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Centre Number

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Candidate Number

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**Pearson Edexcel
International GCSE**

Mathematics B

Paper 2R



Thursday 7 June 2018 – Morning
Time: 2 hours 30 minutes

Paper Reference
4MB0/02R

You must have: Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator. Tracing paper 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.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- **Calculators may be used.**

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.
- Without sufficient working, correct answers may be awarded no marks.

Turn over ►

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Pearson

Answer ALL ELEVEN questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Solve the simultaneous equations

$$2x + 3y = 2.5$$

$$4x + 2y = 7$$

Show clear algebraic working.

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(Total for Question 1 is 4 marks)



2 (a) Evaluate $\begin{pmatrix} 1 & -5 & 2 \\ -2 & 7 & 3 \\ 4 & -5 & 1 \end{pmatrix} \begin{pmatrix} 5 \\ 3 \\ 1 \end{pmatrix}$ (2)

$$\mathbf{A} = \begin{pmatrix} -15 & 1 \\ 8 & 1 \end{pmatrix} \quad \mathbf{B} = \begin{pmatrix} -3 & -1 \\ 2 & 1 \end{pmatrix} \quad \mathbf{C} = \begin{pmatrix} 4 & -2 \\ -6 & 2 \end{pmatrix}$$

Given that $\mathbf{A} - \mathbf{BC} = \lambda\mathbf{B}$ where λ is a scalar,

(b) find the value of λ . (5)

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(Total for Question 2 is 7 marks)

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3 In June 2014,

the exchange rate from pounds sterling (£) to US dollars (\$) was £1.00 = \$1.72
 the price of a barrel of **oil** was \$115.00

In November 2014,

the exchange rate from £ to \$ was £1.00 = \$1.60
 the price of a barrel of **oil** was \$84.00

(a) Calculate the cost, in £ to 2 decimal places, of a barrel of **oil**

(i) in June 2014,

(ii) in November 2014.

(3)

In June 2014, the price of a litre of **petrol** was £1.32

In November 2014, the price of a litre of **petrol** was £1.24

(b) Compare the percentage decrease in the cost of a barrel of **oil**, in £, with the percentage decrease in the price of a litre of **petrol**, in £, from June 2014 to November 2014.

Show your working clearly.

(3)

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Question 3 continued

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(Total for Question 3 is 6 marks)



4 A car travelled 130 km from London to Swindon.

The car used x litres of petrol for this journey.

- (a) Write down an expression, in terms of x , for the average number of kilometres the car travelled for each litre of petrol on its journey from London to Swindon. (1)

On the return journey from Swindon to London, the car travelled 130 km and used $(x - 2)$ litres of petrol.

- (b) Write down an expression, in terms of x , for the average number of kilometres the car travelled for each litre of petrol on the return journey. (1)

On the return journey, the average number of kilometres the car travelled for each litre of petrol was **5 km greater** than the average number of kilometres the car travelled for each litre of petrol on its journey from London to Swindon.

- (c) Write down an equation in x for the information about the average numbers of kilometres the car travelled for each litre of petrol. (1)

- (d) Solve your equation to find the value of x to 3 significant figures. (5)

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$$\left[\text{Solutions of } ax^2 + bx + c = 0: x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \right]$$



Question 4 continued

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(Total for Question 4 is 8 marks)



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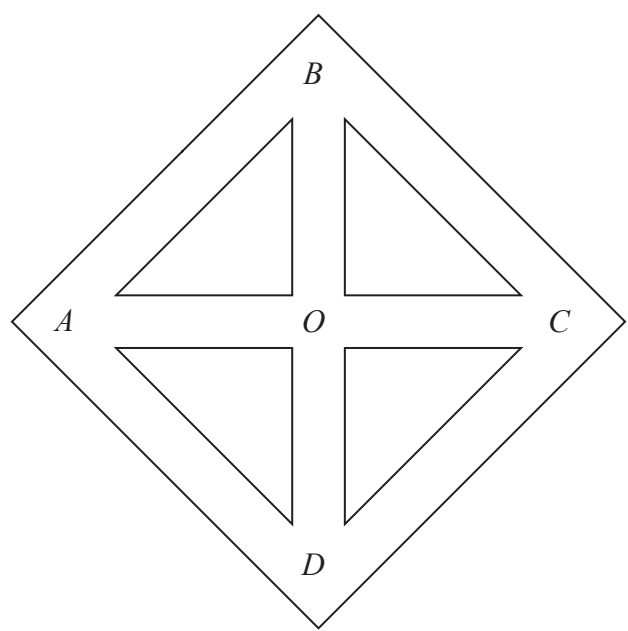


