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GCSE MATHS

Algebra

Edexcel 1MA1 | Subtopic collection Topic 21

Inequalities

Higher tier

Past paper question booklet

49	2003-2025	Higher
question groups	available papers	tier

Before you begin

1. Show working and use units where appropriate.
2. Use extra paper if you need more space.
3. Print at actual size (100%) for measurement questions.

Name _____ **Date** _____

Whole questions are retained for context; some parts cover other points. Legacy sources are labelled.

4. (a) $-2 < x \leqslant 1$

x is an integer.

Write down all the possible values of x.

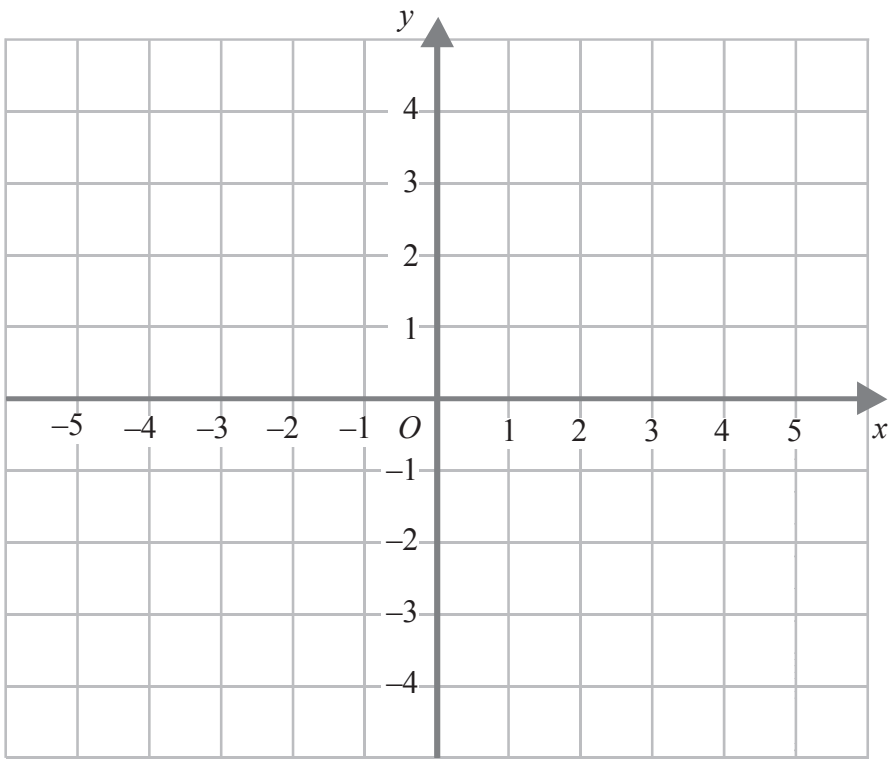
.....

(2)

(b) $-2 < x \leqslant 1$ $y > -2$ $y < x + 1$

x and y are integers.

On the grid, mark with a cross (×), each of the six points which satisfies **all** these 3 inequalities.



(3)

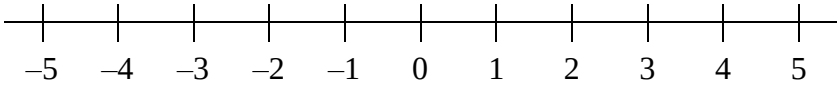
Page Total

8. (a) (i) Solve the inequality

$$5x - 7 < 2x - 1$$

.....

(ii) On the number line, represent the solution set to part (i).



(3)

n is an integer such that $-4 \leq 2n < 3$.

(b) Write down the possible values of n.

.....

(3)

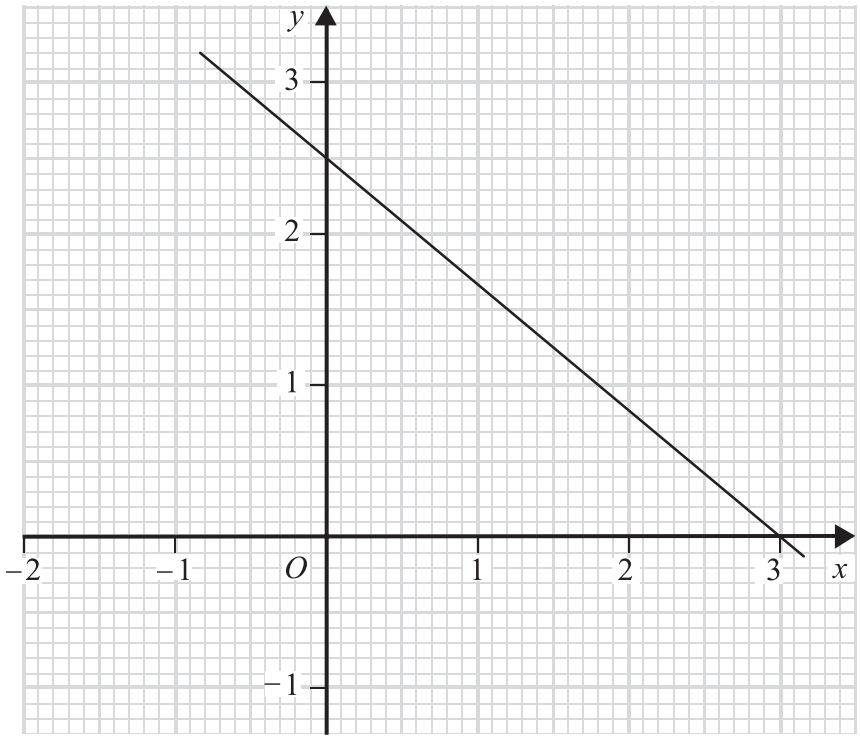
14. Prove that,

$$(n + 1)^2 - (n - 1)^2$$

is a multiple of 4, for all positive integer values of n.

(3)

10.



The line with equation $6y + 5x = 15$ is drawn on the grid above.

(a) Rearrange the equation $6y + 5x = 15$ to make y the subject.

$y =$ .....

(2)

(b) The point $(-21, k)$ lies on the line.
Find the value of k.

$k =$ .....

(2)

(c) (i) On the grid, shade the region of points whose coordinates satisfy the four inequalities

$$y > 0, \quad x > 0, \quad 2x < 3, \quad 6y + 5x < 15$$

Label this region ***R***.

P is a point in the region ***R***. The coordinates of P are both integers.

(ii) Write down the coordinates of P.

(..... , ...)

(3)

7. (a) $-3 \leqslant n < 2$
n is an integer.
Write down all the possible values of n.

.....
(2)

(b) Solve the inequality

$$5x < 2x - 6$$

.....
(2)

Q7

(Total 4 marks)

9. (a) m is an integer such that $-1 \leqslant m < 4$
List all the possible values of m.

.....

(2)

(b) (i) Solve the inequality $3x \geqslant x + 7$

.....

(ii) x is a whole number.
Write down the smallest value of x that satisfies $3x \geqslant x + 7$

.....

(3)

Q9

(Total 5 marks)

Blank

20. (a) Solve the inequality

$$3t + 1 < t + 12$$

.....

(2)

(b) t is a whole number.
Write down the largest value of t that satisfies

$$3t + 1 < t + 12$$

.....

(1)

Q20

(Total 3 marks)

22. Prove that $(3n + 1)^2 - (3n - 1)^2$ is a multiple of 4, for all positive integer values of n.

Q22

(Total 3 marks)

15. k is an integer such that $-1 \leqslant k < 3$

(a) List all the possible values of k.

