

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

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# Pearson Edexcel International GCSE

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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**Answer all TWELVE questions.**

**Write your answers in the spaces provided.**

**You must write down all the stages in your working.**

- 1 (a) Write 248 000 000 in standard form. (1)
- (b) Write  $2.56 \times 10^{-4}$  as an ordinary number. (1)
- (c) Calculate, giving your answer in standard form

$$\frac{2.5 \times 10^{60} - 1.3 \times 10^{59}}{1.5 \times 10^{-48}}$$

(3)

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(Total for Question 1 is 5 marks)

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2 The ages, in years, of 7 friends are

9 8 7 6 10  $a$  7

The mean age of the 7 friends is 8 years.

- (a) Work out the value of  $a$  (2)
- (b) Find the median age of the 7 friends. (2)

There are 34 passengers on a bus.  
The mean age of these passengers is 49 years.

11 of these passengers are pensioners.  
The mean age of these pensioners is 72 years.

- (c) Calculate the mean age, in years, of the passengers on the bus who are not pensioners. (3)

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(Total for Question 2 is 7 marks)



3 Triangles  $A$  and  $D$  are drawn on the grid below.

Triangle  $B$  is the image of triangle  $A$  under a reflection in the line with equation  $y = -x$

(a) On the grid below, draw and label triangle  $B$ .

(2)

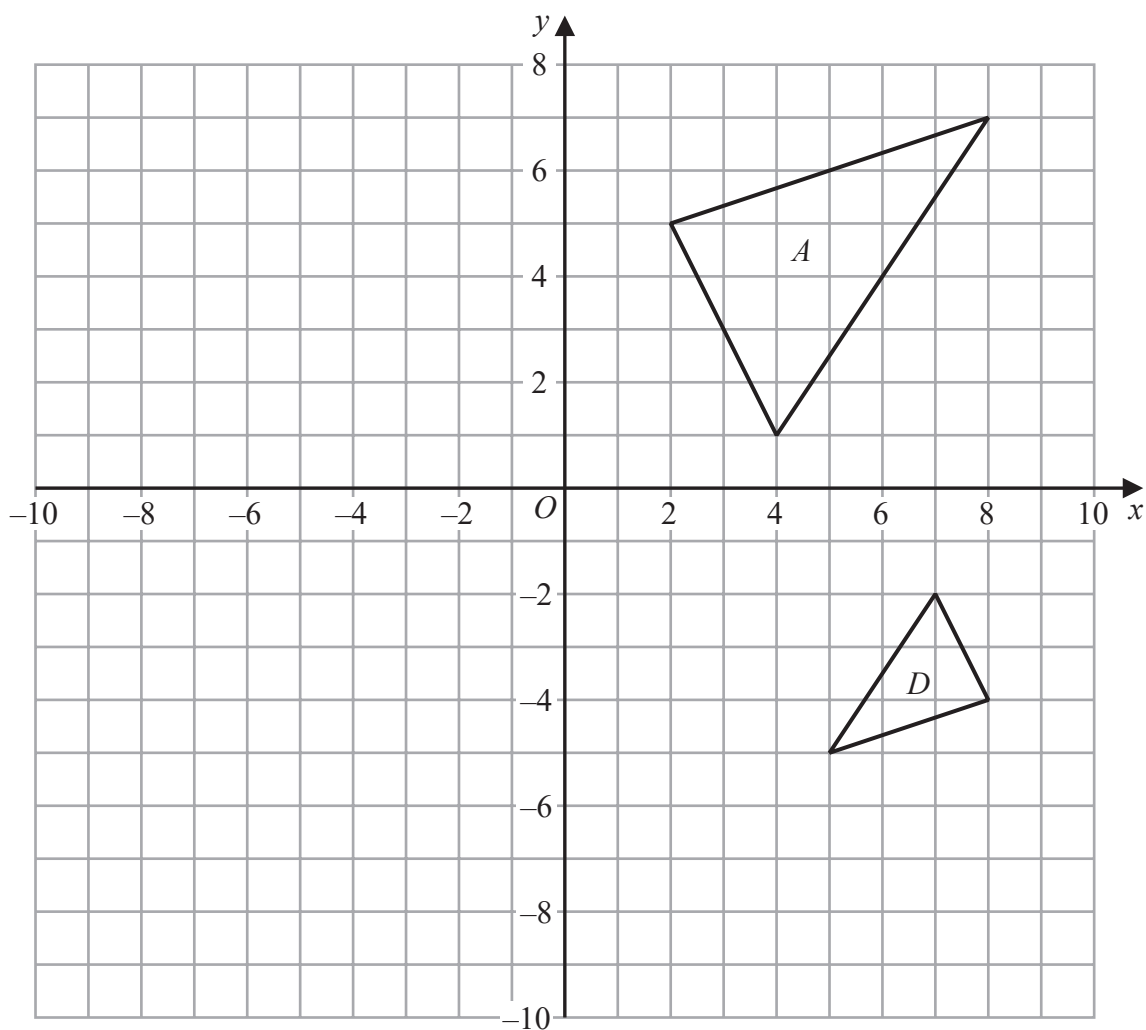
Triangle  $A$  is transformed to triangle  $C$  under the translation  $\begin{pmatrix} -9 \\ -2 \end{pmatrix}$

