**Pearson Edexcel
International GCSE**

Centre Number

Candidate Number

Mathematics B
Paper 2R

Thursday 4 June 2015 – 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.

Answer ALL ELEVEN questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1   **A**, **B** and **C** are three matrices.

$$\mathbf{A} = \begin{pmatrix} p & 3 \\ -3 & 4 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 3 & q \\ -2 & -3 \end{pmatrix} \text{ and } \mathbf{C} = \begin{pmatrix} -12 & r \\ r & -24 \end{pmatrix}$$

Given that **AB** = **C**, find the value of p, the value of q and the value of r.

(Total for Question 1 is 4 marks)

P 4 4 3 9 7 A 0 2 3 6

2 Simplify completely $\dfrac{x^2 - 11x + 24}{x + 5} \div \dfrac{x - 3}{2x^2 + 9x - 5}$

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(Total for Question 2 is 5 marks)

3 A container is a cuboid with internal dimensions of 2 m $\times$ 1.5 m $\times$ 0.5 m.
   The container is empty.

   It is to be filled with water flowing out of a pipe at a rate of 12 500 cm^3/minute.

   (a) Calculate the internal volume, in cm^3, of the container.

   (2)

   (b) Calculate the time, in hours, to fill the container completely.

   (3)

Question 3 continued

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(Total for Question 3 is 5 marks)

P 4 4 3 9 7 A 0 5 3 6

4 *A* and *B* are two sets such that n($\mathscr{E}$) = 60, n(*A*) = 27, n(*A* ∪ *B*) = 53, and n(*A* ∩ *B*) = 16

(a) Using this information, place the number of elements in the appropriate subsets of the Venn diagram below.

(4)

(b) Write down n(*B'*).

(1)

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P 4 4 3 9 7 A 0 6 3 6
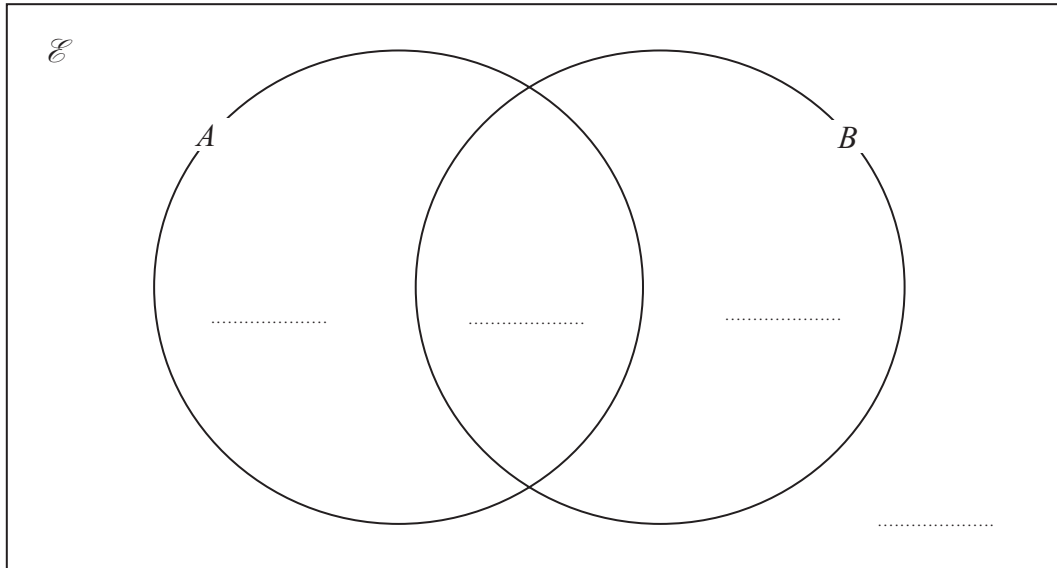
Question 4 continued

(Total for Question 4 is 5 marks)

5 The curve C has equation $y = x - \dfrac{4}{x}$ where $x > 0$

(a) Find $\dfrac{dy}{dx}$

(2)

(b) Find the coordinates of the point on C at which the gradient is 17

(4)

Question 5 continued

(Total for Question 5 is 6 marks)

6 The distance from Beaune to Nevers is 160 km.

A motorist starts from Beaune at 9 00 am and travels towards Nevers at a constant speed of 64 km/h until he arrives at Autun, which is 48 km from Beaune.