Figure 1

Figure 1 shows a maze for a mouse. Inside the maze there are 5 junctions, labelled A , B , C , D and O . When in the maze, the mouse can move in the maze by going directly from junction to junction through a tunnel joining the two junctions, as shown in Figure 1.

When the mouse is at one of the junctions, the mouse leaves the junction by choosing a tunnel at random. The mouse is equally likely to choose any tunnel leading from that junction, including the tunnel the mouse used to enter that junction.

Once the mouse has started to move along a tunnel, the mouse cannot turn around inside the tunnel and go back along the tunnel.

The mouse is placed in the maze at junction A .

- (a) Write down the probability that the mouse will move directly to junction O . (1)

The mouse is at junction O .

- (b) Write down the probability that the mouse will move directly to junction C . (1)

The mouse is at junction O .

- (c) Find the probability that the mouse will move to junction C by going through exactly 2 tunnels without repeating any tunnel. (2)

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Question 5 continued

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The tunnel connecting junctions A and B is now closed, as shown by the dashed lines in Figure 2.

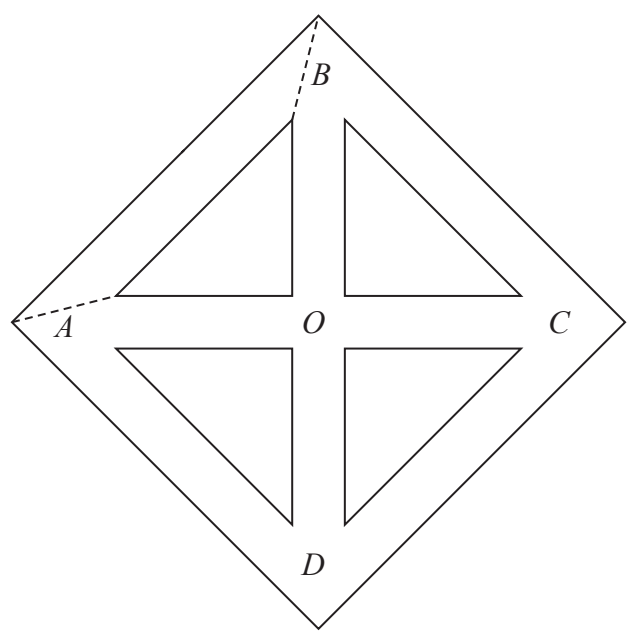


Figure 2

The mouse is at junction B .

- (d) Find the probability that the mouse will move to junction D by going through no more than 3 tunnels without repeating any tunnel. (4)

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Question 5 continued

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(Total for Question 5 is 8 marks)



6 The vertices of triangle A are the points with coordinates $(2, 2)$, $(3, 2)$ and $(2, 4)$.

(a) On the grid, draw and label triangle A .

(1)

Triangle A is transformed to triangle B under the transformation with matrix \mathbf{P} where

$$\mathbf{P} = \begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$$

(b) On the grid, draw and label triangle B .

(3)

Triangle B is transformed to triangle C by the enlargement with centre $(0, -4)$ and scale factor $-\frac{1}{2}$

(c) On the grid, draw and label triangle C .

(3)

(d) Describe fully the **single** transformation that maps triangle C onto triangle A .