.....

(2)

(b) Solve the inequality $6y \geqslant y + 10$

.....

(2)

Q15

(Total 4 marks)

10. $-3 < k \leqslant 2$
k is an integer.

(a) Write down all the possible values of k.

.....
(2)

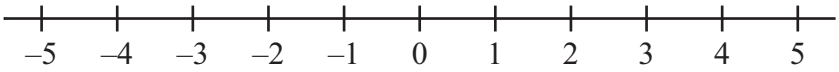
(b) Solve the inequality $\frac{2x}{3} < 10$

.....
(2) **Q10**

(Total 4 marks)

15. (a) $x > -3$

Show this inequality on the number line.



(2)

(b) Solve the inequality $7y + 36 \leqslant 8$

.....

(2)

Q15

(Total 4 marks)

12. $-2 \leqslant n < 5$
n is an integer.

(a) Write down all the possible values of n.

.....
(2)

(b) Solve the inequality $4x + 1 > 11$

.....
(2)

Q12

(Total 4 marks)

21 Prove that

$$(2n + 3)^2 - (2n - 3)^2 \text{ is a multiple of } 8$$

for all positive integer values of n.

(Total for Question 21 is 3 marks)

14 (a) Given that x is an integer such that $-2 < x \leqslant 3$

y is an integer such that $-1 \leqslant y < 5$

and $y = x$

write down the possible values of x.

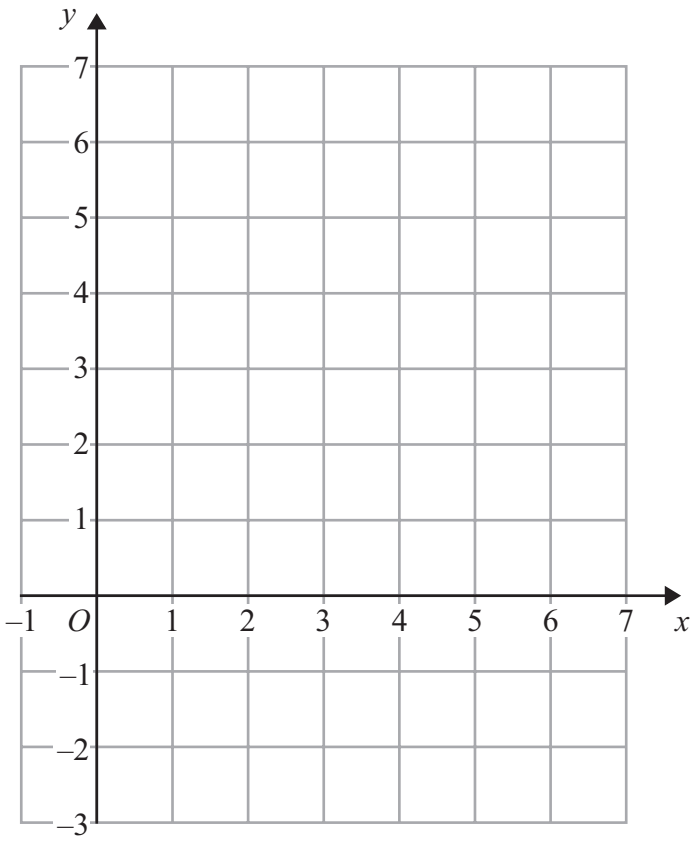
.....

(2)

(b) On the grid below, show by shading the region defined by the inequalities

$y > 1$ $y < 2x - 2$ $y < 6 - x$ $x > 0$

Mark this region with the letter R.



(4)

(Total for Question 14 is 6 marks)

8 (a) n is an integer.

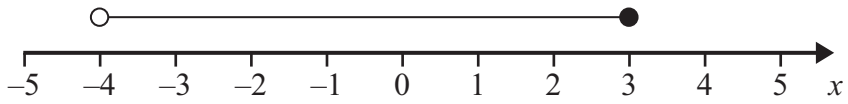
$$-1 \leqslant n < 4$$

List the possible values of n.

.....

(2)

(b)



Write down the inequality shown in the diagram.

.....

(2)

(c) Solve $3y - 2 > 5$

.....

(2)

(Total for Question 8 is 6 marks)

1 $3x + 5 > 16$

x is an integer.

Find the smallest value of x.

.....

(Total for Question 1 is 3 marks)

12 $-3 < n \leqslant 1$

n is an integer.

(a) Write down all the possible values of n.

.....

(2)

(b) Solve the inequality $3p - 7 > 11$

.....

(2)

(Total for Question 12 is 4 marks)

4 $-4 < n \leqslant 1$

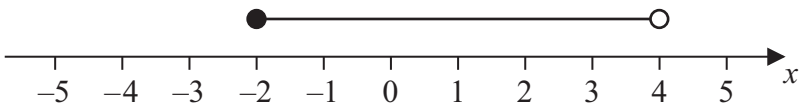
n is an integer.

(a) Write down all the possible values of n.

.....

(2)

(b) Write down the inequalities represented on the number line.



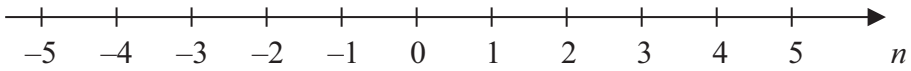
.....

(2)

(Total for Question 4 is 4 marks)

14 $-2 < n \leqslant 3$

(a) Represent this inequality on the number line.



(2)

(b) Solve the inequality $8x - 3 \geqslant 6x + 4$

.....

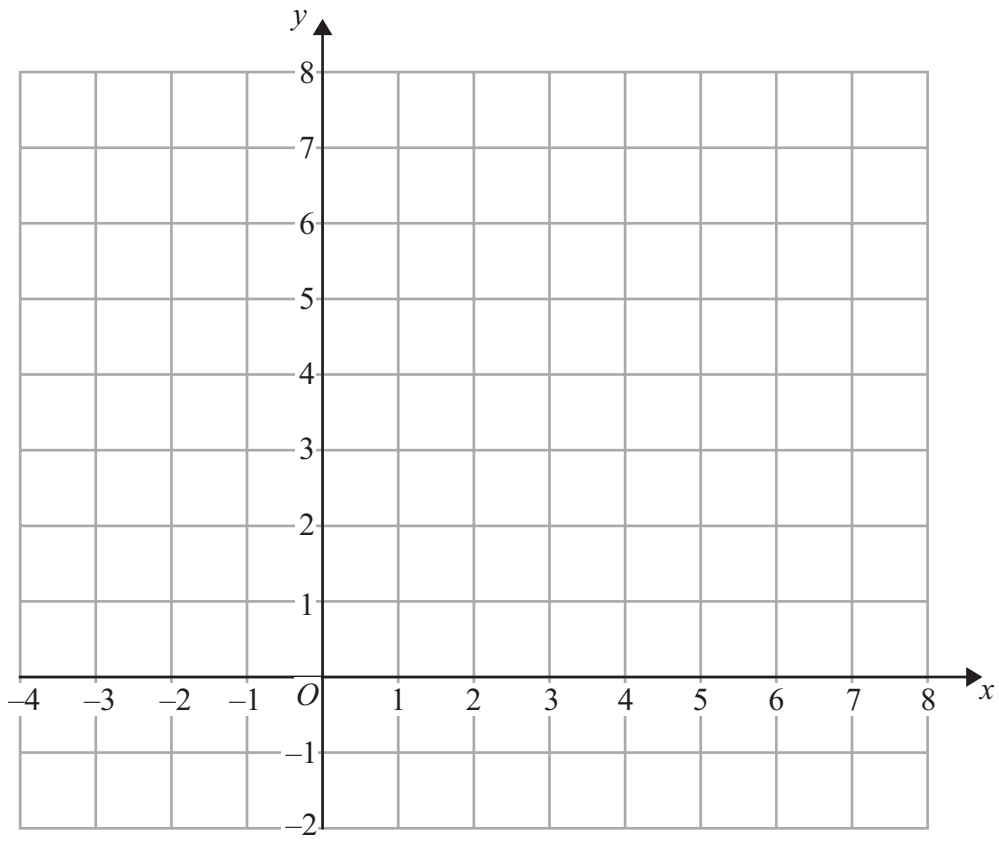
(2)

(Total for Question 14 is 4 marks)

12 On the grid below, show by shading, the region defined by the inequalities

$x + y < 6$ $x > -1$ $y > 2$

Mark this region with the letter R.

