

Warm-Up

1. The length of each side of a square is increased by 6 inches, so the perimeter is now 36 inches. Write and solve an equation to find the original length of each side of the square.

2.  $(11 + x) \frac{3}{4} = 27$       3.  $3(x - 7) = -18$

Jan 30-3:36 PM

### Solving One-Step Inequalities

**CCSS** Common Core State Standards

**7.EE.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

**7.EE.4b** Solve word problems leading to inequalities of the form  $px + q > r$  or  $px + q < r$ , where  $p$ ,  $q$ , and  $r$  are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. *For example: As a salesperson, you are paid \$50 per week plus \$3 per sale. This week you want your pay to be at least \$100. Write an inequality for the number of sales you need to make, and describe the solutions.*

Oct 14-9:15 AM

## Solving Inequalities

< VS >

**Flashback** to elementary school!

How do YOU remember which symbol is "greater than" and which is "less than?"

Gather your thoughts for 20 seconds, then share with a partner.

Jan 27-12:58 PM

What is the difference between  $<$  and  $\leq$  ?

How about  $>$  and  $\geq$  ?

Inequality means ??? equal

Jan 27-5:01 PM

Inequality in a political context:

"President Obama will make *economic inequality* a central theme of his State of the Union address on Tuesday, according to reports, highlighting the issue's emergence as a key political issue." *source: cbsnews.com 1/27/14*

Economic inequality is also known as *income inequality*. What do you think it means?



Jan 30-1:40 PM

**Start thinking about inequalities...** p. 493

**Inquiry** HOW is an inequality like an equation? How is it different?

Think for a few seconds, then hold onto that thought for a few minutes...

**School Dance** Mr. Numkena volunteered to drive Hinto and his friends to the school dance. The car can carry up to 5 people, including the driver. How many friends can ride in the car with Hinto?

What do you know? \_\_\_\_\_

What do you need to find? \_\_\_\_\_

Give a possible amount of people who could ride in Hinto's car: \_\_\_\_\_

Jan 27-1:05 PM

**Investigation 1** p. 493

The real-world situation described above can be represented by the inequality  $x + 2 \leq 5$ . Let  $x$  represent the friends that can ride with Hinto.

$x + 2 \leq 5$

You can use a balance to model and solve the inequality  $x + 2 \leq 5$ .

**Step 1** On one side of a balance, place a paper bag and  cubes to model  $x + 2$ .

**Step 2** On the other side of a balance, place  cubes. Add one cube to the bag at a time. Then complete the table.

Number of Friends, $x$	$x + 2$	Less than or equal to 5?
1	3	yes
2		
3		
4		

So, up to  friends can ride with Hinto to the school dance.

Jan 27-1:07 PM

**VOCAB:**

An inequality is a mathematical sentence that compares quantities. The table shows two examples of inequalities.

Words	Symbols
$x$ is less than two	$x < 2$
$x$ is greater than or equal to four	$x \geq 4$

To solve an inequality means to find values for the variable that make the sentence true. You can use bar diagrams to solve inequalities.

Jan 27-1:08 PM

On p. 496, click on the inequality that best describes each real-world situation.

Real-World Situation	Inequalities
Yolanda wants to score at least 84% on the next history test.	$x \leq 84$ $x \geq 84$
To see a certain movie, you must be at least 15 years old.	$n \leq 15$ $n \geq 15$
Kai has \$499 left on a music download gift card. She has a download costing \$199 in her online shopping cart. How much money does Kai have left to spend?	$x + 199 \leq 499$ $x + 199 > 499$
In some states, teens must be at least 16 years old to obtain a driver's license.	$x < 16$ $x \geq 16$ $x \leq 16$ $x \geq 16$
The Walter family budgets a maximum amount of \$125 per week for groceries. Mr. Walter already spent \$40. How much more can the Walter family spend on groceries?	$x + 40 < 125$ $x + 40 > 125$ $x + 40 \leq 125$ $x + 40 \geq 125$
Miles pays \$50 for a ticket to an amusement park. He cannot spend more than \$50. How much more money can Miles spend at the amusement park?	$x + 50 < 50$ $x + 50 > 50$ $x + 50 \leq 50$ $x + 50 \geq 50$

Jan 27-1:15 PM

**Reflect with a partner:**

**10. Model with Mathematics** Write a real-world situation that could be represented by  $x + 20 \geq 50$ .

*Now, time to write!*

**11. Inquiry** How is an inequality like an equation? How is it different?

Jan 27-1:28 PM

**Essential Question** WHAT does it mean to say two quantities are equal?

**Vocabulary** Subtraction Property of Inequality, Addition Property of Inequality

**Common Core State Standards** 7.EE.4, 7.EE.4b, Mathematical Practices 1, 2, 3, 4

**Real-World Link** p. 497

**Mali** A first class stamp can be used for letters and packages weighing thirteen ounces or less. Fisher is mailing pictures to his grandmother, and only has a first class stamp. His envelope weighs 2 ounces. Follow the steps to determine how much the pictures can weigh so that Fisher can use the stamp.

