Pearson Edexcel International Advanced Level

Thursday 22 January 2026

Morning (Time: 1 hour 30 minutes)

Paper reference **WMA14/01A**

Mathematics

International Advanced Level
Pure Mathematics P4
Question paper

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

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1.

$$f(x) = \frac{27}{(3-5x)^2} \qquad |x| < \frac{3}{5}$$

(a) Find the series expansion of $f(x)$, in ascending powers of x, up to and including the term in x^3
Give each coefficient in its simplest form.

(4)

Using your answer to part (a), find the series expansion in ascending powers of x, up to and including the term in x^3, of

(b) $g(x) = \frac{27}{(3+5x)^2} \qquad |x| < \frac{3}{5}$

(1)

(c) $h(x) = \frac{27}{(3-x)^2} \qquad |x| < 3$

(2)

(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 on calculator technology are not acceptable.

A curve has equation

$$4x^2 - y^2 + 2xy + 5 = 0$$

Given that

- points P and Q lie on the curve
- $\frac{dy}{dx} = 2$ at P and at Q

find the coordinates of P and Q.

(7)

(Total for Question 2 is 7 marks)

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3. The height, h metres, of a shrub, t years after it was planted, is modelled by the differential equation

$$\frac{\mathrm{d}h}{\mathrm{d}t} = \frac{2h^{\frac{3}{2}}}{5t^2} \qquad t > 0$$

Given that $h = 1$ when $t = 1$

(a) solve the differential equation to show that

$$h = \frac{at^2}{(1 + bt)^2}$$

where a and b are constants to be found.

(6)

(b) Hence find, according to the model, the limit of the height of the shrub.

(2)

(Total for Question 3 is 8 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.

Find

$$\int_1^3 \frac{3x^2 + 8}{x^2 - 4x}\,\mathrm{d}x$$

giving the answer in the form $a + b\ln 3$ where a and b are constants.

(7)

(Total for Question 4 is 7 marks)

5. With respect to a fixed origin O, the lines l_1 and l_2 are given by the equations

$$l_1: \quad \mathbf{r} = \begin{pmatrix} 2 \\ 1 \\ 3 \end{pmatrix} + \lambda \begin{pmatrix} -2 \\ 1 \\ 4 \end{pmatrix}$$

$$l_2: \quad \mathbf{r} = \begin{pmatrix} 10 \\ c \\ 3 \end{pmatrix} + \mu \begin{pmatrix} a \\ b \\ -2 \end{pmatrix}$$

where a, b and c are constants and λ and μ are scalar parameters.

Given that

- l_1 and l_2 meet when $\lambda = -2$
- l_1 and l_2 are perpendicular

find the value of a, the value of b and the value of c.

(6)

(Total for Question 5 is 6 marks)

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

(a) Use algebraic integration and the substitution $u = 2x - 1$ to show that

$$\int_2^5 \frac{(3x+2)^2}{2x-1}\,\mathrm{d}x = 72 + \frac{49}{8}\ln 3$$

(6)

The curve C has equation

$$y = \frac{3x+2}{2\sqrt{2x-1}} \qquad x > 1$$

The finite region R is bounded by C, the x-axis and the lines with equations $x = 2$ and $x = 5$

The region R is rotated through 2π radians about the x-axis to form a solid of revolution.

(b) Using the result from part (a), find the exact value of the volume of the solid generated.

(2)

(Total for Question 6 is 8 marks)

7.

