Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Thursday 4 June 2020

Morning (Time: 2 hours 30 minutes) | Paper Reference **4MB1/02**

Mathematics B

Paper 2

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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P 6 1 9 0 7 A 0 1 3 6

Pearson

Answer ALL TWELVE questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1

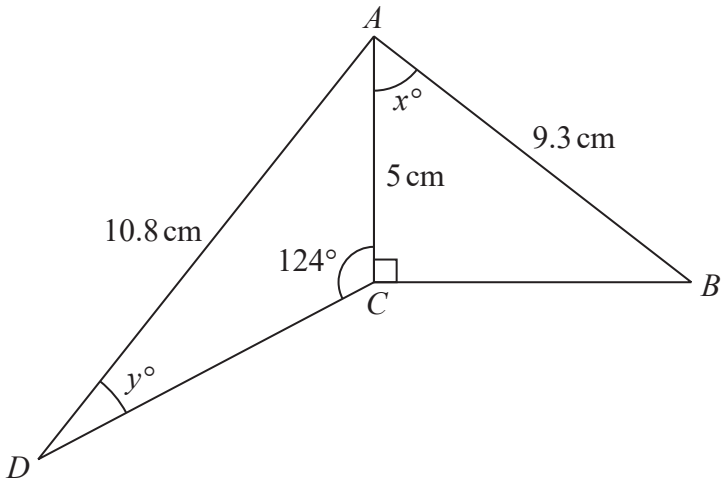


Diagram **NOT** accurately drawn

Figure 1

Figure 1 shows a quadrilateral $ABCD$.

$AB = 9.3\,\text{cm}$ $AC = 5\,\text{cm}$ $AD = 10.8\,\text{cm}$

$\angle ACD = 124°$ $\angle ACB = 90°$ $\angle CAB = x°$ $\angle ADC = y°$

Calculate to one decimal place,

(a) the value of x,

(2)

(b) the value of y.

(3)

$$\left[\text{Sine rule: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}\right]$$

Question 1 continued

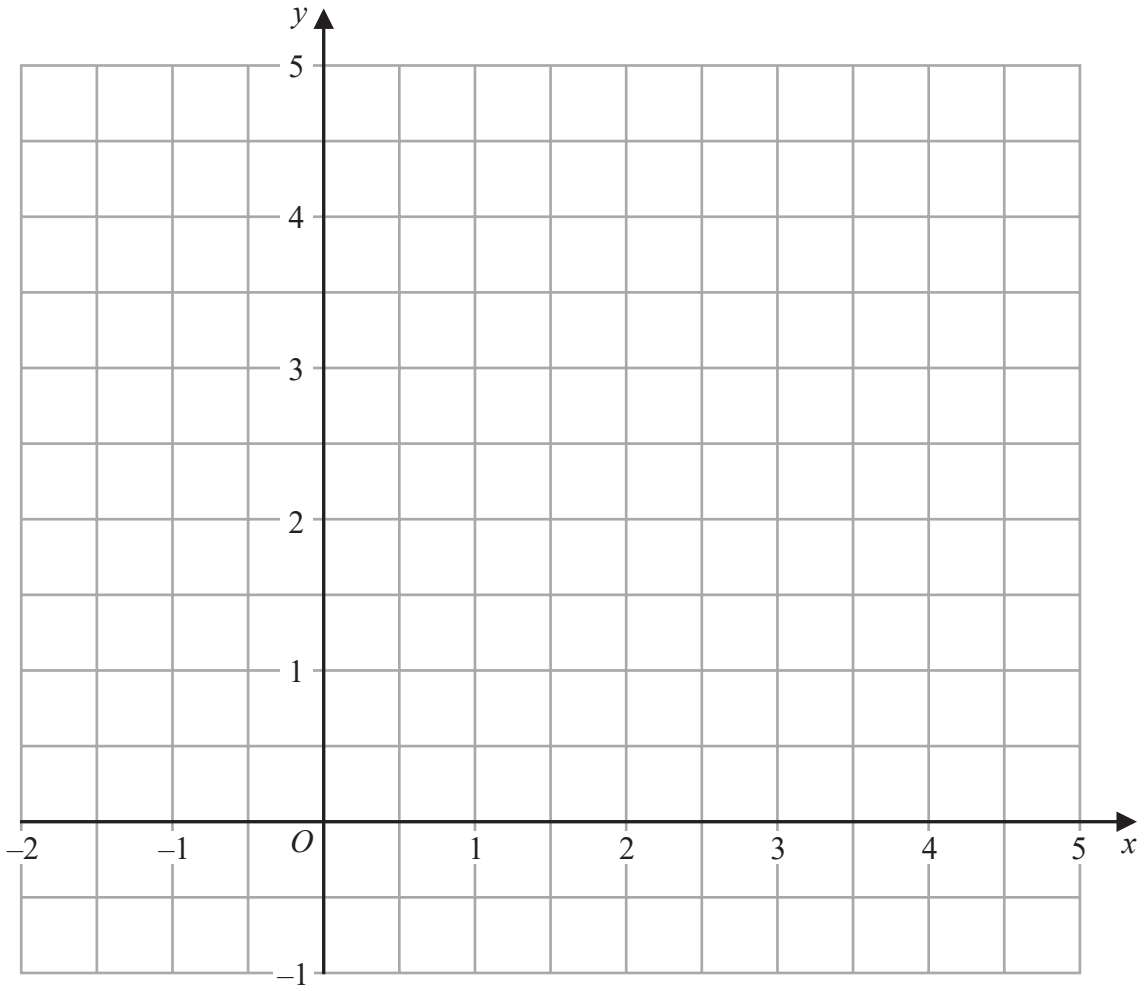
(Total for Question 1 is 5 marks)

