

### Lesson: 6.2.5 - Supplement

Solving and Graphing Two-Step Inequalities

#### CC Standards

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

#### Objective

The students will solve two-step inequalities and graph their solutions.

#### Mathematical Practices

- #1 Make sense of problems and persevere in solving them.
- #5 Use appropriate tools strategically.
- #6 Attend to precision.
- #7 Look for and make use of structure.

#### Teacher Input

- Bellwork: Review bellwork.
- Homework: Review important problems assigned the previous night.
- Introduction: Introduce as directed on the PowerPoint.
- Lesson: Teach as directed by PowerPoint. Look at each slide for additional comments and answers. Make sure students follow along in their notes.

#### Classwork

Page 6

#### Homework

Page 7

#### Extra Practice

Print from any of the 54 inequality worksheets located at:  
<http://www.mathworksheets4kids.com/two-step-inequalities.html>

#### Closure

See last slide of PowerPoint for closure. Student will have to summarize the difference between equations and inequalities. They will have to make up 3 problems where you flip the inequality symbol and 3 problems where you do not flip the symbol.



**Equations vs. Inequalities**

- The good news is that you solve an inequality just like you do an equation.
- There are a few special things to consider with inequalities:
  - 1) We need to look **carefully** at the inequality problem because there are times when you will have to **FLIP** the inequality symbol.
  - 2) We also need to graph the solution set.
- An inequality symbol needs to be **reversed** (flipped) when you **multiply or divide** both sides of the inequality by a negative number.

Example 1:  $-2x + 5 > 15$



Example 2:  $\frac{x}{-8} + 5 \leq 13$

Look for the variable! If it is “teamed-up” with a negative number, Flip it!

**You Try #1**

Analyze each inequality. If it is an inequality where you will need to **flip** the symbol, then **circle** that inequality symbol and write above it what it will look like after the inequality has been solved. *Do not work the problems.*



(1)  $6a - 5 \leq -23$

(2)  $-x + 4 < 14$

(3)  $-\frac{r}{2} + 8 > 16$

(4)  $12 - 11a \geq 45$

(5)  $3x + 9 > -36$

(6)  $-22 < 6c + 4$

(7)  $-6t + (-4) \geq 14$

(8)  $\frac{x}{-6} + 2 \leq 8$

(9)  $5x - 3x + 2 > 12$

(10)  $5x - 8x + 4 < 16$

**Solving an Inequality where you have to reverse (flip) the symbol.**

Solve:  $-3y + 5 > 23$

$$\begin{array}{r} -5 \quad -5 \\ -3y > 18 \end{array}$$

• Subtract 5 from each side.

$$\begin{array}{r} -3y > 18 \\ -3 \quad -3 \end{array}$$

• Divide each side by **negative** 3.

$$y < -6$$

• **Reverse** the inequality sign.

• Graph the solution.

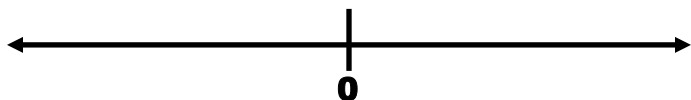
• Open circle, line to the left.





