

Please check the examination details below before entering your candidate information

Candidate surname					Other names				
Centre Number					Candidate Number				

Pearson Edexcel International GCSE

Thursday 4 June 2026

Afternoon (Time: 2 hours)

Paper reference **4PM1/02**

Further Pure Mathematics

PAPER 2

Calculators may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- You must **NOT** write anything on the formulae page.
Anything you write on the formulae page will gain NO credit.

Information

- The total mark for this paper is 100.
- 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.
- Check your answers if you have time at the end.

Turn over ►

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International GCSE in Further Pure Mathematics Formulae sheet

Mensuration

Surface area of sphere = $4\pi r^2$

Curved surface area of cone = $\pi r \times$ slant height

Volume of sphere = $\frac{4}{3}\pi r^3$

Series

Arithmetic series

Sum to n terms, $S_n = \frac{n}{2}[2a + (n-1)d]$

Geometric series

Sum to n terms, $S_n = \frac{a(1-r^n)}{(1-r)}$

Sum to infinity, $S_\infty = \frac{a}{1-r} \quad |r| < 1$

Binomial series

$(1+x)^n = 1 + nx + \frac{n(n-1)}{2!}x^2 + \dots + \frac{n(n-1)\dots(n-r+1)}{r!}x^r + \dots \quad \text{for } |x| < 1, n \in \mathbb{Q}$

Calculus

Quotient rule (differentiation)

$$\frac{d}{dx}\left(\frac{f(x)}{g(x)}\right) = \frac{f'(x)g(x) - f(x)g'(x)}{[g(x)]^2}$$

Trigonometry

Cosine rule

In triangle ABC : $a^2 = b^2 + c^2 - 2bc \cos A$

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$

$$\sin(A+B) = \sin A \cos B + \cos A \sin B$$

$$\cos(A+B) = \cos A \cos B - \sin A \sin B$$

$$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$\sin(A-B) = \sin A \cos B - \cos A \sin B$$

$$\cos(A-B) = \cos A \cos B + \sin A \sin B$$

$$\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

Logarithms

$$\log_a x = \frac{\log_b x}{\log_b a}$$

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Answer all TEN questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Find the value of $\sum_{k=0}^{20} (3k + 5)$

(4)

Working area with horizontal dotted lines for writing.

(Total for Question 1 is 4 marks)



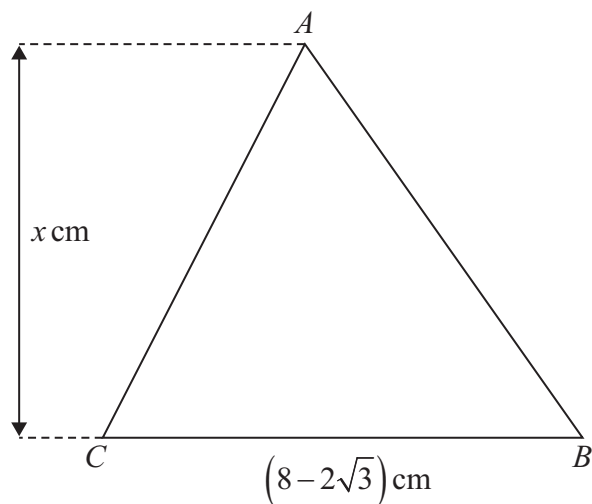


Figure 1

Figure 1 shows triangle ABC such that

- $CB = (8 - 2\sqrt{3}) \text{ cm}$
- The perpendicular height of triangle ABC is $x \text{ cm}$
- The area of triangle ABC is $(4\sqrt{3} - 6) \text{ cm}^2$

Find the exact value of x

Give your answer in the form $\frac{a\sqrt{b}-c}{d}$

where a and c are integers and b and d are prime numbers.

Show your working clearly.