(2)

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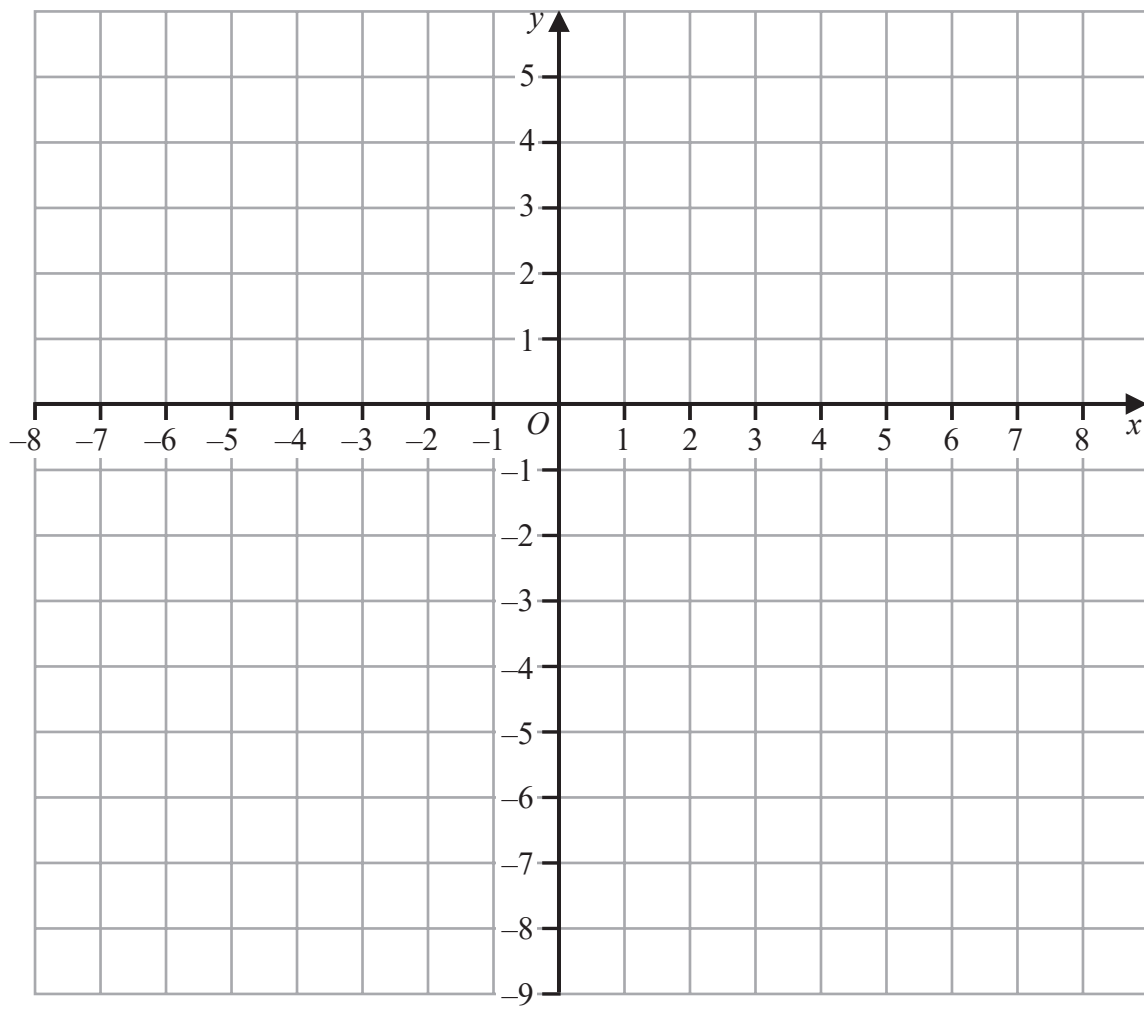
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Question 6 continued



