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Please check the examination details below before entering your candidate infor on

Candidate surname | Other names

Centre Number | Candidate Number

Pearson Edexcel International GCSE

Tuesday 6 June 2023

Afternoon (Time: 2 hours 30 minutes)

Paper reference **4MB1/02R**

Mathematics B
PAPER 2R



You must have: Ruler graduated in centimetres and millimetres, protractor, pair of 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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Answer all ELEVEN questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 On Monday, Tisam buys 600 watermelons in India to sell in the UK.

On Tuesday, Tisam splits 200 of the watermelons each into 8 slices.
She sells each slice for £0.60
She sells all the slices by the end of the day.

(a) Work out how much money Tisam receives from the sale of the watermelon slices on Tuesday.

(2)

On Wednesday, Tisam sells 60% of the remaining watermelons.
She sells them for £1.40 each.

(b) Work out how much money Tisam receives from the sale of the watermelons on Wednesday.

(2)

Tisam gives away for free the watermelons she has left.

Tisam bought the 600 watermelons at a cost of 90 rupees each.
The cost to send the watermelons to the UK was £700

Using an exchange rate of

1 rupee = £0.0097

(c) calculate the percentage profit, to one decimal place, that Tisam makes from the sale of the watermelons.

(4)

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Question 1 continued

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Question 1 continued

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Question 1 continued

(Total for Question 1 is 8 marks)

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2 $\mathscr{E}$ is the universal set and A, B and C are three sets.

$\mathscr{E} = \{ p, q, r, s, t, u \}$
$A = \{ p, r, t \}$
$B = \{ q, r, s \}$

(a) List the elements of the set $A \cap B'$

(1)

Given that
$n(C) = 3$
$n(A \cap C) = 2$
$n(B \cap C) = 1$

(b) list all the possible sets C

(3)

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Question 2 continued

(Total for Question 2 is 4 marks)

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3

(a) Solve $4x - 3 \leqslant 11$

(2

(b) Solve $\frac{y + 8}{2} \geqslant 3$

(2)

(c) On the grid opposite, by drawing suitable straight lines and using shading, show the region **R** that satisfies the inequalities

$$4x - 3 \leqslant 11$$

$$\frac{y + 8}{2} \geqslant 3$$

$$y \leqslant 2x + 1$$

Label the region **R**

(4)

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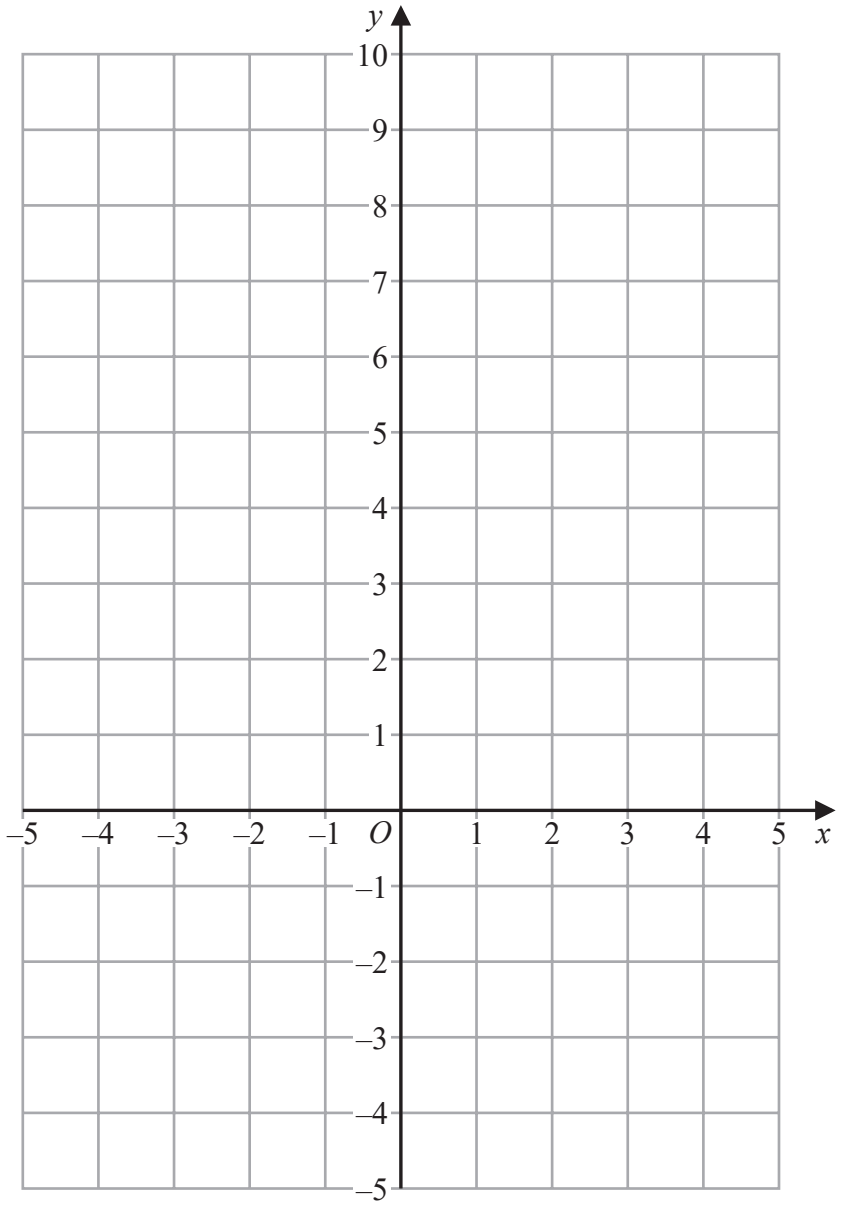
Question 3 continued