(4)

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Question 2 continued

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(Total for Question 2 is 4 marks)



- 3 The point A has coordinates $(2, 14)$ and the point B has coordinates $(6, 11)$
The point D divides the line AB in the ratio $AD : DB = 1 : 2$

Line l passes through D and is perpendicular to AB

Given that l crosses the x -axis at the point X

find the length of XD

(8)



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Question 3 continued

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(Total for Question 3 is 8 marks)



4

$$f(x) = e^{2x}(x^2 + 1)$$

- (a) Show that $f'(x) = 2e^{2x}(x^2 + x + 1)$ (3)

The curve S has equation $y = f(x)$

- (b) Show that S has no stationary points. (2)



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Question 4 continued

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(Total for Question 4 is 5 marks)



5 (a) On the grid opposite draw the line with equation

(i) $4y - 7x - 14 = 0$

(ii) $21y + 25x = 105$

(iii) $4y = x - 8$

(3)

(b) Show, by shading, the region R defined by the inequalities

$$4y - 7x - 14 \leq 0$$

$$21y + 25x \leq 105$$

$$4y \geq x - 8$$

(1)

For all points in R with **integer** coordinates (x, y)

$$Q = 4y + 3x$$

(c) Using your graph, find the greatest value of Q

(3)

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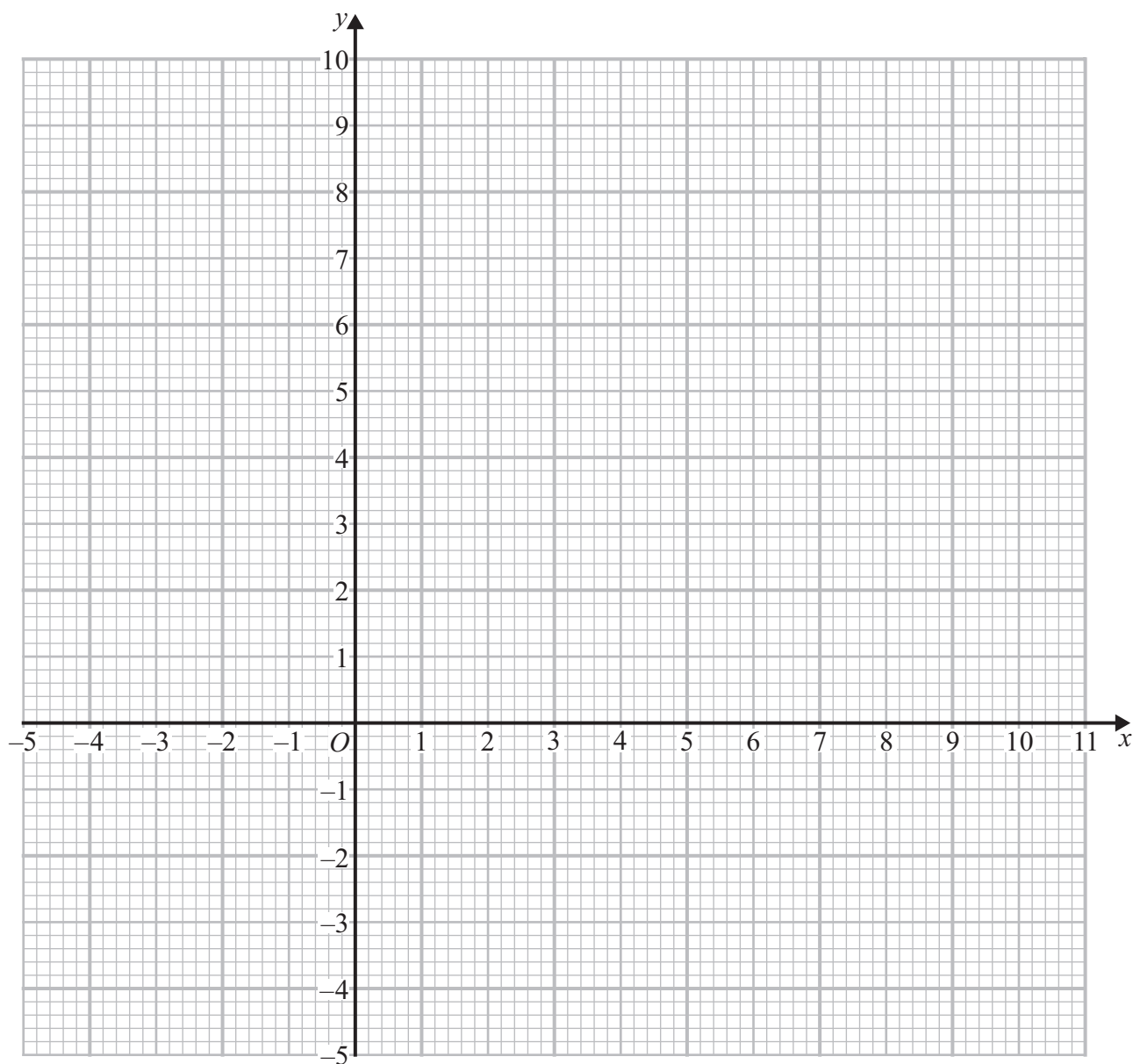
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Question 5 continued



Turn over for a spare grid if you need to redraw your graph.