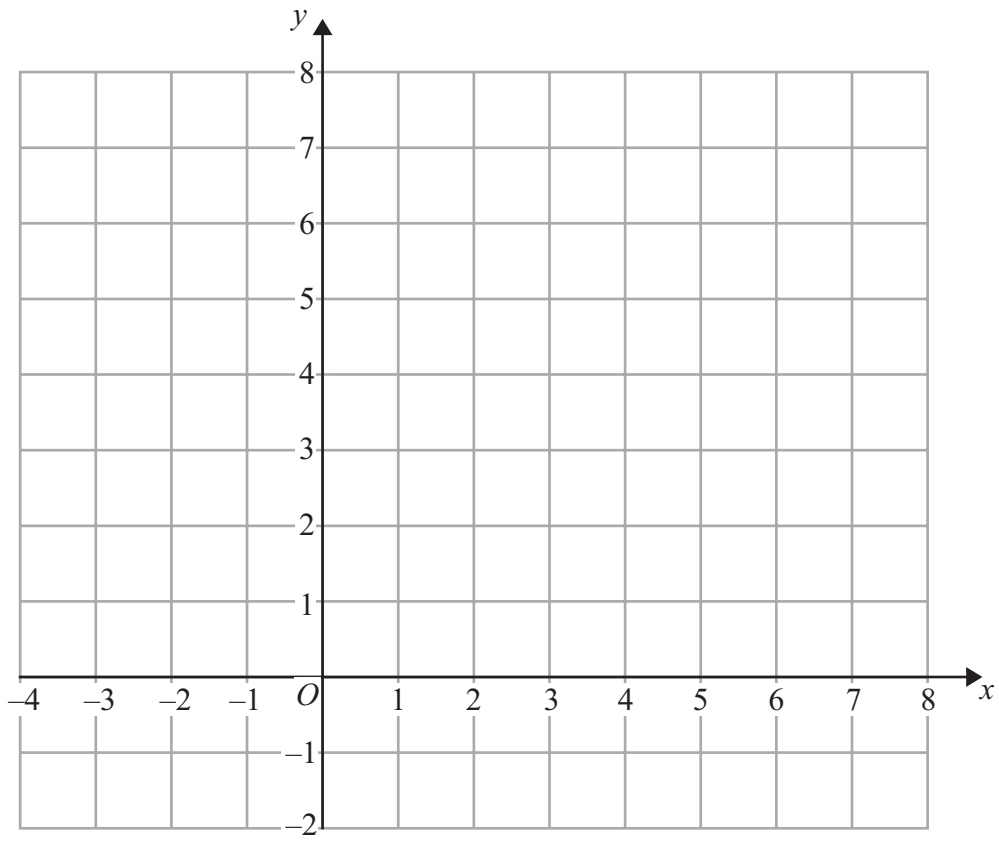


(Total for Question 12 is 4 marks)

12 On the grid below, show by shading, the region defined by the inequalities

$x + y < 6$ $x > -1$ $y > 2$

Mark this region with the letter R.



(Total for Question 12 is 4 marks)

21 (a) Expand and simplify $(y - 2)(y - 5)$

.....

(2)

*(b) Prove algebraically that

$$(2n + 1)^2 - (2n + 1) \quad \text{is an even number}$$

for all positive integer values of n.

(3)

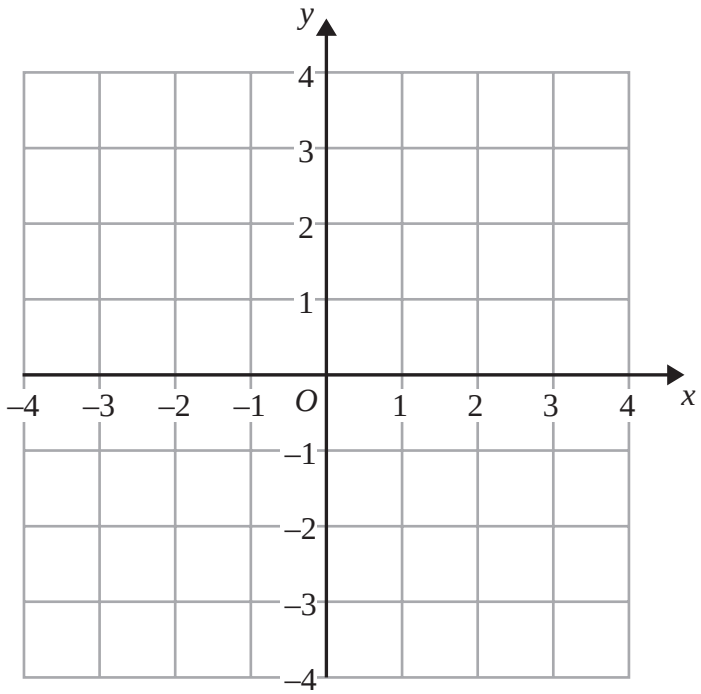
(Total for Question 21 is 5 marks)

12 (a) Solve the inequality $5e + 3 > e + 12$

.....

(2)

(b) On the grid, shade the region defined by the inequality $x + y > 1$



(2)

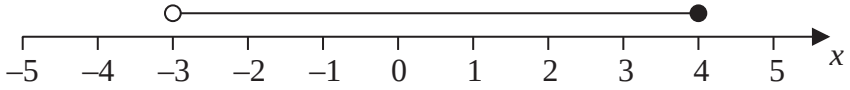
(Total for Question 12 is 4 marks)

5 (a) Solve the inequality $6y + 5 > 8$

.....

(2)

(b) Here is an inequality, in x, shown on a number line.



Write down the inequality.

.....