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

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Question 3 continued

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Question 3 continued

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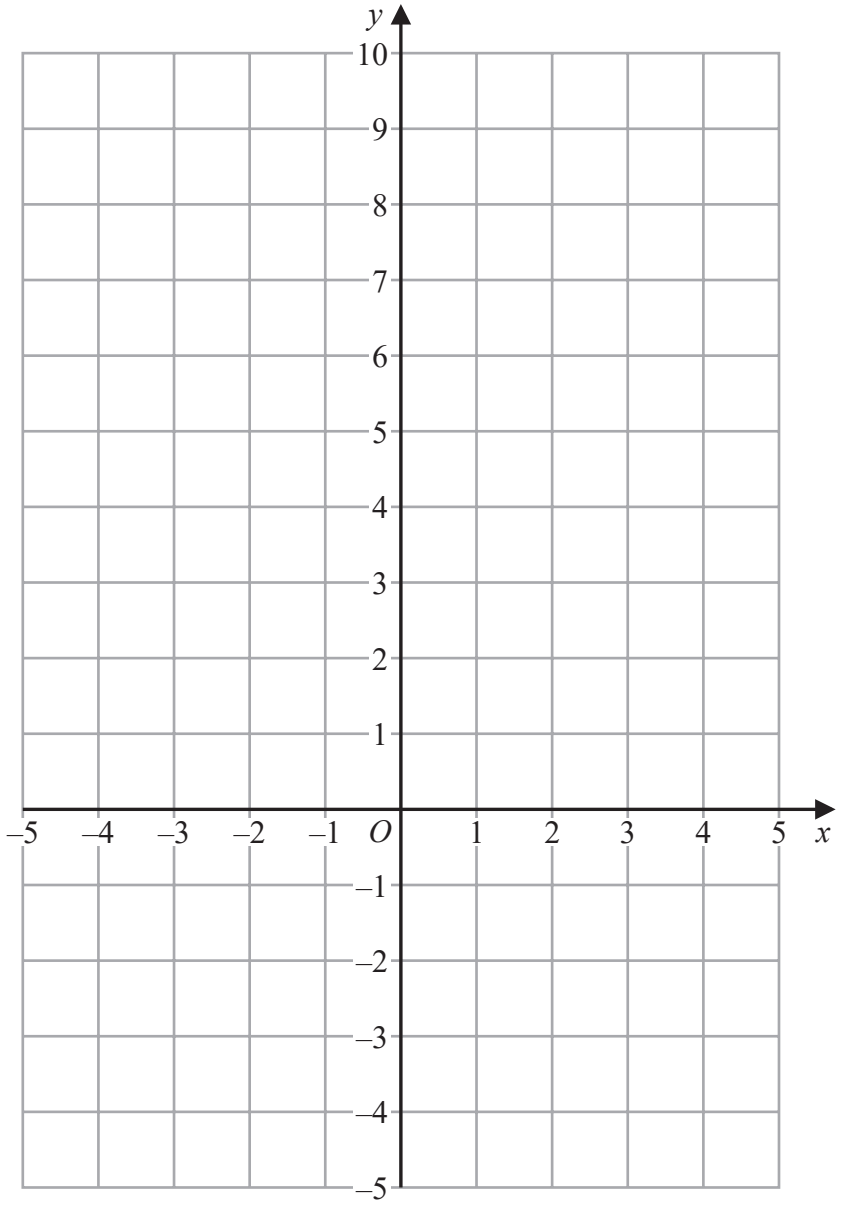

(Total for Question 3 is 8 marks)

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4 $x = 4.2 \times 10^5$ and $y = 6 \times 10^{-100}$

(a) Write x as an ordinary number.

(1

(b) Calculate xy
Give your answer in standard form.

(2)

(c) Calculate $\frac{x}{y}$
Give your answer in standard form.

(2)

(d) Using the values of x and y above, write the following in order of size

$$x \qquad y \qquad \sqrt{x} \qquad \sqrt{y}$$

Start with the smallest value.

(2)

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Question 4 continued

(Total for Question 4 is 7 marks)

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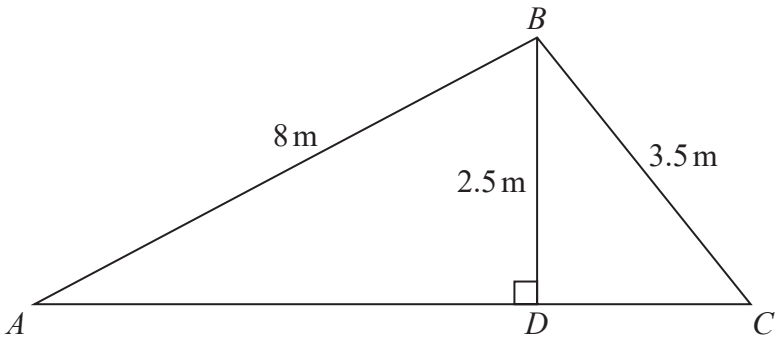

Figure 1

Figure 1 shows a framework of wooden beams, with ADC a straight line.

