

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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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)

Area with horizontal dotted lines for writing answers.

(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)

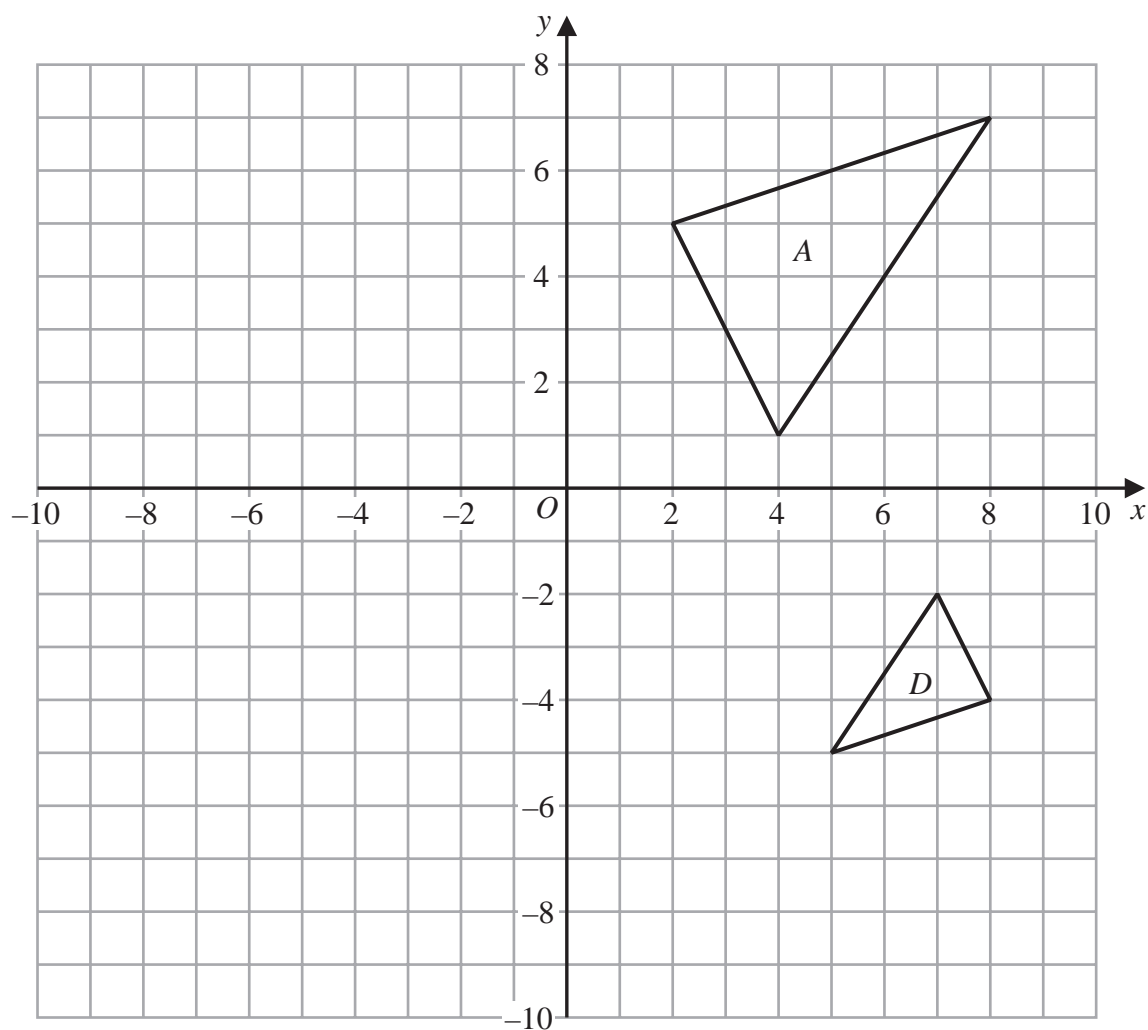
Triangle  $A$  is transformed to triangle  $C$  under the translation  $\begin{pmatrix} -9 \\ -2 \end{pmatrix}$

(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.