Question 5 continued

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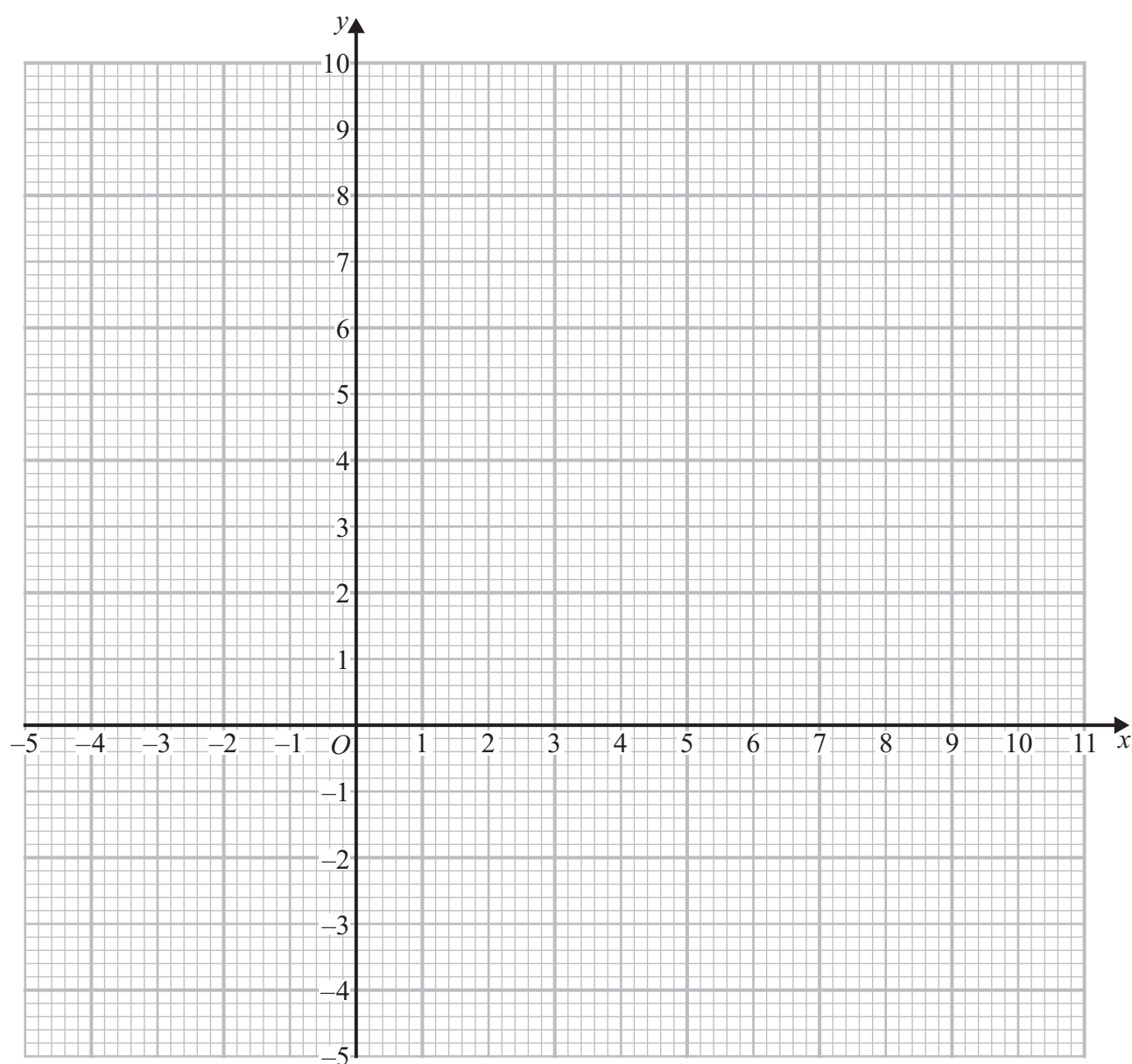
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Question 5 continued

Only use this grid if you need to redraw your graph.