At Autun he rests for 24 minutes before continuing his journey at a constant speed to arrive at Nevers at 11 45 am.

(a) Using the grid opposite, draw a graph to represent the motorist's journey.

(3)

(b) Using your graph, calculate the motorist's speed, in km/h, for his journey from Autun to Nevers.

(2)

At 9 30 am a second motorist starts from Nevers to journey to Beaune on the same road as the first motorist.

The second motorist travels at a constant speed of 80 km/h.

(c) Draw, on the same graph, a straight line to represent the second motorist's journey.

(2)

(d) Using your graph, write down

   (i) the time that the two motorists meet,

   (ii) how far both motorists are from Autun when they meet.

(2)

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Question 6 continued

Nevers ─

140 ─

120 ─

Distance from
Beaune in
kilometres

100 ─

80 ─

60 ─

40 ─

20 ─

Beaune ─
9 00 am   10 00 am   11 00 am   12 00 noon

Time
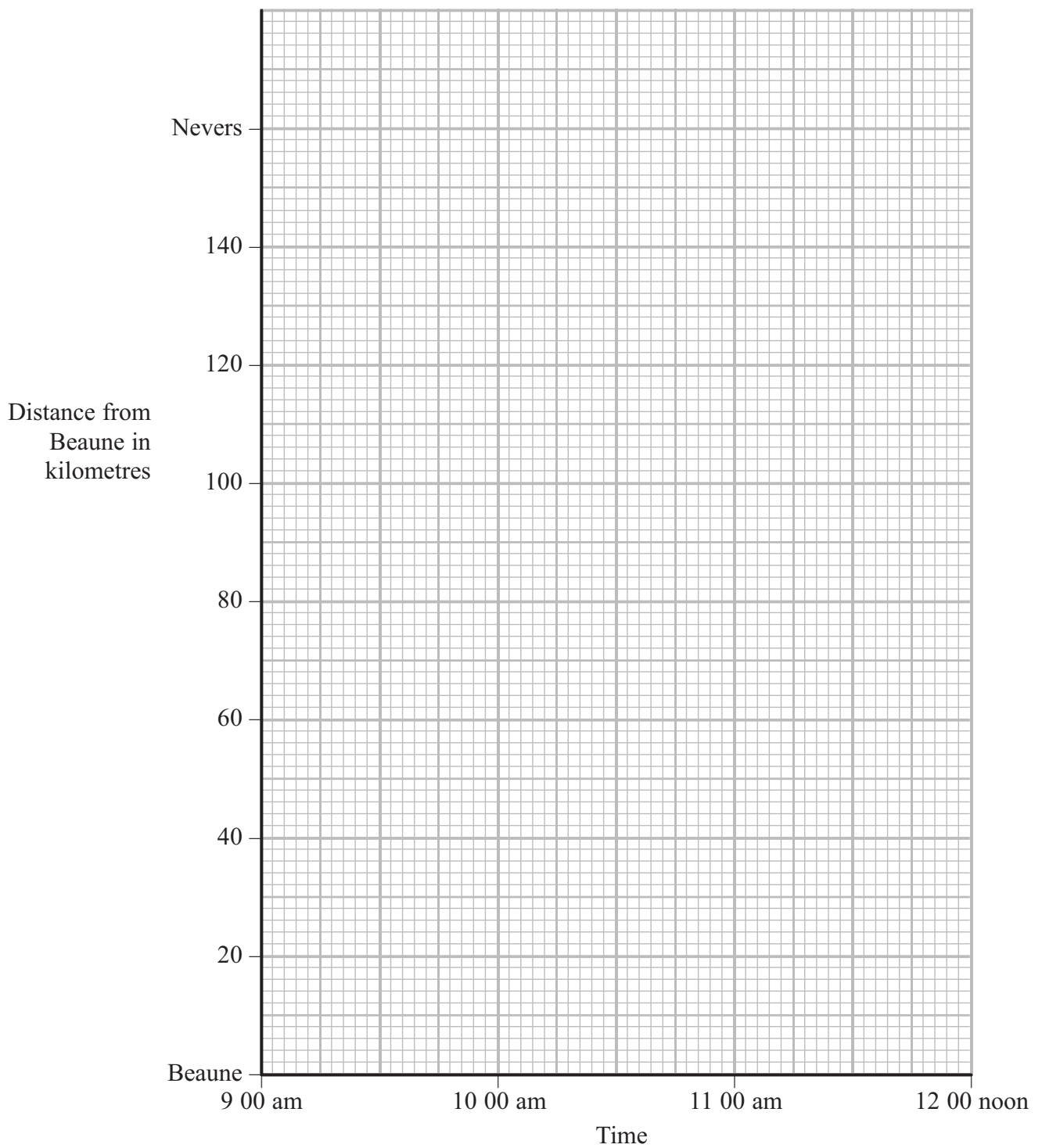
Use the grid on page 13 if you need to redraw your graph.