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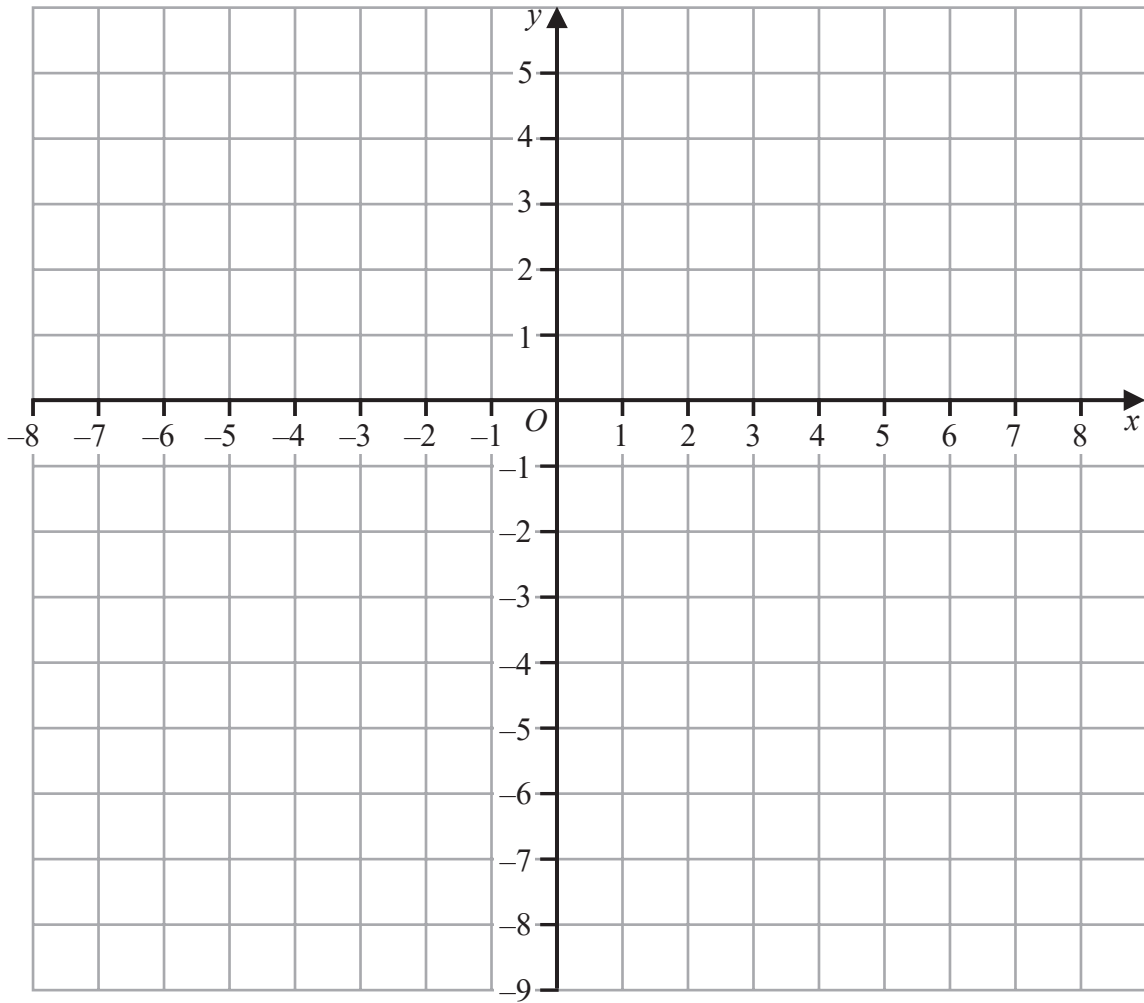
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Question 6 continued

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(Total for Question 6 is 9 marks)



7 (a) Simplify fully $\frac{3x^3 - 14x^2 + 15x}{x - 3}$ where $x \neq 3$ (3)

The curve C has the equation $y = \frac{3x^3 - 14x^2 + 15x}{x - 3}$

(b) Find the coordinates of the stationary point of C . (4)

