

Defining a Region using Multiple Inequalities

Starter

1. (Review of last lesson) Label the region R defined by the inequality $y < x - 3$.
2. (a) On the same set of axes draw the lines $x = 1$ and $y = 3$.
(b) Hence label the region R that satisfies the inequalities $x > 1$ and $y \leq 3$.

Notes

With multiple inequalities, draw each line in turn and *shade the region you don't want* — as if you were crossing out the bit you don't want. The *region R* will be what is *left unshaded*.

Success Criteria – multiple inequalities

1. Draw the line corresponding to the first inequality
2. Shade the side of the line that is not in the required region
3. Repeat steps 1 and 2 for each inequality
4. The required region R, will be the area that is left unshaded

E.g. 1 Label the region R that satisfies the inequalities $-2 < x \leq 1, y > -3$.

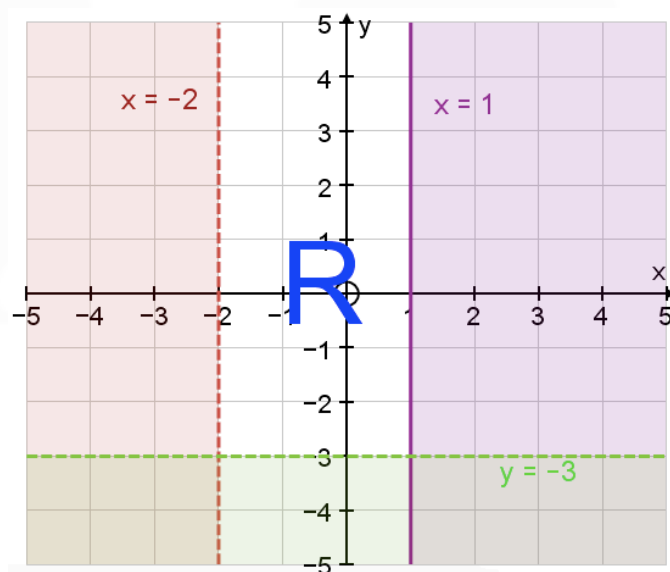
Working: $x = -2$ is a vertical line passing through -2 on the x -axis
 $x = 1$ is a vertical line passing through 1 on the x -axis
 $y = -3$ is a horizontal line passing through -3 on the y -axis

$x = -2$ and $y = -3$ are dotted but $x = 1$ is solid.

From $-2 < x \leq 1$, the required region is between lines so shade the unwanted region.

From $y > -3$, the required region is above the line $y = -3$ so shade the unwanted area below the line.

Put an R in the unshaded region.



E.g. 2 On a graph, label the region R defined by the inequalities $y < x$, $x < 3$ and $x + y \geq 2$.

Working:

Draw the line $y = x$

Let $x = 0, y = 0 \Rightarrow$ plot $(0, 0)$

Let $x = 2, y = 2 \Rightarrow$ plot $(2, 2)$

To check: Let $x = -2, y = -2 \Rightarrow$ plot $(-2, -2)$

Draw a **dotted** line since the inequality is $<$.

Choose the point $(0, 1)$ as it is not on the line.

Substitute into $y < x$: $1 < 0$ False

$(0, 1)$ is not in the required region so shade its side of the line.

$x = 3$ is a vertical line passing through 3 on the x -axis

Draw a **dotted** line since the inequality is $<$.

From $x < 3$, the required region is to the left of the line so shade the unwanted region to the right of the line.

Draw the line $x + y = 2$

The line $x + y = 2$ goes through the points $(0, 2)$ and $(2, 0)$

To check: Let $x = 1, y = 1 \Rightarrow$ plot $(1, 1)$

Draw a **solid** line since the inequality is \geq .

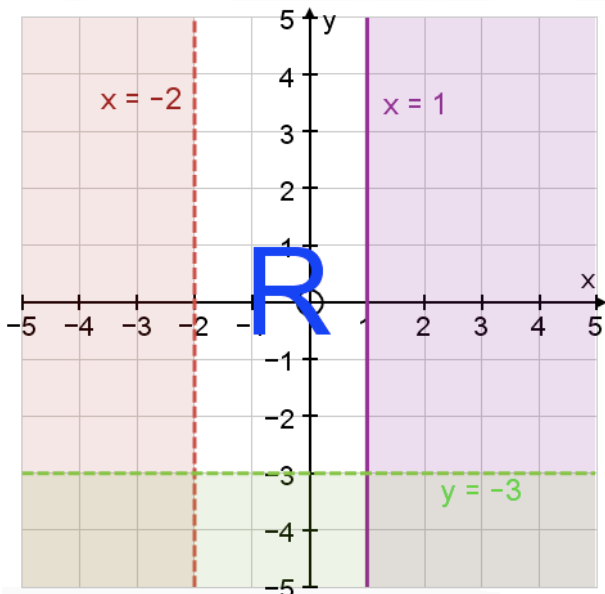
Choose the point $(0, 0)$ as it is not on the line.

Substitute into $x + y \geq 2$: $0 + 0 \geq 2$ False

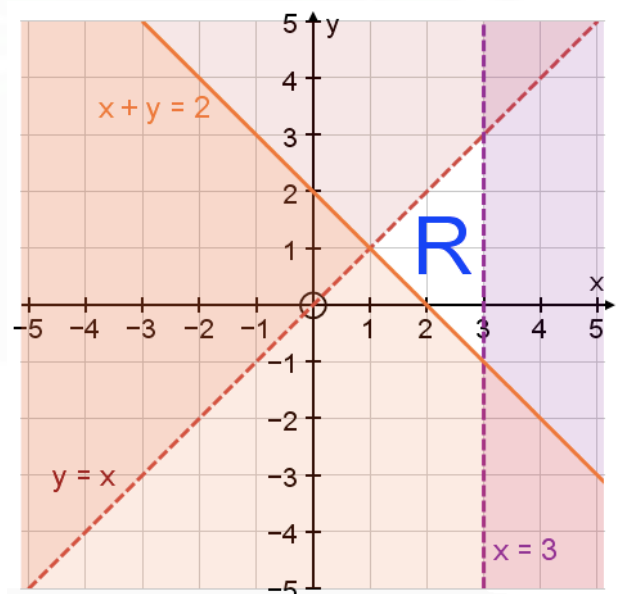
$(0, 0)$ is not in the required region so shade its side of the line.

Write an R in the unshaded region.

E.g. 1



E.g. 2



Video: [Inequalities and regions](#)

[Solutions to Starter and E.g.s](#)

Exercise

9-1 class textbook: p513 E16.2 Qu 4, 5, 6ace..., 7*, 8*
A*-G class textbook: p468 M16.3 Qu 4, 5, 6ace..., 7*
9-1 homework book: p173 E16.2 Qu 2, 4-6, 7*
A*-G homework book: p130 M16.3 Qu 2, 4-6

Summary

Multiple inequalities:

1. Draw the line corresponding to the first inequality
2. Shade the side of the line that is not in the required region
3. Repeat steps 1 and 2 for each inequality
4. The required region R, will be the area that is left unshaded

[Homework book answers \(only available during a lockdown\)](#)