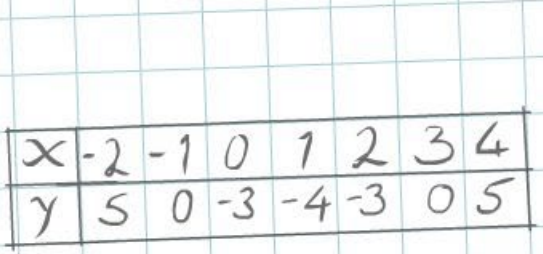
Graphing inequalities in one variable

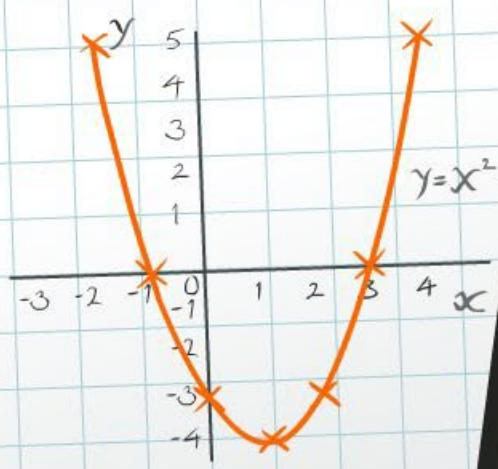


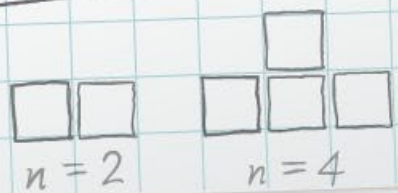
x	-2	-1	0	1	2	3	4
y	5	0	-3	-4	-3	0	5

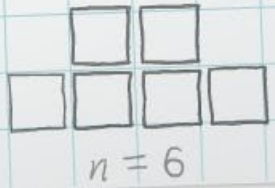
$x^2 - 2x - 3 = 0$

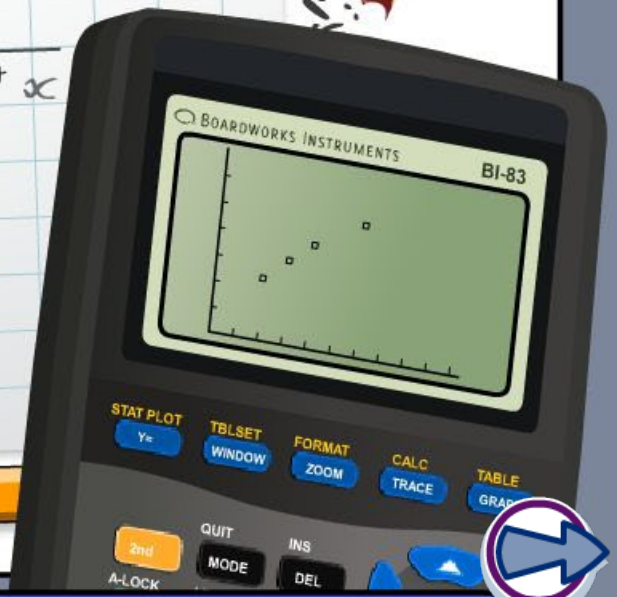
$(x+1)(x-3) = 0$

$x = -1$ or $x = 3$









Information

Common core icons

This icon indicates a slide where the Standards for Mathematical Practice are being developed. Details of these are given in the Notes field.

Slides containing examples of mathematical modeling are marked with this stamp.

This icon indicates an opportunity for discussion or group work.

The **Standards for Mathematical Practice** outlined in the Common Core State Standards for Mathematics describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

They are:

1) Make sense of problems and persevere in solving them.

2) Reason abstractly and quantitatively.

3) Construct viable arguments and critique the reasoning of others.

4) Model with mathematics.

5) Use appropriate tools strategically.

6) Attend to precision.