P 4 4 3 9 7 A 0 1 1 3 6

Question 6 continued

Question 6 continued

Use this grid if you need to redraw your graph.

Distance from Beaune in kilometres (y-axis): Beaune, 20, 40, 60, 80, 100, 120, 140, Nevers

Time (x-axis): 9 00 am, 10 00 am, 11 00 am, 12 00 noon
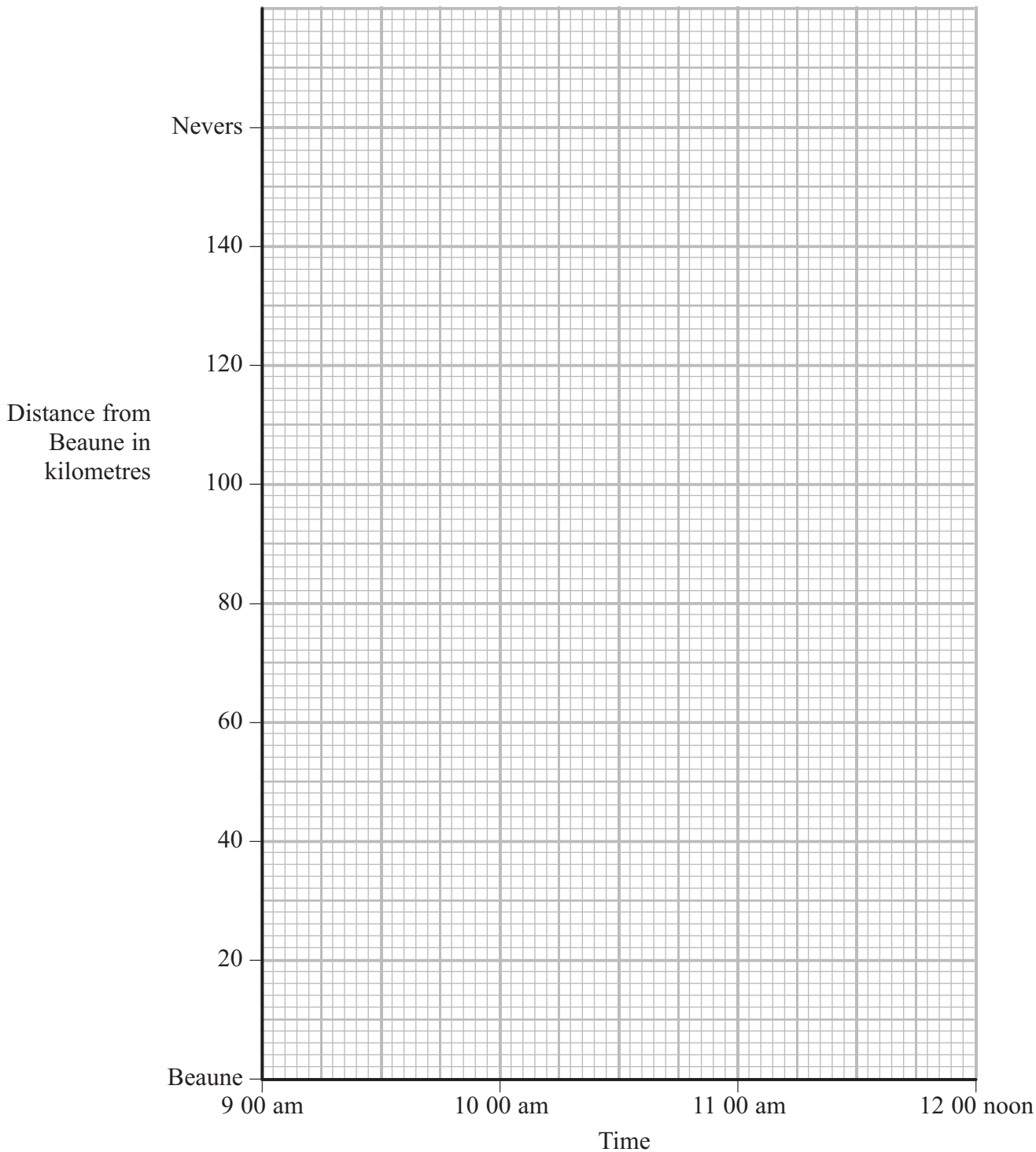
(Total for Question 6 is 9 marks)

