EXAM PAPERS PRACTICE

GCSE OCR Math J560

Inequalities on graph

Answers

"We will help you to achieve A Star "

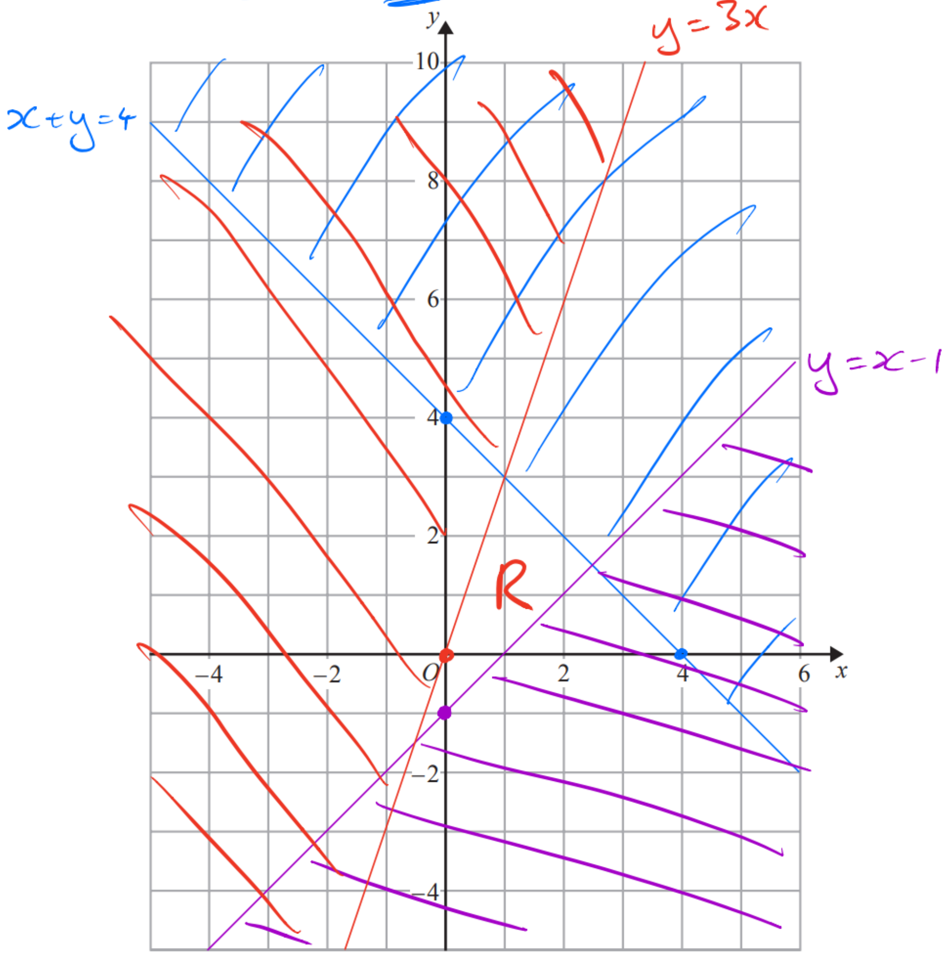
Answer 1

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

$$x + y < 4 \qquad y > x - 1 \qquad y < 3x$$

Label the region **R**.