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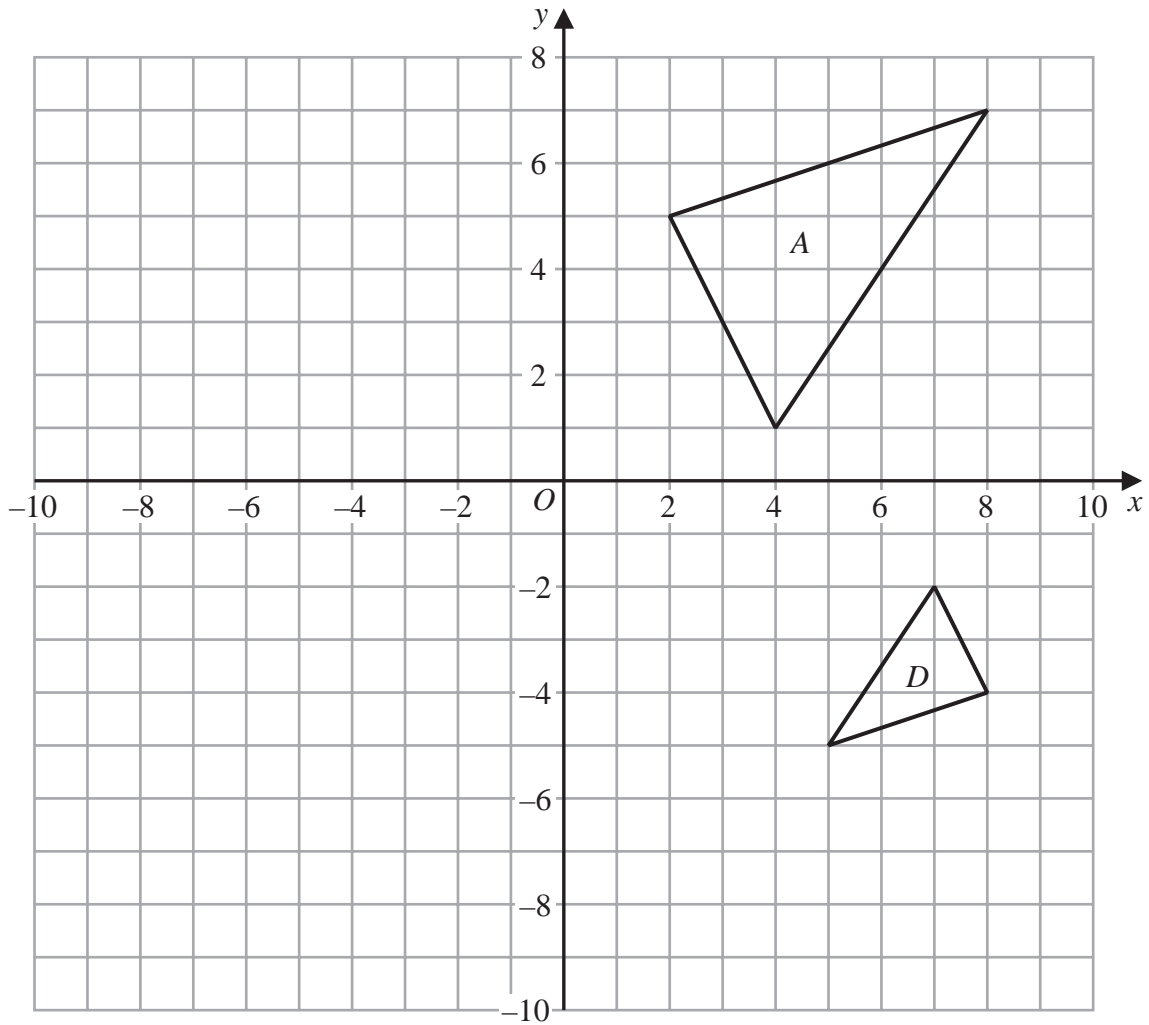
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Question 3 continued

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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)**







**Question 5 continued**

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



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  $\mathbf{B}$  is 10

find  $\mathbf{B}$

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



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**Question 7 continued**

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**Question 7 continued**

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**Question 7 continued**

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



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

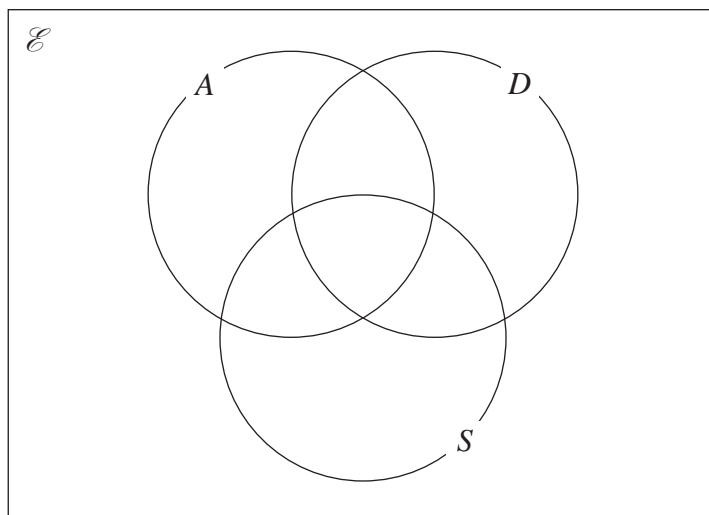
acting ( $A$ ) dancing ( $D$ ) singing ( $S$ ) stage management ( $M$ )