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

(2)

(c) Describe fully the **single** transformation that maps triangle  $A$  onto triangle  $D$ .

(3)

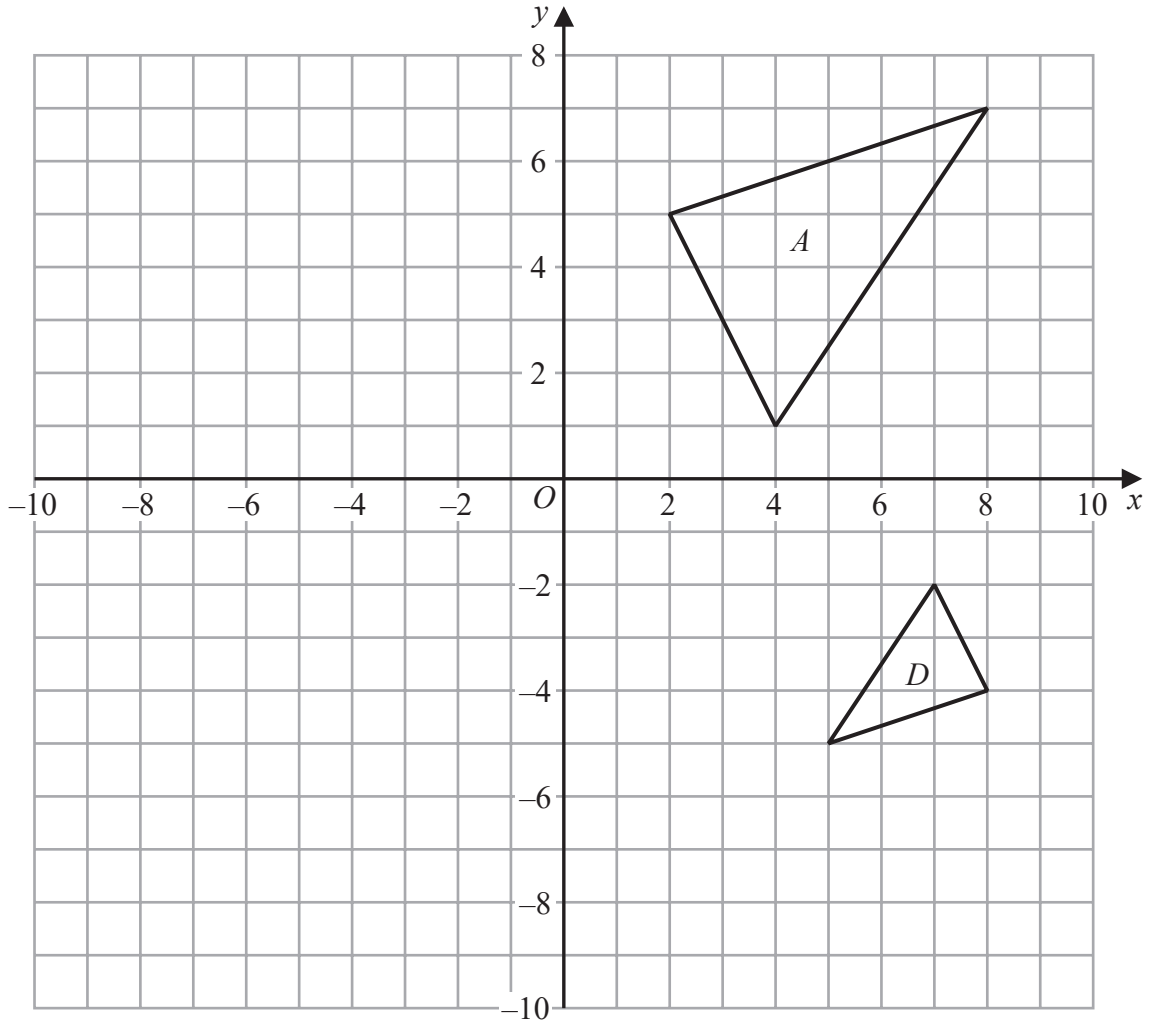


A spare grid is on the next page if you need to redraw your triangles.