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

$$2x + 3y \geqslant 6 \qquad 1 \leqslant x \leqslant 3 \qquad y \leqslant 4$$

Label the region **R**.

(3)



The point P with coordinates (x, y) lies in the region that satisfies the inequalities

$$2x + 3y > 6 \qquad 1 < x < 3 \qquad y < 4$$

Given that x and y are integers,

(b) write down the coordinates of all possible points P.

(2)

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Question 2 continued

(Total for Question 2 is 5 marks)

3 Express $(5x - 6) \div \left(\frac{25x^2 - 36}{x + 3}\right) - \frac{1}{x + 2}$ as a single fraction in its simplest form.

Show clear algebraic working.

(4)

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Question 3 continued

(Total for Question 3 is 4 marks)

4

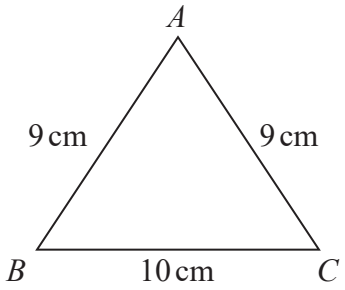

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Figure 2

Figure 2 shows triangle *ABC*.

AB = 9 cm *AC* = 9 cm *BC* = 10 cm

(a) Calculate the area, in cm^2 to one decimal place, of triangle *ABC*.

(3)

Figure 3 shows two solid right prisms, each of length 7 cm.

One of the prisms has triangle *ABC* as a cross section of the prism.
The other prism has trapezium *DEFG* as a cross section of the prism.

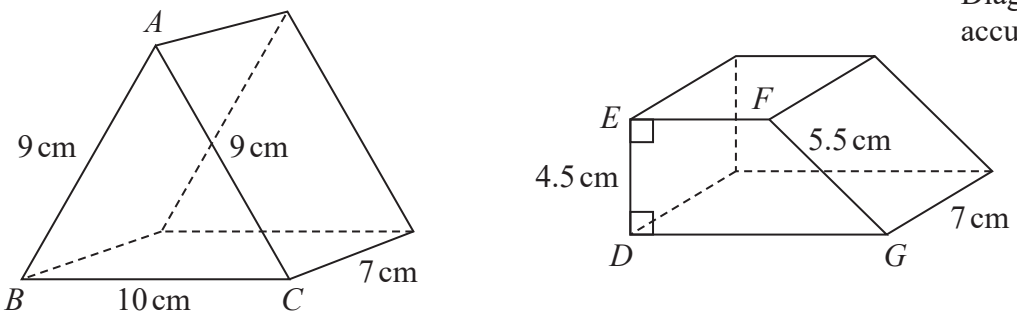

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Figure 3

In trapezium *DEFG*,

DE = 4.5 cm *FG* = 5.5 cm

The perimeter of trapezium *DEFG* is equal to the perimeter of triangle *ABC*.

(b) Calculate the difference, in cm^3 to one decimal place, between the volumes of the two prisms.

(5)

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$$\left[\text{Area of trapezium} = \frac{1}{2}(a+b)h\right]$$

Question 4 continued

Question 4 continued

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Question 4 continued

(Total for Question 4 is 8 marks)

5 Tahina travels to work by bus.
Her total bus fare last week was £12.50
This week her total bus fare has increased by 8%

(a) Calculate her total bus fare for this week.