$AB = 8\,\text{m}$ $BC = 3.5\,\text{m}$ $BD = 2.5\,\text{m}$ $\angle ADB = 90°$

(a) (i) Calculate, giving your answer to the nearest metre, the length of AC

(3)

(ii) Calculate, giving your answer to one decimal place, the size, in degrees, of $\angle BAD$

(2)

A fourth beam DE is added to the framework.
The point E lies on AB and is such that DE is perpendicular to AB

(b) Calculate the length, in metres to 3 significant figures, of DE

(2)

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Question 5 continued

(Total for Question 5 is 7 marks)

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6 Triangles A and B are shown on the grid opposite.

(a) Describe fully the **single** transformation that maps triangle A onto triangle B

(2

Triangle A is transformed to triangle C under the translation $\begin{pmatrix} -1 \\ -8 \end{pmatrix}$

(b) On the grid, draw and label triangle C

(2)

Triangle A is transformed to triangle D under the transformation with the matrix **M** where

$$\mathbf{M} = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$$

(c) On the grid, draw and label triangle D

(3)

Triangle B is transformed to triangle E by a rotation of 180° about the point (0, 1)

(d) On the grid, draw and label triangle E

(2)

(e) Find the matrix which represents the transformation that maps triangle A onto triangle E

(2)

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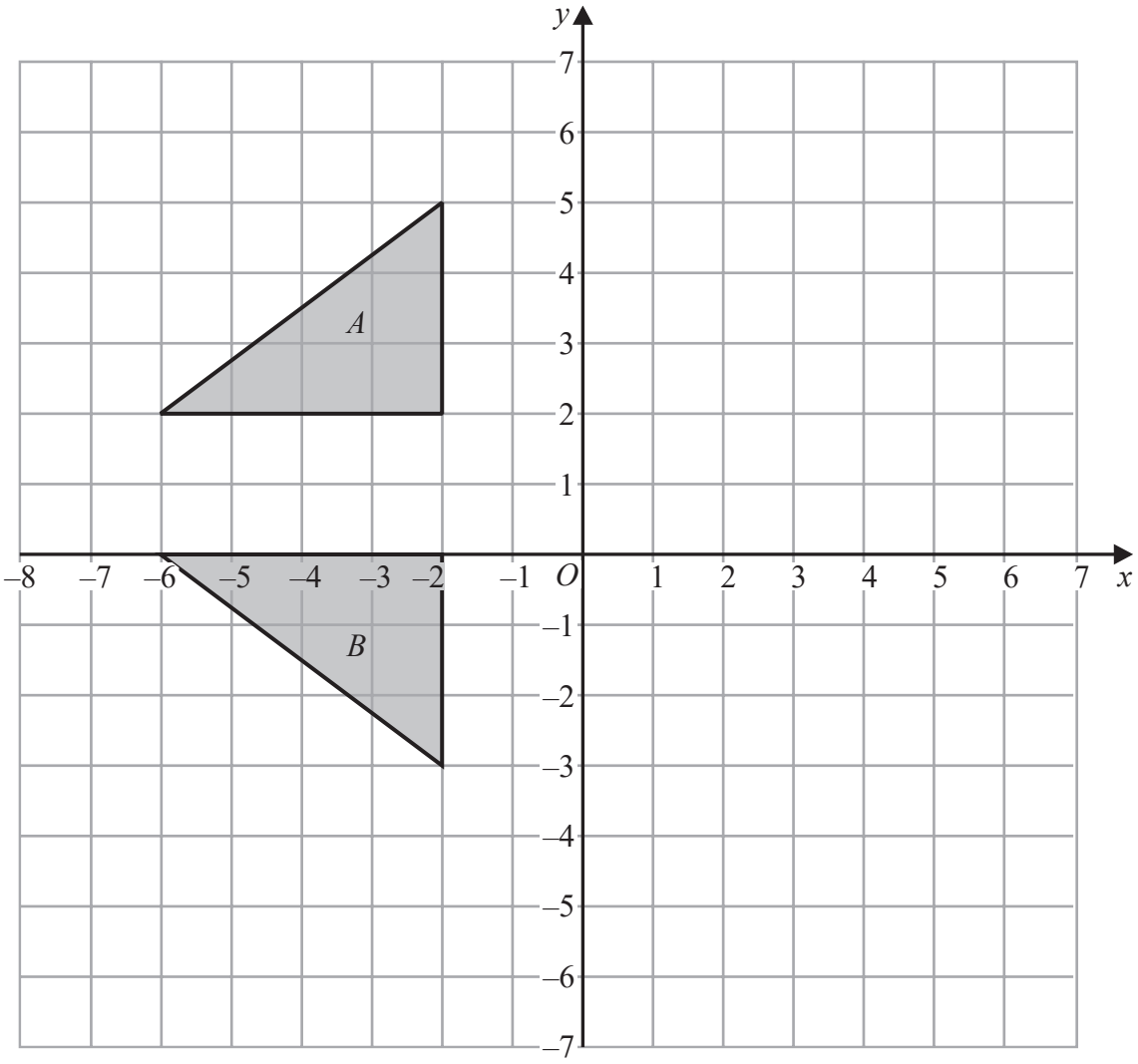
Question 6 continued