7) Look for and make use of structure.

8) Look for and express regularity in repeated reasoning.

This icon indicates that the slide contains activities created in Flash. These activities are not editable.

This icon indicates teacher's notes in the Notes field.

Vertical regions

Inequalities can be represented by **regions** on a graph.

A region is an area where all the points obey a given rule.

Give the coordinates of three points that satisfy $x \geq 2$.
How would you graph the region $x \geq 2$?

Some example coordinates are: (4, 1), (6, 5) and (3, –2).

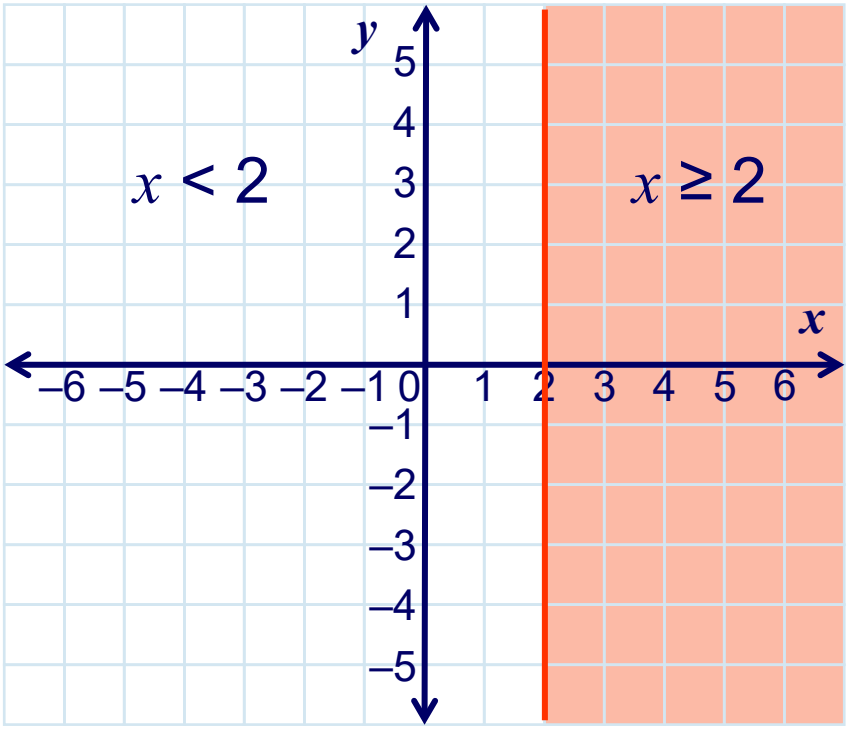
The graph needs to show the area where the x-coordinate of every point is greater than 2.

When graphing inequalities, we shade the desired area.

We can draw the line $x = 2$ and shade the region to its right.

