Learning Objective

Today, we will graph[1] a linear inequality.

[1] on the *x* and *y* axis

CFU

What are we going to do today? **We will graph a linear inequality.**

What are we graphing? **We will be graphing a linear inequality.**

What are we going to do with a linear inequality? **We will graph a linear inequality.**

Activate (or provide) Prior Knowledge

Tell whether each ordered pair is a solution to $2x - 3y = 10$.

(2, -2)

$2x - 3y = 10$

$2(2) + -3(-2) = 10$

$4 + 6 = 10$ ✓

(3, -1)

$2x - 3y = 10$

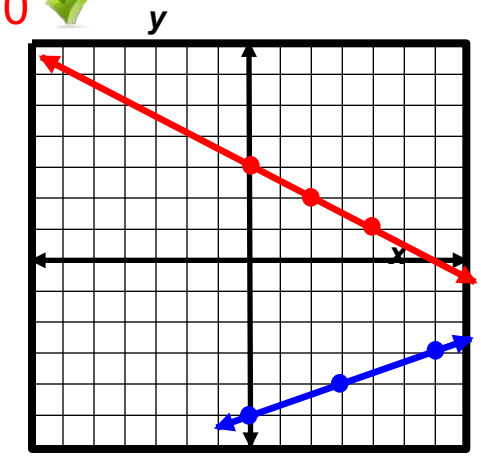
$2(3) + -3(-1) = 10$

$6 + 3 \neq 10$ ✗

Graph the equation:

$y = -\frac{1}{2}x + 3$ $\qquad$ $y = mx + b$

$m = -\frac{1}{2}, b = 3$



$y = \frac{1}{3}x - 5$

$m = \frac{1}{3}, b = -5$

CFU

Determine if the ordered pair is a solution to the equation. How do you determine an ordered pair is a solution to an equation? Graph a linear equation. How do you graph a linear equation? We have already learned how to determine solutions and graph linear equations. Today, we will be solving and graphing linear inequalities.

Algebra I 6.0

Students graph a linear equation and compute the *x*- and *y*-intercepts. They are also able to sketch the region defined by linear inequality.

A **linear inequality** is similar to a linear equation, but the equal sign is replaced with an inequality symbol: >, <, ≥ or ≤. $2x+3y>5$ $y \le -5x+3$

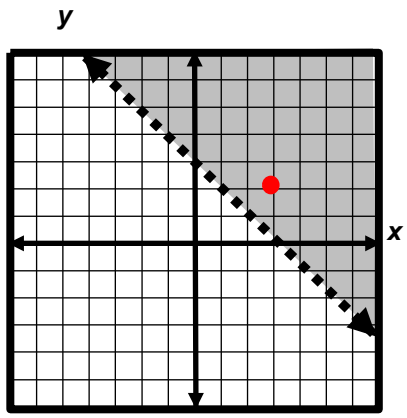
The **solutions to a linear inequality** can be shown as a shaded region that represents the ordered pairs which make the inequality true. The boundary line of the region is the graph of the related equation.

Example:
To graph a linear inequality:

Remember→ multiplying and dividing by a negative means you have to reverse the direction of the inequality.

Step #1: Solve the inequality for *y* (slope-intercept form) if necessary.
Step #2: Graph the boundary line. Use a solid line for ≤ or ≥. Use a dashed line for < or >.
Step #3: Shade above the line for *y* > or *y* ≥. Shade below the line for *y* < or *y* ≤.
Step #4: Substitute one ordered pair from the shaded region to check.

$$3x+2y>6$$
$$-3x \qquad -3x$$
$$2y>-3x+6$$
$$\frac{2y}{2}>\frac{-3x}{2}+\frac{6}{2}$$
$$y>-\frac{3}{2}x+3$$