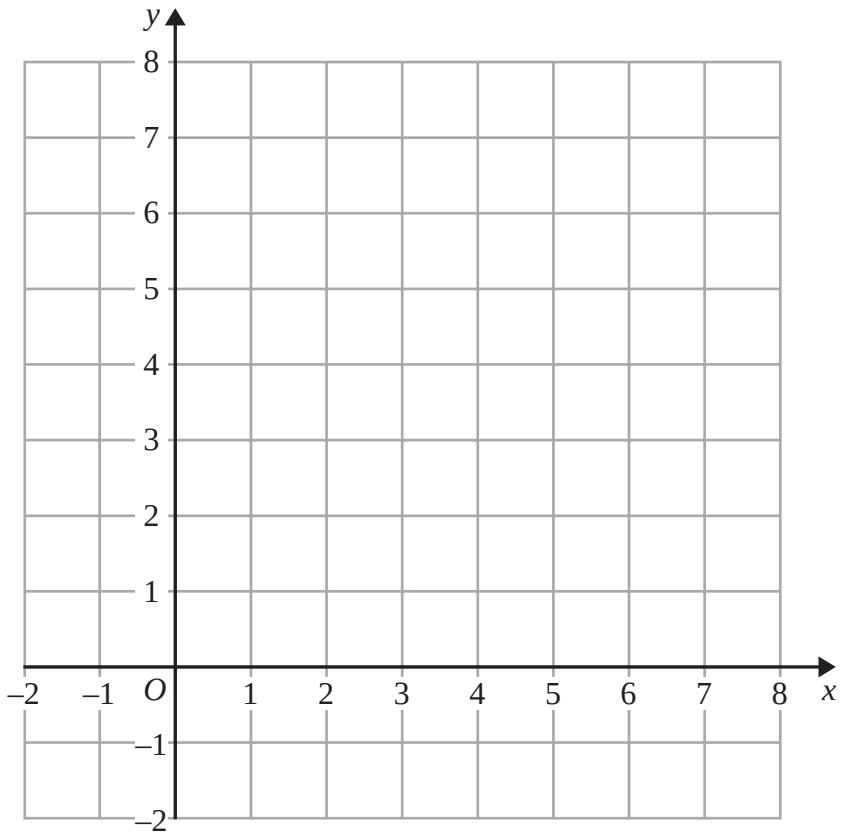
(2)

(Total for Question 5 is 4 marks)

18 On the grid show, by shading, the region that satisfies all three of the inequalities

$x + y < 7$ $y < 2x$ $y > 3$

Label the region **R**.



(Total for Question 18 is 4 marks)

20 Show that $(n + 3)^2 - (n - 3)^2$ is an even number for all positive integer values of n.

(Total for Question 20 is 3 marks)

3 (a) Solve $4(y + 3) = 19$

$y =$ .....

(2)

(b) Solve the inequality $2p - 8 > 7$

.....

(2)

(c) Solve $x^2 + 2x - 15 = 0$

.....

(3)

(Total for Question 3 is 7 marks)

13 (a) Given that x and y are integers such that

$$3 < x < 7$$
$$4 < y < 9$$
$$\text{and } x + y = 13$$

find all the possible values of x.

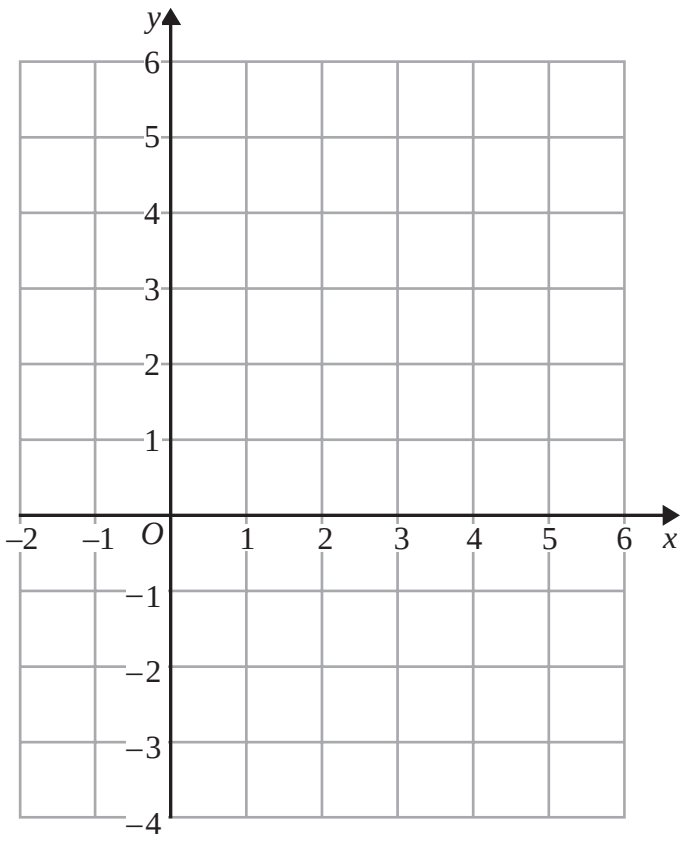
.....

(2)

(b) On the grid below show, by shading, the region defined by the inequalities

$y \geqslant -1$ $y \leqslant 4 - x$ $y \leqslant 3x - 1$

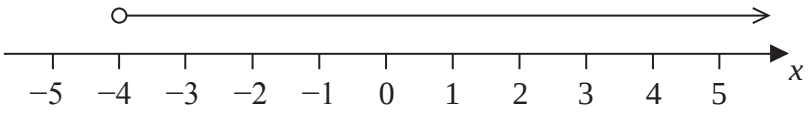
Mark this region with the letter R.



(4)

(Total for Question 13 is 6 marks)

11



(a) Write down the inequality represented on the number line.

.....

(1)

(b) Solve $4y - 9 \leqslant 3$

.....

(2)

(c) $-3 \leqslant n < 2$
$-2 < m < 4$

n and m are integers.

Given that $n = m$, write down all the possible values of n.

.....

(2)

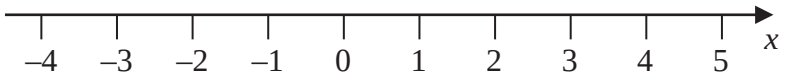
(Total for Question 11 is 5 marks)

12 Solve the inequality $3 - \frac{1}{2}x > x$

.....

(Total for Question 12 is 2 marks)

10 (a) Show the inequality $x < 3$ on the number line below.



(2)

(b) Solve the inequality $4x - 7 \geqslant 13$

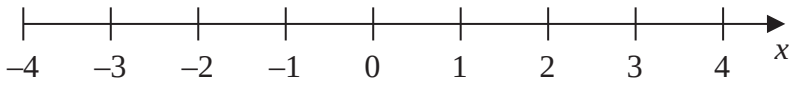
.....

(2)

(Total for Question 10 is 4 marks)

5 (a) $x > -2$

Show this inequality on the number line.



(2)

(b) Work out the greatest integer that satisfies the inequality

$$4y - 1 < y + 7$$

.....

(3)

(Total for Question 5 is 5 marks)