(2)

Tahina works in a kiosk selling hot drinks.
She sells coffee, tea and hot chocolate.

On Monday, Tahina sold a total of 378 hot drinks.
The numbers of cups of coffee, tea and hot chocolate she sold were in the ratios 5 : 3 : 1

(b) Calculate the difference between the number of cups of coffee and the number of cups of hot chocolate that Tahina sold on Monday.

(3)

On Monday, $\frac{3}{14}$ of the number of cups of coffee Tahina sold were sold without milk.

(c) Calculate the number of cups of coffee that Tahina sold without milk.

(2)

The cost of each cup of coffee that Tahina sells from the kiosk is £2.80

Tahina went on holiday to the USA and to Canada.
She bought a cup of coffee in the USA for $3.20

Using an exchange rate of £1 = $1.24

(d) compare the cost of each cup of coffee sold from Tahina's kiosk with the cost of the cup of coffee that Tahina bought in the USA.

(2)

In Canada, Tahina bought a sandwich for 5.28 Canadian dollars.

Using exchange rates of

£1 = $1.24 and 1 Canadian dollar = $0.75

(e) convert 5.28 Canadian dollars to pounds (£)
Give your answer to 2 decimal places.

(3)

Question 5 continued

Question 5 continued

Question 5 continued

(Total for Question 5 is 12 marks)

6 Solve the simultaneous equations

$$x^2 + y^2 = 26$$
$$2x + y = 9$$

Show clear algebraic working.

(6)

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Question 6 continued

(Total for Question 6 is 6 marks)

7

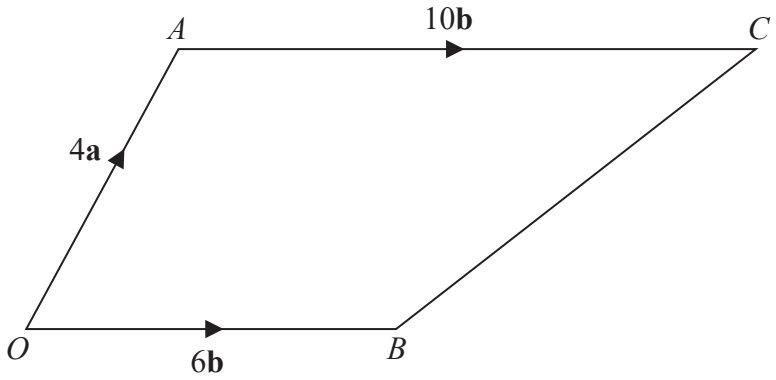

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Figure 4

Figure 4 shows a trapezium $OACB$.

$\overrightarrow{OA} = 4\mathbf{a}$ $\overrightarrow{OB} = 6\mathbf{b}$ $\overrightarrow{AC} = 10\mathbf{b}$

P is the point on AB such that OPC is a straight line.

Find an expression for $\overrightarrow{PC}$ in terms of **a** and **b**.
Give your answer in its simplest form.

(6)

Question 7 continued

(Total for Question 7 is 6 marks)

8 The diagram shows kite A.

Kite B is the image of kite A under a reflection in the line with equation $y = -1$

(a) On the grid opposite, draw and label kite B.

(2)

Kite A is transformed to kite C by a reflection in the line with equation $x = 4$ followed by the translation $\begin{pmatrix} -8 \\ -6 \end{pmatrix}$

Kite C is the image of kite B under a rotation through 180° about the point P.

(b) (i) On the grid opposite, draw and label kite C.

(ii) Find the coordinates of P.

(3)

$$\mathbf{M} = \begin{pmatrix} 0 & -1 \\ -2 & 0 \end{pmatrix} \quad \mathbf{N} = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$$

Kite A is transformed to kite D under the combined transformation with matrix **MN**.

(c) On the grid opposite, draw and label kite D.