Vertical regions

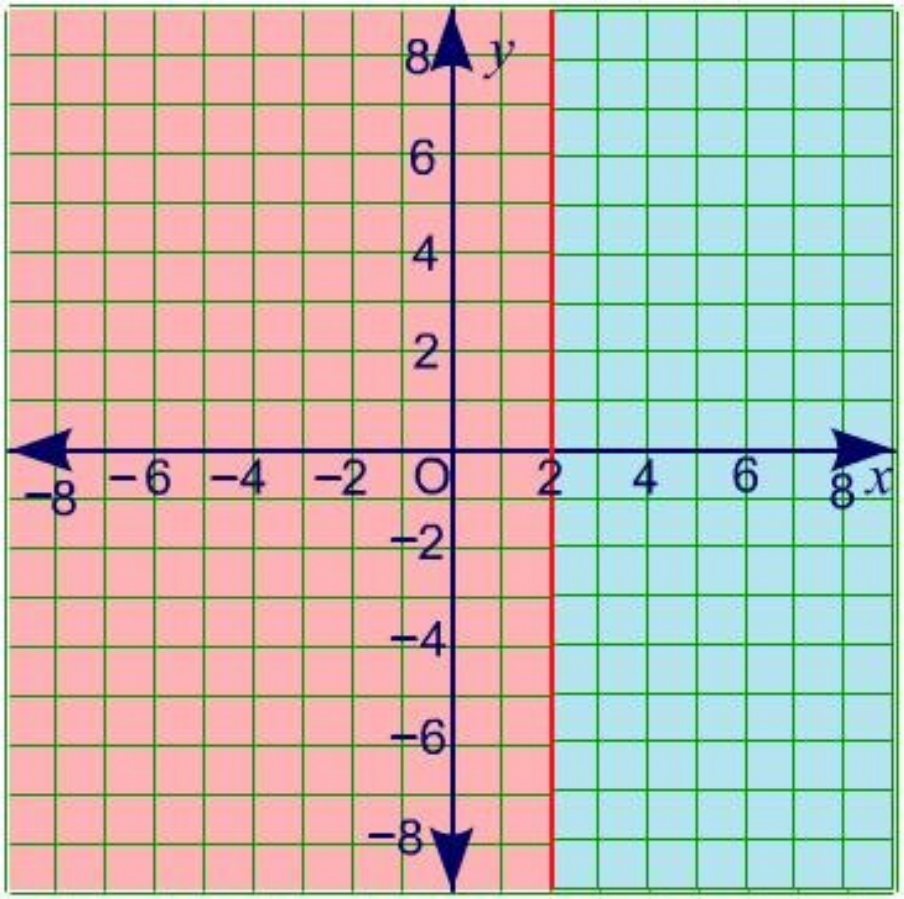
We can represent all the points where the x-coordinate is equal to 2 with the line $x = 2$.



The line $x = 2$ and the region to its *right* contains every point where $x \geq 2$.

The region to the *left* of the line $x = 2$ contains every point where $x < 2$.