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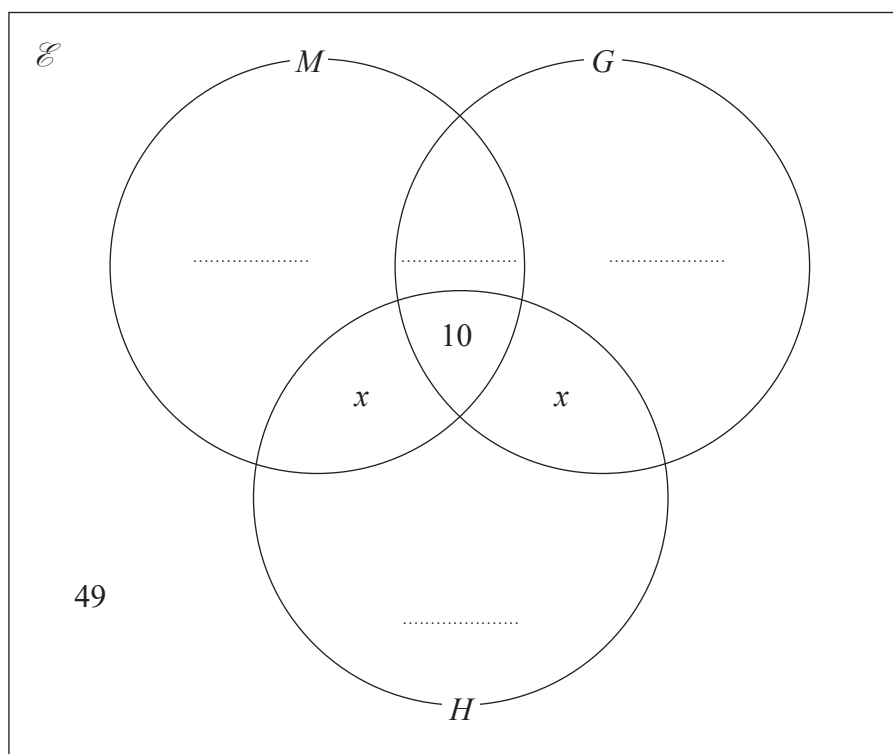
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(Total for Question 7 is 7 marks)



8 In a survey of all 200 students at a school, the numbers of students studying Music (M), Geography (G) and History (H) were recorded.

The incomplete Venn diagram shows some information about the results of the survey.



(a) Write down the number of students studying at least one of Music, Geography and History. (1)

Given that $2x$ students studied Music and Geography but not History and that

$$n(M) = 120 \quad n(G) = 83 \quad n(H) = 60$$

(b) complete the Venn diagram.

Give your answers in terms of x .

(3)

(c) Find the value of x .

(3)

A student at the school is picked at random.

Given that this student studies Music,

(d) find the probability that this student also studies Geography.

(2)

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Question 8 continued

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Question 8 continued

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Question 8 continued

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(Total for Question 8 is 9 marks)



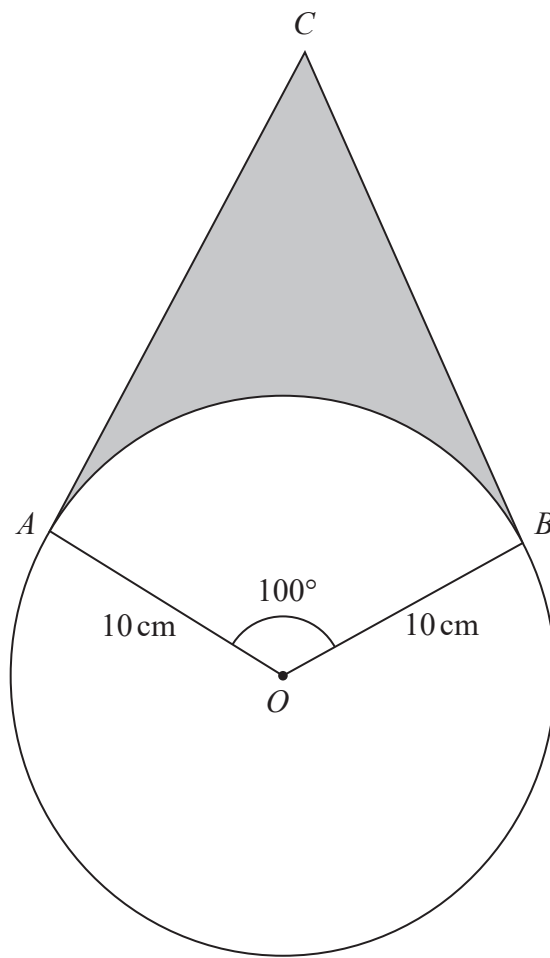


Diagram NOT accurately drawn

Figure 3

Figure 3 shows a circle with centre O and radius 10 cm.