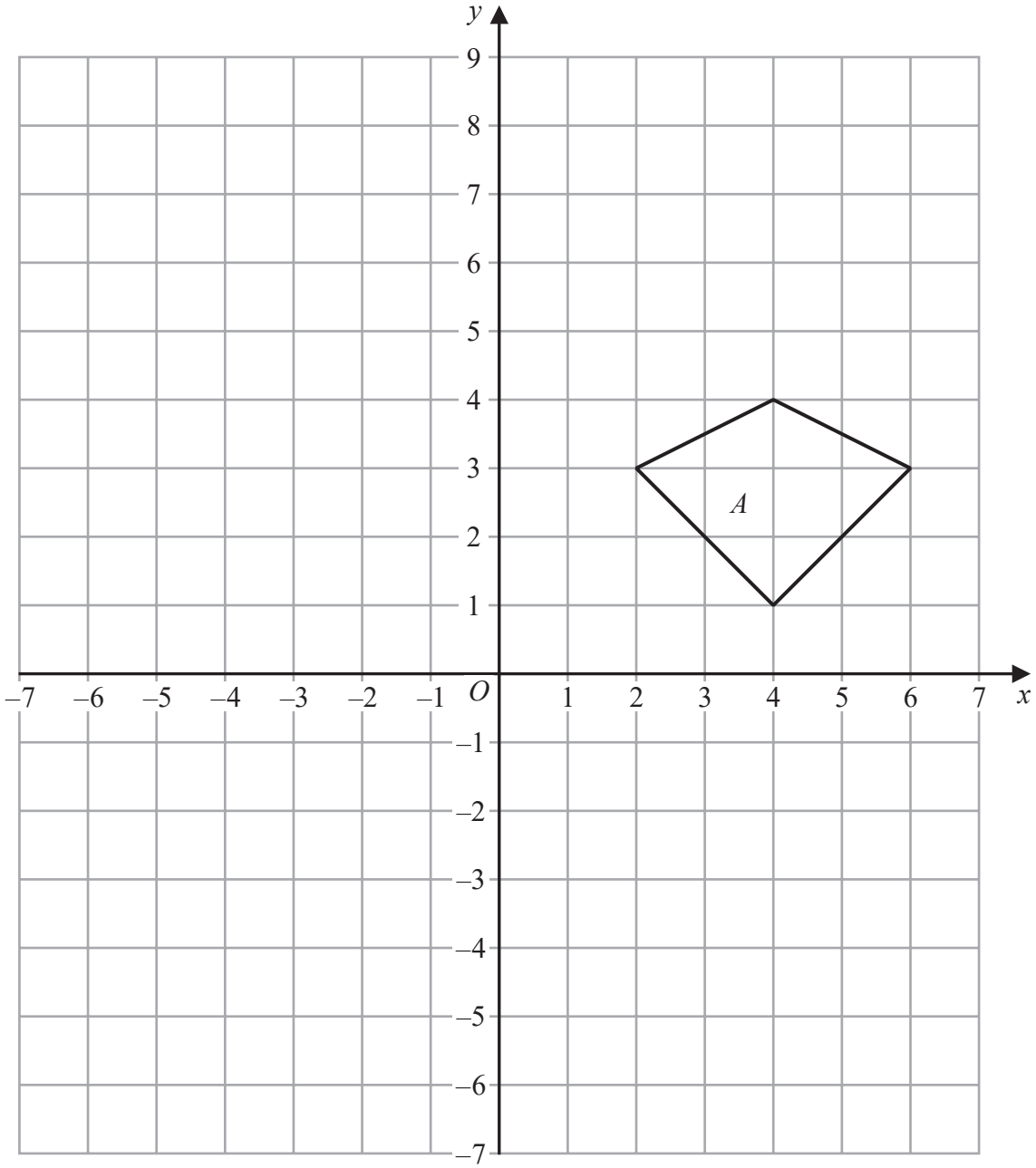
(4)

Given that $\dfrac{\text{area of kite } D}{\text{area of kite } A} = k$

(d) find the value of k.

(1)