Question 3 continued

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



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(Total for Question 3 is 7 marks)



- 4 A curve  $C$  has equation  $x^2 + y^2 = 64$   
A straight line  $l$  has equation  $4y + 3x = 40$

Show that the line  $l$  intersects the curve  $C$  only once.  
Show clear algebraic working.

(6)

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**Question 4 continued**

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**(Total for Question 4 is 6 marks)**



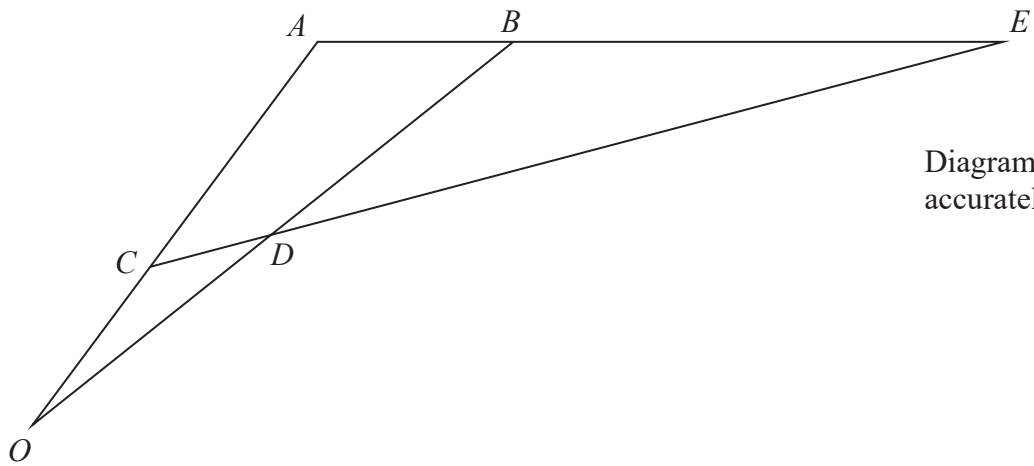


Diagram NOT  
accurately drawn

**Figure 1**

Figure 1 shows triangle  $OAB$

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

(a) find  $\vec{AB}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$

(1)

The point  $C$  lies on  $OA$  such that  $OC:OA = 1:3$

The point  $D$  lies on  $OB$  such that  $\vec{OD} = \frac{2}{5}\vec{OB}$

Given that the point  $E$  is such that  $ABE$  and  $CDE$  are straight lines,

(b) find and simplify an expression, in terms of  $\mathbf{a}$  and  $\mathbf{b}$ , for  $\vec{AE}$

(6)

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**Question 5 continued**

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Handwriting practice area consisting of 28 horizontal dotted lines.

**(Total for Question 5 is 7 marks)**



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6

$$\mathbf{A} = \begin{pmatrix} -2 & -3 \\ 2 & 4 \end{pmatrix} \quad \mathbf{BA} = \begin{pmatrix} 4x & -14 \\ x & -1 \end{pmatrix}$$

Given that the determinant of **B** is 10

find **B**

Show your working clearly.

(7)

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$$\left[ \begin{array}{l} \text{Determinant of matrix } \begin{pmatrix} a & b \\ c & d \end{pmatrix} = ad - bc \\ \text{Inverse of matrix } \begin{pmatrix} a & b \\ c & d \end{pmatrix} = \frac{1}{ad - bc} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix} \end{array} \right]$$



**Question 6 continued**

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Handwriting practice area consisting of 28 horizontal dotted lines.