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Question 6 continued

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Question 6 continued

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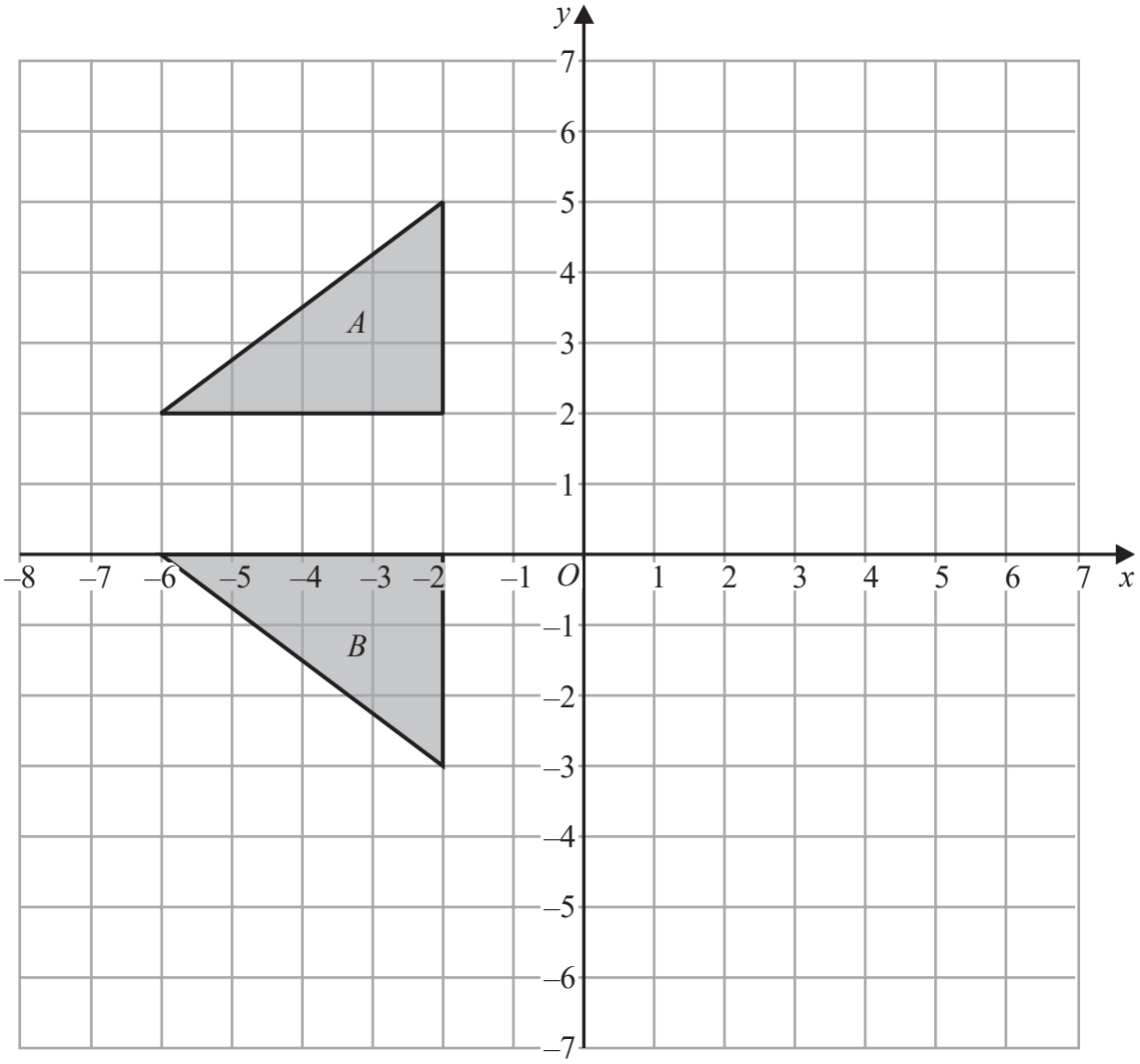

(Total for Question 6 is 11 marks)

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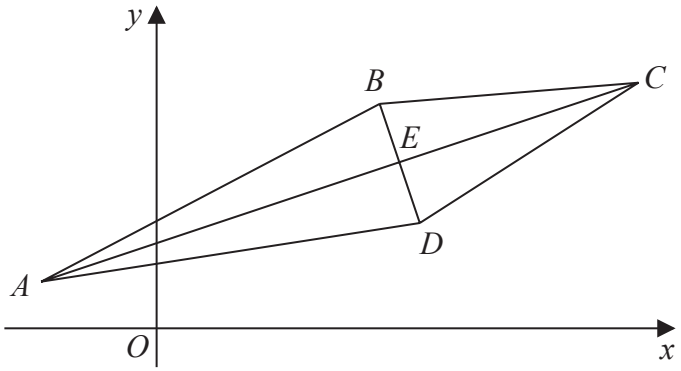