Question 8 continued

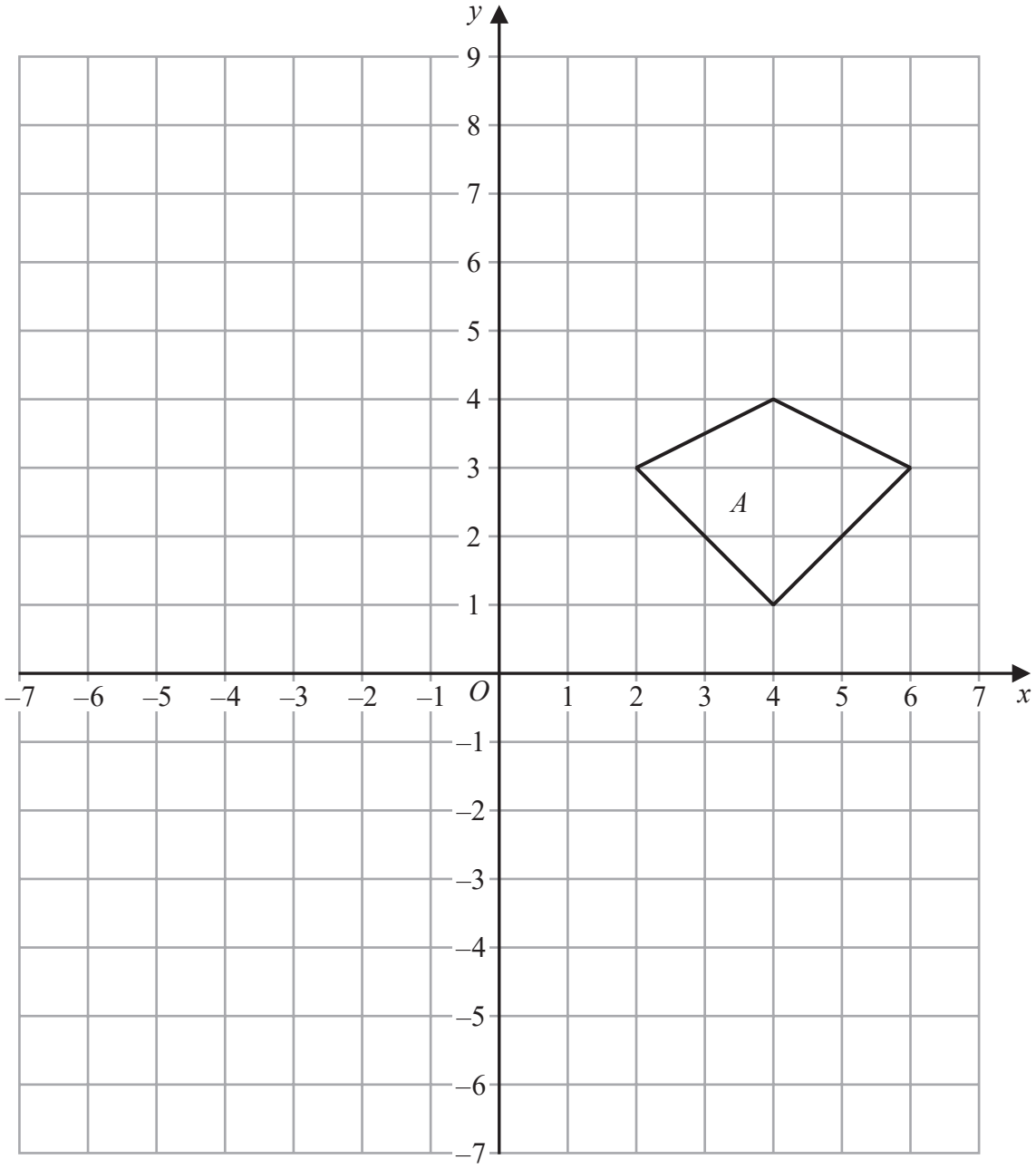


Turn over for a spare grid if you need to redraw your kites.

Question 8 continued

Question 8 continued

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



(Total for Question 8 is 10 marks)

9 90 students from a sixth form college were each asked the following question.

"Do you study any of Biology (B), Chemistry (C) or Physics (P)?"

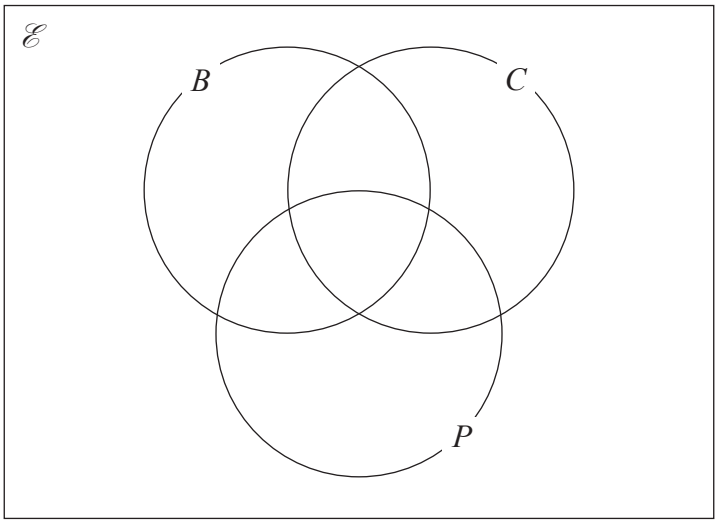
Of these 90 students

7 study all three subjects
15 study Biology and Chemistry
20 study Chemistry and Physics
37 study Chemistry
14 study Biology only
15 study Physics only

The number of these students who study Biology and Physics but not Chemistry is three times the number of these students who study none of these three subjects.