SHADE UNWANTED REGION



DRAW: $x + y = 4$

GOES THRU' $(0, 4)$

AND $(4, 0)$

$y = x - 1$

GRAD $= 1$

y-INT $= -1$

$y = 3x$

GRAD $= 3$

y-INT $= 0$

Answer 2

SHADE THE UNWANTED REGION

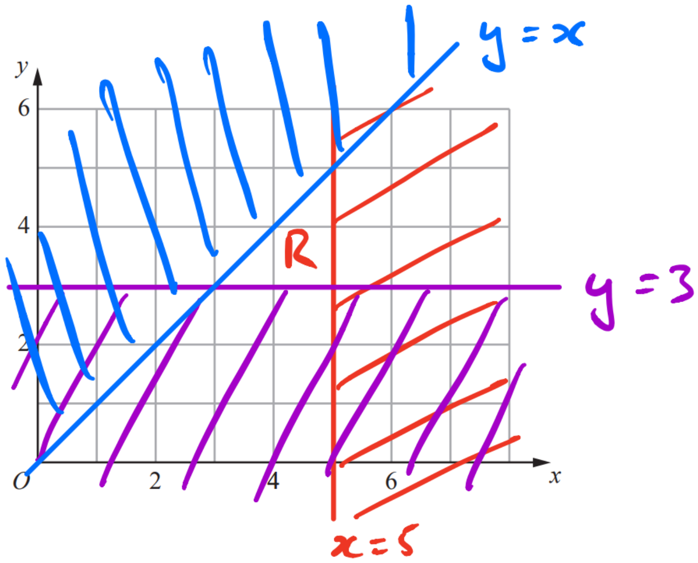
Show, by shading on the grid, the region defined by all three of the inequalities

$x \leqslant 5$ DRAW $x = 5$

$y \geqslant 3$ $y = 3$

$y \leqslant x$ $y = x$

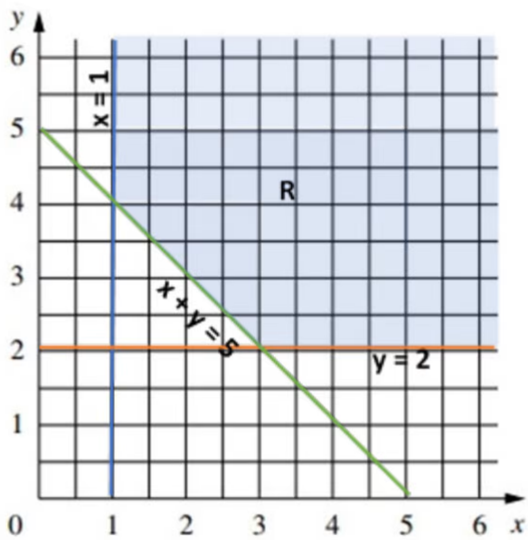
Label your region **R**.



Answer 3

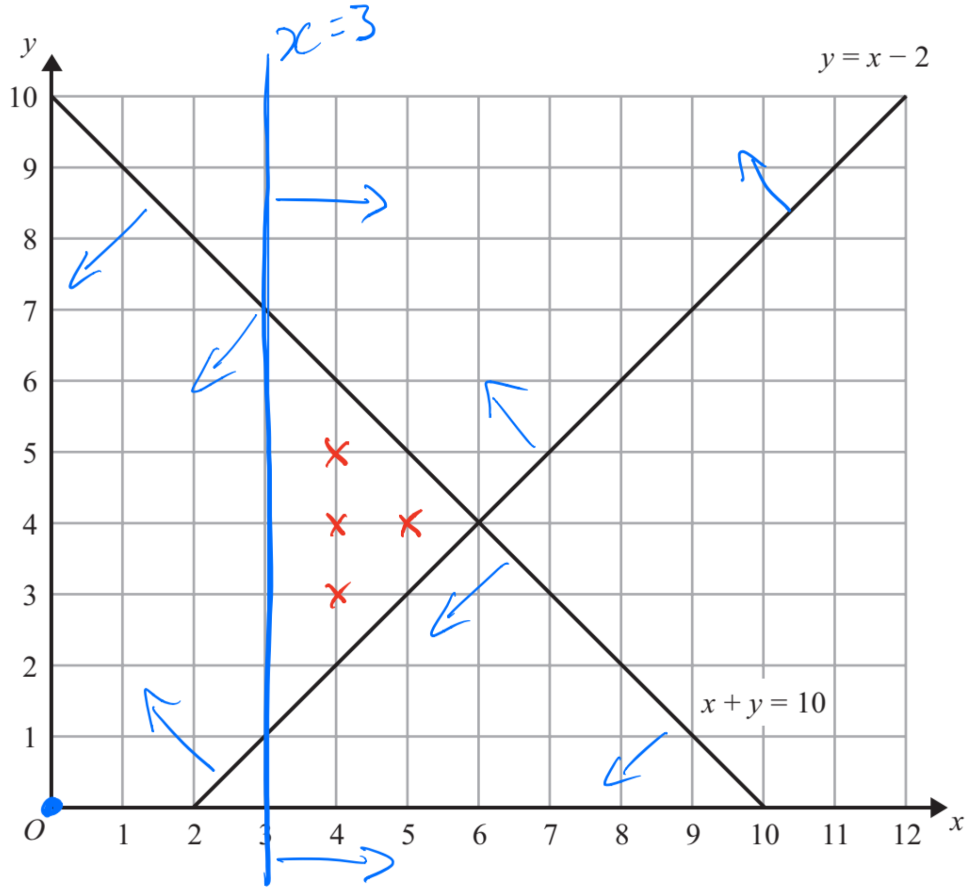
(a) On the grid, draw the lines $x = 1$, $y = 2$ and $x + y = 5$.