Question 33

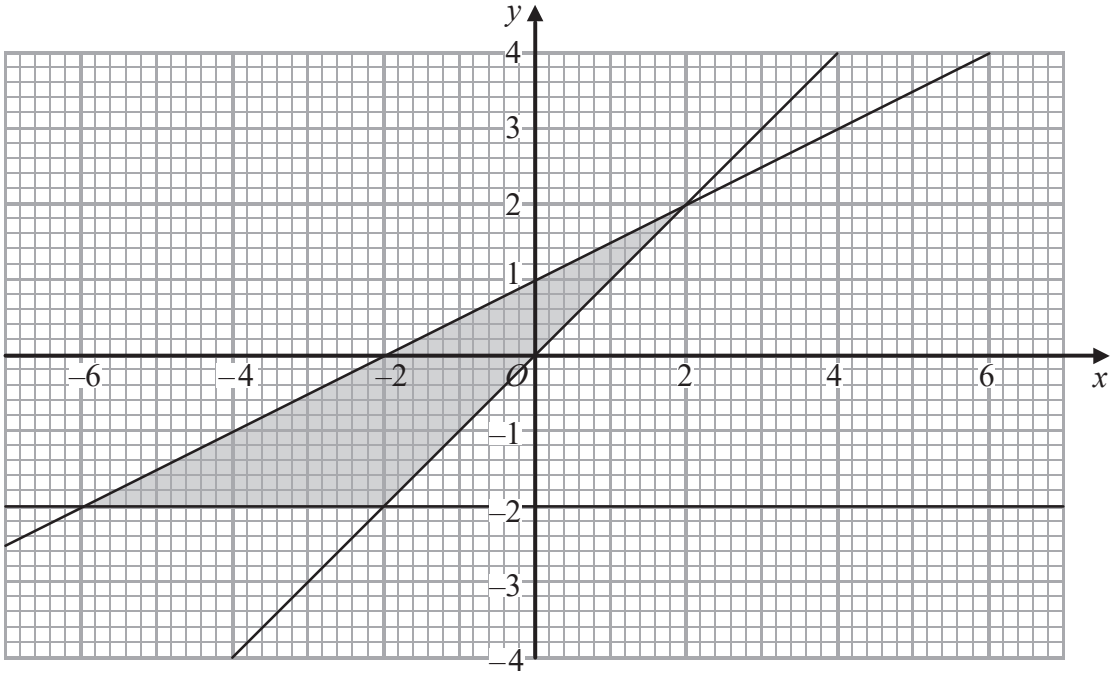
7 A number, n, is rounded to 2 decimal places.
The result is 4.76

Using inequalities, write down the error interval for n.

.....

(Total for Question 7 is 2 marks)

13



Write down the three inequalities that define the shaded region.

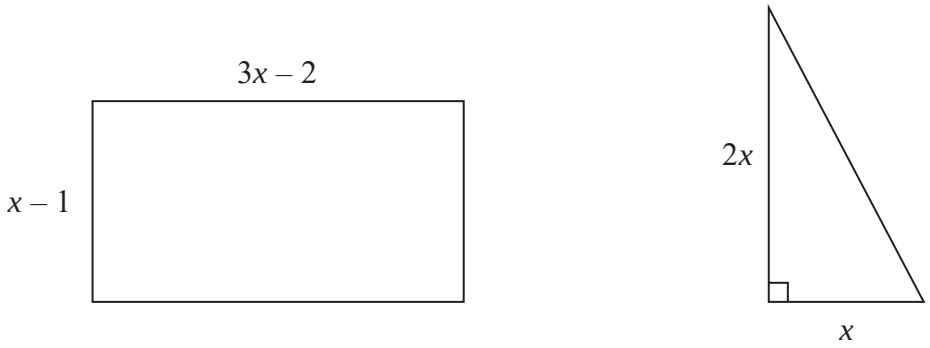
.....

.....

.....

(Total for Question 13 is 4 marks)

23 Here is a rectangle and a right-angled triangle.



All measurements are in centimetres.
The area of the rectangle is greater than the area of the triangle.

Find the set of possible values of x.

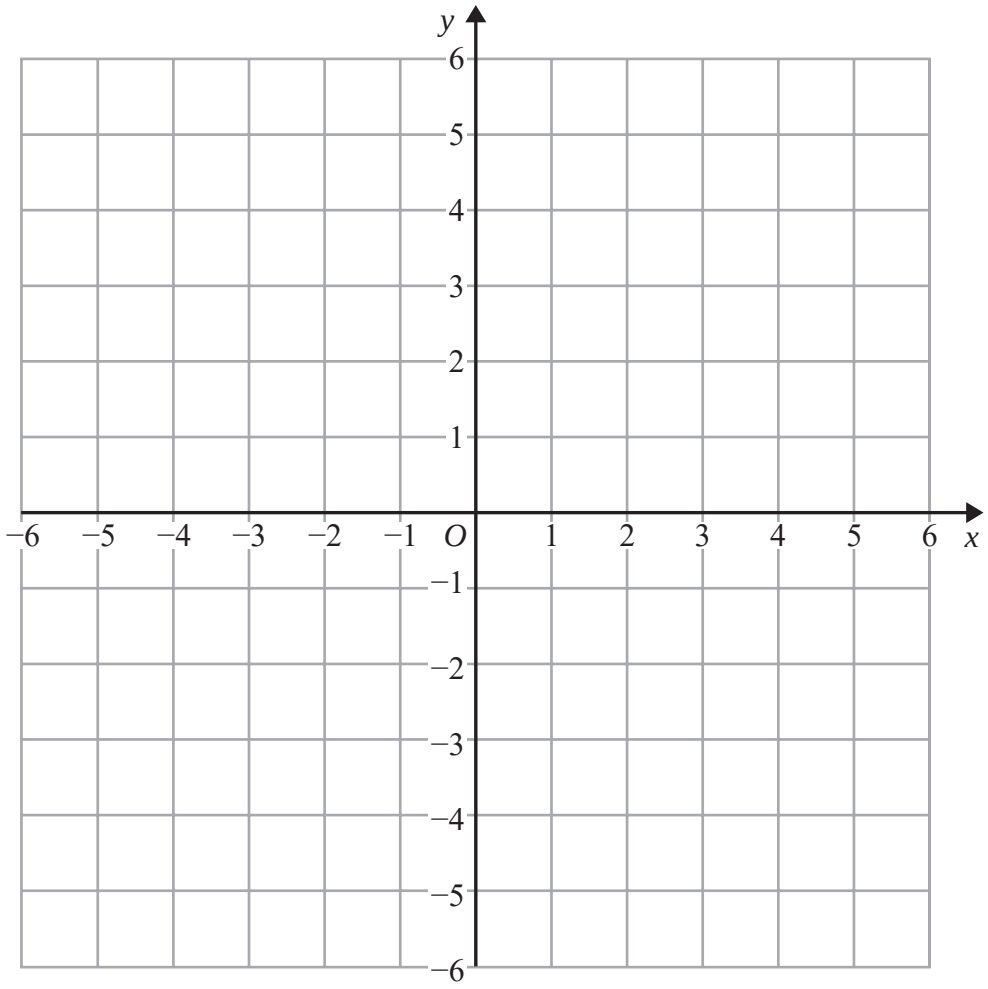
.....

(Total for Question 23 is 5 marks)

14 On the grid, shade the region that satisfies all these inequalities.

$$y > 1 \qquad x + y < 5 \qquad y > 2x$$

Label the region **R**.



(Total for Question 14 is 3 marks)

Question 37

20 n is an integer such that $3n + 2 \leqslant 14$ and $\dfrac{6n}{n^2 + 5} > 1$

Find all the possible values of n.

.....

(Total for Question 20 is 5 marks)

1 (a) Simplify $n^3 \times n^5$

.....

(1)

(b) Simplify $\dfrac{c^3d^4}{c^2d}$

.....

(2)

(c) Solve $\dfrac{5x}{2} > 7$

.....