P 4 4 3 9 7 A 0 1 3 3 6

Turn over ▶

7 A bag contains 7 red sweets and 4 yellow sweets.
Huang is going to take a sweet at random from the bag and eat the sweet.
Saanvi is then going to take at random a sweet from the bag and eat the sweet.

(a) Complete the probability tree diagram.

(3)

Huang's
sweet

Saanvi's
sweet

Red

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Red

$\dfrac{7}{11}$

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Yellow

Red

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Yellow

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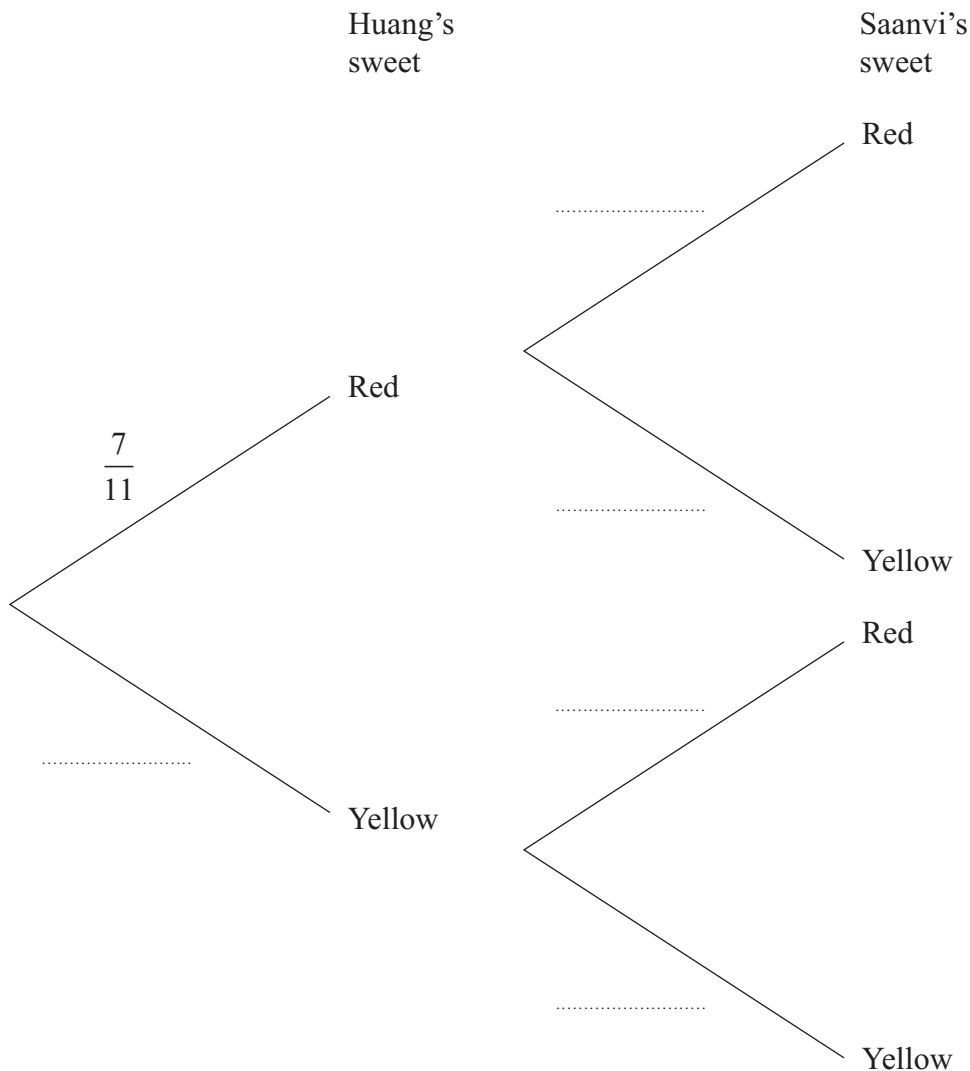
Yellow