The points A and B lie on the circle such that $\angle AOB = 100^\circ$
The point C is such that AC and BC are tangents to the circle.

- (a) Giving reasons, calculate the size, in degrees, of $\angle ACB$. (3)
- (b) Calculate the length, in cm to 3 significant figures, of BC . (3)
- (c) Calculate the area, in cm^2 to 3 significant figures, of $OACB$. (3)
- (d) Calculate the area, in cm^2 to 3 significant figures, of the region shown shaded in Figure 3. (3)

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[Area of circle = πr^2]



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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 12 marks)



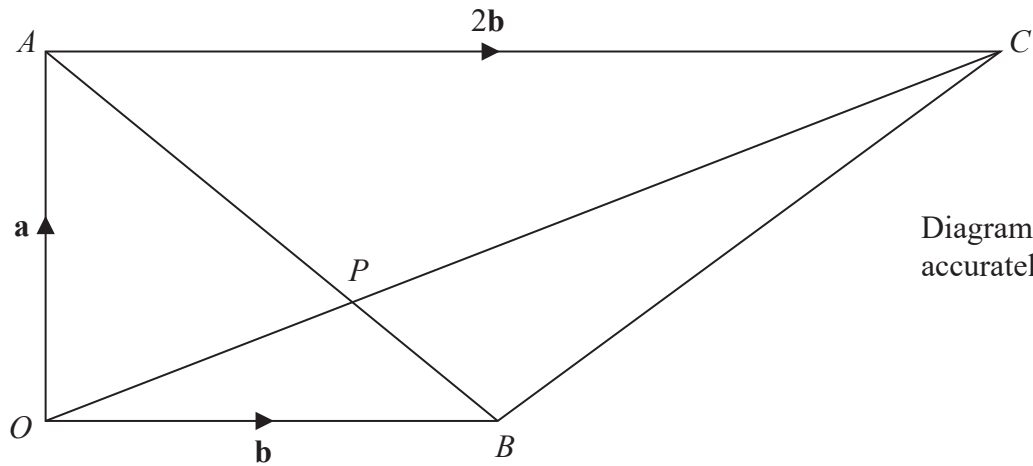


Diagram NOT accurately drawn

Figure 4

Figure 4 shows a trapezium $OACB$ in which $\angle OAC = \angle AOB = 90^\circ$ so that OB and AC are parallel.

Given that $\vec{OA} = \mathbf{a}$, $\vec{OB} = \mathbf{b}$ and $\vec{AC} = 2\mathbf{b}$,

(a) find in terms of \mathbf{a} and \mathbf{b} ,

- (i) \vec{AB} , (ii) \vec{OC} .

(2)

The point P is the intersection of the diagonals OC and AB of the trapezium $OACB$.

Given that $\vec{OC} = \mu\vec{OP}$, where μ is a scalar,

(b) write down an expression for \vec{OP} in terms of \mathbf{a} , \mathbf{b} and μ .

(1)

Given also that $\vec{AB} = \lambda\vec{AP}$, where λ is a scalar,

(c) find and simplify an expression for \vec{OP} in terms of \mathbf{a} , \mathbf{b} and λ .

(2)

(d) Hence find the value of λ and the value of μ .

(4)

Given that $|\mathbf{a}| = 6 \text{ cm}$ and $|\mathbf{b}| = 8 \text{ cm}$,

(e) calculate the length, in cm to 3 significant figures, of OP .

(3)

(f) Calculate the area, in cm^2 , of triangle APC .

(3)

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Question 10 continued

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Question 10 continued

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Question 10 continued

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(Total for Question 10 is 15 marks)



11 (a) Complete the table of values for $y = 2x^2 - 3x + \frac{8}{x}$ giving your values of y to one decimal place.

x	0.5	1	1.5	2	2.5	3	4	5
y	15	7		6			22	36.6

(3)

(b) On the grid opposite, plot the points from your completed table and join them to form a smooth curve.