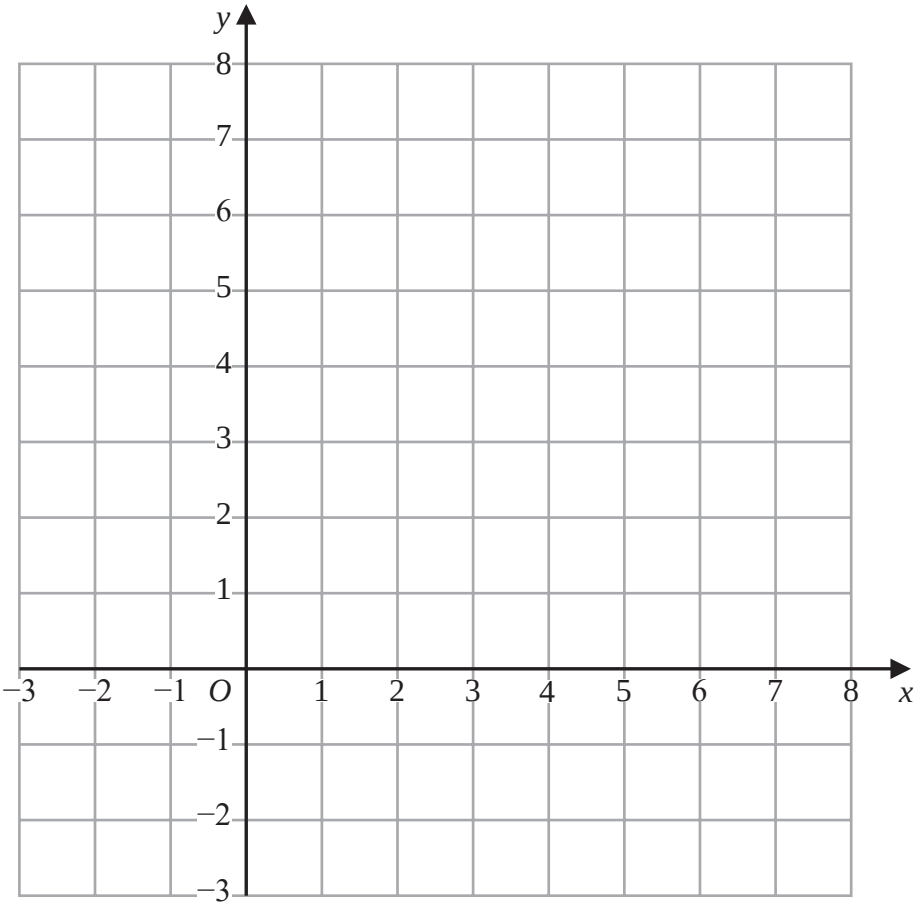
(2)

(Total for Question 1 is 5 marks)

13 (a) On the grid show, by shading, the region that satisfies all these inequalities.

$x \geqslant 0$ $x \leqslant 2$ $y \leqslant x + 3$ $2x + 3y \geqslant 6$

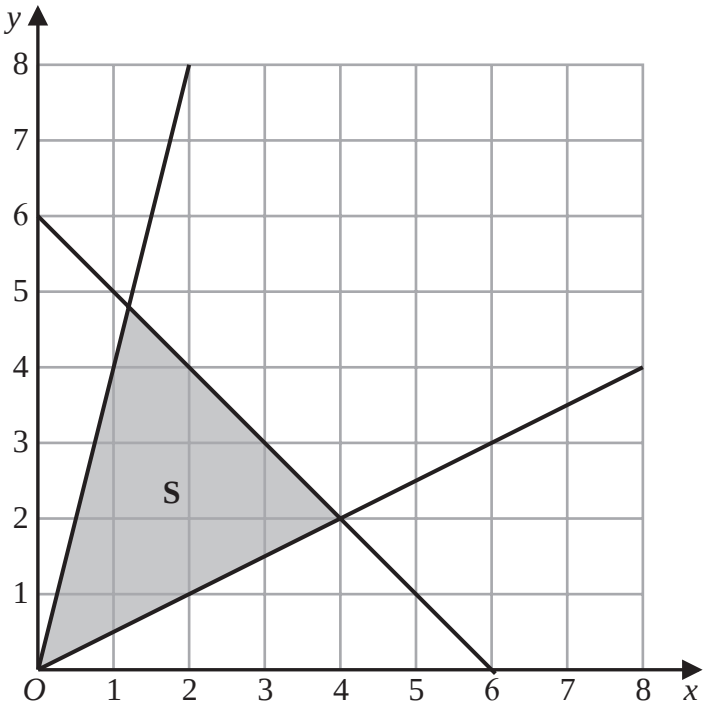
Label the region **R**.



(4)

(b) The diagram below shows the region **S** that satisfies the inequalities

$$y \leqslant 4x \qquad y \geqslant \frac{1}{2}x \qquad x + y \leqslant 6$$



Geoffrey says that the point with coordinates (2, 4) does not satisfy all the inequalities because it does not lie in the shaded region.

Is Geoffrey correct?
You must give a reason for your answer.

.....

.....

.....

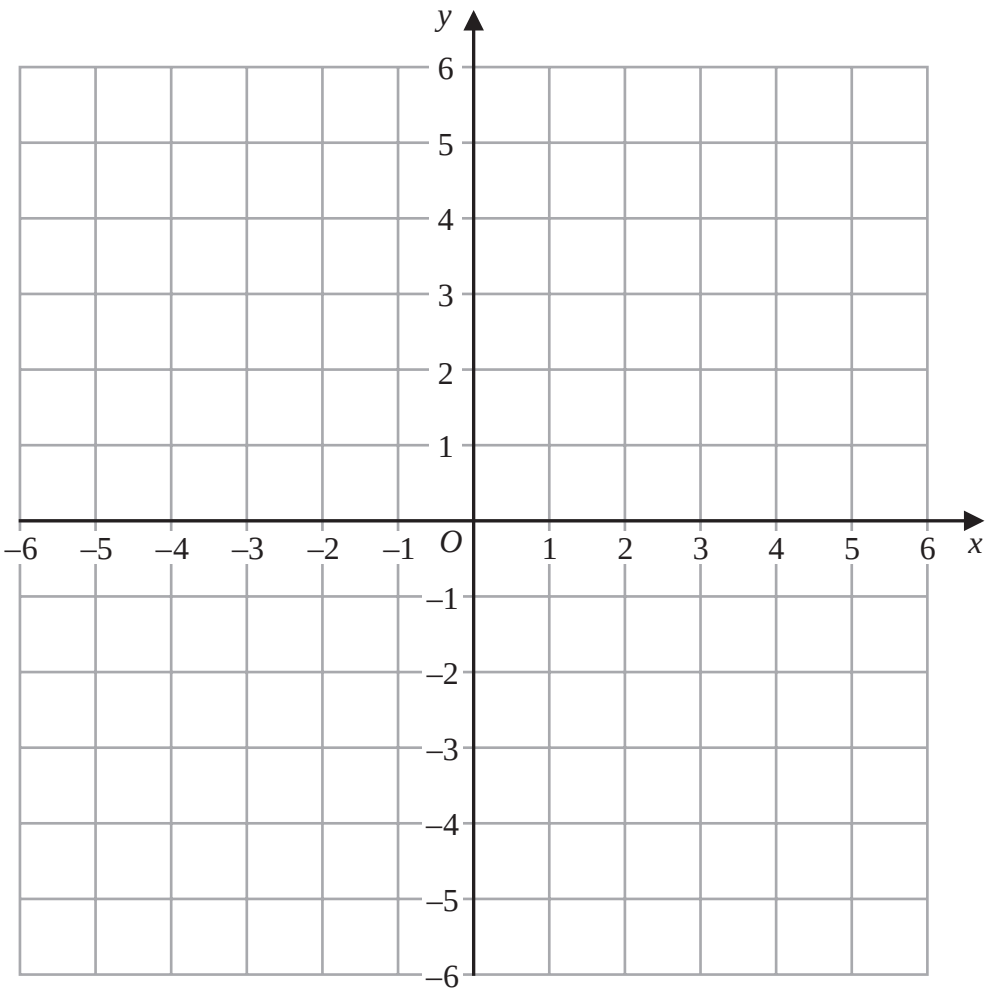
(1)

(Total for Question 13 is 5 marks)

17 On the grid show, by shading, the region that satisfies all of these inequalities.

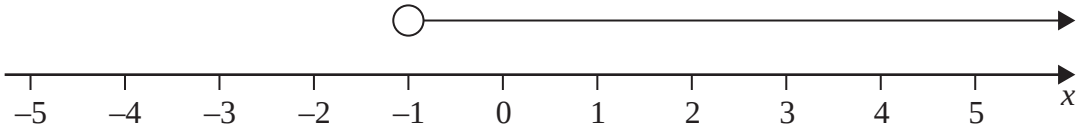
$$2y + 4 < x \qquad x < 3 \qquad y < 6 - 3x$$

Label the region **R**.