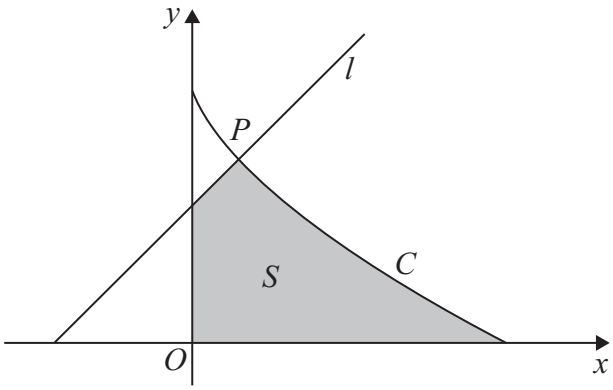

Figure 1

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

Figure 1 shows a sketch of the curve C with parametric equations

$$x = 8\cos^3\theta \qquad y = 6\sin^2\theta \qquad 0 \leqslant \theta \leqslant \frac{\pi}{2}$$

Given that the point P lies on C and has parameter $\theta = \frac{\pi}{3}$

(a) find the coordinates of P.

(2)

The line l is the normal to C at P.

(b) Find an equation for l in the form $y = mx + c$, where m and c are constants.

(5)

The finite region S, shown shaded in Figure 1, is bounded by the curve C, the line l, the y-axis and the x-axis.

(c) Show that the area of S is given by

$$4 + 144\int_0^{\frac{\pi}{3}} (\sin\theta\cos^2\theta - \sin\theta\cos^4\theta)\,\mathrm{d}\theta$$

(6)

(d) Hence, using algebraic integration, find the exact area of S.

(3)

(Total for Question 7 is 16 marks)

8. (a) Factorise $4p^2 - q^2$

(1)

(b) Hence, prove by contradiction, that there are no positive integers p and q such that

$$4p^2 - q^2 = 46$$

(4)

(Total for Question 8 is 5 marks)

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9. $ABCD$ is a parallelogram with AB parallel to DC and AD parallel to BC.
The position vectors of A, B, C and D relative to a fixed origin O are
a, **b**, **c** and **d** respectively.

Given that

$$\mathbf{a} = \mathbf{i} + \mathbf{j} - 2\mathbf{k} \qquad \mathbf{b} = 3\mathbf{i} - \mathbf{j} + 6\mathbf{k} \qquad \mathbf{c} = -\mathbf{i} + 3\mathbf{j} + 6\mathbf{k}$$

(a) find the position vector **d**,

(3)

(b) find the angle between the sides AB and BC of the parallelogram,

(4)

(c) find the area of the parallelogram $ABCD$.

(2)

The point E lies on the line through the points C and D, so that D is the midpoint of CE.

(d) Use your answer to part (c) to find the area of the trapezium $ABCE$.

(2)

(Total for Question 9 is 11 marks)

TOTAL FOR PAPER IS 75 MARKS

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Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

Thursday 22 January 2026

Morning (Time: 1 hour 30 minutes)

Paper reference **WMA14/01A**

Mathematics

International Advanced Level
Pure Mathematics P4
Answer Book

You must have:
Question paper (sent separately).
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 9 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.

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Question 1

Write the answer to Question 1 on these 2 pages

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Question 1 continued

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(Total for Question 1 is 7 marks)

Question 2

Write the answer to Question 2 on these 2 pages

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Question 2 continued

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(Total for Question 2 is 7 marks)

Question 3

Write the answer to Question 3 on these 4 pages

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Question 3 continued

Question 3 continued

Question 3 continued

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(Total for Question 3 is 8 marks)

Question 4

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Question 4 continued

Question 4 continued

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Question 4 continued

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(Total for Question 4 is 7 marks)

Question 5

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Question 5 continued

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(Total for Question 5 is 6 marks)

Question 6

Write the answer to Question 6 on these 4 pages

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Question 6 continued

Question 6 continued

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Question 6 continued

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(Total for Question 6 is 8 marks)

Question 7

Write the answer to Question 7 on these 4 pages

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Question 7 continued

Question 7 continued

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Question 7 continued

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(Total for Question 7 is 16 marks)

Question 8

Write the answer to Question 8 on these 2 pages

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Question 8 continued

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(Total for Question 8 is 5 marks)

Question 9

Write the answer to Question 9 on these 3 pages

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Question 9 continued

Question 9 continued

(Total for Question 9 is 11 marks)

TOTAL FOR PAPER IS 75 MARKS

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