The region R is shaded in blue on the diagram below.



Answer 4

The lines $y = x - 2$ and $x + y = 10$ are drawn on the grid.



On the grid, mark with a cross (×) each of the points with integer coordinates that are in the region defined by

WHOLE NUMBERS

$y > x - 2$ → $(2, 4)$

$(0, 0)$ ← $x + y < 10$

$x > 3$

$4 > 2 - 2$ ✓

$0 + 0 < 10$ ✓

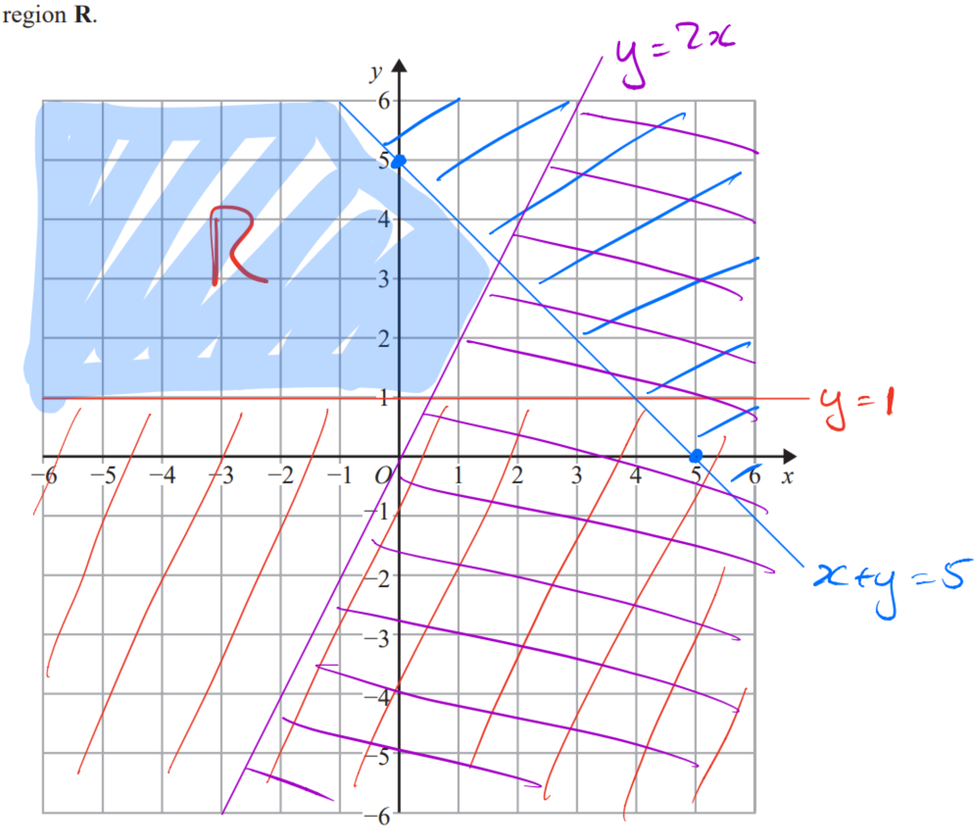
Answer 5

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

UNWANTED

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

Label the region **R**.