Let x be the number of these students who study none of these three subjects.

(a) Show all this information on the Venn diagram, giving the number of students in each appropriate subset, in terms of x where necessary.



(3)

(b) Find the value of x.

(2)

(c) Find

(i) $n(B' \cap C)$

(ii) $n(B \cup C \cup P)$

(iii) $n(B \cap C \cap P')$

(3)

One of the students is to be chosen at random.
Given that this student studies Chemistry,

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

(2)

Question 9 continued

(Total for Question 9 is 10 marks)

10 The function g is such that

$$g: x \mapsto \frac{12}{x-3}$$

(a) State the value of x that must be excluded from any domain of g.

(1)

The function h is defined for all values of x by

$$h: x \mapsto x^2 + 4$$

(b) Write down the range of h.

(1)

(c) Find h(–9)

(1)

(d) Find hg(5)

(2)

(e) Express the inverse function g^{-1} in the form $g^{-1}: x \mapsto ...$

(2)

(f) Show that hg(x) can be written as $\frac{4(45 - 6x + x^2)}{(x-3)^2}$

(4)

(g) Solve hg(x) = 5
Show clear algebraic working.

(3)

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Question 10 continued

Question 10 continued

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Question 10 continued

(Total for Question 10 is 14 marks)

11 (a) Complete the table of values for $y = 2x^3 - 3x + 4$

x	–2.5	–2	–1.5	–1	–0.5	0	0.5	1	1.5	2	2.5
y	–19.75		1.75		5.25		2.75		6.25	14	27.75

(3)

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

(3)

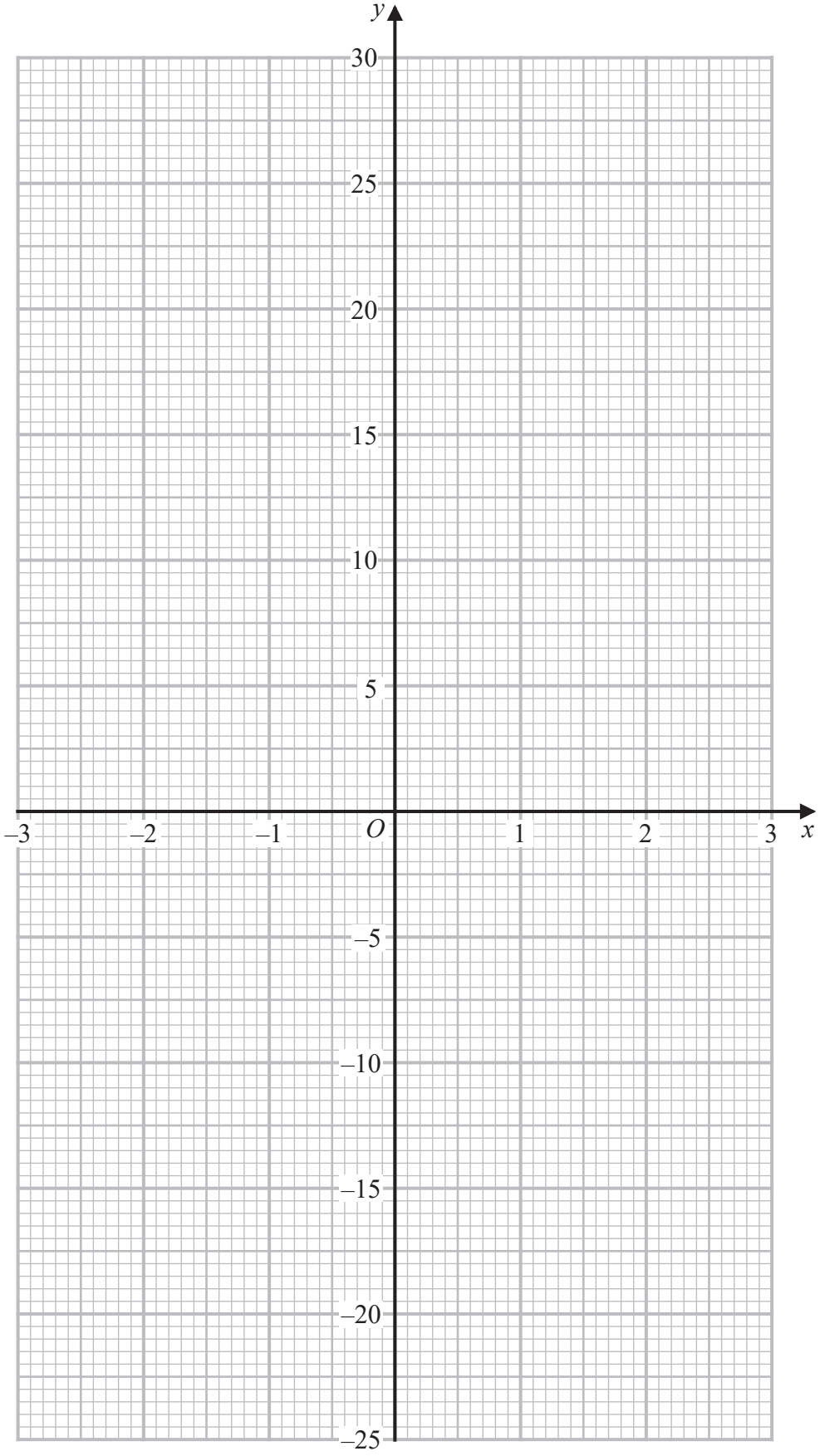
(c) By drawing on the grid a suitable tangent to the curve, find an estimate, to the nearest whole number, of the gradient of the curve at the point where $x = 2$