Vertical regions 1

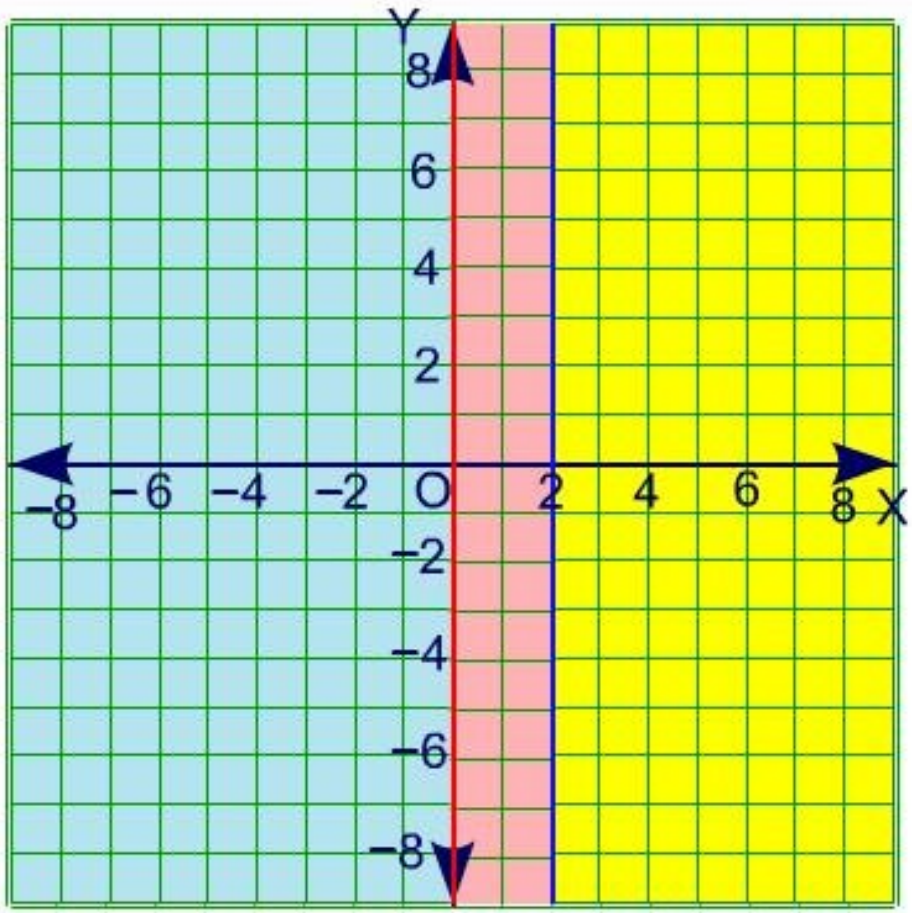


Use this activity to see how different inequalities create different regions.

$1 \; x \geq 2$

$1 \; x \leq 2$

Vertical regions 2



Use this activity to see how different inequalities create different regions.

$0 \leq x \leq 2$

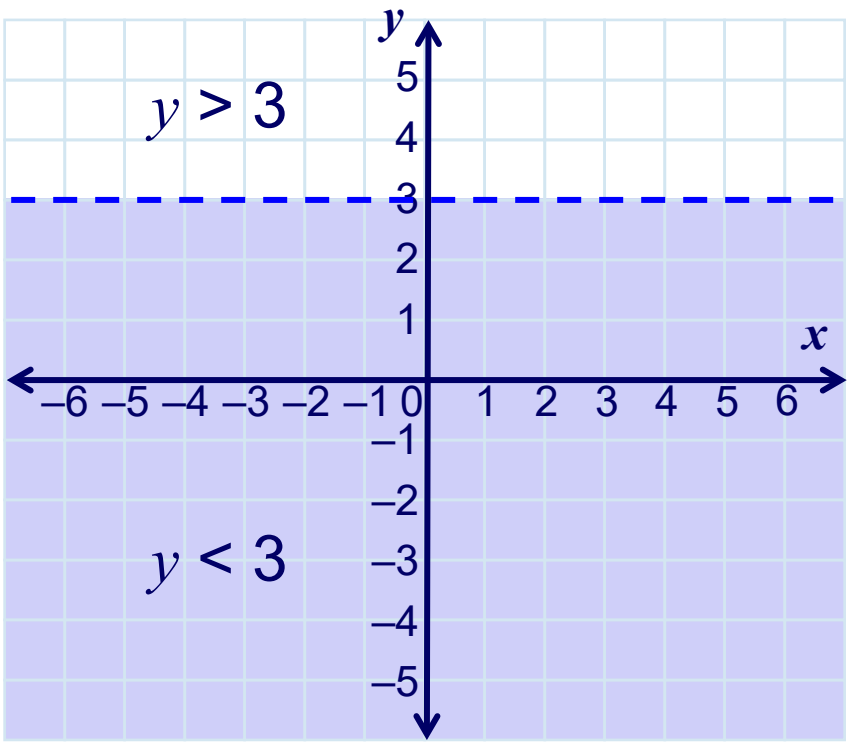
$x \leq 0$

$x \geq 2$

Horizontal regions

How do you think we can represent the region $y < 3$ on a graph?