(Total for Question 17 is 3 marks)

1 (a) Write down the inequality shown on this number line.



.....

(1)

(b) On the number line below, show the inequality $-3 \leqslant y < 4$



(2)

(Total for Question 1 is 3 marks)

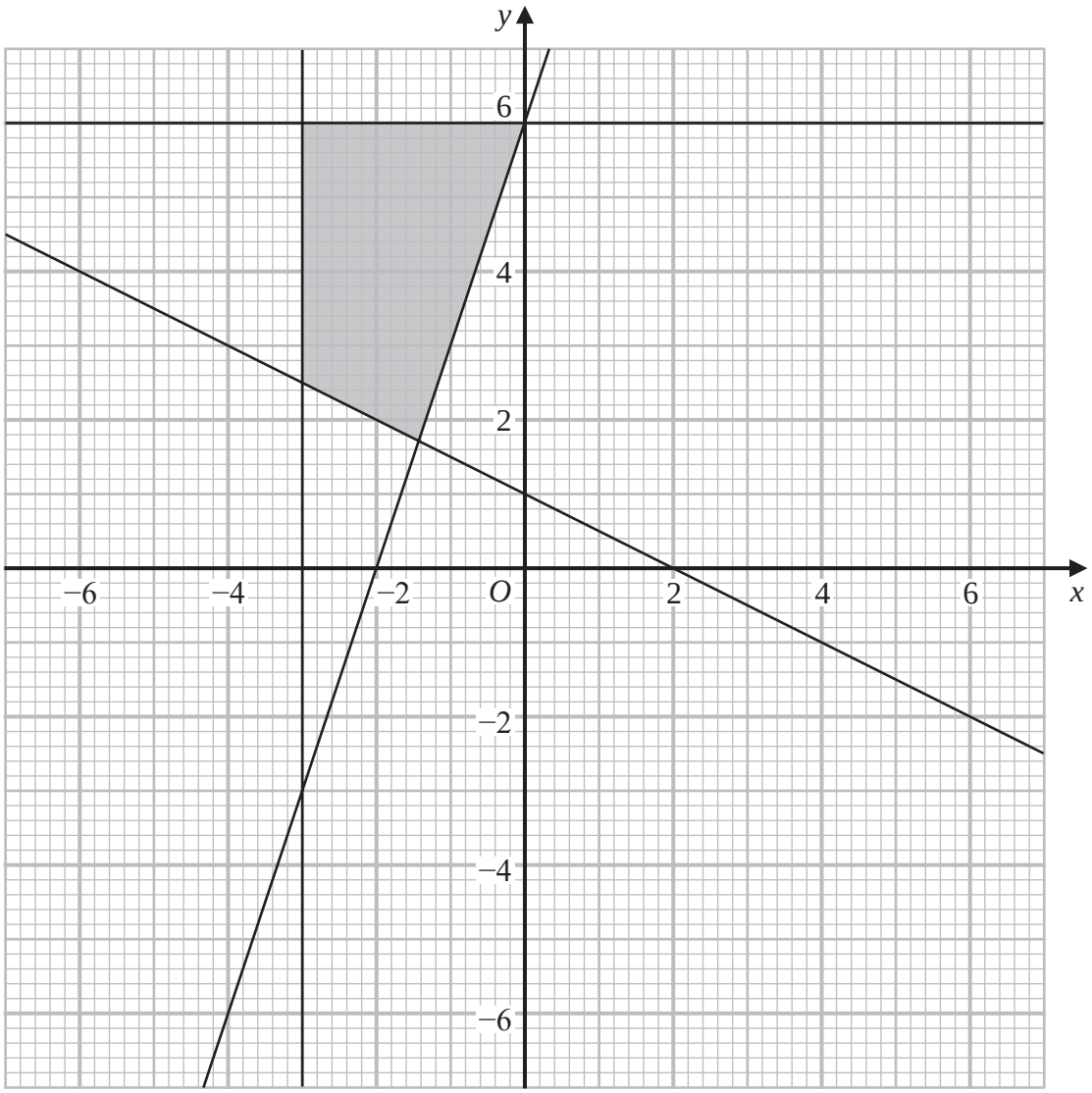
22 Find algebraically the set of values of x for which

$$x^2 - 49 > 0 \quad \textbf{and} \quad 5x^2 - 31x - 72 > 0$$

.....

(Total for Question 22 is 5 marks)

16 The shaded region shown on the grid is bounded by four straight lines.



Find the four inequalities that define the shaded region.

.....

.....

.....

.....

(Total for Question 16 is 4 marks)

Question 44

November 2022 | 1MA1/3H | Original Q11

11 x and y are integers such that

$$3 < x < 8$$
$$4 < y < 10$$
and $x + y = 14$

Find all the possible values of x.

.....

(Total for Question 11 is 2 marks)

24 Find the set of possible values of x for which

$$4x^2 - 25 < 0 \quad \textbf{and} \quad 12 - 5x - 3x^2 > 0$$

You must show all your working.

.....

(Total for Question 24 is 5 marks)

4 $-2 \leqslant n < 5$

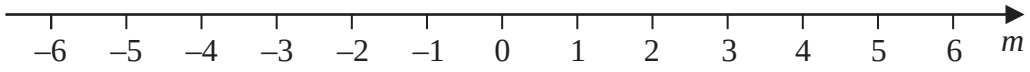
n is an integer.

(a) Write down the greatest possible value of n.

.....

(1)

(b) On the number line below, show the inequality $-4 \leqslant m < 1$



(2)

(c) Solve $\frac{2}{5}g - 4 < 6$

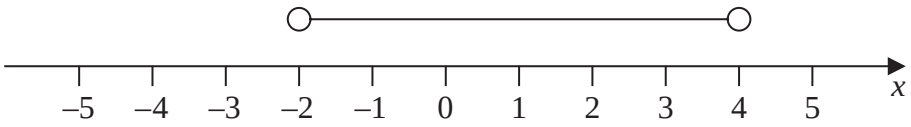
.....

(3)

(Total for Question 4 is 6 marks)

4 Jenna is asked to show the inequality $-3 < x \leqslant 4$ on a number line.

Here is her answer.



(a) Write down two mistakes Jenna has made.

1 .....

.....

2 .....

.....