(2)

(d) Use your graph to find the range of values of x, in $-2.5 \leqslant x \leqslant 2.5$, for which $2x^3 - 3x + 4 > 5x$

(2)

Question 11 continued



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

Question 11 continued

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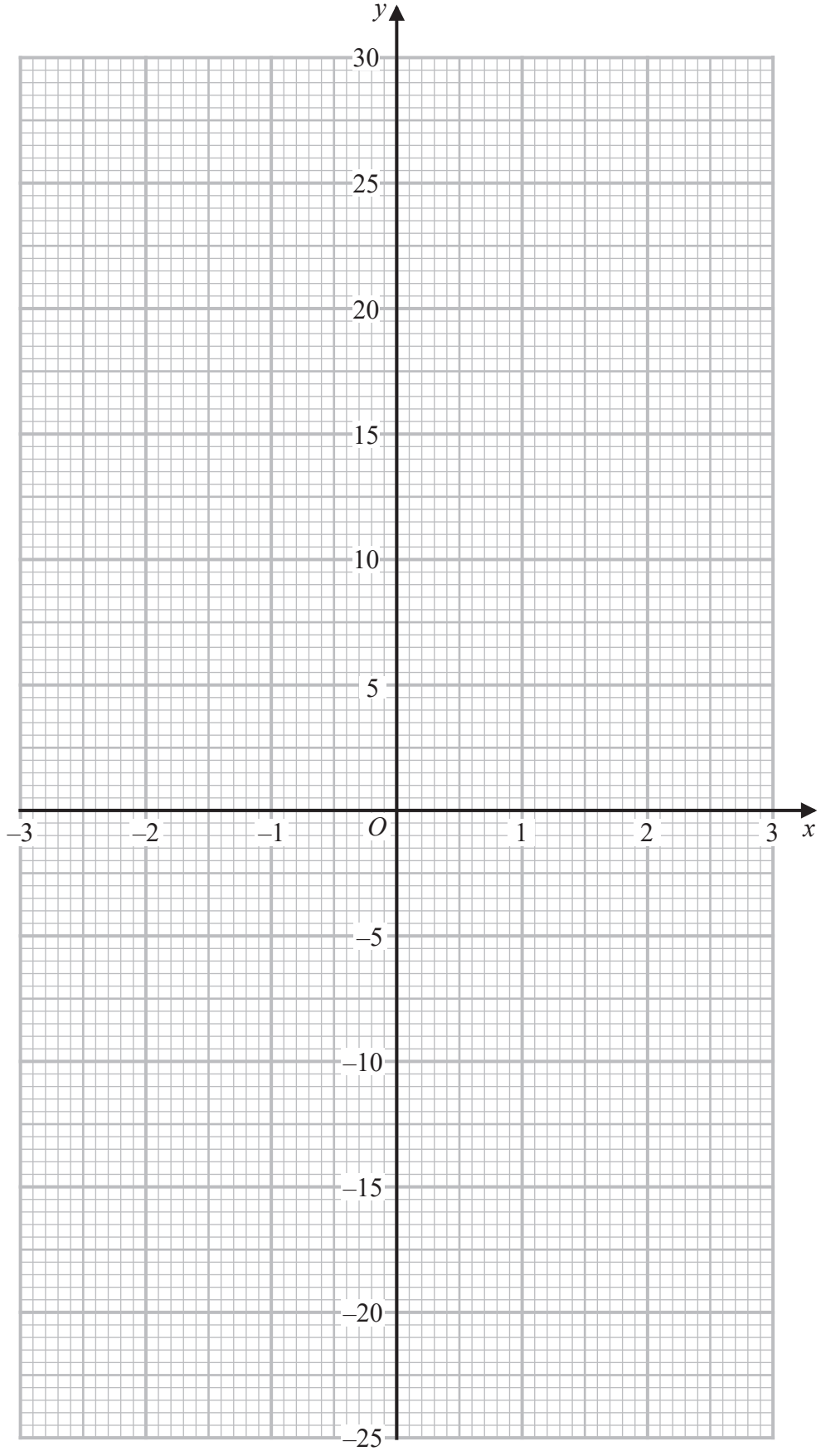
Question 11 continued