**(Total for Question 6 is 7 marks)**



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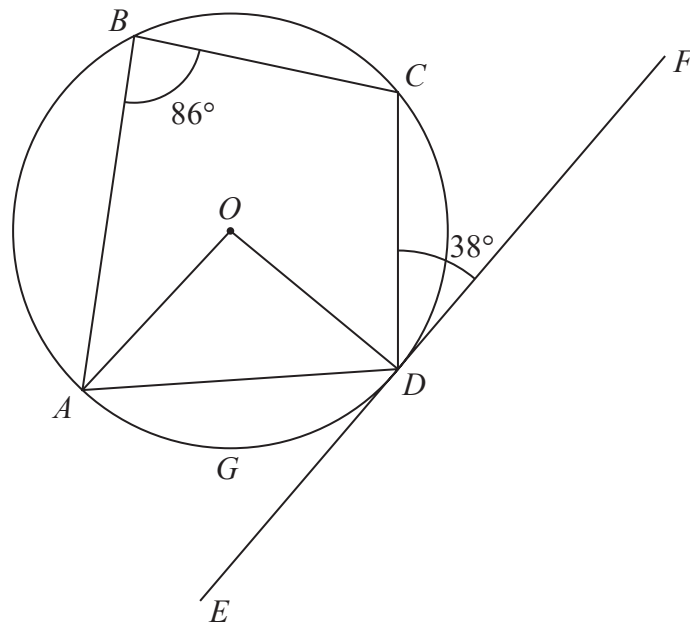


Diagram NOT accurately drawn

Figure 2

In Figure 2,  $ABCDG$  is a circle, centre  $O$

$EDF$  is the tangent to the circle at the point  $D$

$$\angle ABC = 86^\circ \quad \angle CDF = 38^\circ$$

The length of the arc  $AGD$  is  $0.8\pi$  cm.

(a) Giving reasons, show that the radius of the circle is 1.5 cm. (6)

(b) Calculate the area, in  $\text{cm}^2$  to 2 decimal places, of the circle  $ABCDG$  (2)

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**Question 7 continued**

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Area with horizontal dotted lines for writing.



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**Question 7 continued**

Handwriting practice area consisting of 25 horizontal dotted lines.

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**Question 7 continued**

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**(Total for Question 7 is 8 marks)**



P 6 8 8 1 8 A 0 1 5 3 2

- 8 All 66 students in a drama group take part in at least one of the four activities given below.

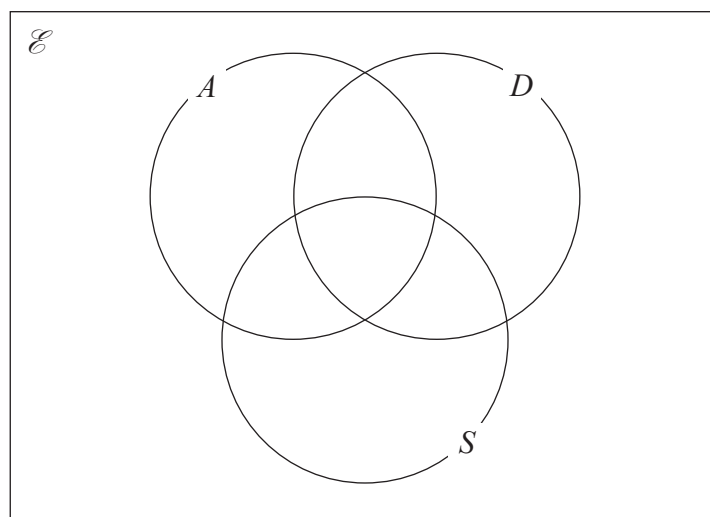
acting ( $A$ ) dancing ( $D$ ) singing ( $S$ ) stage management ( $M$ )

Of these 66 students

- 11 take part in acting, dancing and singing
- 17 take part in acting and singing
- 14 take part in dancing and singing
- 16 take part in acting and dancing
- 33 take part in singing
- 37 take part in acting
- 29 take part in dancing

Any student who takes part in stage management does **not** take part in acting, dancing or singing.

- (a) Show all this information on the Venn diagram, giving the number of students in each subset.



(3)

- (b) Find (i)  $n(M)$

(ii)  $n([A \cap D'] \cup S)$

(iii)  $n([A \cap D \cap S']')$

(3)

One of the students in the drama group is selected at random.

Given that this student takes part in dancing,

- (c) find the probability that this student also takes part in

(i) stage management,

(1)

(ii) singing.