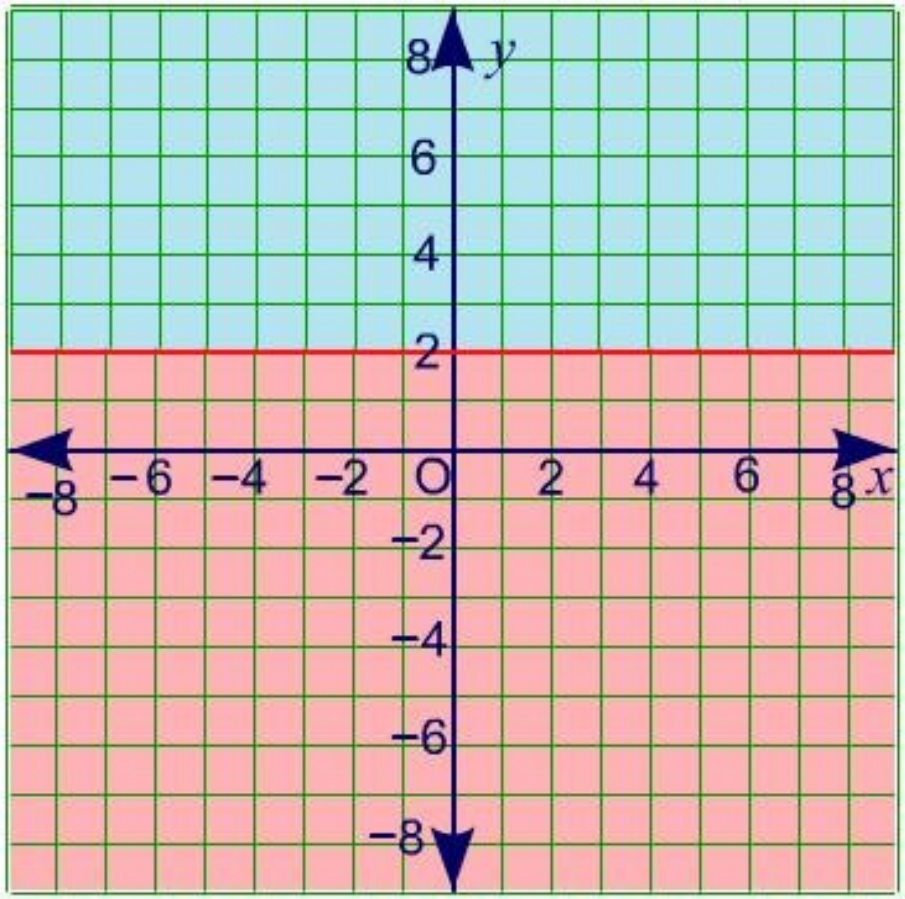
The region where $y < 3$ does *not* include points where $y = 3$ and so we draw $y = 3$ as a **dotted** line.



The region *below* the line $y = 3$ contains every point where $y < 3$.

The region *above* the line $y = 3$ contains every point where $y > 3$.