Figure 2

Figure 2 shows a quadrilateral $ABCD$ with $\overrightarrow{AB} = \begin{pmatrix} 8.5 \\ 4.5 \end{pmatrix}$ and $\overrightarrow{AC} = \begin{pmatrix} 15 \\ 5 \end{pmatrix}$

The diagonals AC and BD meet at the point E

(a) Find as a column vector $\overrightarrow{BC}$

(1)

The point E has coordinates (6, 4)
Given that $AE : AC = 3 : 5$

(b) find the coordinates of the point A

(3)

Given that $ABCD$ is a kite,

(c) find the coordinates of the point D

(3)

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Question 7 continued

(Total for Question 7 is 7 marks)

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8 The function f is such that

$$f: x \mapsto 1 - \frac{1}{x} \quad \text{where } x \neq 0$$

(a) State a value that cannot be in the range of the function f

(1)

(b) Solve $16\,f(x) = x + 8$

(4)

(c) Show that $ff(x) = f^{-1}(x)$

(6)

(d) State a value that cannot be in the domain of the function f^{-1}

(1)

(e) Evaluate $fff(2)$

(1)

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

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Question 8 continued

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Question 8 continued

(Total for Question 8 is 13 marks)

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9 The curve C has equation

$$y = x^2 + \frac{24}{x} - 25 \qquad \text{for } 0 < x \leqslant 5$$

(a) Find, to one decimal place, the coordinates of the stationary point of C

(5)

(b) Complete the table of values for y
Give your values of y to one decimal place where necessary.

x	0.4	0.6	0.8	1	2	3	4	5
y	35.2			0		–8	–3	4.8

(2)

(c) On the grid opposite, plot the stationary point and plot the points from your completed table. Join these to form a smooth curve.

(4)

(d) By drawing a suitable straight line on the grid, find estimates, to one decimal place, of the solutions to the equation

$$x^3 + 8x^2 - 49x + 24 = 0$$

within the range $0 < x \leqslant 5$

(4)

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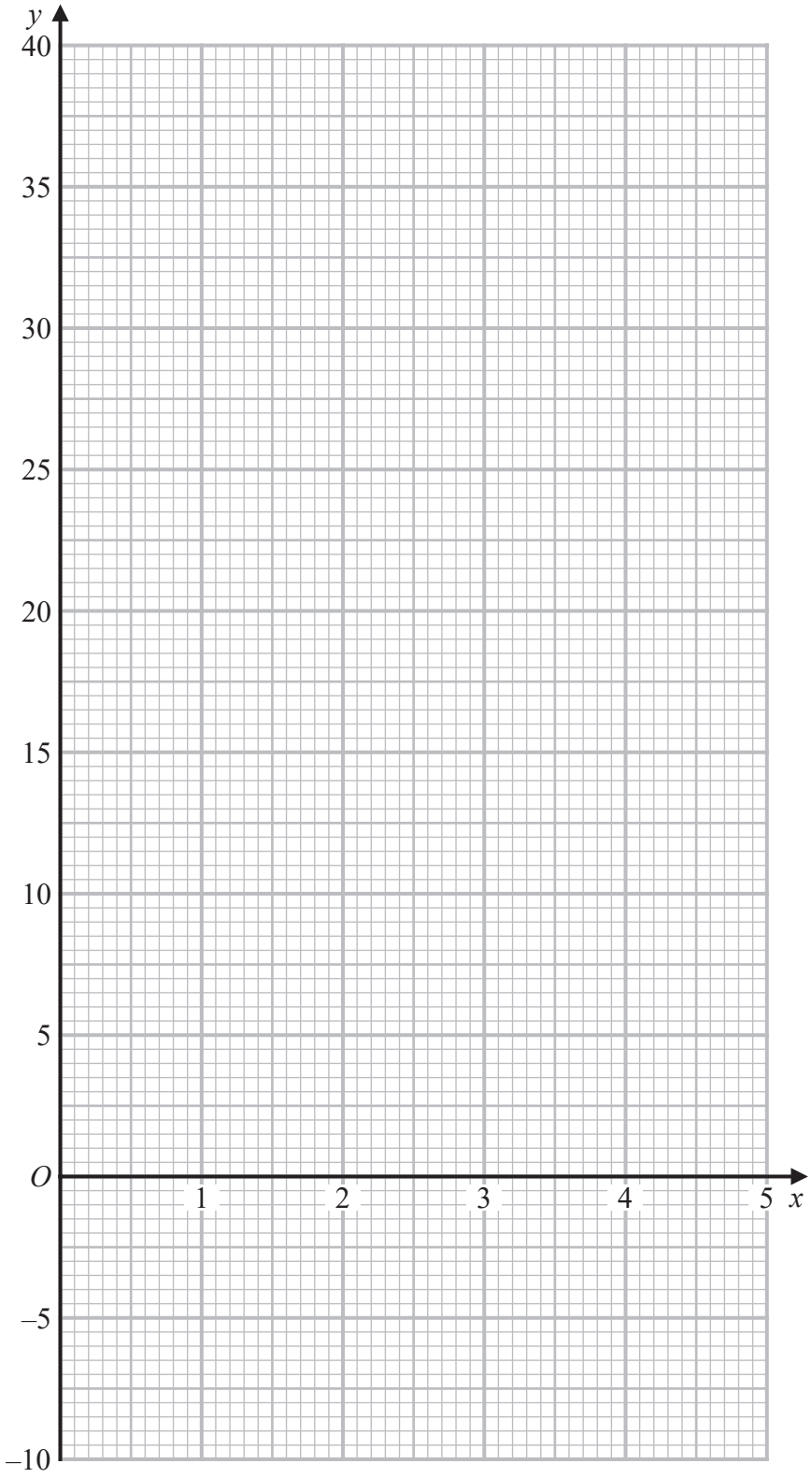
Question 9 continued