(b) Calculate the probability that

    (i)   Huang's sweet is red and Saanvi's sweet is yellow,

    (ii)   at least one of the sweets taken is yellow.

(5)

Given that Saanvi's sweet is yellow,

(c) show that the probability that Huang's sweet was yellow is 0.3

(3)

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Question 7 continued

Question 7 continued

Question 7 continued

(Total for Question 7 is 11 marks)

8 Nargis and Tony mark examination papers for an overseas examination board.

Nargis marks a number of Question **A**. In one hour she marks x questions.

(a) Write down an expression, in terms of x, for the average time, in minutes, that Nargis takes to mark one Question **A**.

(1)

Tony marks a number of Question **B**. In one hour he marks $(x - 27)$ questions.

(b) Write down an expression, in terms of x, for the average time, in minutes, that Tony takes to mark one Question **B**.

(1)

The average time for Tony to mark one Question **B** is 2 minutes more than the average time for Nargis to mark one Question **A**.

(c) Using all the information given, write down an equation in x.

(1)

(d) Show that this equation simplifies to $x^2 - 27x - 810 = 0$

(3)

(e) Find the value of x.

(3)

Tony is paid at a rate of £10.80 per hour.

(f) Calculate how much Tony is paid for marking each Question **B**.

(2)

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Question 8 continued

P44397A01936

Question 8 continued

Question 8 continued

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(Total for Question 8 is 11 marks)

P 4 4 3 9 7 A 0 2 1 3 6

9

B

Diagram **NOT** accurately drawn

100°

12 m

9 m

A

D

C
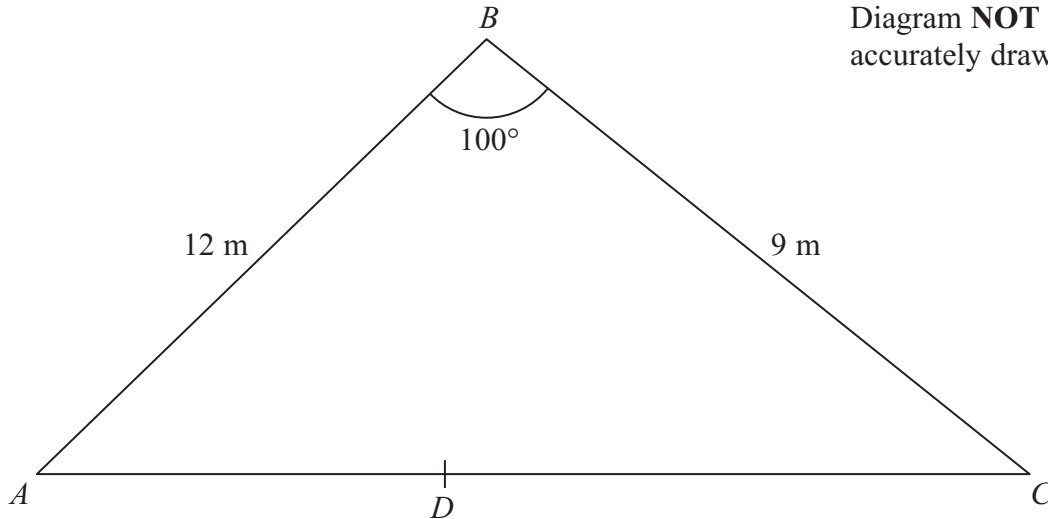
Figure 1

In Figure 1, *ABC* are three points on horizontal ground such that *AB* = 12 m, *BC* = 9 m and ∠*ABC* = 100°

Calculate to 3 significant figures,

(a) the length, in m, of *AC*,

(3)

(b) the size in degrees, of ∠*CAB*.