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(Total for Question 5 is 7 marks)



- 6 (a) (i) Expand $\left(1 + \frac{x}{4}\right)^{-\frac{1}{2}}$ in ascending powers of x up to and including the term in x^3
- Express each coefficient as an exact fraction in its lowest terms.
- (ii) Write down the range of values of x for which your expansion is valid.
- (b) Hence write down the expansion of $\left(1 - \frac{x}{4}\right)^{-\frac{1}{2}}$ in ascending powers of x up to and including the term in x^3
- Express each coefficient as an exact fraction in its lowest terms.

$$f(x) = \left(\frac{1}{(4+x)(4+x)} \right)^{\frac{1}{2}}$$

- (c) Use your answer to part (a) to obtain a series expansion for $f(x)$ in ascending powers of x up to and including the term in x^2 .
Express each coefficient as an exact fraction in its lowest terms. (3)
- (d) Hence, using algebraic integration, obtain an estimate of $\int_0^{0.2} f(x) dx$.
Give your answer to 8 significant figures. (3)



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Question 6 continued

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Question 6 continued

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Question 6 continued

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(Total for Question 6 is 11 marks)



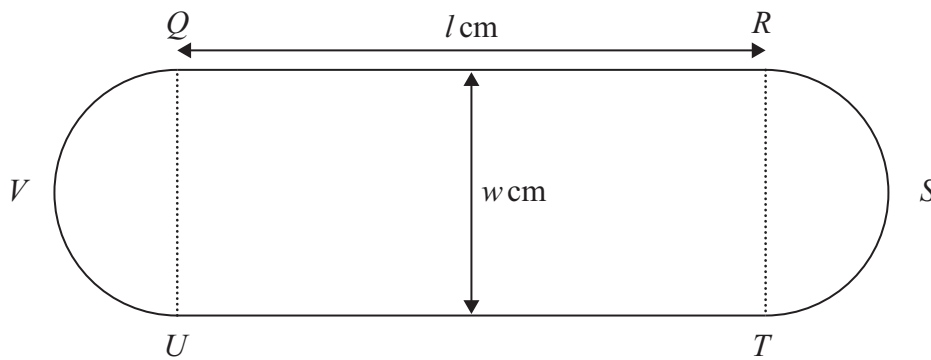


Figure 2

Figure 2 shows shape $QRSTUV$

- $QRTU$ is a rectangle of length l cm and width w cm
- RST and UVQ are both semicircles of diameter w cm

The shape $QRSTUV$ has a perimeter of P cm and an area of A cm²

Given that $P = 18$

- (a) Show that
$$A = 9w - \frac{\pi w^2}{4}$$
 (5)

Given that w can vary

- (b) (i) use calculus to find the maximum value of A
Give your answer in exact form. (4)

- (ii) show that for this value of A , shape $QRSTUV$ is a circle. (1)

- (iii) state the exact diameter of this circle. (1)

- (c) Justify that this value is the maximum value of A (1)



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Question 7 continued

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Question 7 continued

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Question 7 continued

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(Total for Question 7 is 12 marks)



8 (a) Using the formulae given on page 2, show that

(i) $\cos 2A = 2 \cos^2 A - 1$

(ii) $\sin 2A = 2 \sin A \cos A$

(3)

(b) Show that

$$\cos 3A = 4 \cos^3 A - 3 \cos A$$

(5)

(c) Hence, solve in radians to one decimal place, the equation

$$9 \cos A - 12 \cos^3 A - 2 = 0 \quad \text{for } -\pi \leq A \leq 0$$

(4)

(d) Using calculus and showing your working, evaluate

$$\int_0^{\frac{\pi}{6}} \cos^3 \theta \, d\theta$$

Give your answer as a fraction in its simplest form.

(4)

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Question 8 continued

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Question 8 continued

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Question 8 continued

Handwriting practice area with horizontal dotted lines.

