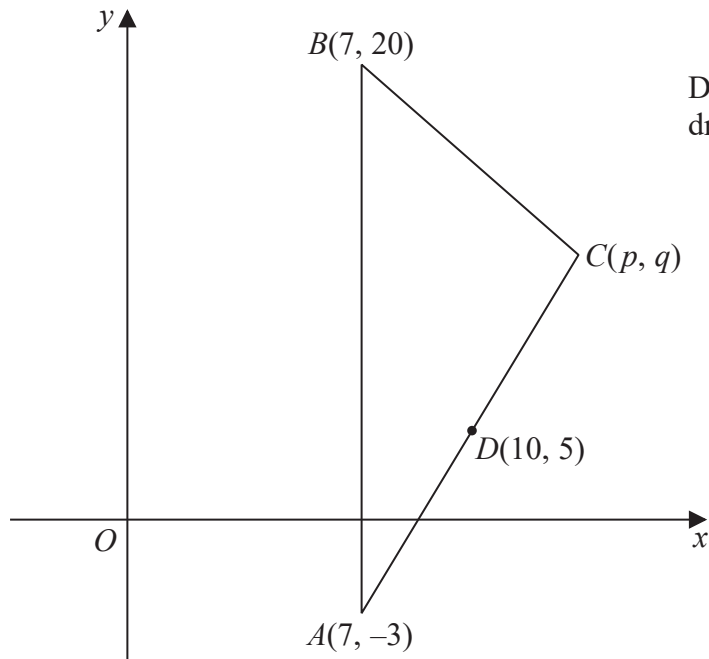


Figure 4

The points  $A(7, -3)$ ,  $B(7, 20)$  and  $C(p, q)$  form the vertices of a triangle  $ABC$ , as shown in Figure 4. The point  $D(10, 5)$  is the midpoint of  $AC$ .

- (a) Find the value of  $p$  and the value of  $q$ . (2)

The line  $l$  passes through  $D$  and is perpendicular to  $AC$ .

- (b) Find an equation for  $l$ , in the form  $ax + by = c$ , where  $a$ ,  $b$  and  $c$  are integers. (5)

Given that the line  $l$  intersects  $AB$  at  $E$ ,

- (c) find the exact coordinates of  $E$ . (2)

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Question 10 continued

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Question 10 continued

Lined area for writing the answer to Question 10.



Question 10 continued

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Q10

(Total 9 marks)



(3)

Question 11 continued

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Q11

(Total 7 marks)



- (4)

giving your answers, in degrees, to 2 decimal places.

*(Solutions based entirely on graphical or numerical methods are not acceptable.)*

- $$\frac{\cos^2 x + 2\sin^2 x}{1 - \sin^2 x} = 5$$

$$\tan^2 x = k, \quad \text{where } k \text{ is a constant.}$$

- $$\frac{\cos^2 x + 2\sin^2 x}{1 - \sin^2 x} = 5$$

giving your answers, in radians, to 3 decimal places.

(7)

Question 12 continued

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Question 12 continued

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Q12

(Total 11 marks)



13. The circle  $C$  has equation

$$(x - 3)^2 + (y + 4)^2 = 30$$

Write down

- (a) (i) the coordinates of the centre of  $C$ ,  
(ii) the exact value of the radius of  $C$ .

(2)

Given that the point  $P$  with coordinates  $(6, k)$ , where  $k$  is a constant, lies inside circle  $C$ ,

- (b) show that

$$k^2 + 8k - 5 < 0$$

(3)

- (c) Hence find the exact set of values of  $k$  for which  $P$  lies inside  $C$ .

(4)

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**Question 13 continued**

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Question 13 continued

Lined area for writing the answer to Question 13.



Question 13 continued

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Q13

(Total 9 marks)



(d) Assuming the model, find the value of  $N$ . (5)

Question 14 continued

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Question 14 continued

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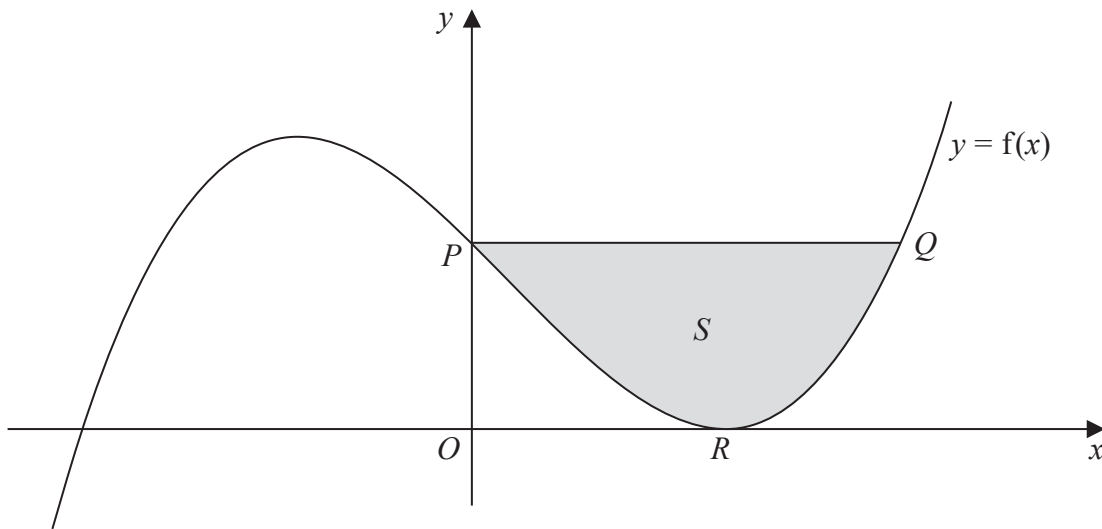
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Q14

(Total 10 marks)



15.



**Figure 5**

Figure 5 shows a sketch of part of the graph  $y = f(x)$ , where

$$f(x) = \frac{(x-3)^2(x+4)}{2}, \quad x \in \mathbb{R}$$

The graph cuts the  $y$ -axis at the point  $P$  and meets the positive  $x$ -axis at the point  $R$ , as shown in Figure 5.

(a) (i) State the  $y$  coordinate of  $P$ .

(ii) State the  $x$  coordinate of  $R$ .

(2)

The line segment  $PQ$  is parallel to the  $x$ -axis. Point  $Q$  lies on  $y = f(x)$ ,  $x > 0$

(b) Use algebra to show that the  $x$  coordinate of  $Q$  satisfies the equation

$$x^2 - 2x - 15 = 0$$

(3)

(c) Use part (b) to find the coordinates of  $Q$ .

(3)

The region  $S$ , shown shaded in Figure 5, is bounded by the curve  $y = f(x)$  and the line segment  $PQ$ .

(d) Use calculus to find the exact area of  $S$ .

(6)

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Question 15 continued

Handwriting practice area with 30 horizontal lines.

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Question 15 continued

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Q15

(Total 14 marks)



The point  $P(1, 4)$  lies on the curve with equation  $y = f(x)$ .

The tangent to  $y = f(x)$  at the point  $P$  has equation  $y = 12x - 8$

Calculate the value of  $a$  and the value of  $b$ .

(5)



Question 16 continued

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**TOTAL FOR PAPER: 125 MARKS**

48