Horizontal regions 1

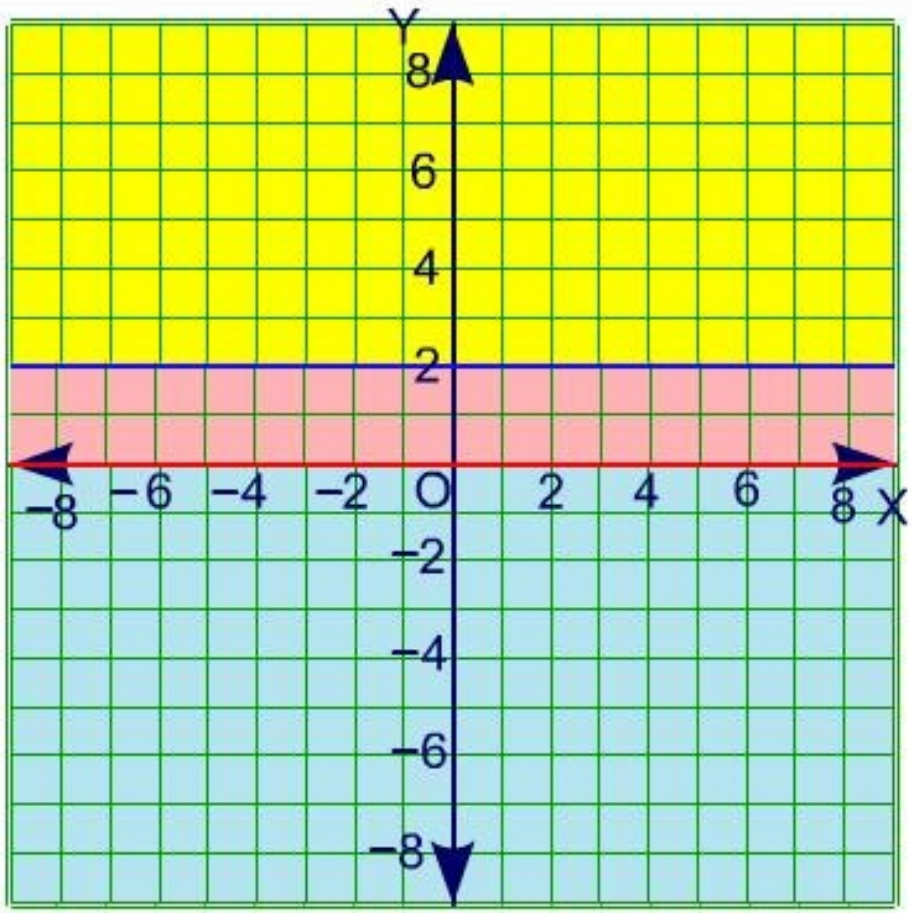


Use this activity to see how different inequalities create different regions.

$y \geq 2$

$y \leq 2$

Horizontal regions 2



Use this activity to see how different inequalities create different regions.

$0 \leq y \leq 2$

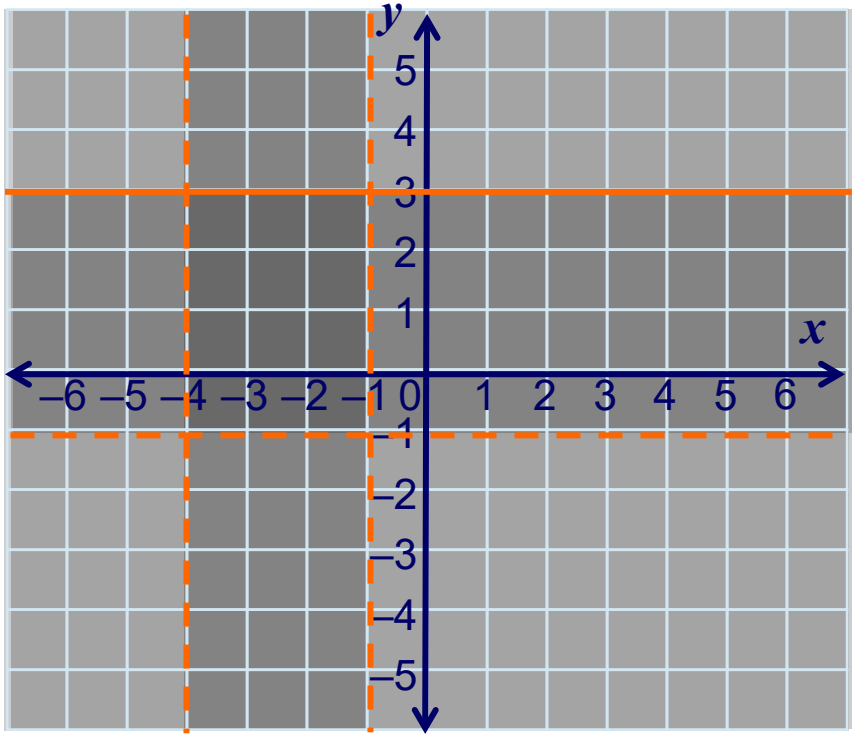
$y \leq 0$

$y \geq 2$

Horizontal and vertical regions combined

When several regions are shown on the same graph, we usually shade in the desired regions.

This is so that the required area where the regions overlap can be identified; it is the darkest area.