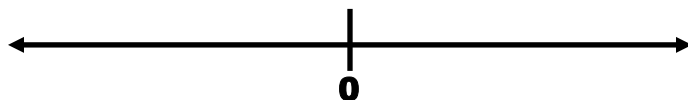
**Guided Practice #1**

$$3x + 4 \geq 16$$



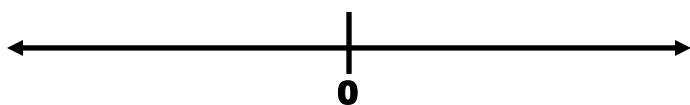
**You Try #1**

$$5 + 4x < 33$$



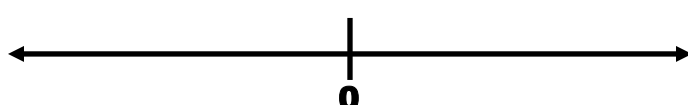
**Guided Practice #2**

$$7 - 2x > 11$$



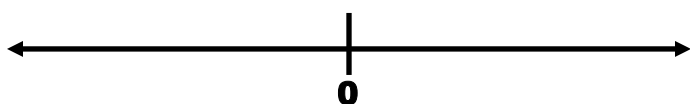
**You Try #2**

$$6 - 3x \leq 9$$



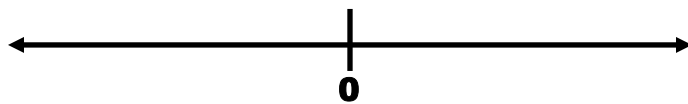
**Guided Practice #3**

$$\frac{x}{2} - 5 < -8$$



**You Try #3**

$$\frac{x}{4} + 3 \geq -7$$

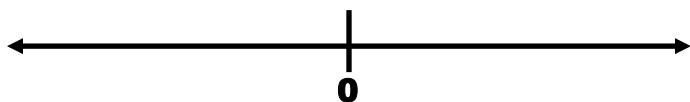




**Guided Practice #4**



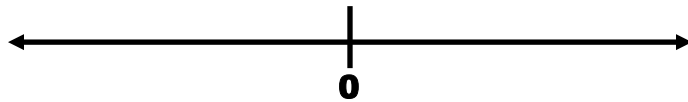
$$8 - \frac{x}{3} \leq 7$$



**You Try #4**



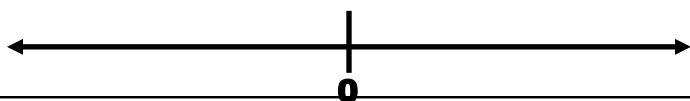
$$1 - \frac{x}{2} > -4$$



**Guided Practice #5**



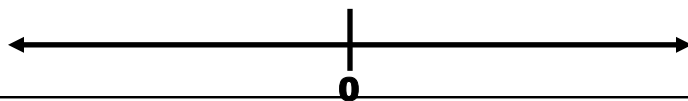
$$-k + 6 \geq 42$$



**You Try #5**



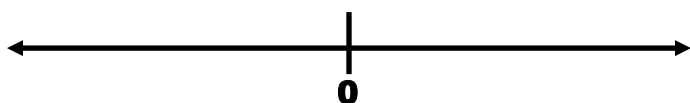
$$-m + 3 \leq -3$$



**Guided Practice #6**



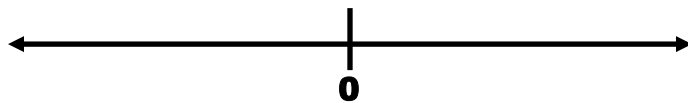
$$-2 > 2x - 10$$



**You Try #6**



$$-11 < -6x + 1$$

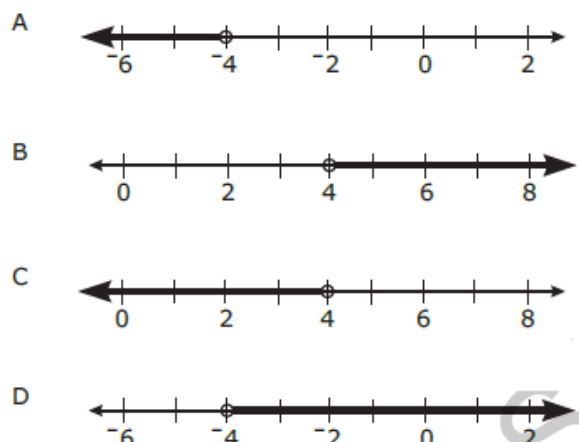




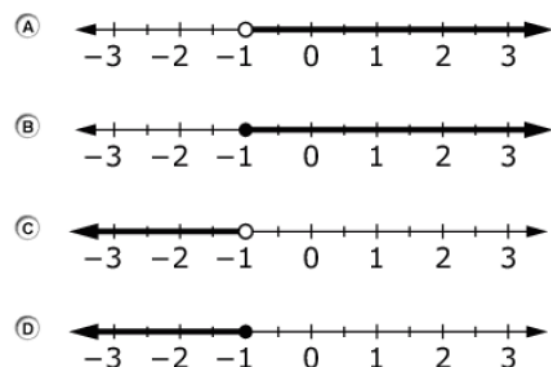
(1) What is the solution to the inequality  $-3x - 42 > 3$ ?

- A  $x > -13$
- B  $x < -13$
- C  $x > -15$
- D  $x < -15$

