Tell whether the value is a solution of the inequality.

1. $4x > 11$; $x = 3$ — $4(3) > 11$, $12 > 11$
2. $16 \geq 4y$; $y = 4$ — $16 \geq 4(4)$, $16 \geq 16$
3. $17x \geq 15$; $x = 0$ — $17(0) \geq 15$, $0 \geq 15$, NO
4. $-7x < 9$; $x = 6$ — $-7(6) < 9$, $-42 < 9$
5. $-7b < 25$; $b = -4$ — NO — $-7(-4) < 25$, $28 < 25$
6. $x + \frac{2}{9} > 0$; $x = -1$ — $x + \frac{2}{9} > 0$, $-1 + \frac{2}{9} > 0$, $-\frac{9}{9} + \frac{2}{9} > 0$, $-\frac{7}{9} > 0$

Warm Up

- Substitution
  - Substitute the given value
  - determine if the resulting inequality is true

Solve the literal equation for *x*.

1. $y = 3x - 9x$ — $y = -6x$, $-y/6 = x$
2. $a = x - 7xz$ — $x = \frac{a}{1-7z}$, $\frac{a}{1-7z} = \frac{x(1-7z)}{1-7z}$
3. $y = 3x - rx - 7$ — $y + 7 = x(3 - r)$, $\frac{y+7}{3-r} = x$
4. $sx - tx = r$ — $x(s - t) = r$, $x = r/s - t$
5. $11 + 6x + 3kx = y$ — $y - 11 = 6x + 3kx$, $y - 11 = x(6 + 3k)$, $\frac{y-11}{6+3k} = x$
6. $C = 86x - 59$ — $C + 59 = 86x$, $\frac{C+59}{86} = x$

Cumulative Warm Up

- Solving a literal equation requires us to move terms around to make the equation look different.
- Combine like terms
- Solve for given variable

Essential Question

How can you graph a linear inequality in two variables?

- A solution of a linear inequality in 2 variables is an ordered pair (x, y) that makes the inequality true.
- The graph shows all the solutions of the inequality in a coordinate plane

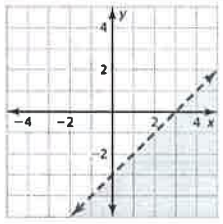
Essential Question

What you will learn:

- Check solutions of linear inequalities
- Graph linear inequalities in two variables
- Use linear inequalities to solve real world problems.

Work with a partner.

a. Write an equation represented by the dashed line.



b. The solutions of an inequality are represented by the shaded region. In words, describe the solutions of the inequality.

c. Write an inequality represented by the graph. Which inequality symbol did you use? Explain your reasoning.

Exploration 1

a. $y = x - 3$

b. all ordered pairs below the graph of $y = x - 3$

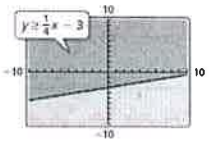
c. $y < x - 3$ the point $(4, 0)$ is in the shaded region, and to make the inequality true for that point the $<$ symbol is needed.

Work with a partner.

Use a graphing calculator to graph $y \geq \frac{1}{4}x - 3$.

a. Enter the equation $y = \frac{1}{4}x - 3$ into your calculator.

b. The inequality has the symbol $\geq$. So, the region to be shaded is above the graph of $y = \frac{1}{4}x - 3$, as shown. Verify this by testing a point in this region, such as (0, 0), to make sure it is a solution of the inequality.



Exploration 2

- use graphing technology
- when given a point such as $(0, 0)$ → substitute it in and see if the inequality is true

Because the inequality symbol is *greater than or equal to*, the line is solid and not dashed. Some graphing calculators always use a solid line when graphing inequalities. In this case, you have to determine whether the line should be solid or dashed, based on the inequality symbol used in the original inequality.

Exploration 2B

$>$, $<$ dashed line

$\geq$, $\leq$ solid line

Work with a partner. Graph each linear inequality in two variables. Explain your steps. Use a graphing calculator to check your graphs.

a. $y > x + 5$ **b.** $y \leq -\frac{1}{2}x + 1$ **c.** $y \geq -x - 5$

Exploration 3

* Student practice

- Treat like an equation
- find $y = mx + b$
- use y-intercept
- Slope to graph
- test point to verify which side to shade

Tell whether the ordered pair is a solution of the inequality.

a. $2x + y < -3$; $(-1, 9)$ **b.** $x - 3y \geq 8$; $(2, -2)$

x y

$2(-1) + 9 < -3$

$-2 + 9 < -3$

$7 < -3$

false

x y

$2 - 3(-2) \geq 8$

$2 + 6 \geq 8$

$8 \geq 8$

true

Example 1

- Use x and y values given
- Substitute in
- Is inequality true?