(2)





**Question 8 continued**

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**(Total for Question 8 is 9 marks)**



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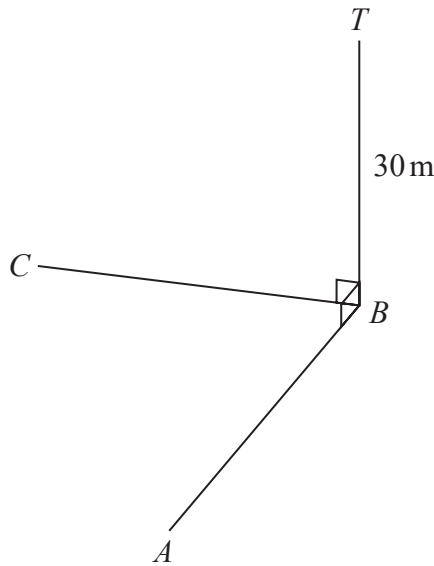


Diagram NOT accurately drawn

Figure 3

Figure 3 shows three points  $A$ ,  $B$  and  $C$  on horizontal ground. A vertical mast  $BT$  of height 30m is at point  $B$ .

The angle of elevation of  $T$  from  $A$  is  $32^\circ$   
 The angle of elevation of  $T$  from  $C$  is  $25^\circ$

The bearing of  $A$  from  $B$  is  $195^\circ$   
 The bearing of  $C$  from  $B$  is  $280^\circ$

Calculate the bearing, in degrees to the nearest degree, of  $C$  from  $A$ .

(8)

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$$\left( \begin{array}{l} \text{Sine rule: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \\ \text{Cosine rule: } a^2 = b^2 + c^2 - 2bc \cos A \end{array} \right)$$

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**Question 9 continued**

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**Question 9 continued**

Handwriting practice area with 25 horizontal dotted lines.

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**Question 9 continued**

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**(Total for Question 9 is 8 marks)**



10 The production costs of building a *Kimo* boat are

\$L for labour  
\$M for materials  
\$H for overheads

In 2020, the total of the production costs for a *Kimo* boat was \$120 000 where

$$L:M:H = 5:3:2$$

- (a) Calculate the value of  $H$  in 2020 (2)

The production costs were different in 2021 from what they were in 2020

The labour costs had increased by 10%  
The cost of materials had increased by 5%  
The overheads had decreased by 4%

- (b) Calculate the percentage increase, from 2020 to 2021, in the total of the production costs of building a *Kimo* boat. (3)

Gordon bought a *Kimo* boat and sold it a year later for \$360 000, making a loss of 25% on the price for which he bought the boat.

- (c) Calculate the price for which Gordon bought the boat. (2)

Gordon sold the boat to a friend living in Hungary. Gordon's friend paid Gordon the \$360 000 in Hungarian forints.

Using exchange rates of

$$£1 = \$1.35 \quad £1 = 388.50 \text{ Hungarian forints}$$

- (d) change \$360 000 to Hungarian forints. (3)

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**Question 10 continued**

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**Question 10 continued**

Handwriting practice area consisting of 25 horizontal dotted lines.

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**Question 10 continued**

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**(Total for Question 10 is 10 marks)**



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11 (a) On the grid on the opposite page, draw the straight line with equation

(i)  $4y - 3x = 6$        $-3 \leq x \leq 4$

(ii)  $3y + 2x = 15$        $-3 \leq x \leq 4$

(4)

(b) Using your straight lines, find an estimate, to one decimal place, of the solution of the simultaneous equations

$$\begin{aligned} 4y - 3x &= 6 \\ 3y + 2x &= 15 \end{aligned}$$

(1)

(c) Hence, or otherwise, solve the inequality  $\frac{6 + 3x}{4} < \frac{15 - 2x}{3}$

(1)

(d) Complete the table of values for  $y = x^2 - 2x - 1$

$x$	-2	-1	0	1	2	3	4
$y$			-1			2	7

(2)

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

(2)

(f) Using part (a) and part (e), find an estimate, to one decimal place, for the range of values of  $x$  for which

$$x^2 - \frac{11}{4}x - \frac{5}{2} < 0$$

Show your working clearly.