(2) Which choice is a graph of the solution set for  $12 - x < 8$ ?



(3) Which number line shows the solution to the inequality  $-3x - 5 < -2$ ?



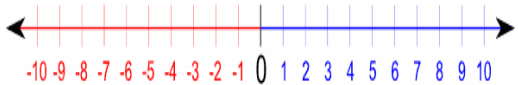
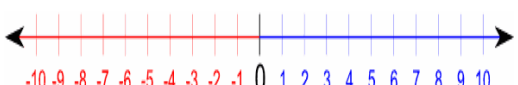
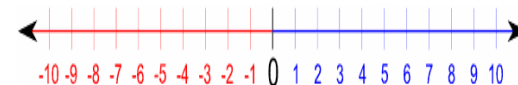
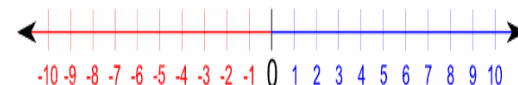
(4) Which set of numbers is included in the solution set of  $4 - 3x < -2$ ?

- A  $\{2.5, 8, 15\}$
- B  $\{-8, 0, 1.5\}$
- C  $\{-15, -8, 0\}$
- D  $\{0, 2.5, 8\}$



Name \_\_\_\_\_ Date \_\_\_\_\_ Period: \_\_\_\_\_

**Solve and Graph each inequality.**

<p>1) <math>3x + 12 \leq -9</math></p> 	<p>2) <math>\frac{x}{5} - 3 &gt; -4</math></p> 
<p>3) <math>0 \geq 5k + 15</math></p> 	<p>4) <math>9 - 2y &lt; 7</math></p> 

**Solve each inequality.**

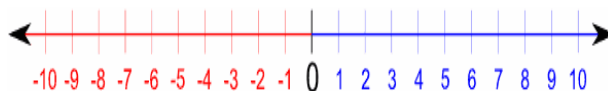
5)  $-\frac{x}{4} + 2 > 11$

6)  $6t + 7 \geq -23$

7)  $-k + 75 \leq 100$       $k \geq 25$

8) List 3 possible solutions to the inequality  $2 - 7x > 9$ .  $x < -1$  ... Answers will vary.  
{-1.5, -2, -10}

9) Graph the following inequality:  $-8 \leq x$



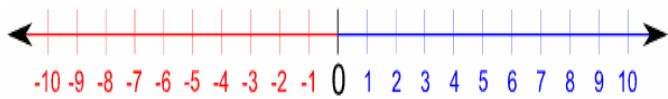
10) John solved the inequality  $3x - 5 \geq 28$  and determined that  $x$  could equal to 12. Is John correct? Explain why or why not. \_\_\_\_\_