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Question 9 continued

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Question 9 continued

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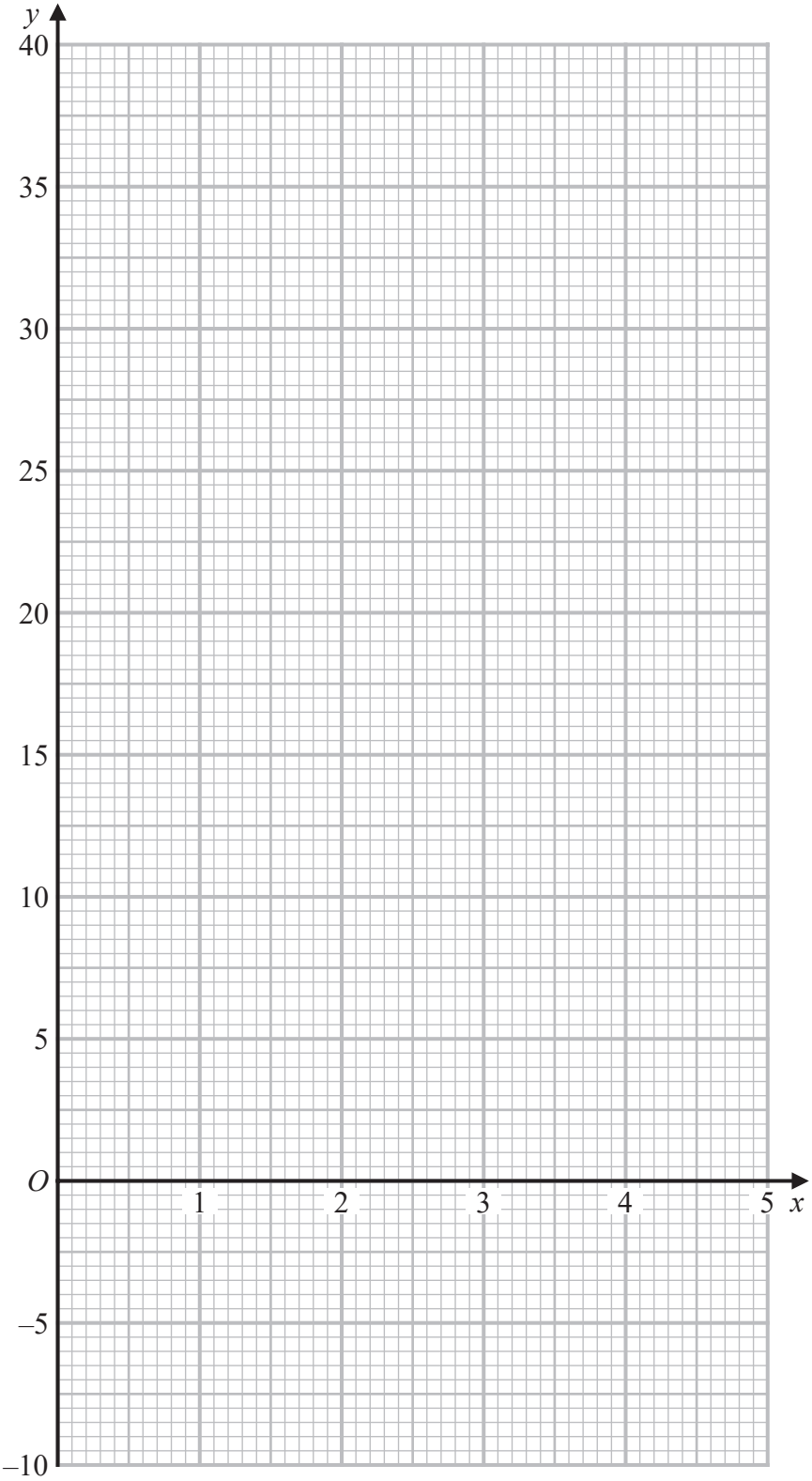

(Total for Question 9 is 15 marks)

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10 Hugo is learning a new game. Each time he plays the game the possible outcomes ar that he may win, draw or lose.