(3)

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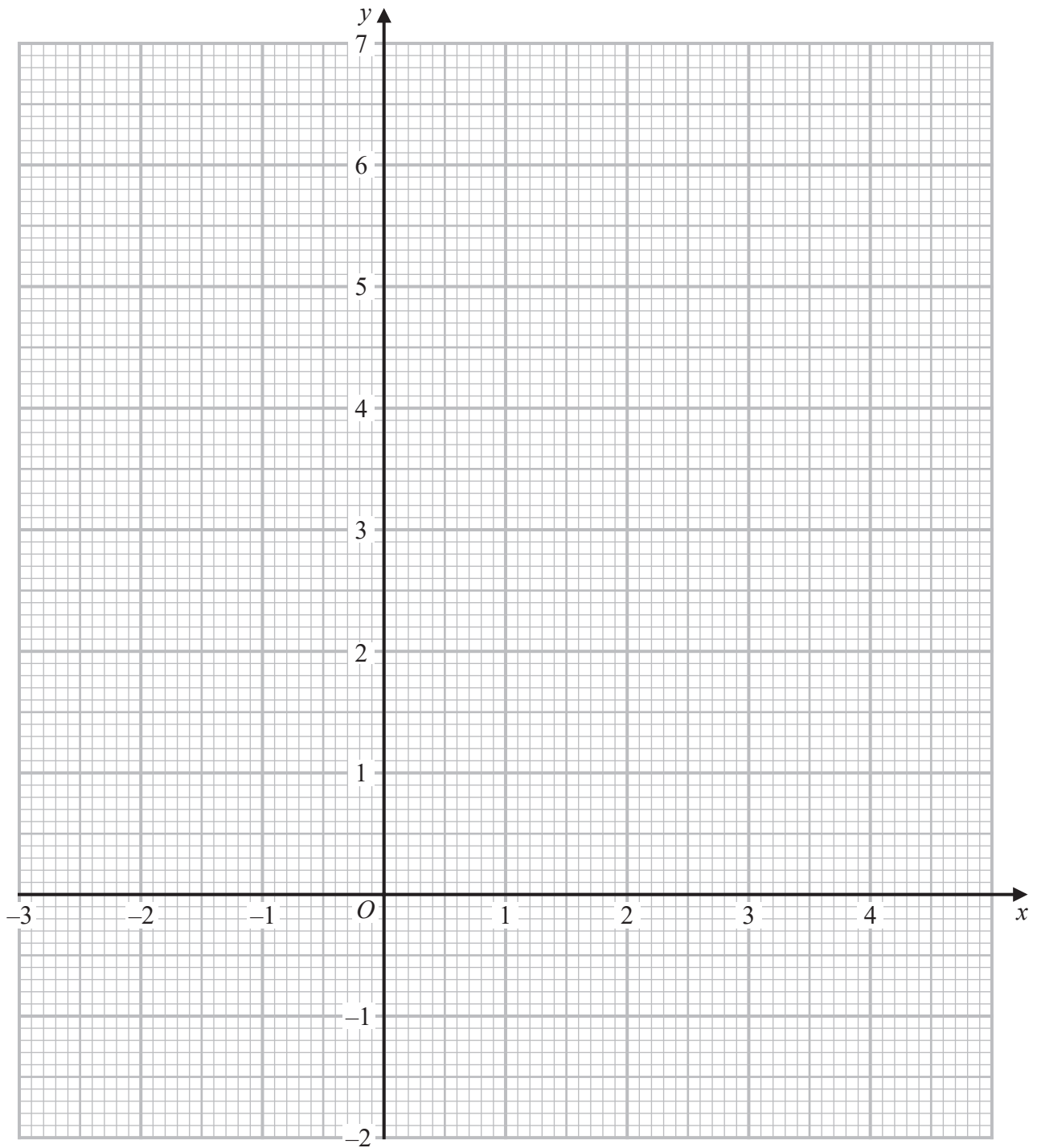
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Question 11 continued



