Please check the examination details below before entering your candidate information

| Candidate surname | Other names |
|---|---|

Centre Number | Candidate Number

# Pearson Edexcel International Advanced Level

## Tuesday 13 January 2026

Morning (Time: 1 hour 30 minutes)

Paper reference **WMA12/01**

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# 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* ▶

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

$$(3 + kx)^7$$

where $k$ is a non-zero constant. Give each term in simplest form.

**(4)**

Given that, in this expansion, the coefficient of $x^2$ is 3 times the coefficient of $x^3$

(b) find, in simplest form, the value of $k$.

**(2)**

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**Question 1 continued**

**(Total for Question 1 is 6 marks)**

**2.**

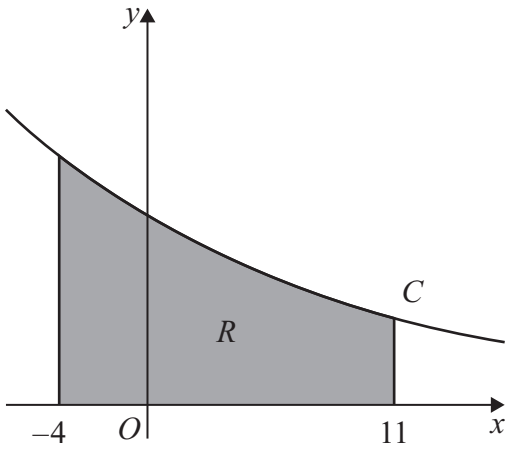



**Figure 1**

Figure 1 shows a sketch of part of the curve $C$ with equation $y = 2^{-0.1x}$

The table below shows corresponding values of $x$ and $y$ for $y = 2^{-0.1x}$

The $y$ values are given to 4 decimal places.

| $x$ | –4 | –1 | 2 | 5 | 8 | 11 |
|---|---|---|---|---|---|---|
| $y$ | 1.3195 | 1.0718 | 0.8706 | 0.7071 | 0.5743 | 0.4665 |

The region $R$, shown shaded in Figure 1, is bounded by $C$, the $x$-axis and the lines with equations $x = –4$ and $x = 11$

(a) Use the trapezium rule with all the values of $y$ in the table to find an estimate for the area of $R$. Give the answer to 2 decimal places.

**(3)**

(b) State how you would use the trapezium rule to get a more accurate estimate for the true area of $R$.

**(1)**

Using the answer to part (a) and showing your working,

(c) estimate the value of

$$\int_{-4}^{11} 2^{3-0.1x}\,\mathrm{d}x$$

**(2)**

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**Question 2 continued**

**(Total for Question 2 is 6 marks)**

**3.** (i) Given that

- $f(x) = 4x^3 + 6x + k$, where $k$ is a constant
- $(x + 2)$ is a factor of $f(x)$

find the remainder when $f(x)$ is divided by $(x – 5)$

**(4)**

(ii) Find the remainder, $R$, and the quotient, $Q(x)$, when

$$6x^3 – 15x^2 – 21x + 8$$

is divided by $(2x + 3)$

**(3)**

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**Question 3 continued**

**(Total for Question 3 is 7 marks)**

**4.** **In this question you must show all stages of your working.**
**Solutions relying entirely on calculator technology are not acceptable.**

Given that $k$ is a positive constant and

$$\int_k^{2k} \left( \frac{12}{x^2} + 4 \right) \mathrm{d}x = 14$$

find the possible values of $k$.

**(5)**

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**Question 4 continued**

**(Total for Question 4 is 5 marks)**

**5.** The circle $C_1$ has equation

$$x^2 + y^2 - 6x + 5y - 41 = 0$$

(a) Find

(i) the coordinates of the centre of $C_1$

(ii) the radius of $C_1$

**(3)**

The circle $C_2$ has

- centre $(-k, 0)$ where $k$ is a positive constant
- radius 5

Given that circles $C_1$ and $C_2$ touch

(b) find the exact value of $k$.

**(3)**

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**Question 5 continued**

**(Total for Question 5 is 6 marks)**

**6.** (i) Given that $p$ and $q$ are consecutive odd numbers, where $p > q > 0$, prove that

$$p^2 - q^2$$

is a multiple of 8

**(4)**

(ii) The curve $C$ has equation

$$y = x^3 + 12x^2 + 49x + 2$$

Prove that $C$ has no stationary points.