The first time Hugo plays the game the probability that

he wins is $\frac{1}{4}$

he draws is $\frac{1}{12}$

(a) Show that the probability that Hugo loses the first game is $\frac{2}{3}$

(1)

The second time Hugo plays the game the probability that

he wins is $\frac{3}{5}$

he draws is $\frac{1}{10}$

he loses is $\frac{3}{10}$

(b) Use the information to complete the tree diagram opposite.

(2)

Hugo plays the game twice.

(c) Find the probability that he draws both of his games.

(2)

Hugo scores points each time he plays.
He scores 3 points if he wins, 2 points if he draws and 1 point if he loses.

After 2 games Hugo has 3 points.

(d) Find the probability that Hugo lost the first game.

(5)

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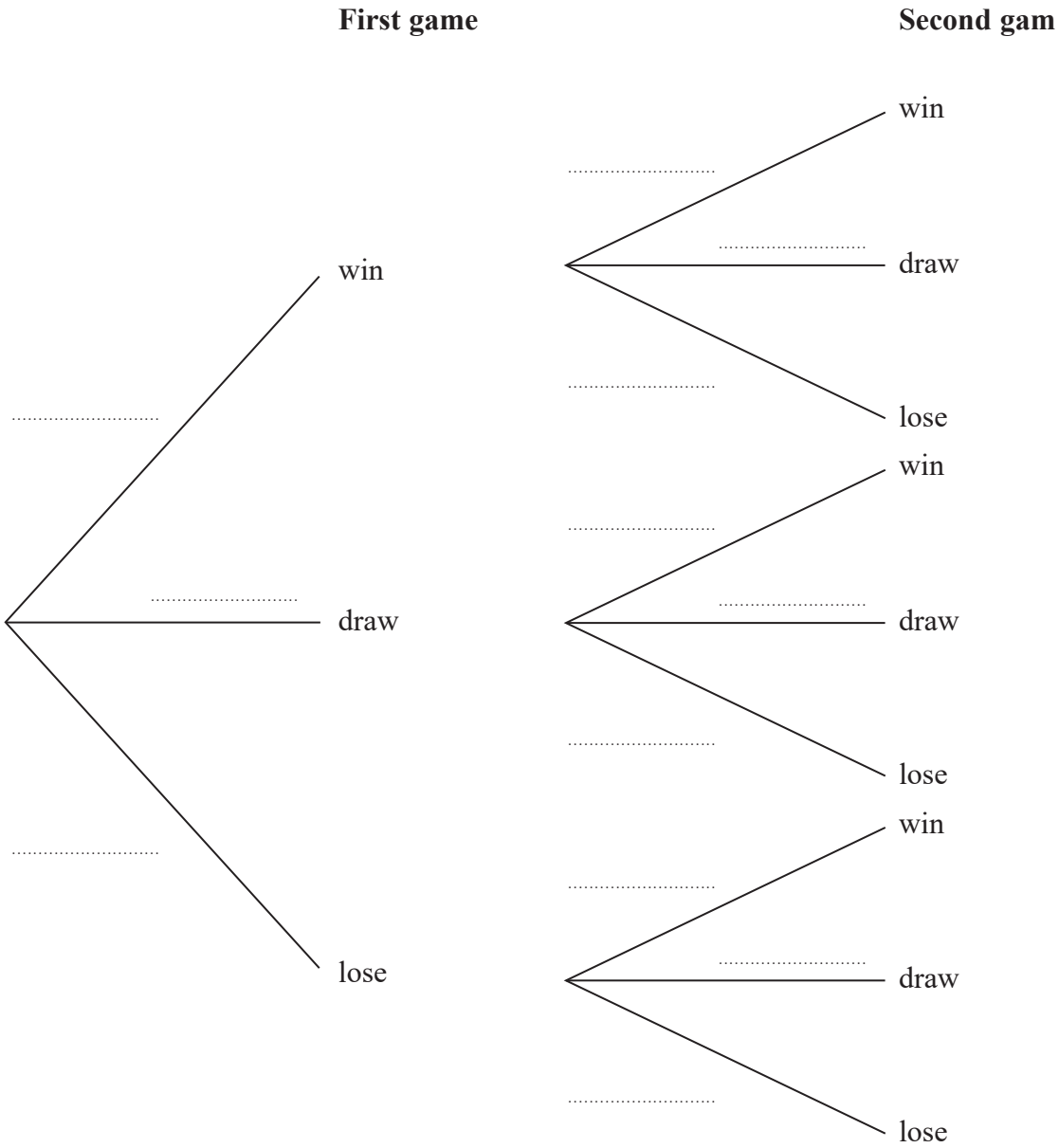

Turn over for a spare copy of the tree diagram.