Name \_\_\_\_\_ Date \_\_\_\_\_ Period \_\_\_\_\_

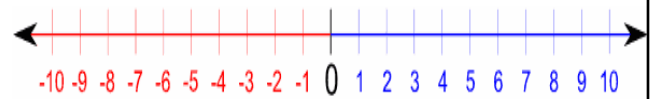
1) **Solve and Graph.**

$$2x + 4 \geq 14$$



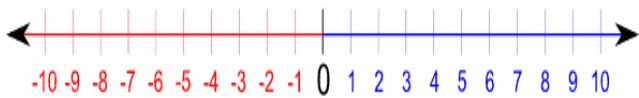
2) **Solve and Graph.**

$$\frac{x}{-3} - 3 \leq -2$$



3) **Solve and Graph.**

$$-15 < 2x - 7$$



4) **Solve for x.**

$$-24 + 7x < 11$$

5) **Solve for h.**

$$6h - 10h + 2 \geq -10$$

6) **Solve for x.**

$$-x + 5 > 23$$



 **Answer Keys** 



**Equations vs. Inequalities**

- The good news is that you solve an inequality just like you do an equation.
- There are a few special things to consider with inequalities:
  - 3) We need to look **carefully** at the inequality problem because there are times when you will have to **FLIP** the inequality symbol.
  - 2) We also need to graph the solution set.
- An inequality symbol needs to be **reversed** (flipped) when you **multiply or divide** both sides of the inequality by a negative number.

Example 1:  $-2x + 5 > 15$



Example 2:  $\frac{x}{-8} + 5 \leq 13$

Look for the variable! If it is “teamed-up” with a negative number, Flip it!

Analyze each inequality. If it is an inequality where you will need to **flip** the symbol, then **circle** that inequality symbol and write above it what it will look like after the inequality has been solved. *Do not work the problems.*



(1)  $6a - 5 \leq -23$

(2)  $-x + 4 \begin{matrix} > \\ \text{circle} \end{matrix} 14$

(3)  $-\frac{r}{2} + 8 \begin{matrix} < \\ \text{circle} \end{matrix} 16$

(4)  $12 - 11a \begin{matrix} \leq \\ \text{circle} \end{matrix} 45$

(5)  $3x + 9 > -36$

(6)  $-22 < 6c + 4$

(7)  $-6t + (-4) \begin{matrix} \leq \\ \text{circle} \end{matrix} 14$

(8)  $\frac{x}{-6} + 2 \begin{matrix} \geq \\ \text{circle} \end{matrix} = 8$

(9)  $5x - 3x + 2 > 12$

(10)  $5x - 8x + 4 \begin{matrix} > \\ \text{circle} \end{matrix} 16$

**Solving an Inequality where you have to reverse (flip) the symbol.**

Solve:  $-3y + 5 > 23$

$$\begin{array}{r} -5 \\ -5 \end{array} \quad \bullet \text{Subtract 5 from each side.}$$

$$\begin{array}{r} -3y > 18 \\ -3 & -3 \end{array}$$

$$\bullet \text{Divide each side by negative 3.}$$

$$y < -6 \quad \bullet \text{Reverse the inequality sign.}$$

 $\bullet$  Graph the solution.

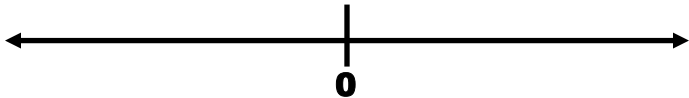
Open circle, line to the left.





