Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

A Level Clouds 出品

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.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.

Turn over ▶

Pearson

1.

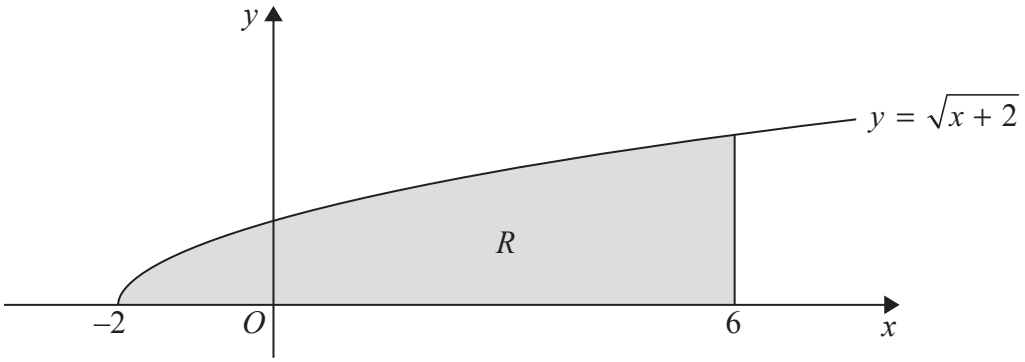

Figure 1

Figure 1 shows a sketch of part of the curve with equation $y = \sqrt{x + 2}$, $x \geqslant -2$

The finite region R, shown shaded in Figure 1, is bounded by the curve, the x-axis and the line $x = 6$

The table below shows corresponding values of x and y for $y = \sqrt{x + 2}$

x	–2	0	2	4	6
y	0	1.4142	2		2.8284

(a) Complete the table above, giving the missing value of y to 4 decimal places.

(1)

(b) Use the trapezium rule, with all of the values of y in the completed table, to find an approximate value for the area of R, giving your answer to 3 decimal places.

(3)

Use your answer to part (b) to find approximate values of

(c) (i) $\displaystyle\int_{-2}^{6} \frac{\sqrt{x + 2}}{2}\,\mathrm{d}x$

(ii) $\displaystyle\int_{-2}^{6} \left(2 + \sqrt{x + 2}\right)\mathrm{d}x$

(4)

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Question 1 continued

(Total for Question 1 is 8 marks)

2. $f(x) = x^4 - x^3 + 3x^2 + ax + b$

where a and b are constants.

When $f(x)$ is divided by $(x - 1)$ the remainder is 4

When $f(x)$ is divided by $(x + 2)$ the remainder is 22

Find the value of a and the value of b.

(5)

Question 2 continued

(Total for Question 2 is 5 marks)

3.

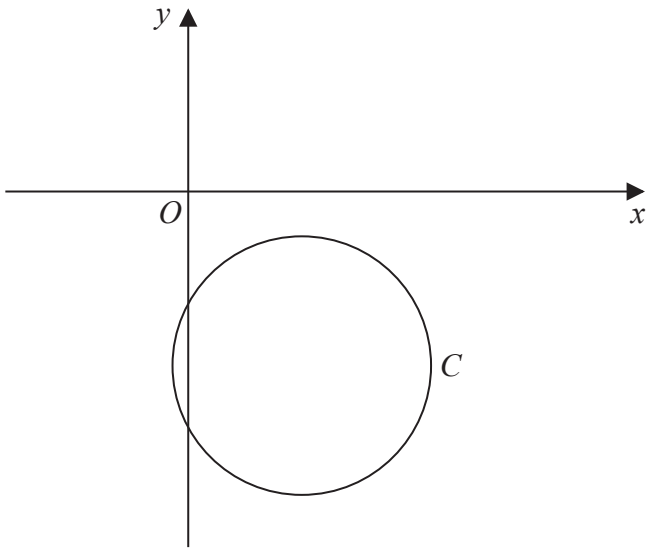

Figure 2

Figure 2 shows a sketch of the circle C with equation

$$x^2 + y^2 - 6x + 9y + 18 = 0$$

(a) Find (i) the coordinates of the centre of C

(ii) the exact value of the radius of C

(3)

Line l is parallel to the y-axis and intersects C at points P and Q.

Given that length PQ is 5

(b) find two distinct equations for l.