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Question 10 continued

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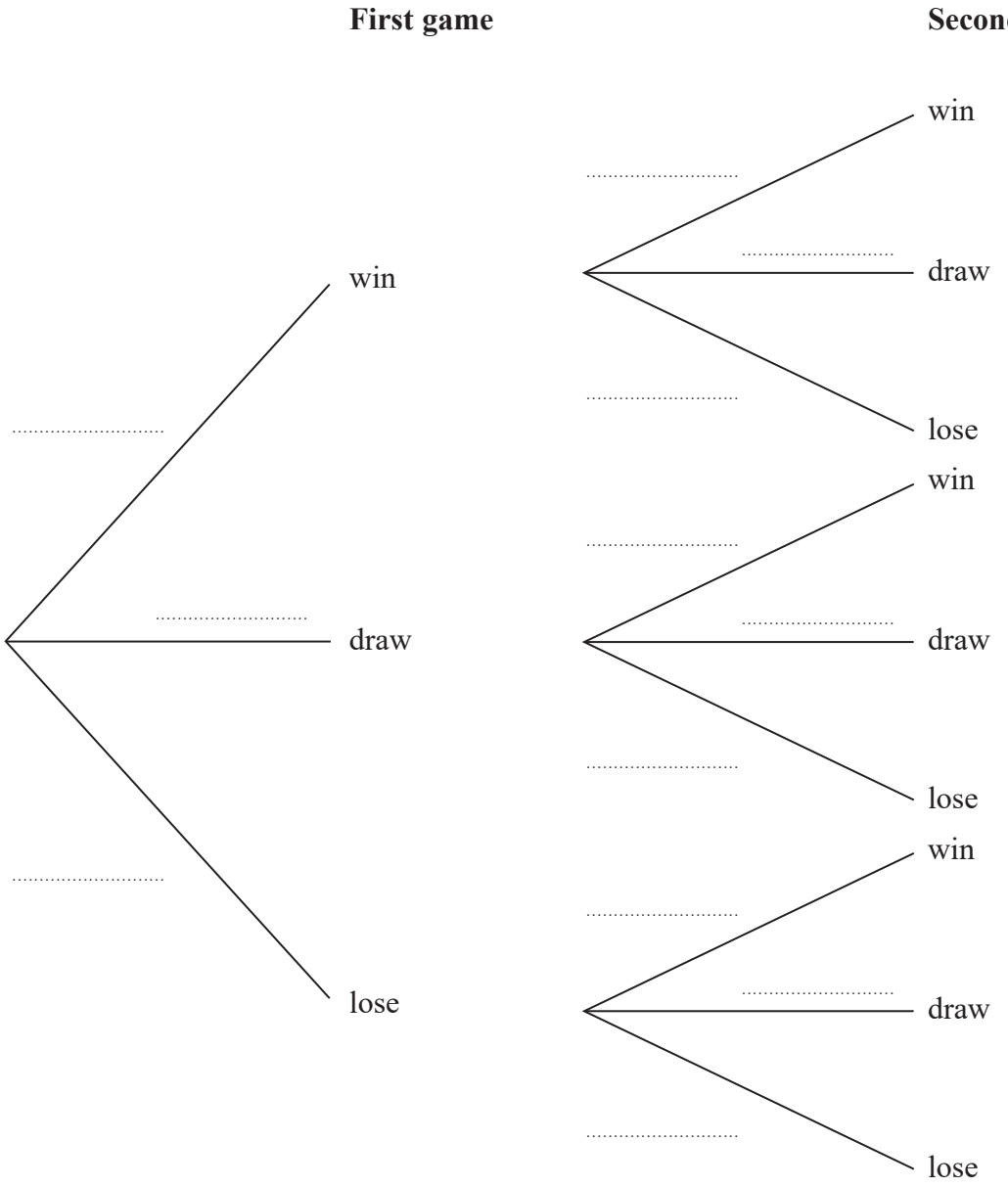
Question 10 continued

Only use this diagram if you need to redraw your tree diagram.



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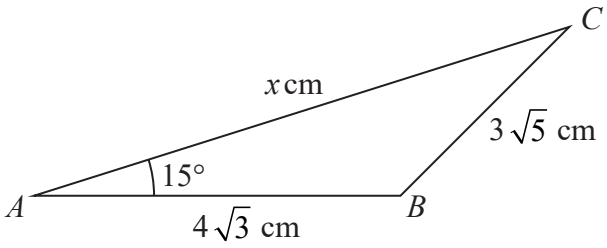

Figure 3

Figure 3 shows triangle ABC

$AB = 4\sqrt{3}$ cm $\quad BC = 3\sqrt{5}$ cm $\quad AC = x$ cm $\quad \angle BAC = 15°$

Given that the exact value of $\cos 15° = \dfrac{\sqrt{6} + \sqrt{2}}{4}$

(a) show that x is a solution of the equation

$$x^2 - \left(6\sqrt{2} + 2\sqrt{6}\right)x + 3 = 0$$

(3)

(b) Write the equation given in part (a) in the form $(x - k)^2 = 21 + 12\sqrt{3}$ where k is a constant that should be stated as a simplified surd.

(2)

(c) Show that $\left(3 + 2\sqrt{3}\right)^2 = 21 + 12\sqrt{3}$

(2)

Given that $\angle ABC$ is obtuse

(d) use parts (b) and (c) to find the exact value of x
Give your answer in the form $a + b\sqrt{2} + c\sqrt{3} + \sqrt{d}$ where a, b, c and d are integers.

(3)

[Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$]

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Question 11 continued

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Question 11 continued

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Question 11 continued

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