Pearson Edexcel International Advanced Level

Tuesday 12 May 2026

Morning (Time: 1 hour 30 minutes)

Paper reference **WMA12/01A**

Mathematics

International Advanced Subsidiary/Advanced Level
Pure Mathematics P2
Question paper

You must have:
Answer book (sent separately).
Do not return this question paper with the answer book.

Turn over

P 8 4 8 1 2 A

Pearson

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

$$f(x) = ax^3 + 7x^2 - 46x + 24$$

where a is a constant.

(a) Find, in simplest form in terms of a, the remainder when $f(x)$ is divided by $(x - 2)$

(2)

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

(b) show that $a = 5$

(1)

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

(4)

(Total for Question 1 is 7 marks)

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2. **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 constant,

(a) use algebraic integration to find

$$\int_1^4 kx^{-3} + 4x^{\frac{3}{2}}\,dx$$

giving the answer in simplest form in terms of k.

(4)

(b) Hence find the exact value of k for which

$$\int_1^4 kx^{-3} + 4x^{\frac{3}{2}}\,dx = 50$$

(2)

(Total for Question 2 is 6 marks)

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3. The sequence $u_1, u_2, u_3, \ldots$ satisfies

$$u_1 = 5 \qquad u_{n+1} = \frac{3}{2}u_n - \frac{1}{2}u_n^2 + 4$$

(a) Show that this sequence is periodic, stating its period.

(3)

(b) State the value of u_{200}

(1)

(c) Find, showing all steps of your working, the value of

$$\sum_{r=1}^{200} u_r$$

(3)

(Total for Question 3 is 7 marks)

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

The curve C has equation

$$y = 2x^3 + 7x + \frac{3}{x}$$

(a) Find the exact values of the x coordinates of the stationary points of C.

(4)

(b) Hence find the exact range of values of x for which C is increasing.

(2)

(Total for Question 4 is 6 marks)

5. The table below gives some x and y values for a function, $y = \mathrm{f}(x)$.

The y values are given to 4 significant figures.

x	3	3.25	3.5	3.75	4	4.25	4.5
y	5.389	6.231	6.815	7.028	6.901	6.732	6.469

(a) Use the trapezium rule with all the y values in the table to find an estimate for

$$\int_3^{4.5} \mathrm{f}(x)\,\mathrm{d}x$$

giving the answer to 3 significant figures.

(3)

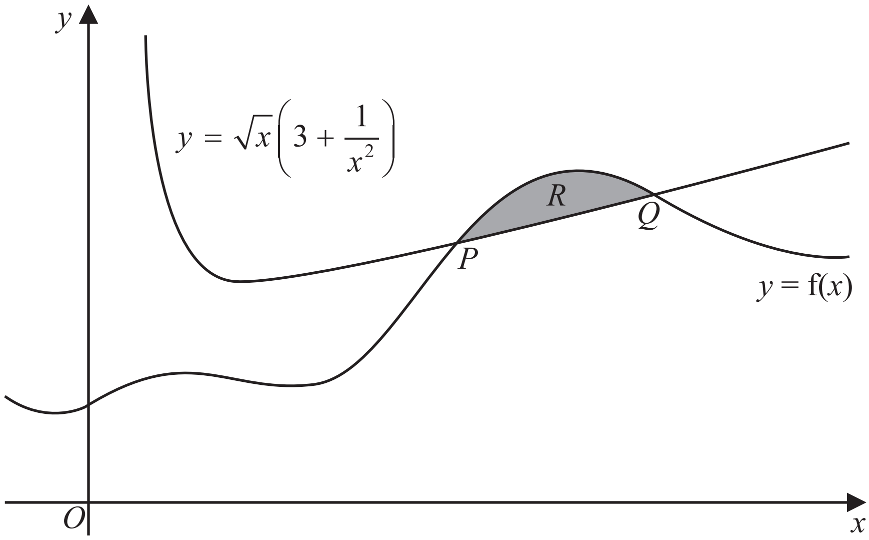

Figure 1

Figure 1 shows a sketch of the curve with equation $y = \mathrm{f}(x)$ and the curve with equation $y = \sqrt{x}\left(3 + \frac{1}{x^2}\right)$

The finite region R, shown shaded in Figure 1, is bounded by both curves.

(b) Find

$$\int \sqrt{x}\left(3 + \frac{1}{x^2}\right)\mathrm{d}x$$

(3)

The curves intersect at the points P and Q with x coordinates 3 and 4.5 respectively, as shown in Figure 1.

(c) Use the answer to part (a) and the answer to part (b) to find an estimate for the area of R. Give the answer to 2 significant figures.