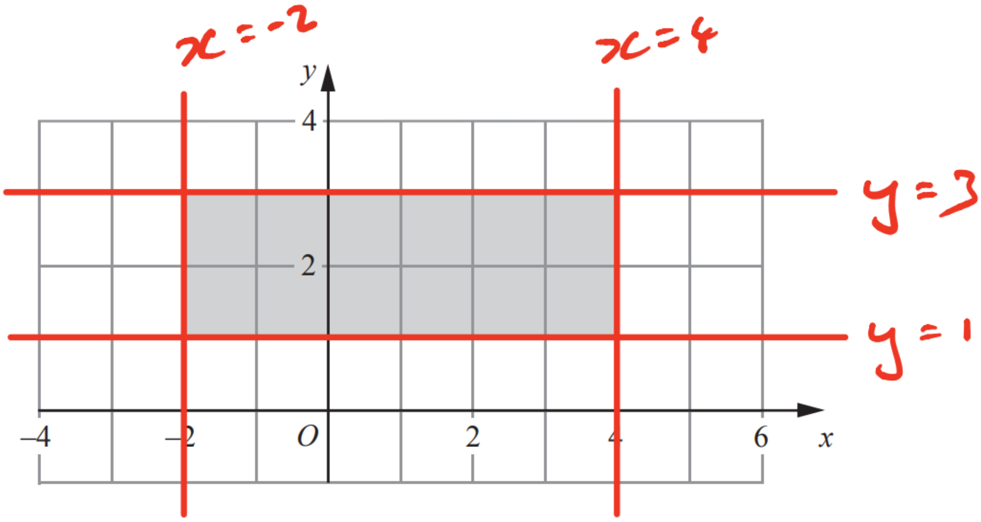


DRAW $y = 1$ HORIZONTAL LINE THROUGH (0, 1)

DRAW $x + y = 5$ GOES THROUGH (0, 5) AND (5, 0)

DRAW $y = 2x$ GOES THROUGH ORIGIN
GRADIENT 2

Answer 6



Write down inequalities to fully define the shaded region.

FIRST, WRITE DOWN EQUATIONS OF THE EDGES...

$x = -2$ RIGHT $\underline{x \geq -2}$

$x = 4$ LEFT $\underline{x \leq 4}$

$y = 1$ ABOVE $\underline{y \geq 1}$

$y = 3$ BELOW $\underline{y \leq 3}$

EXAM PAPERS PRACTICE

Answer 7

(b) Write R in the region where $x \geqslant 1$, $y \geqslant 2$ and $x + y \geqslant 5$.

For the inequality $x \geq 1$, the correct region is the one on the right of the line x = 1.

For the inequality $y \geq 2$, the correct region is the one above the line y = 2.

For the inequality $x + y \geq 5$, the correct region is the one on the right of the line x + y = 5.

Answer 8

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

"WHOLE NUMBER"

"LESS THAN"

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

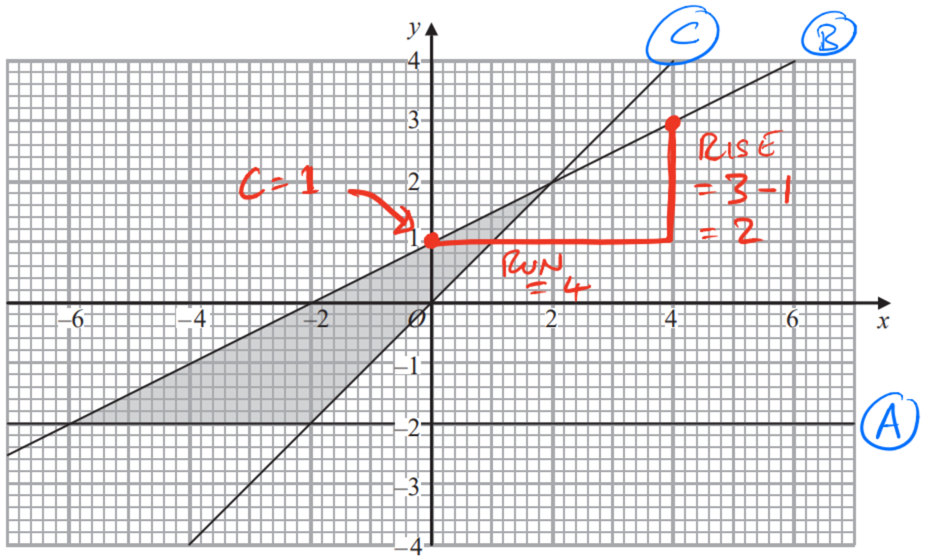
find all the possible values of x.

x : 4 , 5 , 6

y : 5 6 7 8

5 , 6

Answer 9



Write down the three inequalities that define the shaded region.