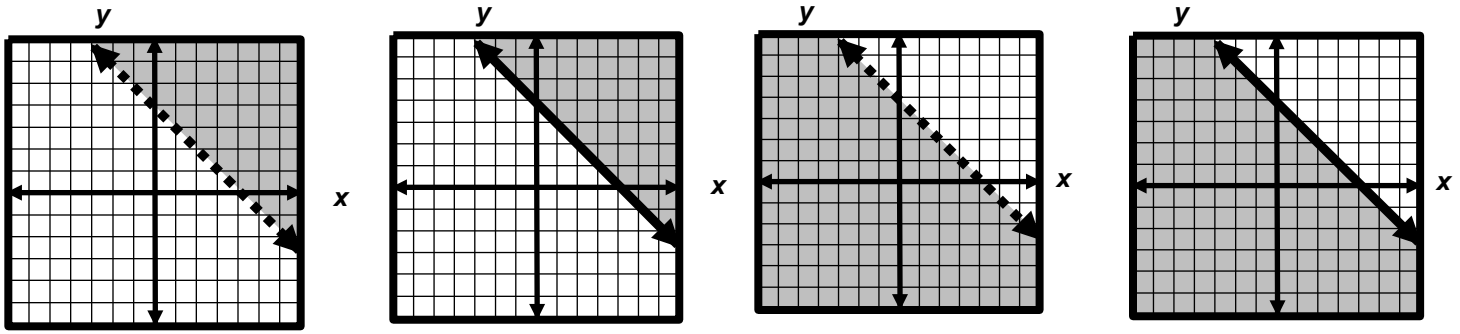


$$3x+2y>6$$
$$3(3)+2(2)>6$$
$$9+4>6$$ ✓

Concept Development

A **linear inequality** is similar to a linear equation, but the equal sign is replaced with an inequality symbol: >, <, ≥ or ≤.

The **solutions to a linear inequality** can be shown as a shaded region that represents the ordered pairs which make the inequality true. The boundary line of the region is the graph of the related equation.



$y > -1x + 4$	$y \geq -1x + 4$	$y < -1x + 4$	$y \leq -1x + 4$
Dashed	Solid	Dashed	Solid
Above	Above	Below	Below

CFU

What is a linear inequality? A linear inequality is similar to a linear equation, but the equal sign is replaced with an inequality symbol: >, <, ≥ or ≤.

What does it the shaded region represent? The shaded region represents the ordered pairs which make the inequality true.

Which two inequality symbols would be graphed with a solid line? A. >, <B. ≥, ≤

Which two inequality symbols would have shaded regions above the line? A. >, ≥B. <, ≤

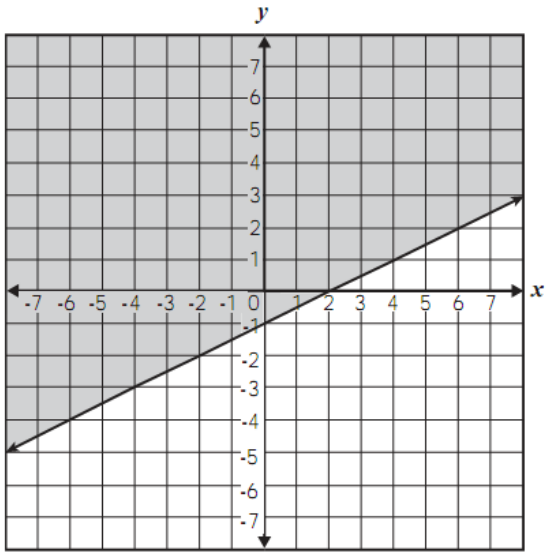
Importance

It is important to learn how to graph a linear inequality because:

• *it will assist you in making decisions where there are many options with limitations.*

• *it is tested on the CST.*

24 **Which inequality is shown on the graph below?**



A $y < \frac{1}{2}x - 1$

B $y \leq \frac{1}{2}x - 1$

C $y > \frac{1}{2}x - 1$

D $y \geq \frac{1}{2}x - 1$

CSA10130

CFU

Does anyone else have another reason why it is important to graph a linear inequality? (pair-share) Why is it important to graph a linear inequality? You may give me one of my reasons or one of your own. Which reason means the most to you? Why?

The **solutions to a linear inequality** can be shown as a shaded region that represents the ordered pairs which make the inequality true. The boundary line of the region is the graph of the related equation.

Graph a linear inequality.

Step #1: Solve the inequality for *y* (slope-intercept form) if necessary.
Step #2: Graph the boundary line. Use a solid line for ≤ or ≥. Use a dashed line for < or >.
Step #3: Shade above the line for *y* > or *y* ≥. Shade below the line for *y* < or *y* ≤.
Step #4: Substitute one ordered pair from the shaded region to check.

Remember→ multiplying and dividing by a negative means you have to reverse the direction of the inequality.

1. Solve the inequality for *y* (slope-intercept form) if necessary.

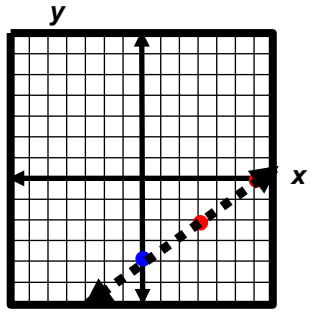
$y > \frac{2}{3}x - 4$

Already in slope-intercept form.