**Step 1** Let  $x$  represent the weight of the pictures. Write and solve an equation to find the maximum weight of the pictures.

weight of the envelope + weight of the pictures = maximum weight of the package

$2 + x = 13$

**Step 2** Replace the equals sign in your equation with the less than or equal to symbol,  $\leq$ .

Refer to Step 2. Name three possible values of  $x$  that will result in a true sentence.

Solve for  $x$ .

So, the maximum weight of the pictures is  ounces.

Jan 27-1:39 PM

**So, what's an inequality again?**

Oh, yeah. An inequality is a mathematical  that  quantities.

And, solving an inequality means finding values for the  that make the inequality .

The table below gives some examples of the words you might use when describing different inequalities.

Inequalities			
Words	• is less than • is fewer than	• is greater than • is more than • exceeds	• is less than or equal to • is no more than • is at most
Symbols	$<$	$>$	$\leq$ $\geq$

Jan 27-1:44 PM

Solve the one-step equation  $x + 3 = 10$

I'll wait while you do that... 

Jan 30-2:20 PM

Now, check out the following inequality.  
Compare the solution to your equation to the solution to the inequality. Tell me some things you notice...

**Examples**

**1. Solve  $x + 3 > 10$ .**

$x + 3 > 10$  Write the inequality.  
 $-3 \quad -3$  Subtract 3 from each side.  
 $x > 7$  Simplify.

Therefore, the solution is  $x > 7$ .

You can check this solution by substituting a number greater than 7 into the original inequality. Try using 8.

Check  $x + 3 > 10$  Write the inequality.  
 $8 + 3 > 10$  Replace x with 8. Is this sentence true?  
 $11 > 10$  This is a true statement. ✓

Question: Do the solutions of the equation and the inequality mean the same thing?

Jan 27-1:51 PM

The solution to an inequality is called a **SOLUTION SET**.

A "set" implies there is more than one, right? A set of tennis matches, a set of repetitions when you lift weights...

A solution set is a group of values that makes an inequality true.

**Ex:  $x > 7$  is the solution set for the inequality  $x + 3 > 10$**

Place the following values into one category or the other to tell if they are solutions of the inequality above or not solutions.

(5) (-7) (10) ( $\sqrt{144}$ ) (7)

Solutions | NOT Solutions

Jan 30-2:22 PM

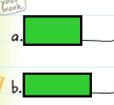
**2. Solve  $-6 \geq n - 5$ .**

$-6 \geq n - 5$  Write the inequality.

**Got It?** Do these problems to find out.

Solve each inequality.

a.  $a - 3 < 8$       b.  $0.4 + y \geq 7$



Jan 27-1:52 PM

**Graphing Solution Sets**

Graphs show all the values that are in a solution set.

$a < 5$

$a \leq 5$

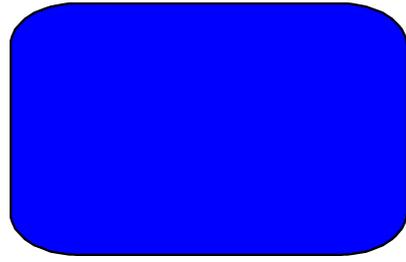
What is different about the solution sets of these two inequalities?  
What is different about their graphs?

Make your own graphic organizer to help you remember how to graph solution sets.

Jan 30-2:31 PM

**Example**

**3. Solve  $a + \frac{1}{2} < 2$ . Graph the solution set on a number line.**



Jan 27-1:52 PM

p. 500 **Write Inequalities**

Inequalities can be used to represent real-world situations. You will want to first identify a variable to represent the unknown value.

**Example**

4. Dylan has \$18 to ride go-karts and play games at the state fair. Suppose the go-karts cost \$5.50. Write and solve an inequality to find the most he can spend on games.

Words	Cost of go-kart	plus	cost of games	must be less than or equal to	total amount.
Symbols	Let $x$ = the cost of the games.				
Inequality	5.5	+	$x$	$\leq$	18

Jan 30-2:43 PM

**Guided Practice**

Solve each inequality. Graph the solution set on a number line. (Examples 1-3)

1.  $6 + h \geq 12$

2.  $14 + t > 5$

3. An elevator can hold 2,800 pounds or less. Write and solve an inequality that describes how much more weight the elevator can hold if it is currently holding 2,375 pounds. Interpret the solution. (Example 4)

4. **Building on the Essential Question** Explain when you would use addition and when you would use subtraction to solve an inequality.

**Rate Yourself!**  
Are you ready to move on?  
Shade the section that applies.

YES ? NO

For more help, go online to access a Personal Tutor.

500 Chapter 6 Equations and Inequalities

Jan 30-3:13 PM

**Ticket Out the Door**

Do the solutions  
 $x = 7$  and  $x < 7$   
have the same meaning? Explain.

Jan 27-1:53 PM

**Warm-up**

Solve and Graph.

$8 < p - 1$

$w + 5 \geq -6$

Write an inequality and solve.

Two less than a number is less than 9.