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)

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**Question 8 continued**

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



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9

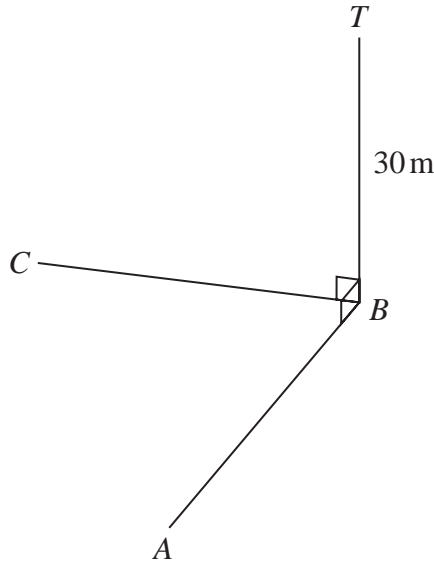


Diagram NOT accurately drawn

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**

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**Question 9 continued**

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



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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**

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**Question 10 continued**

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



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

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

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

(4)

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

$$4y - 3x = 6$$

$$3y + 2x = 15$$

(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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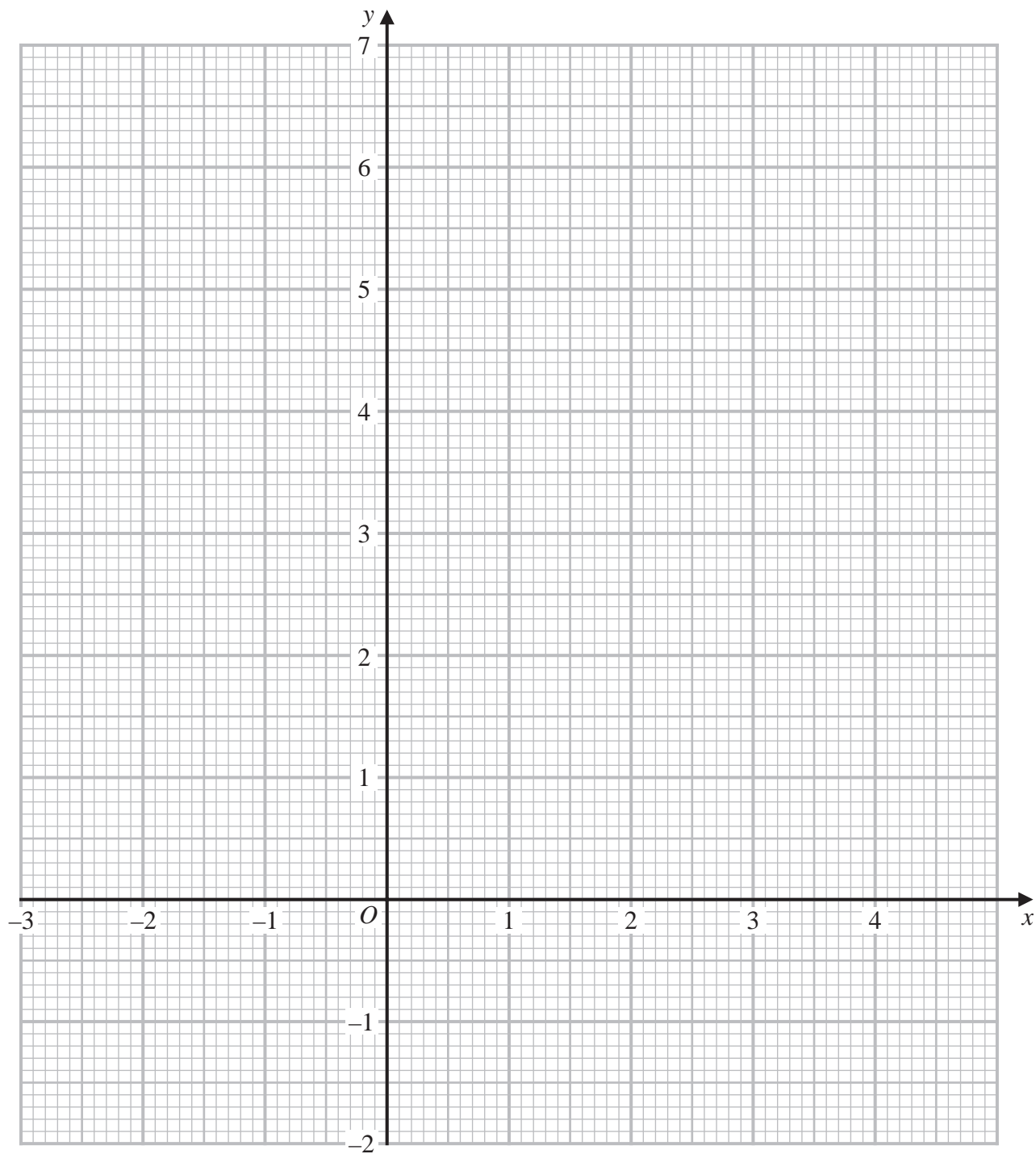


