TOPIC 8

LESSON 8.4b

Be Greater Than

7.EE.4b

Objective

Solving Inequalities with Incerse Operations

Warm-Up

Graph each inequality on a number line.

1. $x > 6$

2. $x \geq 2\frac{1}{2}$

3. $x < 6.2$

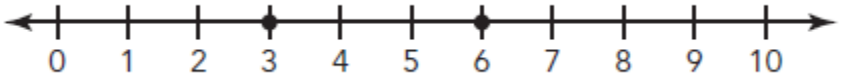
4. $x \leq 9$

EXPLORE 2

Multiplying and Dividing by Positive Numbers

Next, let's investigate what happens when each side of an inequality is multiplied or divided by the same positive number.

Consider the inequality $3 < 6$.



1. Perform each operation to the numbers 3 and 6. Then, plot the new values on the number line. Finally, write a corresponding inequality statement.

a. Multiply each number by $\frac{1}{2}$.

$3\left(\frac{1}{2}\right)$ _____ $6\left(\frac{1}{2}\right)$

b. Multiply each number by 2.

$3(2)$ _____ $6(2)$

c. Divide each number by $\frac{1}{2}$.

$3 \div \frac{1}{2}$ _____ $6 \div \frac{1}{2}$

or

$\frac{3}{\frac{1}{2}}$ _____ $\frac{6}{\frac{1}{2}}$

e. Divide each number by 2.

$3 \div 2$ _____ $6 \div 2$ or $\frac{3}{2}$ _____ $\frac{6}{2}$

f. Divide each number by 3.

$3 \div 3$ _____ $6 \div 3$ or $\frac{3}{3}$ _____ $\frac{6}{2}$

2. When you multiply the same positive number to each side of the inequality or divide the same positive number from each side of the inequality, what do you notice about the resulting inequality symbol?

_____

_____

_____

3. Identify the constraints of the value a that makes Robin's claim correct.

Robin

No matter what positive number I multiply to or divide from both sides of the inequality, the relationship between the two sides of the inequality stays the same:

$$3 < 6$$

$$3(a) < 6(a)$$

$$\frac{3}{a} < \frac{6}{a}$$

4. Consider the inequality $2x < 6(2)$.
a. Write an inequality to describe the possible values of x.

_____

b. What could you do to both sides of the original inequality to determine your answer to part (a)?

5. Suppose you have the inequality $2x < 6$. Determine the possible values of x. Explain your reasoning.

6. Michelle is 3 times as old as her sister Beth.
For each question, write and solve an equation or inequality to describe Beth's possible ages. Then, graph the solution set on the number line.
a. How old will Beth be when Michelle is at least 27 years old?

b. How old will Beth be when Michelle is younger than 30 years old?

c. How old will Beth be when Michelle is 42 years old?

7. Solve each inequality and graph the solution set on the number line.

a. $10x \geq 45$

b. $\frac{x}{3} \leq 21$

c. $3 < x \div 8$

8. Choose one of the inequalities from Question 7 and write a real-world situation that can be modeled by the algebraic statement.

EXPLORE 3

Multiplying and Dividing by Negative Numbers

Finally, let's investigate what happens when each side of an inequality is multiplied or divided by the same negative number.

Consider the inequality $3 < 6$.

1. Perform each operation to the numbers 3 and 6. Then, plot the new values on the number line. Finally, write a corresponding inequality statement.

a. Multiply each number by $-\frac{1}{2}$.

$3\left(-\frac{1}{2}\right)$ _____ $6\left(-\frac{1}{2}\right)$

b. Multiply each number by −2.

3(−2) _____ 6(−2)

c. Multiply each number by −3.

3(−3) _____ 6(−3)

d. Divide each number by $-\frac{1}{2}$.

$3 \div \left(-\frac{1}{2}\right)$ _____ $6 \div \left(-\frac{1}{2}\right)$ or $\frac{3}{\left(-\frac{1}{2}\right)}$ _____ $\frac{6}{\left(-\frac{1}{2}\right)}$

e. Divide each number by −2.

$3 \div (-2)$ _____ $6 \div (22)$ or $\frac{3}{(-2)}$ _____ $\frac{6}{(-2)}$

f. Divide each number by −3.

$3 \div (-3)$ _____ $6 \div (-3)$ or $\frac{3}{(-3)}$ _____ $\frac{6}{(-3)}$

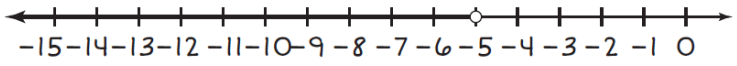
2. When you multiply the same negative number to each side of the inequality or divide the same negative number from each side of the inequality, what do you notice about the resulting inequality symbol?

3. Jenna and Brendan are trying to solve $-4x < 20$. Consider their solutions and explanations.

Brendan's Solution

$-4x < 20$

$x < -5$

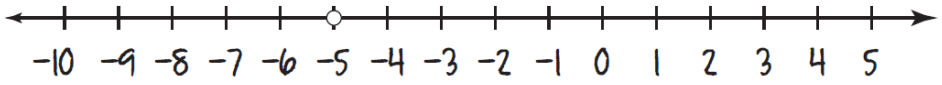


I divided both sides by -4 to solve the inequality.

Jenna's Solution

$-4x < 20$

$x > -5$



I know that when I multiply or divide any given number by a negative number, I have to pay attention to the sign of my answer. So when I divide both sides of the inequality by − 4, the inequality sign should reverse.

a. Determine who is correct. List three values from each person's solution, and verify that those solutions make the original inequality $-4x < 20$ true. What do you notice? Explain your reasoning.

Check for Brendan's solution.

Check for Jenna's solution.

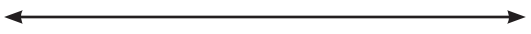
b. Circle the correct solution and explanation, and cross out the incorrect solution and explanation from Brendan's and Jenna's work.

4. Solve each inequality and graph the solution set. Then, list three values from each solution set, and verify that each value makes the original inequality true.

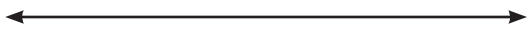
a. $8x > 16$

b. $\frac{x}{3} \leq 24$

c. $-5x < 35$



d. $\frac{x}{-2} \geq 5$



Name: _____ Date: _____ Class: _____

Homework HW

LESSON 8.4b

Be Greater Than

Objective Solving Inequalities with Incerse Operations

Practice

1. Match each inequality with the correct solution.

a. $x < -2$	i. $4x + 12 < 20$
b. $x < 2$	ii. $55 < 35 + 10x$
c. $x > -2$	iii. $-\frac{3}{2}x + 12 > 15$
d. $x > 2$	iv. $-8x < 16$

2. Solve each one-step inequality and graph the solution set on a number line.

a. $x + 7 \geq 13$	b. $-4 > x - 3$
c. $\frac{x}{4} \leq \frac{5}{2}$	d. $18.3 > 6.1x$
e. $3 < \frac{x}{-8}$	f. $-10x \geq 45$

3. Solve each two-step inequality and graph the solution set on a number line.

a. $-17 < 3 - 5x$	b. $21 - 9x \geq -6$
c. $-500 \leq 11x - 60$	d. $-x + 38 < 59$