2. Graph the boundary line. Use a solid line for ≤ or ≥. Use a dashed line for < or >.

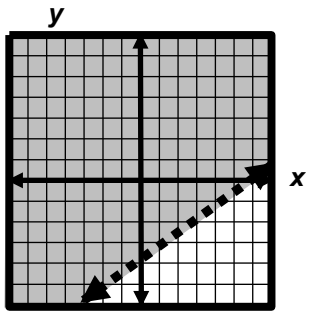
$y > \frac{2}{3}x - 4 \qquad m = \frac{2}{3}, b = -4$

> means to graph a dashed line



3. Shade above the line for *y* > or *y* ≥. Shade below the line for *y* < or *y* ≤.

> means to shade ABOVE the line



4. Substitute one ordered pair from the shaded region to check.

Choose (0,0) for test

$y > \frac{2}{3}x - 4$

$0 > \frac{2}{3}(0) - 4$

$0 > -4$ ✓

CFU - How did I solve for the inequality? How did I know whether to use a solid line or a dashed line? How did I know which side of the line to shade? How do I know that my answer is correct?

Skill Development/Guided Practice (continued)

The **solutions to a linear inequality** can be shown as a shaded region that represents the ordered pairs which make the inequality true. The boundary line of the region is the graph of the related equation.

Graph a linear inequality.

Step #1: Solve the inequality for *y* (slope-intercept form) if necessary.
Step #2: Graph the boundary line. Use a solid line for ≤ or ≥. Use a dashed line for < or >.
Step #3: Shade above the line for *y* > or *y* ≥. Shade below the line for *y* < or *y* ≤.
Step #4: Substitute one ordered pair from the shaded region to check.

Remember→ multiplying and dividing by a negative means you have to reverse the direction of the inequality.

1. Solve the inequality for *y* (slope-intercept form) if necessary.

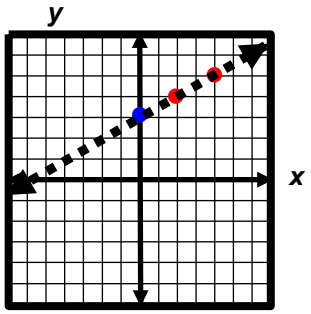
$y < \frac{1}{2}x + 3$

Already in slope-intercept form.

2. Graph the boundary line. Use a solid line for ≤ or ≥. Use a dashed line for < or >.

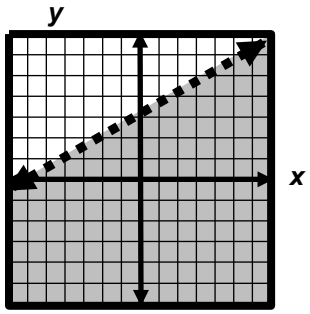
$y < \frac{1}{2}x + 3$ $\quad m = \frac{1}{2}, b = 3$

< means to graph a dashed line



3. Shade above the line for *y* > or *y* ≥. Shade below the line for *y* < or *y* ≤.

< means to shade BELOW the line



4. Substitute one ordered pair from the shaded region to check.

Choose (0,0) for test

$y < \frac{1}{2}x + 3$

$0 < \frac{1}{2}(0) + 3$

$0 < 3$ ✓

CFU – Do Step #1 and show. Do Step #2… How did you solve for the inequality? How did you know whether to use a solid line or a dashed line? How did you know which side of the line to shade? Which step is the hardest for you? Why?

The **solutions to a linear inequality** can be shown as a shaded region that represents the ordered pairs which make the inequality true. The boundary line of the region is the graph of the related equation.

Graph a linear inequality.

Step #1: Solve the inequality for *y* (slope-intercept form) if necessary.
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Step #4: Substitute one ordered pair from the shaded region to check.

Remember→ multiplying and dividing by a negative means you have to reverse the direction of the inequality.

1. Solve the inequality for *y* (slope-intercept form) if necessary.

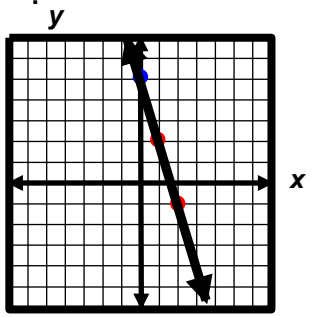
$$-6x-2y \geq -10$$
$$+6x \qquad +6x$$
$$-2y \geq 6x-10$$
$$\frac{-2y}{-2} \leq \frac{6x}{-2}+\frac{-10}{-2}$$
$$y \leq -3x+5$$

Dividing by a negative – reverse the inequalities

2. Graph the boundary line. Use a solid line for ≤ or ≥. Use a dashed line for < or >.

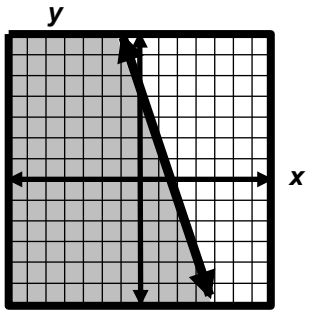
$y \leq -3x+5 \quad m=\frac{-3}{1}, b=5$

≤ means to graph a solid line



3. Shade above the line for *y* > or *y* ≥. Shade below the line for *y* < or *y* ≤.

> means to shade BELOW the line



4. Substitute one ordered pair from the shaded region to check.

$$-6x-2y \geq -10$$

Choose (0,0) for test

$$-6(0)-2(0) \geq -10$$
$$0 \geq 8$$ ✓

CFU - How did I solve for the inequality? How did I know whether to use a solid line or a dashed line? How did I know which side of the line to shade? How do I know that my answer is correct?