Question 11 continued

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**Question 11 continued**

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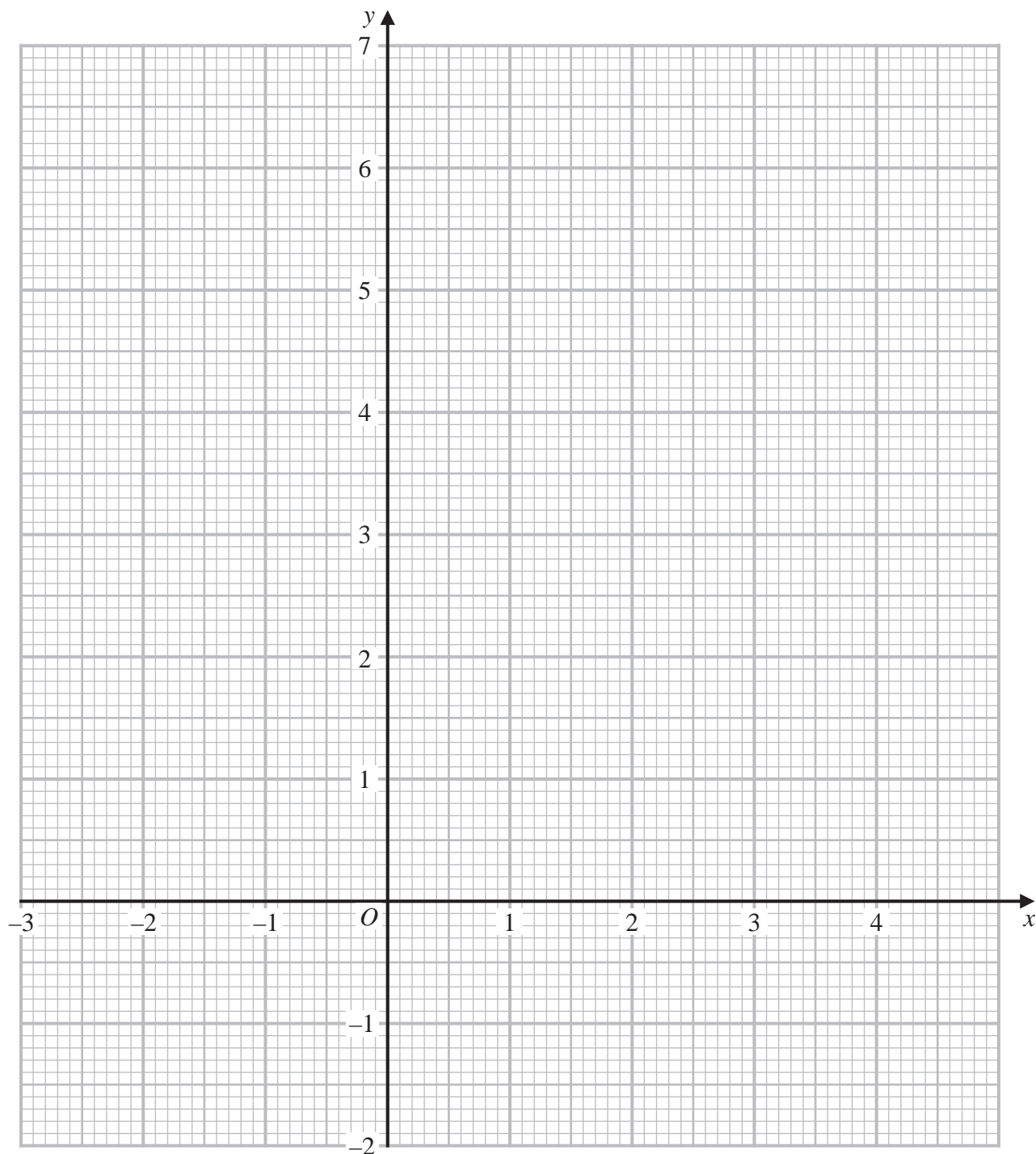
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## Question 11 continued

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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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