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



(Total for Question 11 is 10 marks)

12 Harvey has two bags of counters, bag *A* and bag *B*.

Bag *A* contains 8 red counters, 3 orange counters and 4 yellow counters only.
Bag *B* contains 3 red counters, 2 orange counters and 5 green counters only.

Harvey takes at random one counter from bag *A* and one counter from bag *B*.

(a) Complete the probability tree diagram on the opposite page.

(3)

(b) Calculate the probability that the two counters taken have different colours.

(3)

Harvey replaces the counters into the bags from which he took the counters.

Chen has a bag, bag *C*, that contains 10 red counters and x orange counters only.

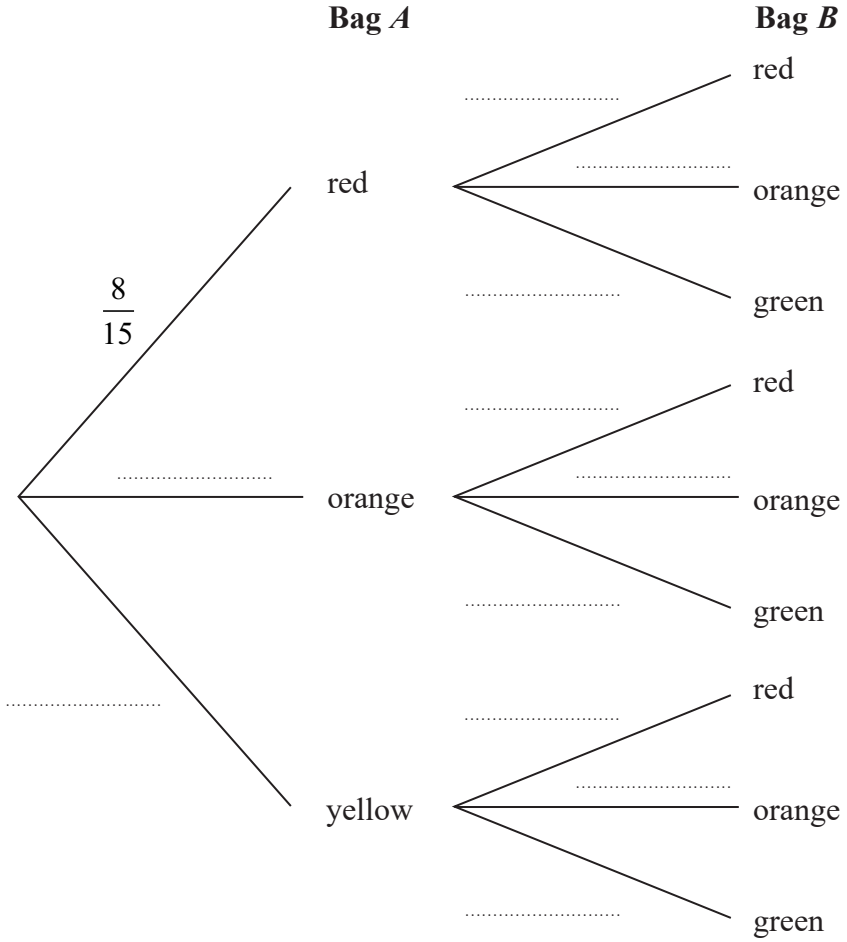
Chen takes at random one counter from bag *A*, one counter from bag *B* and one counter from bag *C*.

The probability that all three counters that Chen takes have the same colour is $\frac{1}{15}$

(c) Find the value of x.

(4)

Question 12 continued



Question 12 continued

(Total for Question 12 is 10 marks)

TOTAL FOR PAPER IS 100 MARKS