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

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**Question 11 continued**

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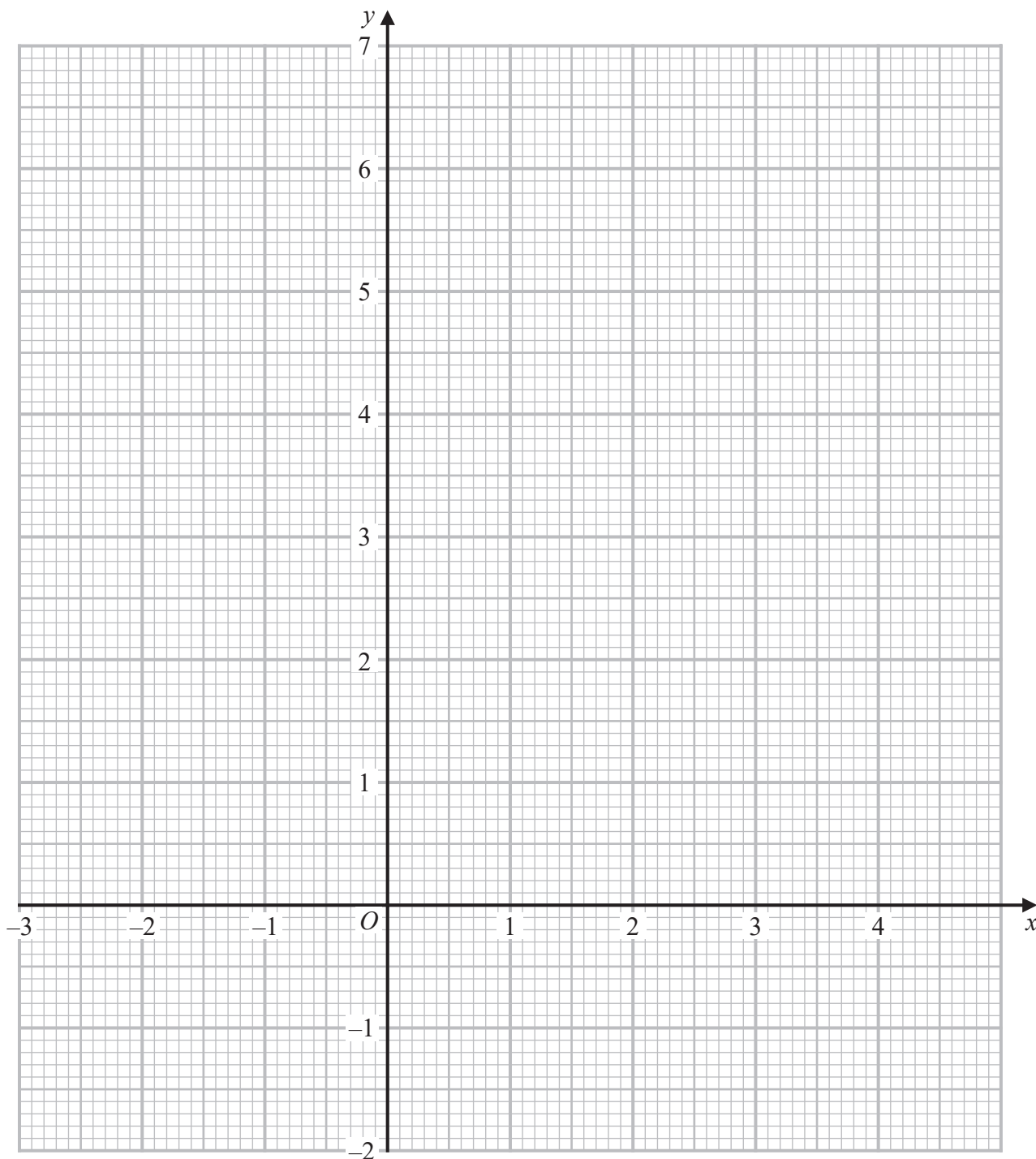
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Question 11 continued

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(Total for Question 11 is 13 marks)



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12 The function  $g$  is defined for all values of  $x$  by

$$g : x \mapsto 5 - x^2$$

(a) Find  $g(-4)$  (1)

(b) Write down the range of the function  $g$  (1)

The function  $f$  is defined as

$$f : x \mapsto \frac{4}{2x - 11} \quad x \neq \frac{11}{2}$$

(c) Find  $fg(2)$  (2)

(d) Express the inverse function  $f^{-1}$  in the form  $f^{-1} : x \mapsto \dots$  (3)

(e) State the value of  $x$  that must be excluded from any domain of  $f^{-1}$  (1)

(f) Express  $ff(x)$  in terms of  $x$  giving your answer as a single fraction in its simplest form. (3)

The function  $h$  is defined for all values of  $x$  by

$$h : x \mapsto x(x + 1)$$

The function  $m$  is defined for all values of  $x$  by

$$m : x \mapsto ax + b$$

where  $a$  and  $b$  are constants such that  $a > 0$  and  $b > 0$

Given that  $hm(x) = 3(x + 1)(3x + 2)$  for all values of  $x$

(g) find the value of  $a$  and the value of  $b$  (2)

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**Question 12 continued**

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**Question 12 continued**

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**(Total for Question 12 is 13 marks)**

**TOTAL FOR PAPER IS 100 MARKS**

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