(2)

(Total for Question 5 is 8 marks)

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

(i) Solve, using logarithms,

$$7^{x+3} = 5$$

giving the answer to 3 significant figures.

(2)

(ii) (a) Show that the equation

$$18\left(\log_8 y\right)^2 + 5\log_8\left(64y^3\right) = 73$$

can be written as

$$6\left(\log_8 y\right)^2 + 5\log_8 y - 21 = 0$$

(3)

(b) Hence find the exact values of y for which

$$18\left(\log_8 y\right)^2 + 5\log_8\left(64y^3\right) = 73$$

(3)

(Total for Question 6 is 8 marks)

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7. The circle C has equation

$$(x-3)^2 + (y-6)^2 = k$$

where k is a positive constant.

(a) Write down the coordinates of the centre of C.

(1)

The line l passes through the origin, O, and the centre of C.

(b) Find an equation for the line l, giving the answer in the form $y = mx$, where m is a constant.

(2)

Given that

- the point A is the point on C closest to O
- the distance OA is $\sqrt{5}$

(c) find the two possible values of k.

(4)

(Total for Question 7 is 7 marks)

8. (a) Find the first four terms, in ascending powers of x, of the binomial expansion of $(k + 4x)^{12}$, where k is a constant. Give each term in simplest form.

(4)

Given that the coefficient of x^3 in this expansion is $\frac{55}{2}$

(b) find the value of k.

(2)

Using the value of k found in part (b) and the answer to part (a),

(c) find the coefficient of y^3 in the expansion of

$$\left(y + \frac{2}{y}\right)\left(k + 4y^2\right)^{12}$$

(3)

(Total for Question 8 is 9 marks)

9.

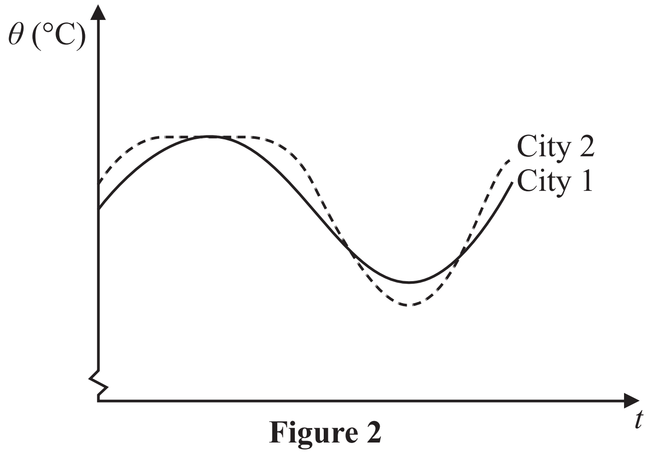

Figure 2

Figure 2 shows graphs modelling the temperature, in degrees Celsius, in two cities over the same 24-hour period from 8 am to 8 am.

The temperature, θ°C, in City 1 is modelled by the equation

$$\theta = 17 + 5\sin\left(\frac{\pi t}{12}\right)$$

where t is the number of hours after 8 am.

(a) Show that, according to the model, at 12 noon the temperature in City 1 is approximately 21.3°C.

(2)

The temperature, θ°C, in City 2 is modelled by the equation

$$\theta = 16 + 6\sin\left(\frac{\pi t}{12}\right) + 3\cos^2\left(\frac{\pi t}{12}\right)$$

where t is the number of hours after 8 am.

Use the equations of the models to answer parts (b) and (c).

When $t = T$ the temperature in each city is the same.

(b) Show that T satisfies the equation

$$3\sin^2\left(\frac{\pi T}{12}\right) - \sin\left(\frac{\pi T}{12}\right) - 2 = 0$$

(3)

(c) Hence find the values of T for which the temperature in each city is the same, giving the answers to 3 significant figures where necessary.
You must show all stages of your working.

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

(5)

(Total for Question 9 is 10 marks)

10. (i) Given that

- $f(n) = 168n - 119 - 24n^2$
- n is a positive integer less than 7

use proof by exhaustion to show that $f(n)$ is always a perfect square.

(3)

You may use the table on page 30 of the answer book to illustrate your answer.
The first 2 rows have been completed for you.

(ii) Given n is an integer with $n \geqslant r$, use the formula

$$^nC_r = \frac{n!}{r!(n-r)!}$$

to prove that

$$^nC_r + {}^nC_{r+1} = {}^{n+1}C_{r+1}$$

You must show all stages of your working.

(4)

(Total for Question 10 is 7 marks)

TOTAL FOR PAPER IS 75 MARKS