Students graph a linear equation and compute the *x*- and *y*-intercepts. They are also able to sketch the region defined by linear inequality.

The **solutions to a linear inequality** can be shown as a shaded region that represents the ordered pairs which make the inequality true. The boundary line of the region is the graph of the related equation.

Graph a linear inequality.

Step #1: Solve the inequality for *y* (slope-intercept form) if necessary.
Step #2: Graph the boundary line. Use a solid line for ≤ or ≥. Use a dashed line for < or >.
Step #3: Shade above the line for *y* > or *y* ≥. Shade below the line for *y* < or *y* ≤.
Step #4: Substitute one ordered pair from the shaded region to check.

Remember→ multiplying and dividing by a negative means you have to reverse the direction of the inequality.

1. Solve the inequality for *y* (slope-intercept form) if necessary.

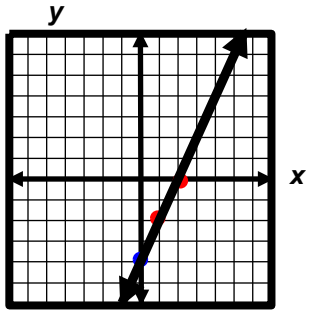
$$4x - 2y \le 8$$
$$-4x \qquad -4x$$
$$-2y \le -4x + 8$$
$$\frac{-2y}{-2} \ge \frac{-4x}{-2} + \frac{8}{-2}$$
$$y \ge 2x - 4$$

Dividing by a negative – reverse the inequalities

2. Graph the boundary line. Use a solid line for ≤ or ≥. Use a dashed line for < or >.

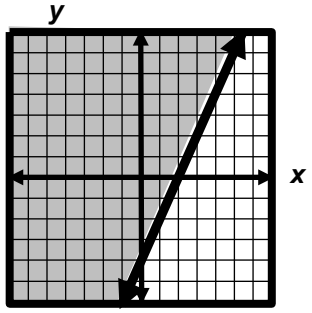
$y \ge 2x - 4$ $\quad m = \frac{2}{1}, b = -4$

≥ means to graph a solid line



3. Shade above the line for *y* > or *y* ≥. Shade below the line for *y* < or *y* ≤.

≥ means to shade ABOVE the line



4. Substitute one ordered pair from the shaded region to check.

Choose (0,0) for test

$$4x - 2y \le 8$$
$$4(0) - 2(0) \le 8$$
$$0 \le 8$$ ✓

CFU – Do Step #1 and show. Do Step #2… How did you solve for the inequality? How did you know whether to use a solid line or a dashed line? How did you know which side of the line to shade? How did you verify your shading?

Closure

1. What is a linear inequality?

A linear inequality is similar to a linear equation, but the equal sign is replaced with an inequality symbol.

2. What does the shaded region of the graph represent?

The shaded region represents the solutions of the linear inequality.

3. What did you learn today about graphing a linear inequality? Why is that important to you?

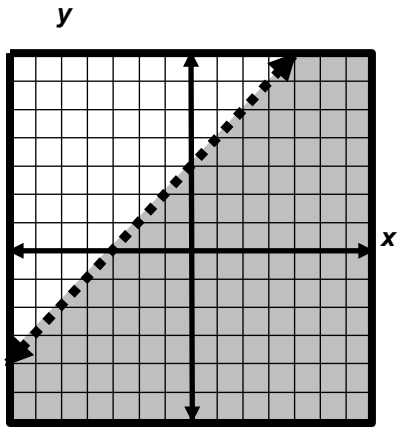
4. Graph the linear inequality below.

Step #1: Solve the inequality for *y* (slope-intercept form) if necessary.
Step #2: Graph the boundary line. Use a solid line for ≤ or ≥. Use a dashed line for < or >.
Step #3: Shade above the line for *y* > or *y* ≥. Shade below the line for *y* < or *y* ≤.
Step #4: Substitute one ordered pair from the shaded region to check.

$y < 1x + 3$

$y < \frac{1}{1}x + 3$

$m = \frac{1}{1}, b = 3$



$2x + y \geq -2$

$-2x \qquad -2x$

$y \geq -2x - 2$

$y \geq -2x - 2$

$m = -2, b = -2$