(2)

(b) Work out the greatest integer that satisfies the inequality

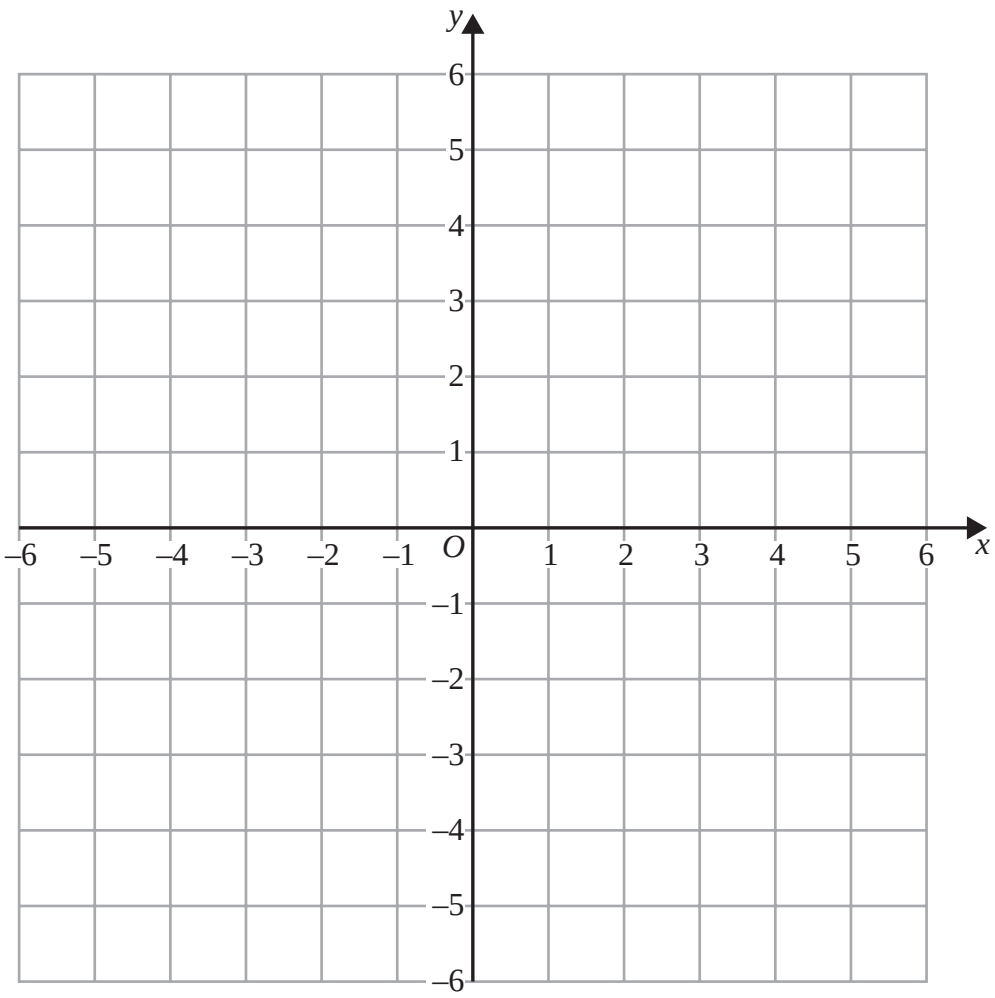
$$5y - 7 < 16$$

.....

(2)

(Total for Question 4 is 4 marks)

13



On the grid, shade the region **R** that satisfies all the following inequalities.

$x \leqslant 2$ $y \geqslant -3$ $y \leqslant 2x + 1$ $3x + 2y \leqslant 6$

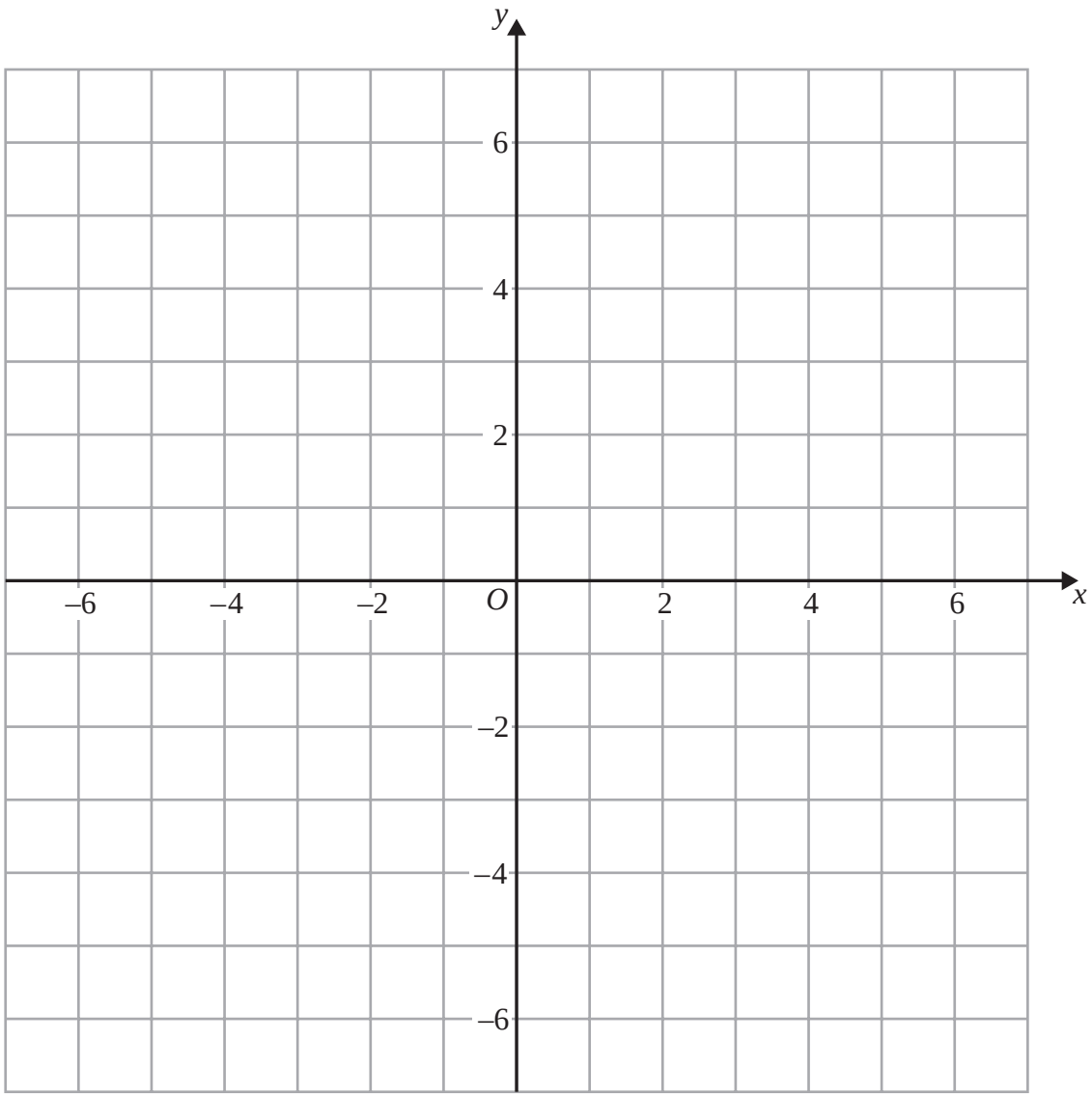
Label the region **R**.

(Total for Question 13 is 3 marks)

15 (a) On the grid, show by shading, the region that satisfies all of these inequalities.

$$x + y < 5 \qquad y > 1 \qquad x > 2 \qquad y < 3x - 2$$

Label the region **R**.



(4)

Ron says,

> "I can remove one of the four inequalities from the grid so that the region **R** will not change."

Ron is correct.

(b) Which inequality can be removed so that the region **R** will not change?

.....

(1)

(Total for Question 15 is 5 marks)