Tell whether the ordered pair is a solution of the inequality.

1. $x + y > 0$; $(-2, 2)$ **2.** $4x - y \geq 5$; $(0, 0)$

3. $5x - 2y \leq -1$; $(-4, -1)$ **4.** $-2x - 3y < 15$; $(5, -7)$

Monitoring Progress 1-4

* Student practice

Core Concept

Graphing a Linear Inequality in Two Variables

Step 1 Graph the boundary line for the inequality. Use a dashed line for $<$ or $>$. Use a solid line for $\leq$ or $\geq$.

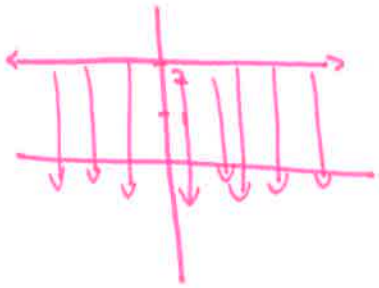
Step 2 Test a point that is not on the boundary line to determine whether it is a solution of the inequality.

Step 3 When the test point is a solution, shade the half-plane that contains the point. When the test point is *not* a solution, shade the half-plane that does *not* contain the point.

Core Concept

- Graph just like a linear equation
- Choose dashed / solid line
- Pick test point
- If test point makes true statement, shade side w/ test point. If false shade side w/o test point

Graph $y \leq 2$ in a coordinate plane.



Example 2

- solid line because $\leq$
- use (0,0) for test point

$y \leq 2$

$0 \leq 2$

- true statement → shade on the side that has the test point

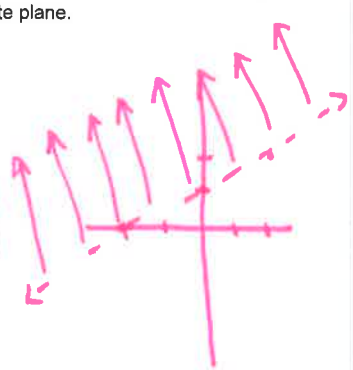
Graph $-x + 2y > 2$ in a coordinate plane.

$-x + 2y > 2$

$+x \quad +x$

$\frac{2y}{2} > \frac{x}{2} + \frac{2}{2}$

$y > \frac{1}{2}x + 1$



Example 3

- dashed line because $>$
- use (0,0) for test point

$-x + 2y > 2$

$-0 + 2(0) > 2$

$0 > 2$ false

- Since test point creates false inequality, shade side that does not include test point

Graph the inequality in a coordinate plane.

5. $y > -1$

6. $x \leq -4$

7. $x + y \leq -4$

8. $x - 2y < 0$

Monitoring Progress 5-8

- Student practice
- Graph each on a different piece of paper

You can spend at most \$10 on grapes and apples for a fruit salad. Grapes cost \$2.50 per pound, and apples cost \$1 per pound. Write and graph an inequality that represents the amounts of grapes and apples you can buy. Identify and interpret two solutions of the inequality.

Cost per lb grapes · Pounds grapes + Cost per lb Apple · lb of apples ≤ Amount to spend

$2.50x + 1y \leq 10$

Example 4

- Can graph using x and y-intercepts
- remember when line
  Crosses x-axis $y = 0$
  Crosses y-axis $x = 0$

9. You can spend at most \$12 on red peppers and tomatoes for salsa. Red peppers cost \$4 per pound, and tomatoes cost \$3 per pound. Write and graph an inequality that represents the amounts of red peppers and tomatoes you can buy. Identify and interpret two solutions of the inequality.

$y \leq -\frac{4}{3}x + 4$

Monitoring Progress 9

- Student practice

Phone Message: Write a brief phone message that you would leave for a friend who missed today's class. Explain how to graph a linear inequality in two variables.

Closure