	LINE	INEQUALITY
A	$y = -2$	$y \geq -2$
B	$m = \frac{\text{RISE}}{\text{RUN}} = \frac{2}{4} = \frac{1}{2}$	
	$y = \frac{1}{2}x + 1$	$y \leq \frac{1}{2}x + 1$
C	$m = 1, \; c = 0$	
	$y = x$	$y \geq x$

EQUATION OF A STRAIGHT LINE

$y = mx + c$

GRADIENT; y-INTERCEPT

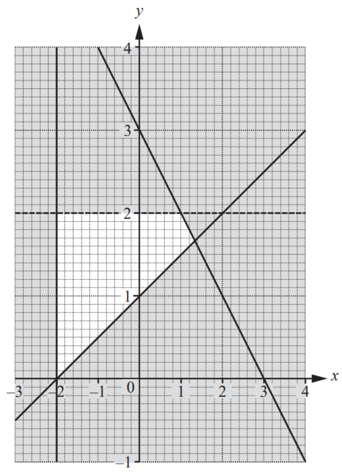
GRADIENT

$m = \frac{\text{RISE}}{\text{RUN}}$

$m = \frac{y_2 - y_1}{x_2 - x_1}$

FOR TWO POINTS (x_1, y_1) AND (x_2, y_2)

Answer 10



Find the four inequalities that define the region that is **not** shaded.

It is important to note a couple of key points: A full line indicates a 'loose' inequality (ie. '≤ or ≥'), whilst a dotted line implies an 'absolute' inequality (ie. '< or >'). In addition, two of the inequalities are simply horizontal and vertical lines meaning they relate exclusively to y and x respectively. Thus:

$y < 2$ and $x \geq -2$

The equation for the remaining inequalities can be worked by using the general formula for a straight line ($y=mx+c$), where c is the y-intercept and m is the gradient.

The gradient is calculated as the $\frac{difference\ in\ y\ values}{the\ difference\ in\ x\ values}$. (use any clearly visible triangle to work this out). Take care to ensure that you differentiate between positive gradient (slopes up from left to right), and negative gradient (slopes down from left to right). To see which way round the signs go, test using a point in the shaded area and check whether the inequality agrees and makes sense, otherwise correct to make the inequality logical.

For the snegative gradient line: y-intercept = 3 and the $gradient = \frac{0-3}{3} = -1$

This therefore gives an equation of $y = -x + 3$ and hence the inequality is $y \leq -x + 3$

For the positive gradient line: y-intercept = 1 and the $gradient = \frac{1}{0-(-2)} = \frac{1}{2}$

This gives an equation of $y = \frac{1}{2}x + 1$ and hence the inequality is $y \geq \frac{1}{2}x + 1$

Answer 11

UNWANTED REGION

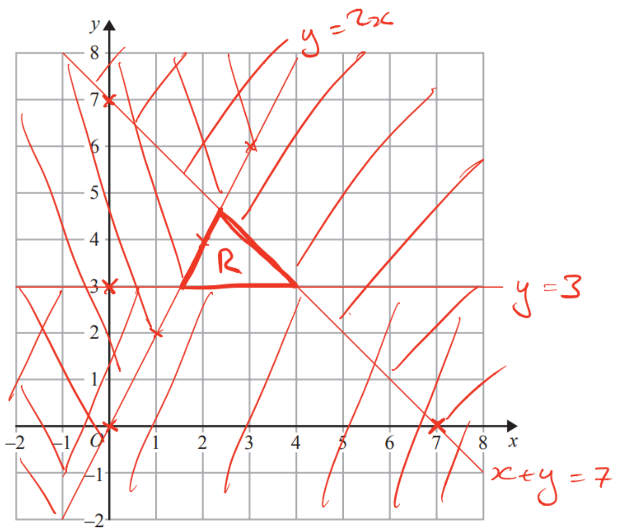
On the grid show, by shading, the region that satisfies all three of the inequalities

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

Label the region **R**.