(3)

(c) Using your graph, find an estimate, to one decimal place, of the minimum value of

$$2x^2 - 3x + \frac{8}{x} \text{ in the interval } 0.5 \leq x \leq 5$$

(1)

(d) By drawing a suitable tangent to your curve, calculate an estimate, to one decimal

place, of the gradient of $y = 2x^2 - 3x + \frac{8}{x}$ at the point where $x = 3$

(3)

(e) By drawing a suitable straight line on your grid, find estimates, to one decimal place, of two solutions of the equation $2x^3 - 7x^2 - 4x + 8 = 0$ in the interval $0.5 \leq x \leq 5$

(5)

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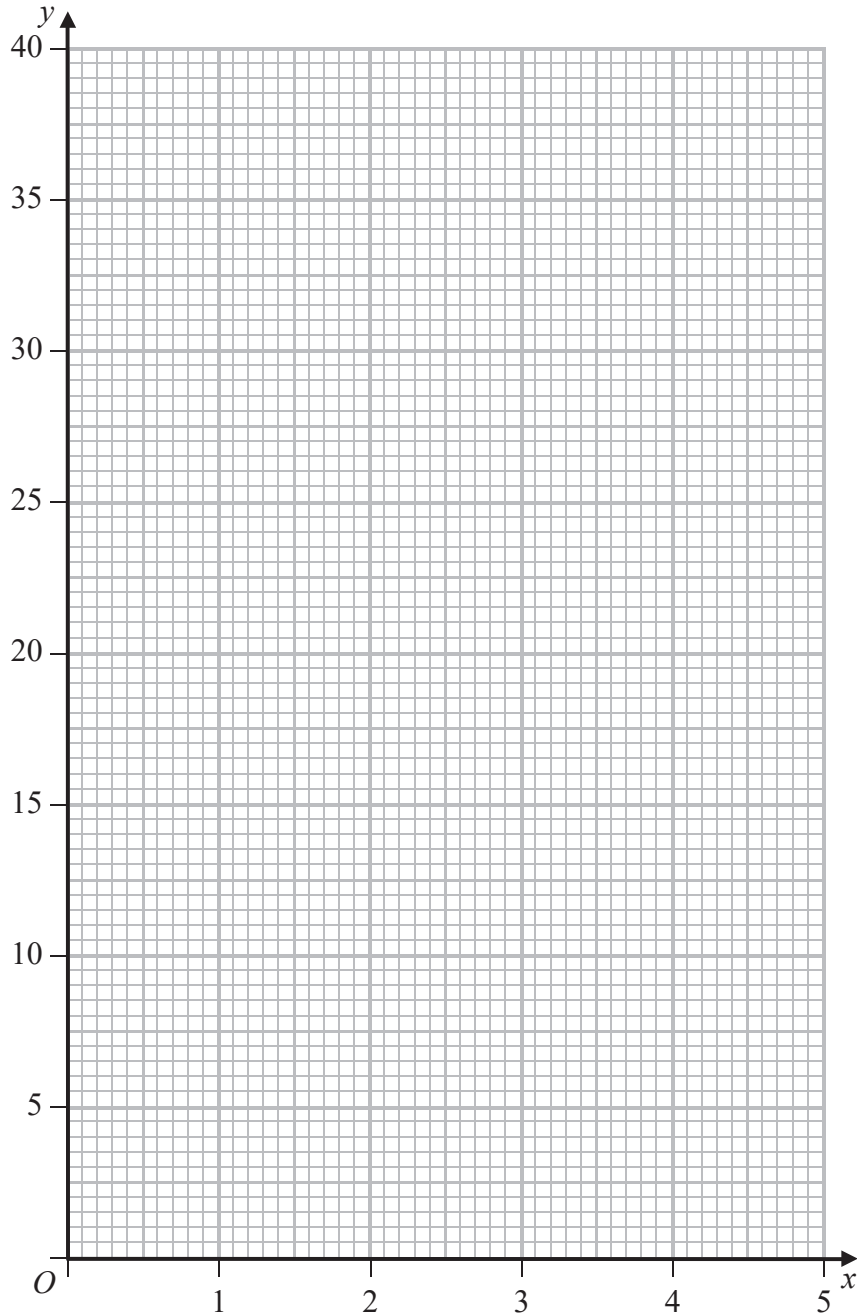
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Question 11 continued