(3)

D is the point on *AC* such that *DB* bisects ∠*ABC*.

(c) Calculate, giving your answer to 3 significant figures, the area in m², of triangle *BDC*.

(6)

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

Sine rule: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Area of triangle $= \dfrac{1}{2} bc \sin A$]

Question 9 continued

Question 9 continued

Question 9 continued

P 4 4 3 9 7 A 0 2 5 3 6

10

Diagram **NOT** accurately drawn
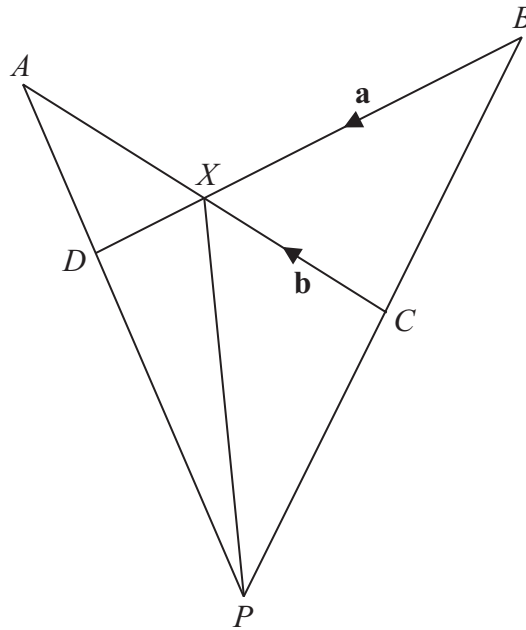
Figure 2

In Figure 2, *A*, *B*, *C* and *D* are four points such that *BD* and *CA* intersect at *X*.

$BX : XD = 3 : 1$ and $CX : XA = 4 : 3$

$\overrightarrow{BX} = \mathbf{a}$ and $\overrightarrow{CX} = \mathbf{b}$

(a) Find, in terms of **a** or **b** or **a** and **b**,

   (i) $\overrightarrow{XD}$,   (ii) $\overrightarrow{XA}$,   (iii) $\overrightarrow{AD}$,   (iv) $\overrightarrow{BC}$

(4)

The point *P* is such that *ADP* and *BCP* are straight lines.

Given that $\overrightarrow{AP} = \lambda \overrightarrow{AD}$,

(b) show that $\overrightarrow{XP} = \dfrac{1}{3}\lambda\mathbf{a} + \dfrac{3}{4}(1-\lambda)\mathbf{b}$

(3)

Given also that $\overrightarrow{BP} = \mu\overrightarrow{BC}$,

(c) find an expression for $\overrightarrow{XP}$ in terms of **a**, **b** and μ.

(1)

(d) Find the value of μ and the value of λ.

(4)

Given that $|\mathbf{a}| = 6$ cm,

(e) write down the length of *XD*.

(1)

Given also that *ABCD* is a cyclic quadrilateral and $|\mathbf{b}| = y$ cm,

(f) find the value of *y*.

(3)

Question 10 continued

P 4 4 3 9 7 A 0 2 7 3 6

Question 10 continued

(Total for Question 10 is 16 marks)

11 A length of wire 60 cm long is cut into two pieces. One piece of wire is bent to form a right-angled triangle ABC with $AB = 3x$ cm, $BC = 4x$ cm and $\angle ABC = 90°$

(a) Find an expression, in terms of x, for the area, in cm^2, of triangle ABC.

(1)

(b) Find an expression, in terms of x, for the perimeter, in cm, of triangle ABC.

(2)

The other piece of wire is bent to form a rectangle with sides of length y cm and $2y$ cm.

(c) Find an expression for y in terms of x.

(2)

(d) Show that the total area of the triangle and the rectangle, A m^2, is given by

$$A = 14x^2 - 80x + 200$$

(3)

Question 11 parts (e), (f) and (g) continue on page 32.

Question 11 continued

P 4 4 3 9 7 A 0 3 1 3 6

(e) Complete the following table of values for $A = 14x^2 - 80x + 200$

x	0	1	2	3	4	5
A	200		96		104	150

(2)

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

(3)

The total area of the triangle and the rectangle is 120 cm²

(g) Using your graph or otherwise, find the area, to the nearest cm², of the larger of the two possible triangles.