Oct 14-9:33 AM

**Solving One-Step Inequalities**

**Common Core State Standards**

7.EE.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

7.EE.4b Solve word problems leading to inequalities of the form  $px + q > r$  or  $px + q < r$ , where  $p$ ,  $q$ , and  $r$  are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. For example: As a salesperson, you are paid \$50 per week plus \$3 per sale. This week you want your pay to be at least \$100. Write an inequality for the number of sales you need to make, and describe the solutions.

Oct 14-9:15 AM

**Key Concept** **Multiplication and Division Properties of Inequality, Positive Number**

**Work Zone**

**STOP and Reflect**  
What does the inequality  $c > 0$  mean? Explain below.

**Words** The **Multiplication Property of Inequality** and the **Division Property of Inequality** state that an inequality remains true when you multiply or divide each side of an inequality by a positive number.

**Symbols** For all numbers  $a$ ,  $b$ , and  $c$ , where  $c > 0$ ,  
1. If  $a > b$ , then  $ac > bc$  and  $\frac{a}{c} > \frac{b}{c}$ .  
2. If  $a < b$ , then  $ac < bc$  and  $\frac{a}{c} < \frac{b}{c}$ .  
*These properties are also true for  $a \geq b$  and  $a \leq b$ .*

You can solve inequalities by using the Multiplication Property of Inequality and the Division Property of Inequality.

**Key Concept** **Multiplication and Division Properties of Inequality, Negative Number**

**Words** When you multiply or divide each side of an inequality by a negative number, the inequality symbol must be reversed for the inequality to remain true.

**Symbols** For all numbers  $a$ ,  $b$ , and  $c$ , where  $c < 0$ ,  
1. If  $a > b$ , then  $ac < bc$  and  $\frac{a}{c} < \frac{b}{c}$ .  
2. If  $a < b$ , then  $ac > bc$  and  $\frac{a}{c} > \frac{b}{c}$ .

**Examples**  $7 > 1$        $-4 < 16$   
 $-2(7) < -2(1)$       Reverse the symbols.       $-4 > 16$   
 $-14 < -2$        $1 > -4$

*These properties are also true for  $a \geq b$  and  $a \leq b$ .*

**STOP and Reflect**  
What does the inequality  $c < 0$  mean? Explain below.

[http://youtu.be/RPHLOmla\\_U](http://youtu.be/RPHLOmla_U)

**THIS IS VERY IMPORTANT!!**

Jan 30-3:16 PM

**Examples** p. 506

1. Solve  $8x \leq 40$ .

2. Solve  $\frac{d}{2} > 7$ .

The solution is  $d > 14$ . You can check this solution by substituting a number greater than 14 into the inequality.

**Got It?** Do these problems to find out.

a.  $4x < 40$       b.  $6 \geq \frac{x}{7}$

Jan 30-3:16 PM

**Examples** p. 507

3. Solve  $-2g < 10$ . Graph the solution set on a number line.

4. Solve  $\frac{x}{-3} \leq 4$ . Graph the solution set on a number line.

**Got It?** Do these problems to find out.

c.  $\frac{k}{-2} < 9$

Jan 27-1:55 PM

**Example**

5. Ling earns \$8 per hour working at the zoo. Write and solve an inequality that can be used to find how many hours she must work in a week to earn at least \$120. Interpret the solution.

**Words** Amount earned times number is at amount earned per hour of hours least each week.

**Variable** Let  $x$  represent the number of hours.

**Inequality**  $8 \cdot x \geq 120$

Jan 30-3:32 PM

Solve each inequality. Graph the solution set on a number line. (Examples 1-4)

1.  $-3n \leq -22$       2.  $\frac{t}{-4} < -11$

3. At a baseball game you can get a single hot dog for \$2. You have \$10 to spend. Write and solve an inequality to find the number of hot dogs you can buy. Interpret the solution. (Example 5)

4. **Building on the Essential Question** Explain when you should reverse the inequality symbol when solving an inequality.

**Rate Yourself!** How confident are you about solving multiplication and division inequalities? Check the box that applies.

For more help, go online to access a Personal Tutor.

**Work with your partner/group to complete these problems on p.508**

(answers on next slide)

Jan 30-3:33 PM

**Guided Practice** p. 508

Solve each inequality. Graph the solution set on a number line. (Examples 1-4)

1.  $-3n \leq -22$

2.  $\frac{t}{-4} < -11$

3. At a baseball game you can get a single hot dog for \$2. You have \$10 to spend. Write and solve an inequality to find the number of hot dogs you can buy. Interpret the solution. (Example 5)

4. **Building on the Essential Question** Explain when you should not reverse the inequality symbol when solving an inequality.

**Rate Yourself!** How confident are you about solving multiplication and division inequalities? Check the box that applies.

For more help, go online to access a Personal Tutor.

Jan 30-3:33 PM

**Ticket out the door...**

24.  $12p \geq -72$       25.  $\frac{t}{-7} > 10$       26.  $-8 < \frac{y}{5}$

Jan 30-3:34 PM



Oct 14-10:59 AM