**(4)**

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**Question 6 continued**

**Question 6 continued**

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**Question 6 continued**

**(Total for Question 6 is 8 marks)**

**7.** **In this question you must show all stages of your working.**
**Solutions relying entirely on calculator technology are not acceptable.**

(i) Find the exact solution of the equation

$$8^{2x-5} = 20$$

giving the answer in the form $a + b\log_2 5$ where $a$ and $b$ are rational constants.

**(4)**

(ii) Using the laws of logarithms, solve the equation

$$\log_3(13 + 2y) + 3 = 2\log_3(4 - y)$$

**(5)**

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**Question 7 continued**

**(Total for Question 7 is 9 marks)**

**8.** **In this question you must show all stages of your working.**
**Solutions relying entirely on calculator technology are not acceptable.**

(i) Solve, for $0 \leqslant \theta < 180$

$$4\tan^2(2\theta - 30)° + 1 = 49$$

giving the answers to one decimal place.

**(5)**

(ii) Solve, for $0 \leqslant x < 2\pi$

$$2\tan x \sin x + 3 = 0$$

giving the answers, in radians, in the form $k\pi$ where $k$ is a rational constant.

**(5)**

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**Question 8 continued**

**Question 8 continued**

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**Question 8 continued**

**(Total for Question 8 is 10 marks)**

**9.** A company mines lithium.

- in year 1, the company mined 12 400 tonnes of lithium
- in year 15, the company is predicted to mine 7 500 tonnes of lithium

Model *A* assumes that the mass of lithium the company mines will decrease by the same amount each year.

According to model *A*,

(a) find the mass of lithium the company will mine in year 5

**(3)**

(b) calculate the **total** mass of lithium the company will mine from year 1 to year 15 inclusive.

**(2)**

Model *B* assumes that the mass of lithium the company mines will decrease by the same percentage each year.

(c) Find, according to model *B*, the mass of lithium the company will mine in year 10. Give the answer to the nearest 10 tonnes.

**(3)**

According to model *B*, there is a limit to the **total** mass of lithium that can be mined.

(d) Calculate the value of this limit. Give the answer to the nearest 100 tonnes.

**(2)**

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**Question 9 continued**

**Question 9 continued**

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**Question 9 continued**

**(Total for Question 9 is 10 marks)**

**10.**

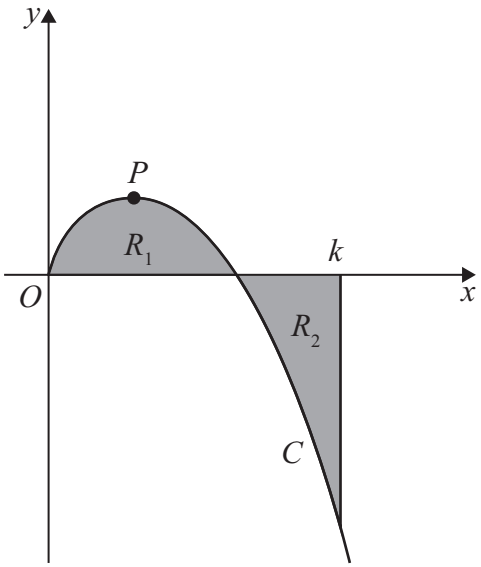



**Figure 2**

**In this question you must show all stages of your working.**
**Solutions relying entirely on calculator technology are not acceptable.**

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

$$y = \frac{\sqrt{x}\left(100 - x^2\right)}{40} \qquad x \geqslant 0$$

The point $P$ is a stationary point on $C$.

(a) Use algebraic differentiation to find the exact $x$ coordinate of $P$.

**(4)**

The region $R_1$, shown shaded in Figure 2, is bounded by $C$ and the $x$-axis.

The region $R_2$, also shown shaded in Figure 2, is bounded by $C$, the $x$-axis and the line with equation $x = k$, where $k$ is a constant.

Given that the area of $R_1$ is equal to the area of $R_2$

(b) use algebraic integration to find the exact value of $k$.

**(4)**

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**Question 10 continued**

**Question 10 continued**

**(Total for Question 10 is 8 marks)**

**TOTAL FOR PAPER IS 75 MARKS**

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