(3)

Question 11 continued
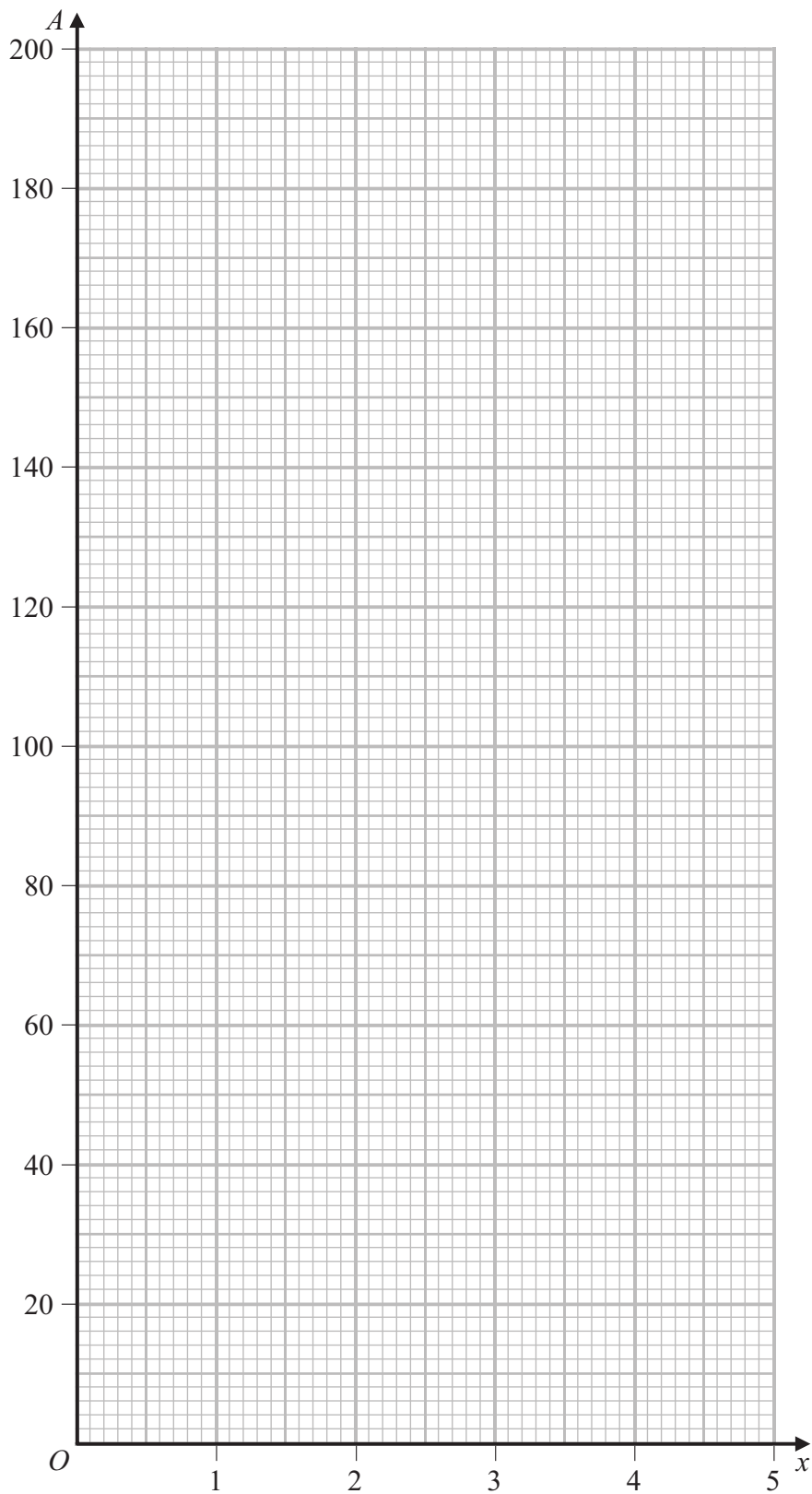
(Total for Question 11 is 16 marks)

TOTAL FOR PAPER IS 100 MARKS

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