(4)

Question 3 continued

(Total for Question 3 is 7 marks)

4. (a) Find the first 4 terms, in ascending powers of x, in the binomial expansion of

$$\left(1+\frac{x}{4}\right)^{12}$$

giving each coefficient in its simplest form.

(3)

(b) Find the term independent of x in the expansion of

$$\left(\frac{x^2+8}{x^5}\right)\left(1+\frac{x}{4}\right)^{12}$$

(3)

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Question 4 continued

(Total for Question 4 is 6 marks)

5. (i) Use the laws of logarithms to solve the equation

$$3\log_8 2 + \log_8(7 - x) = 2 + \log_8 x$$

(5)

(ii) Using algebra, find, in terms of logarithms, the exact value of y for which

$$3^{2y} + 3^{y+1} = 10$$

(5)

Question 5 continued

Question 5 continued

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Question 5 continued

(Total for Question 5 is 10 marks)

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

Solutions relying entirely on calculator technology are not acceptable.

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

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

(5)

(ii) Solve, for $0 < \theta < 360°$

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

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

(5)

Question 6 continued

Question 6 continued

Question 6 continued

(Total for Question 6 is 10 marks)

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

Solutions relying entirely on calculator technology are not acceptable.

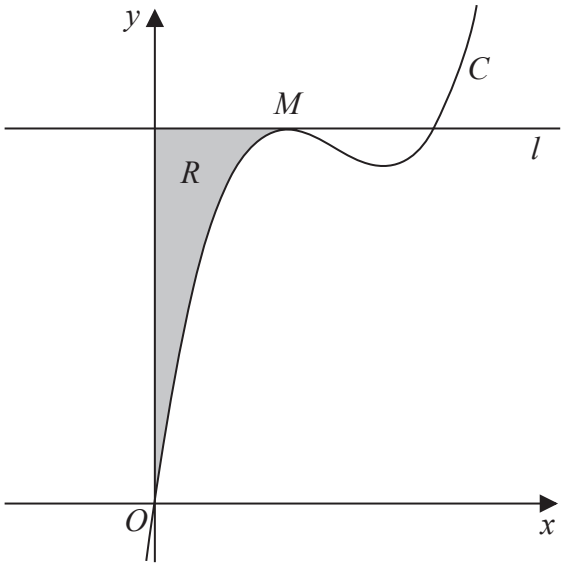

Figure 3

Figure 3 shows a sketch of part of the curve C with equation

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

The point M is the maximum turning point of C and is shown in Figure 3.

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 3, is bounded by the curve C, the line l and the y-axis.

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

(5)

Question 7 continued

Question 7 continued

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Question 7 continued

(Total for Question 7 is 10 marks)

8. A sequence is defined by

$$u_1 = k, \text{ where } k \text{ is a constant}$$

$$u_{n+1} = 4u_n - 3, \quad n \geqslant 1$$

(a) Find u_2 and u_3 in terms of k, simplifying your answers as appropriate.

(3)

Given $\sum_{n=1}^{3} u_n = 18$

(b) find k.

(3)

Question 8 continued

(Total for Question 8 is 6 marks)

9. (i) Use algebra to prove that for all real values of x

$$(x - 4)^2 \geqslant 2x - 9$$

(3)

(ii) Show that the following statement is untrue.

$2^n + 1$ is a prime number for all values of n, $n \in \mathbb{N}$

(1)

Question 9 continued

(Total for Question 9 is 4 marks)

10. (i) A car has five gears. Given that

- the maximum speed of the car in first gear is $22\,\text{km}\,\text{h}^{-1}$
- the maximum speed in each successive gear forms a geometric sequence
- the maximum speed of the car in fifth gear is $130\,\text{km}\,\text{h}^{-1}$

find the maximum speed of the car in second gear, giving your answer, in $\text{km}\,\text{h}^{-1}$, to one decimal place.

(4)

(ii) The first two terms of an arithmetic sequence are 208 and 207.2

Given that S_n is the sum to n terms,

(a) find the maximum value of S_n

(4)

(b) Hence or otherwise state the smallest value of N such that $S_N < 0$

(1)

Question 10 continued

Question 10 continued

(Total for Question 10 is 9 marks)

TOTAL FOR PAPER IS 75 MARKS