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| Candidate surname    |                      | Other names          |                      |
| Centre Number        |                      | Candidate Number     |                      |
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**Pearson Edexcel International Advanced Level**

**Time** 1 hour 30 minutes **Paper reference** **WMA12/01**

**Mathematics**  
**International Advanced Subsidiary/Advanced Level**  
**Pure Mathematics P2**

**You must have:**  
 Mathematical Formulae and Statistical Tables (Yellow), calculator

Total Marks

Candidates may use any calculator permitted by Pearson regulations. 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).
- **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.
- Inexact answers should be given to three significant figures unless otherwise stated.

### Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 10 questions in this question paper. The total mark for this paper is 75.
- 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.

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- (3)

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Question 1 continued

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Q1

(Total 6 marks)



$$\begin{aligned} u_1 &= 6 \\ u_{n+1} &= ku_n + 3 \end{aligned}$$

(a) Find, in terms of  $k$ , an expression for  $u_3$ .

(2)

Given that  $\sum_{n=1}^3 u_n = 117$

(b) find the value of  $k$ .

(3)

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Question 2 continued

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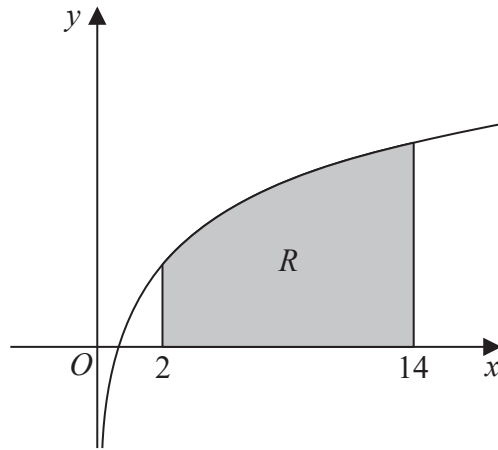
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Q2

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3.



**Figure 1**

Figure 1 shows a sketch of part of the curve with equation  $y = \log_{10} x$

The region  $R$ , shown shaded in Figure 1, is bounded by the curve, the line with equation  $x = 2$ , the  $x$ -axis and the line with equation  $x = 14$

Using the trapezium rule with four strips of equal width,

(a) show that the area of  $R$  is approximately 10.10 (3)

(b) Explain how the trapezium rule could be used to obtain a more accurate estimate for the area of  $R$ . (1)

(c) Using the answer to part (a) and making your method clear, estimate the value of

(i)  $\int_2^{14} \log_{10} \sqrt{x} \, dx$

(ii)  $\int_2^{14} \log_{10} 100x^3 \, dx$

**(4)**

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Question 3 continued

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Question 3 continued

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Q3

(Total 8 marks)



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$$f(x) = (x^2 - 2)(2x - 3) - 21$$

- (1)

- (2)

- (5)

Question 4 continued

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Question 4 continued

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Question 4 continued

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Q4

(Total 8 marks)



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- and so on, forming an arithmetic sequence.

- (2)

Given that this occurred at the end of year  $N$ ,

- $$N^2 - 65N + 1036 = 0 \quad (3)$$

- (1)

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Q5

(Total 6 marks)



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- find the exact value of  $p$ . (4)

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Question 6 continued

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Question 6 continued

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(Total 8 marks)

Q6



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- (d) find the sum of the first 4 terms of the series. (2)

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Question 7 continued

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Question 7 continued

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Q7

(Total 10 marks)



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8.

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Solutions relying entirely on calculator technology are not acceptable.

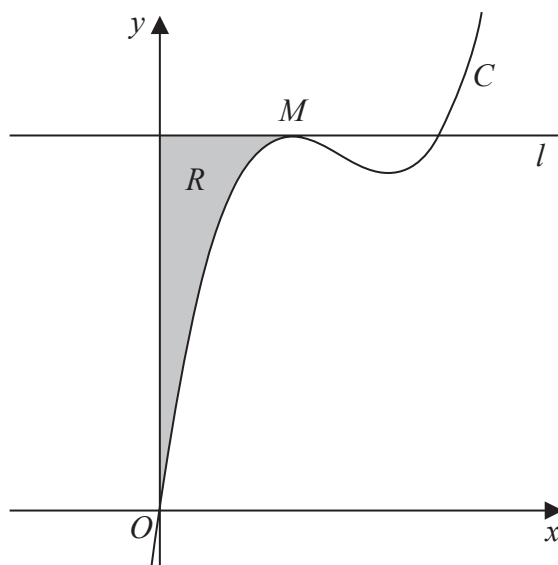


Figure 2

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

$$y = \frac{4}{3}x^3 - 11x^2 + kx \quad \text{where } k \text{ is a constant}$$

The point  $M$  is the maximum turning point of  $C$  and is shown in Figure 2.

Given that the  $x$  coordinate of  $M$  is 2

(a) show that  $k = 28$  (3)

(b) Determine the range of values of  $x$  for which  $y$  is increasing. (2)

The line  $l$  passes through  $M$  and is parallel to the  $x$ -axis.

The region  $R$ , shown shaded in Figure 2, is bounded by the curve  $C$ , the line  $l$  and the  $y$ -axis.

(c) Find, by algebraic integration, the exact area of  $R$ . (5)

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### Question 8 continued

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Question 8 continued

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(Total 10 marks)

Q8

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9. (a) Prove that for all positive values of  $x$  and  $y$ ,

$$\frac{x+y}{2} \geq \sqrt{xy} \quad (3)$$

- (b) Prove by counter-example that this inequality does not hold when  $x$  and  $y$  are both negative. (1)

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Question 9 continued

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(Total 4 marks)

Q9



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10.

**In this question you must show all stages of your working.**

**Solutions relying entirely on calculator technology are not acceptable.**

(i) Solve, for  $-\frac{\pi}{2} < x < \frac{\pi}{2}$

$$\tan^2\left(2x + \frac{\pi}{4}\right) = 3 \tag{5}$$

(ii) Solve, for  $0 < \theta < 360^\circ$

$$(2 \sin \theta - \cos \theta)^2 = 1$$

giving your answers, as appropriate, to one decimal place.

(5)



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Question 10 continued

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**Q10**

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Q10

**TOTAL FOR PAPER IS 75 MARKS**