(Total for Question 8 is 16 marks)



9 The curve C has equation

$$y = \frac{px - 3}{x - q} \quad x \neq q$$

C crosses the x -axis at the point A

The line n with equation $8y - 10x + 15 = 0$ is the normal to C at A

(a) Show that

(i) $p = 2$ (3)

(ii) $q = 4$ (7)

(b) Write down an equation of the asymptote to C that is

- (i) parallel to the x -axis
(ii) parallel to the y -axis (2)

(c) Write down the coordinates of the point where C crosses the y -axis. (1)

(d) Using the axes on the next page, sketch C
Clearly label the asymptotes and the coordinates where C crosses the coordinate axes. (3)

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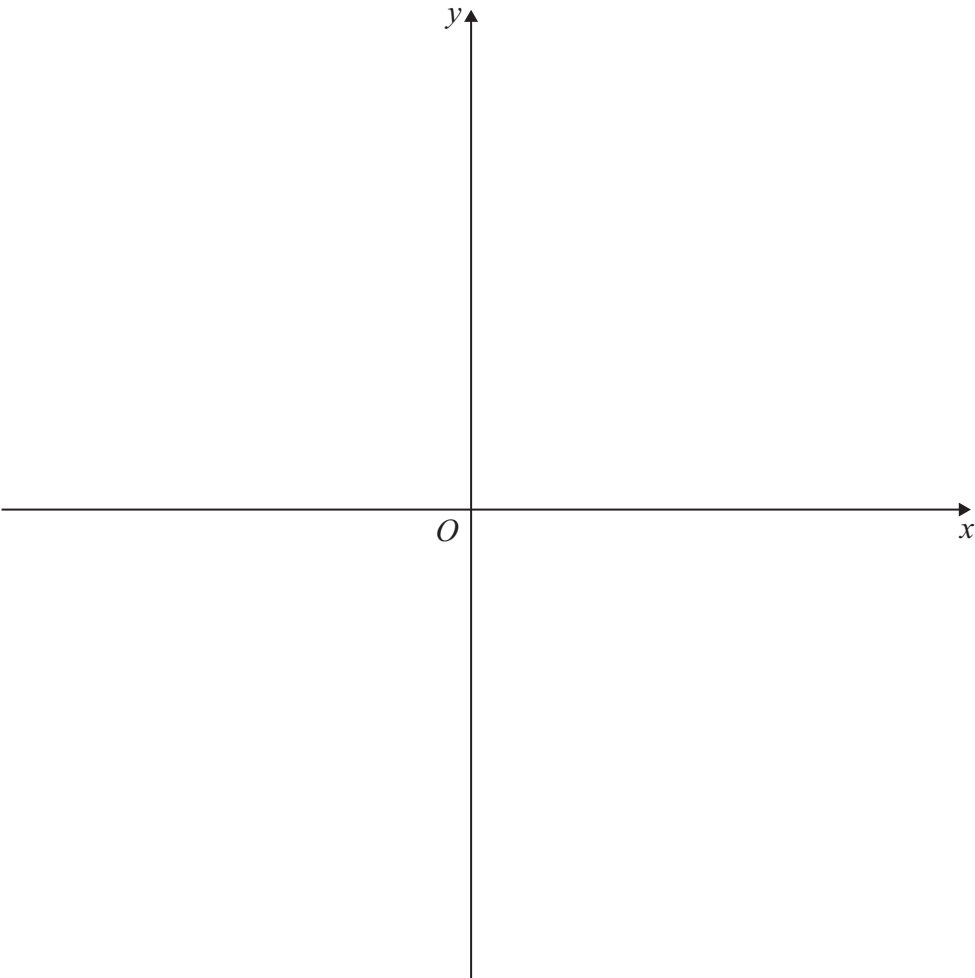


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Question 9 continued



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Question 9 continued

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Question 9 continued

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(Total for Question 9 is 16 marks)



Diagram **NOT**
accurately drawn



Figure 3

Figure 3 shows quadrilateral $ABCD$ such that

$$\vec{AB} = \mathbf{a} + p\mathbf{b}$$

$$\vec{CD} = 2\mathbf{a} - 9\mathbf{b}$$

$$\vec{AC} = 7\mathbf{a} - 6\mathbf{b}$$

where $|\mathbf{a}| = |\mathbf{b}| = 1$ and $p > 0$

Given that $|\vec{AB}| = \sqrt{17}$

(a) show that $ABCD$ is a trapezium.

(7)

The diagonals AC and BD of the quadrilateral intersect at the point X

(b) Using a vector method, find the ratio $AX : XC$

(6)

Given that $\frac{\text{area of triangle } CXD}{\text{area of trapezium } ABCD} = K$

(c) find the value of K

(4)

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Question 10 continued

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Question 10 continued

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(Total for Question 10 is 17 marks)

TOTAL FOR PAPER IS 100 MARKS

