

Please check the examination details below before entering your candidate information

Candidate surname

Other names

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

Centre Number

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Candidate Number

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**Wednesday 10 October 2018**

Morning (Time: 2 hours 30 minutes)

Paper Reference **WMA01/01**

**Core Mathematics C12**

**Advanced Subsidiary**

**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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**Pearson**

1. (i) Given that  $125\sqrt{5} = 5^a$ , find the value of  $a$ .

(2)

(ii) Show that  $\frac{16}{4 - \sqrt{8}} = 8 + 4\sqrt{2}$

You must show all stages of your working.

(3)

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Question 1 continued

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Q1

(Total 5 marks)



2. Use algebra to solve the simultaneous equations

$$x + y = 5$$

$$x^2 + x + y^2 = 51$$

You must show all stages of your working.

(7)

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Question 2 continued

Lined area for writing the answer to Question 2.

(Total 7 marks)

Q2



3. Given that  $y = 2x^3 - \frac{5}{3x^2} + 7$ ,  $x \neq 0$ , find in its simplest form

(a)  $\frac{dy}{dx}$ , (3)

(b)  $\int y \, dx$ . (4)

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Question 3 continued

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(Total 7 marks)

Q3



4. A sequence of numbers  $u_1, u_2, u_3, \dots$  satisfies

$$u_n = kn - 3^n$$

where  $k$  is a constant.

Given that  $u_2 = u_4$

- (a) find the value of  $k$

(3)

- (b) evaluate  $\sum_{r=1}^4 u_r$

(3)

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Question 4 continued

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Q4

(Total 6 marks)



$$\left(1 - \frac{1}{2}x\right)^{10}$$

(4)

$$(3 + 5x - 2x^2)\left(1 - \frac{1}{2}x\right)^{10}$$

(2)

Question 5 continued

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Question 5 continued

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Q5

(Total 6 marks)



6. (a) Sketch the graph of  $y = \left(\frac{1}{2}\right)^x$ ,  $x \in \mathbb{R}$ , showing the coordinates of the point at which the graph crosses the y-axis.

(2)

The table below gives corresponding values of  $x$  and  $y$ , for  $y = \left(\frac{1}{2}\right)^x$

The values of  $y$  are rounded to 3 decimal places.

$x$	-0.9	-0.8	-0.7	-0.6	-0.5
$y$	1.866	1.741	1.625	1.516	1.414

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

$$\int_{-0.9}^{-0.5} \left(\frac{1}{2}\right)^x dx$$

(3)

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**Question 6 continued**

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**Q6**

**(Total 5 marks)**



- (4)



Question 7 continued

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Question 7 continued

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(Total 8 marks)

Q7

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8.

$$f(x) = 2x^3 - 3x^2 + px + q$$

where  $p$  and  $q$  are constants.

When  $f(x)$  is divided by  $(x - 1)$ , the remainder is  $-6$

(a) Use the remainder theorem to show that  $p + q = -5$

(2)

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

(b) find the value of  $p$  and the value of  $q$ .

(3)

(c) Factorise  $f(x)$  completely.

(4)

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Question 8 continued

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**Question 8 continued**

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**Q8**

**(Total 9 marks)**



- (2)

(5)



Question 9 continued

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Question 9 continued

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Q9

(Total 7 marks)



10.