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Question 11 continued

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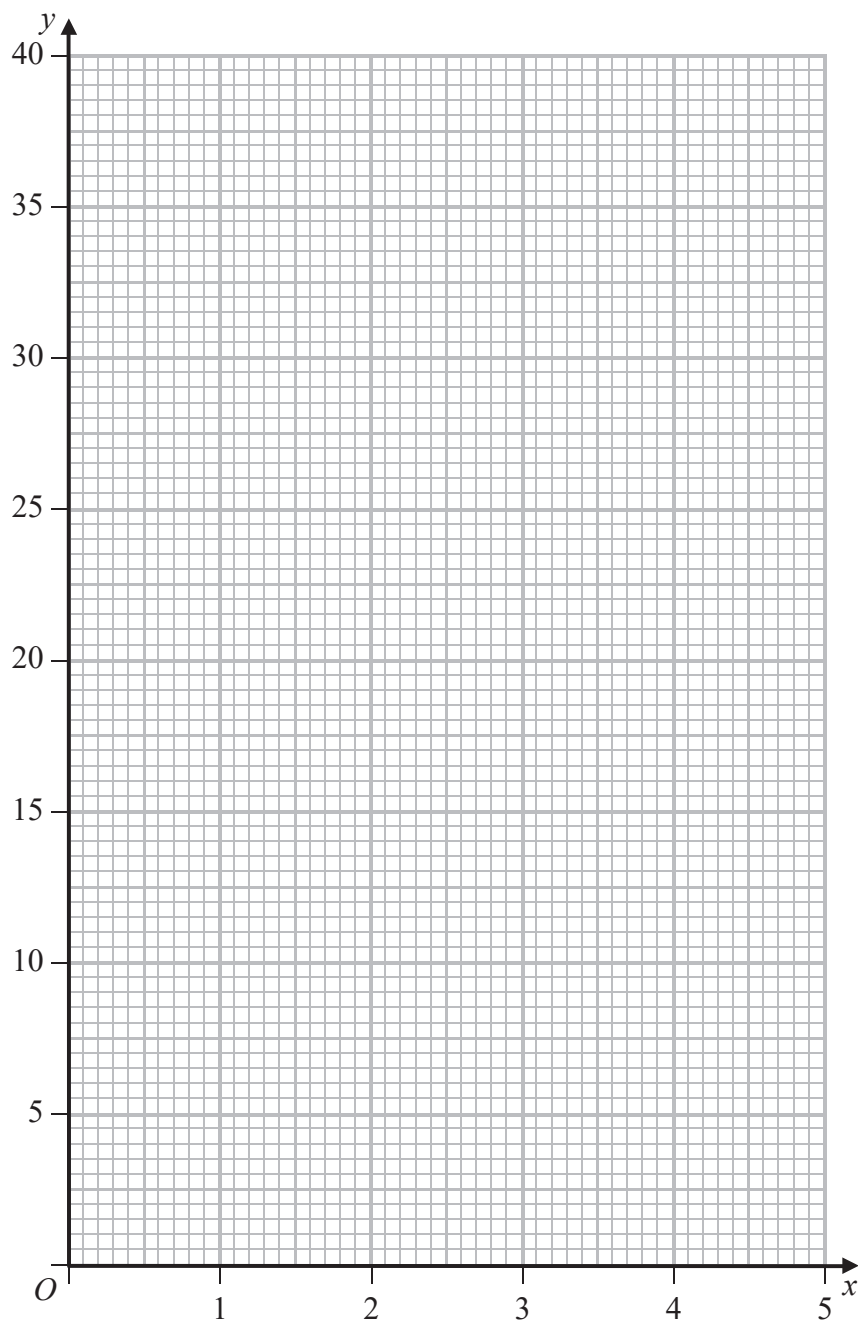
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TOTAL FOR PAPER IS 100 MARKS



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