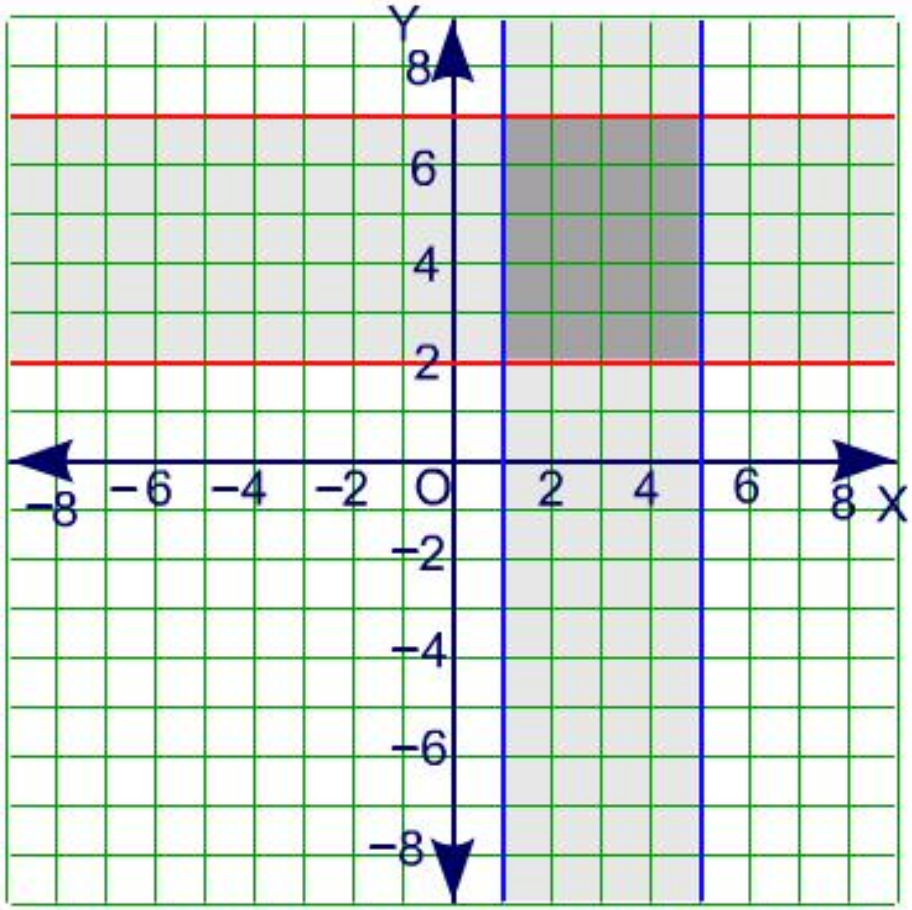
For example, to graph the region where $-4 < x < -1$ and $-1 < y \leq 3$,

1) shade in the regions $x > -4$ and $x < -1$

2) shade in the regions $y > -1$ and $y \leq 3$.

The darkest region is the solution.

Combining regions



Use this activity to see how different inequalities create different regions.

$2 \leq y \leq 7$

$1 \leq x \leq 5$

The language of inequalities

Many real-life situations require us to use inequalities to describe quantities. The phrases in this activity are often used when speaking of numbers in a certain context that have a range of possible values. It's important to recognize how these phrases can be translated into math notation using inequalities to help us set up and solve a problem!

Press **start** to begin.

start

Summer job

To earn money for college, James has taken a summer job selling ice cream from a bicycle at the park.

Here are his notes about the time and money involved:

Summer season starts on June 1st and ends on September 1st, so I have at most 3 months (12 weeks) to work.

I can earn a maximum of $2,000 during the summer in this job. Before I start, I must prepare my bicycle to hold ice cream, which will cost me $250 at most, and take no more than two weeks.

Draw a graph to help visualize James' situation. Discuss how altering certain constraints would affect his opportunity (in time *or* money).

Summer job