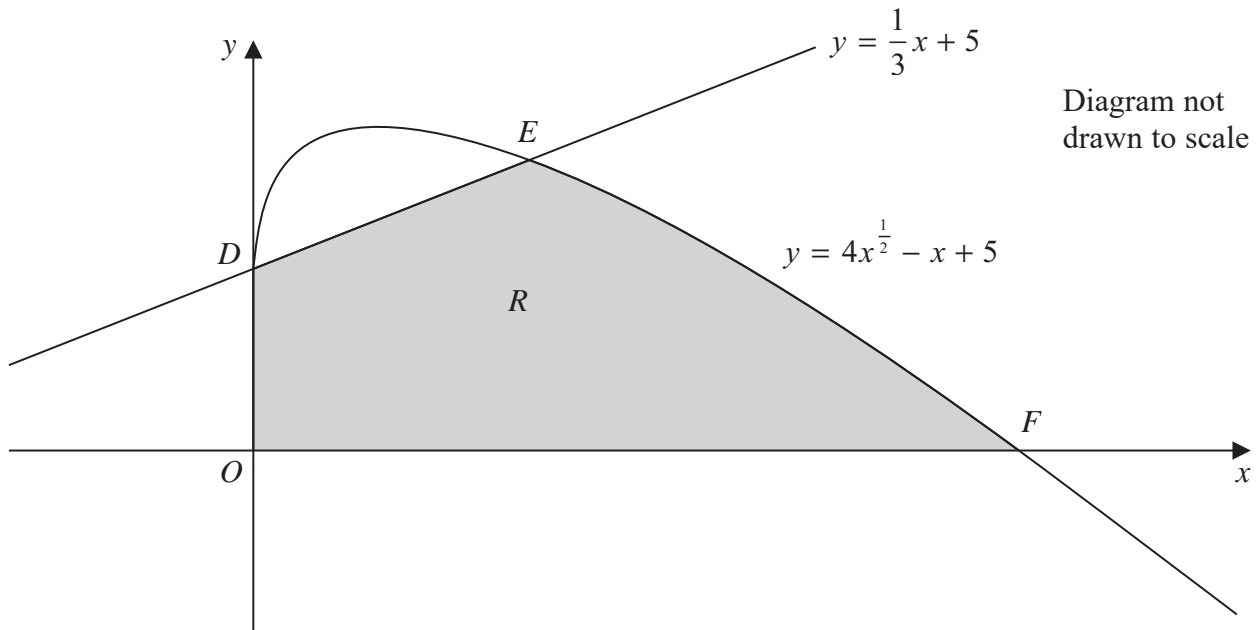


Figure 1

The finite region  $R$ , which is shown shaded in Figure 1, is bounded by the coordinate axes, the straight line  $l$  with equation  $y = \frac{1}{3}x + 5$  and the curve  $C$  with equation  $y = 4x^{\frac{1}{2}} - x + 5$ ,  $x \geq 0$

The line  $l$  meets the curve  $C$  at the point  $D$  on the  $y$ -axis and at the point  $E$ , as shown in Figure 1.

- (a) Use algebra to find the coordinates of the points  $D$  and  $E$ . (4)

The curve  $C$  crosses the  $x$ -axis at the point  $F$ .

- (b) Verify that the  $x$  coordinate of  $F$  is 25 (1)

- (c) Use algebraic integration to find the exact area of the shaded region  $R$ . (6)

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**Question 10 continued**

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Question 10 continued

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Q10

(Total 11 marks)



(a) Show that  $k$  satisfies the inequality

$$6k^2 - 7k - 49 < 0$$

(4)

(b) Find the range of possible values for  $k$ .

(4)





Question 11 continued

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Q11

(Total 8 marks)



(3)

(5)

$$6 \cos(2\theta - 10^\circ) - 5 \tan(2\theta - 10^\circ) = 0$$

giving your answers to one decimal place.

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

Question 12 continued

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Question 12 continued

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Q12

(Total 8 marks)



13. (i) Find the value of  $x$  for which

$$4^{3x+2} = 3^{600}$$

giving your answer to 4 significant figures.

(3)

(ii) Given that

$$\log_a (3b - 2) - 2\log_a 5 = 4, \quad a > 0, a \neq 1, b > \frac{2}{3}$$

find an expression for  $b$  in terms of  $a$ .

(4)

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**Question 13 continued**

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**Question 13 continued**

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**Q13**

**(Total 7 marks)**



(2)

(2)

(7)

- (c) Find the exact area of triangle  $ODE$ .

Question 14 continued

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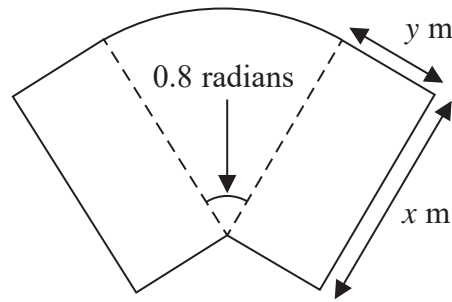
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Q14

(Total 11 marks)



15.



**Figure 2**

Figure 2 shows a plan for a garden.

The garden consists of two identical rectangles of width  $y$  m and length  $x$  m, joined to a sector of a circle with radius  $x$  m and angle  $0.8$  radians, as shown in Figure 2.

The area of the garden is  $60 \text{ m}^2$ .

(a) Show that the perimeter,  $P$  m, of the garden is given by

$$P = 2x + \frac{120}{x} \quad (5)$$

(b) Use calculus to find the exact minimum value for  $P$ , giving your answer in the form  $a\sqrt{b}$ , where  $a$  and  $b$  are integers.

(4)

(c) Justify that the value of  $P$  found in part (b) is the minimum.

(2)

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**Question 15 continued**

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Question 15 continued

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Q15

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(Total 11 marks)



16. The first three terms of a geometric series are  $(k + 5)$ ,  $k$  and  $(2k - 24)$  respectively, where  $k$  is a constant.

(a) Show that  $k^2 - 14k - 120 = 0$  (3)

(b) Hence find the possible values of  $k$ . (2)

(c) Given that the series is convergent, find

(i) the common ratio,

(ii) the sum to infinity. (4)

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Question 16 continued

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**TOTAL FOR PAPER: 125 MARKS**

**END**