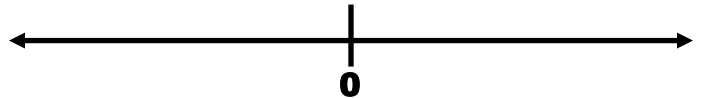
**Guided Practice #1**

$$3x + 4 \geq 16 \quad x \geq 4$$



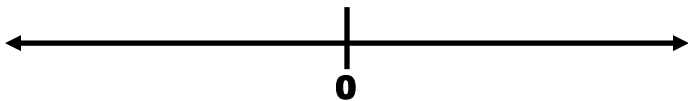
**You Try #1**

$$5 + 4x < 33 \quad x < 7$$



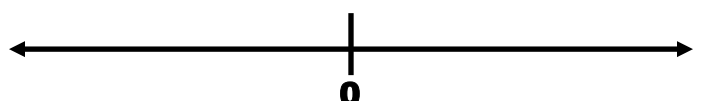
**Guided Practice #2**

$$7 - 2x > 11 \quad x < -2$$



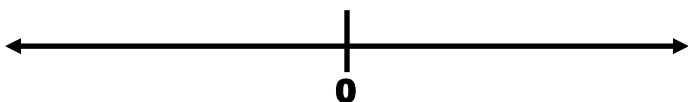
**You Try #2**

$$6 - 3x \leq 9 \quad x \geq -1$$



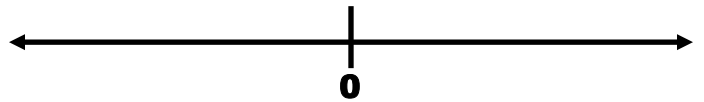
**Guided Practice #3**

$$\frac{x}{2} - 5 < -8 \quad x < -6$$



**You Try #3**

$$\frac{x}{4} + 3 \geq -7 \quad x \geq -40$$

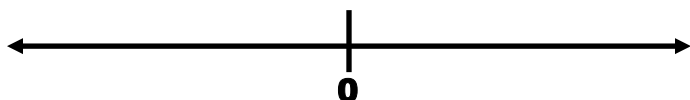




Guided Practice #4



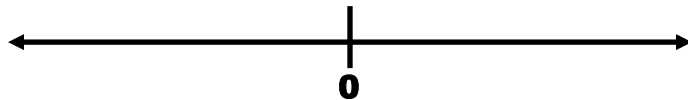
$$8 - \frac{x}{3} \leq 7 \quad x \geq 3$$



You Try #4



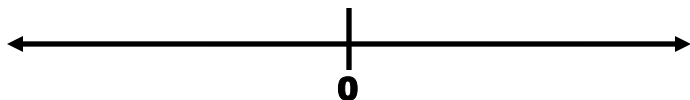
$$1 - \frac{x}{2} > -4 \quad x < 10$$



Guided Practice #5



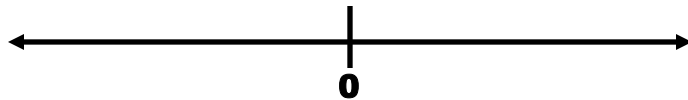
$$-k + 6 \geq 42 \quad k \leq -36$$



You Try #5



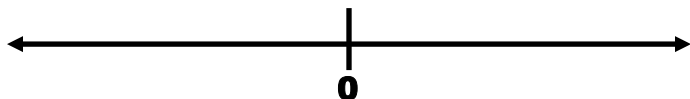
$$-m + 3 \leq -3 \quad m \geq 6$$



Guided Practice #6



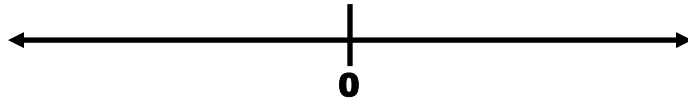
$$-2 > 2x - 10 \quad x < 4$$



You Try #6



$$-11 < -6x + 1 \quad x < 2$$





## STATE TEST PREP

Try These...

(1) What is the solution to the inequality  $-3x - 42 > 3$ ?

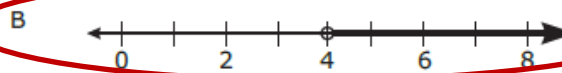
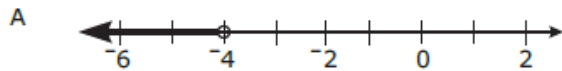
A  $x > -13$

B  $x < -13$

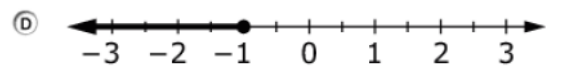
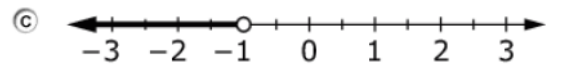
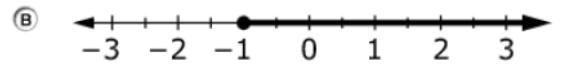
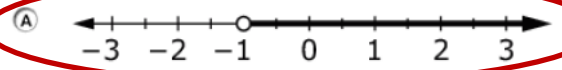
C  $x > -15$

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(2) Which choice is a graph of the solution set for  $12 - x < 8$ ?