$<$ "LESS THAN"

$>$ "GREATER THAN"



DRAW: $x + y = 7$

WHEN $x = 0$, $y = 7$

WHEN $y = 0$, $x = 7$

IS $0 + 0$ LESS THAN 7?

YES

SO WE WANT LOWER SIDE

$y = mx + c$

$y = 2x$

$y < 2x$

IS BELOW THE LINE

$y = 3$

$y > 3$

IS ABOVE THE LINE

Answer 12

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

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

Mark this region with the letter R.

UNWANTED REGION

STRAIGHT LINE

$y = mx + c$

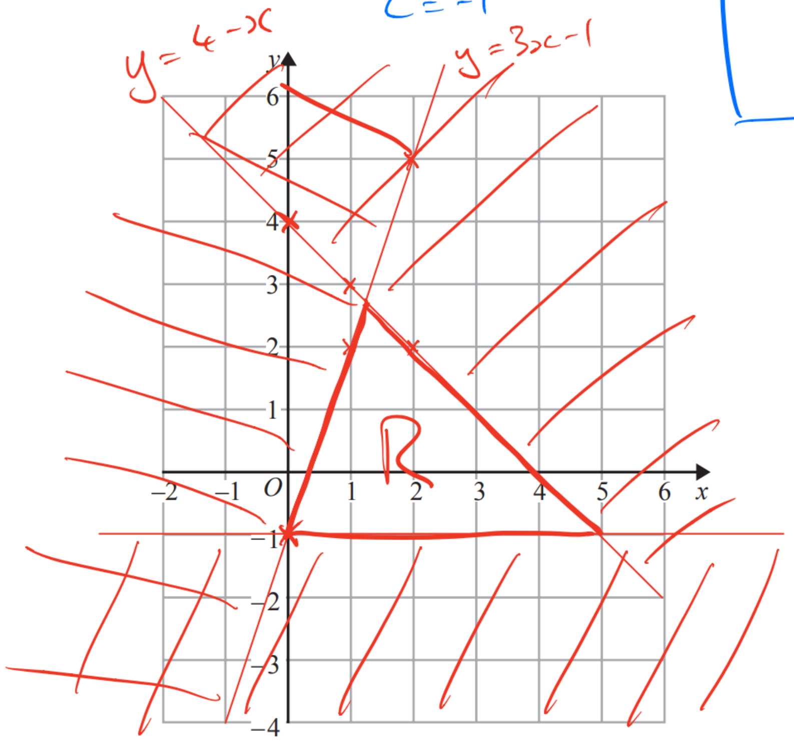
GRADIENT $\quad$ y-INTERCEPT

$m = -1$

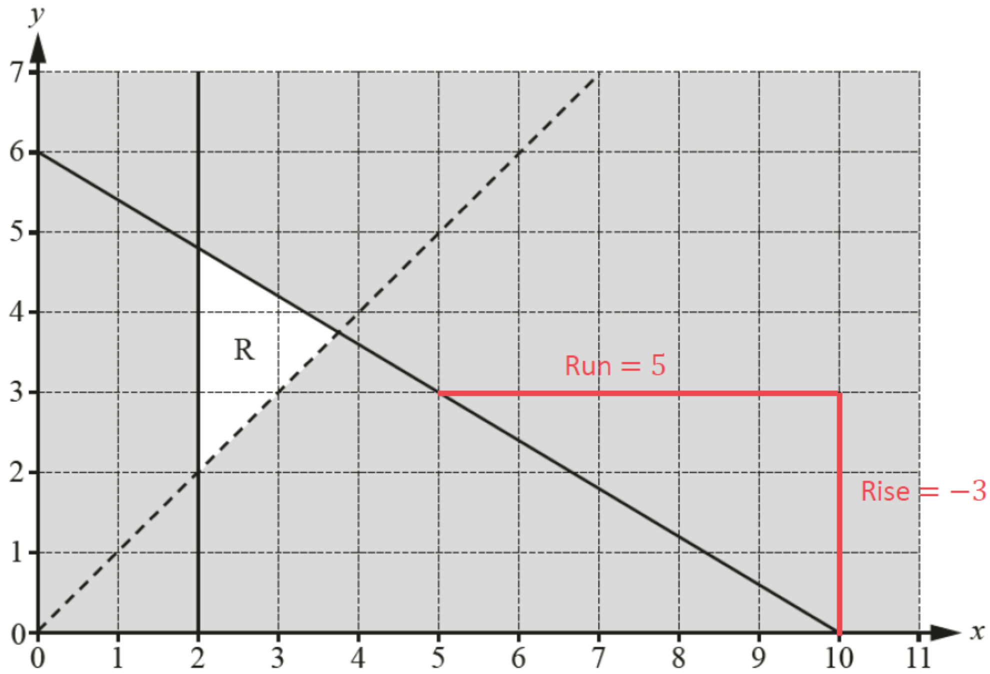
$c = 4$

$m = 3$

$c = -1$



Answer 13



Find the three inequalities that define the unshaded region, R.

The general equation of a straight line is $y = mx + c$ where m is the gradient and c is the y-intercept.

The dotted line has a gradient of 1 and a y-intercept of 0 so its equation is $y = x$

The other diagonal line has a gradient of $\frac{\text{Rise}}{\text{Run}} = \frac{-3}{5}$ and a y-intercept of 6 so it is $y = -\frac{3}{5}x + 6$

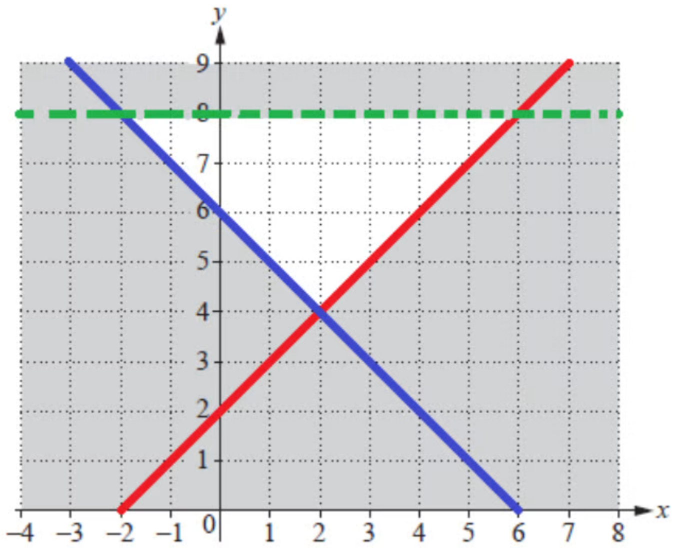
Vertical lines all have equation $x = k$ so this one is $x = 2$

The region is above (but does not include) $y = x$ so one inequality is $\boldsymbol{y > x}$

The region is below (and includes) $y = -\frac{3}{5}x + 6$ so another inequality is $\boldsymbol{y \leq -\frac{3}{5}x + 6}$

The region is to the right of (and includes) $x = 2$ so the final inequality is $\boldsymbol{x \geq 2}$

Answer 14



Write down the 3 inequalities which define the unshaded region.

First we identify the equations of the four lines which serve as the boundaries of the region.

To get the inequalities, we pick a point inside the region (for example (2,5)), put the coordinates into our equations and then change the sign to satisfy the conditions.

For example we have $y=6-x$ and since for x=2 the function has value 4, which is smaller than y=5, therefore we have the inequality $y\geq 6-x$.

It is important to realize that line for $y=8$ is a dashed line, so there is no equality possible.

Therefore the three inequalities are as follows:

$$y < 8$$

$$y \geq 6 - x$$

$$y \geq x + 2$$