(3) Which number line shows the solution to the inequality  $-3x - 5 < -2$ ?



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A  $\{2.5, 8, 15\}$

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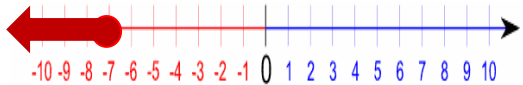
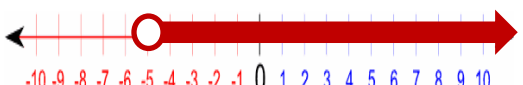
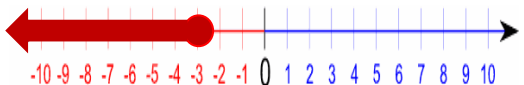
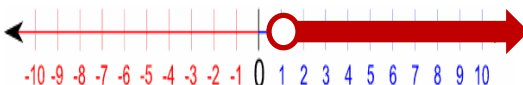
C  $\{-15, -8, 0\}$

D  $\{0, 2.5, 8\}$



Name \_\_\_\_\_ Date \_\_\_\_\_ Period: \_\_\_\_\_

Solve and Graph each inequality.

<p>1) <math>3x + 12 \leq -9</math>     <math>x \leq -7</math></p> 	<p>2) <math>\frac{x}{5} - 3 &gt; -4</math>     <math>x &gt; -5</math></p> 
<p>3) <math>0 \geq 5k + 15</math>     <math>k \leq -3</math></p> 	<p>4) <math>9 - 2y &lt; 7</math>     <math>y &gt; 1</math></p> 

Solve each inequality.

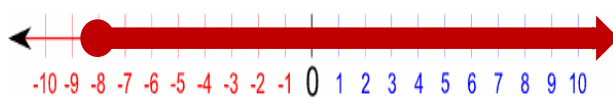
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9) Graph the following inequality:  $-8 \leq x$



10) John solved the inequality  $3x - 5 \geq 28$  and determined that  $x$  could equal to 12. Is John correct? Explain why or why not. John is correct. The solution is  $x \geq 11$ . Twelve meets the criteria because it is greater than 11.



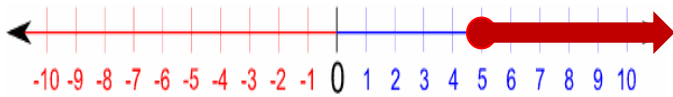
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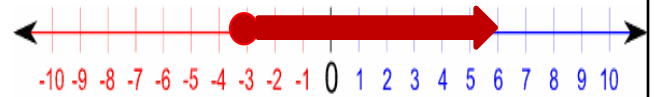
1) **Solve and Graph.**

$$2x + 4 \geq 14 \quad x \geq 5$$



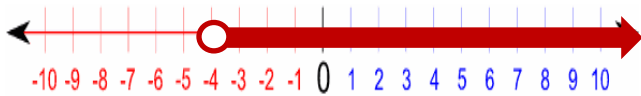
2) **Solve and Graph.**

$$\frac{x}{-3} - 3 \leq -2 \quad x \geq -3$$



3) **Solve and Graph.**

$$-15 < 2x - 7 \quad x > -4$$



4) **Solve for x.**

$$-24 + 7x < 11 \quad x < 5$$

5) **Solve for h.**

$$6h - 10h + 2 \geq -10 \quad x \leq 3$$

6) **Solve for x.**

$$-x + 5 > 23 \quad x < -18$$