Solving Inequalities

Inequality Signs

An *inequality* is like an equation, but instead of an equal sign (=) it has one of these signs:

$<$: less than

$\leq$: less than or equal to

$>$: greater than

$\geq$: greater than or equal to

“x < 5”

means that whatever value *x* has,

it must be less than 5.

What could x be?

“$x \geq -2$”

means that whatever value *x* has,

it must be greater than or equal to -2.

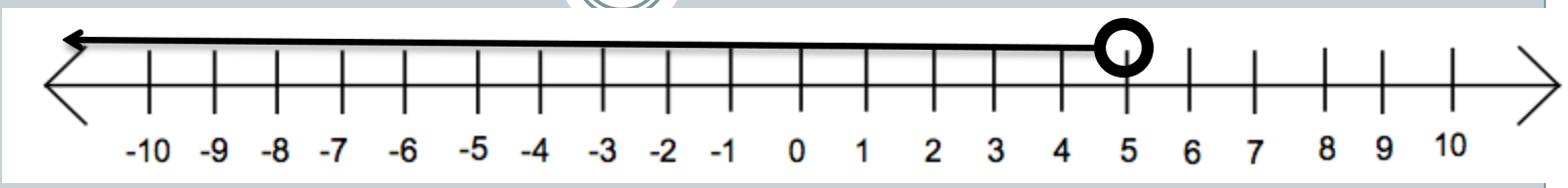
What could x be?

Graphing Rules

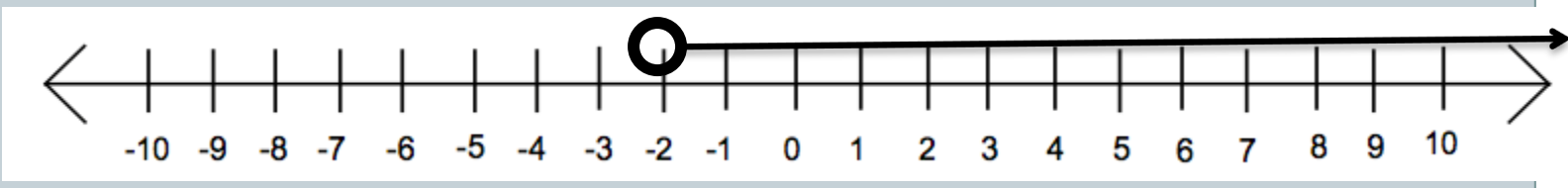
Symbol	Circle	Direction of Arrow
$<$	Open	Left
$>$	Open	Right
$\leq$	Closed	Left
$\geq$	Closed	Right

Examples:

- $x < 5$

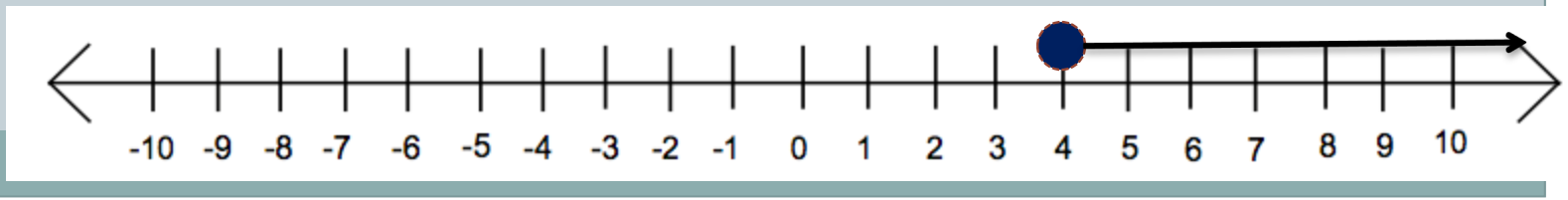


- $x > -2$



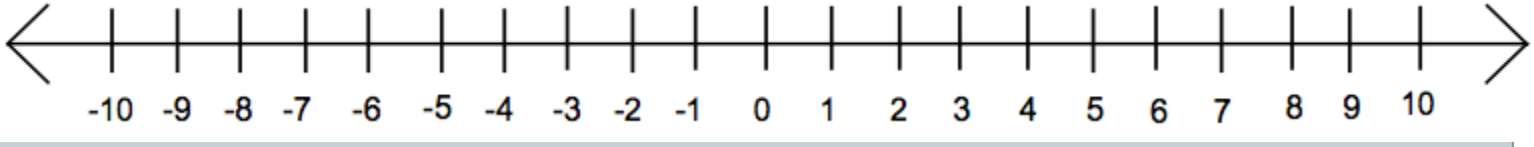
- $x \leq -8$

- $x \geq 4$

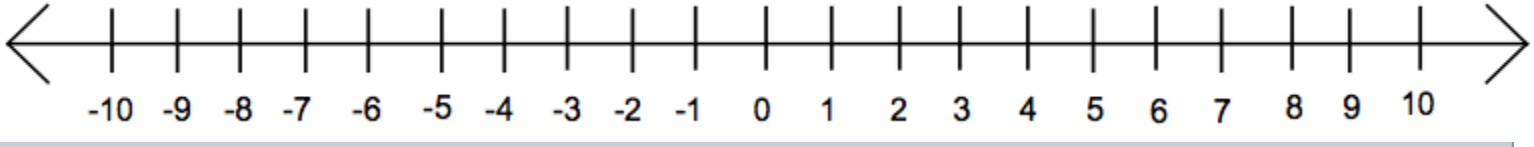


You Try:

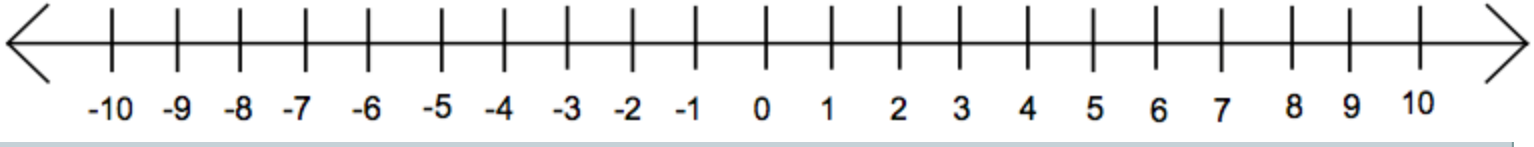
- $x < -6$



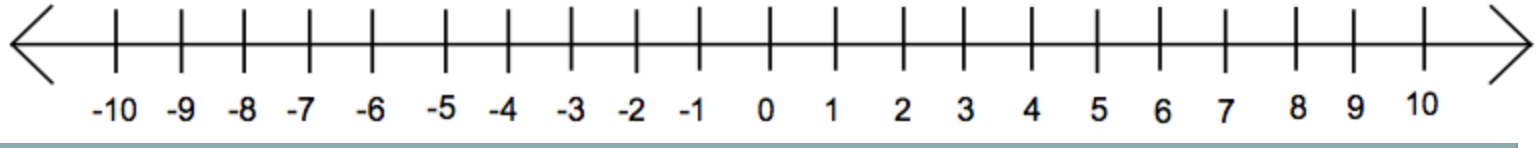
- $x > 2$



- $x \leq 0$



- $x \geq -7$



Practice

- $x + 5 \geq 13$
- $5 + x < 7$
- $2x - 14 > 4$
- $\frac{x}{4} + 3 \leq 7$

DAY 2

Use the Key Words to Write an Inequality

- A number added to 5 is greater than 12
- The quotient of 2 and a number is at most 6
- 7 multiplied by a number is less than 16
- 18 decreased by a number is no less than 12.8
- 17 is greater than or equal to 8 less than a number

Solving One-Step Inequalities

$X-15<73$

Solving One-Step Inequalities

$y+15<25$

Solving One-Step Inequalities

$$\frac{x}{5} = 10$$

Multiply both sides by the reciprocal of the coefficient

$$5 \times \frac{x}{5} = 10 \times 5$$

$$x = 50$$

Solving One-Step Inequalities

$$5x > 20$$

Divide both sides by the coefficient of x

$$\frac{5x}{5} > \frac{20}{5}$$

$$x > 4$$

Solving Inequalities!

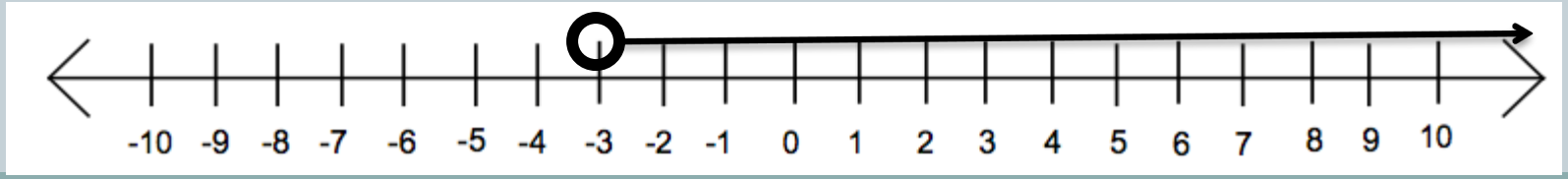
- Solving inequalities is the same as solving equations.
- There are only 2 things you need to know…
  - 1.) If you multiply or divide by a negative number you must switch the sign.

$$\frac{-7x}{-7} < \frac{21}{-7}$$

$$x > -3$$

Dividing by a negative means switch the sign!!

  - 2.) You will graph your solutions.



Special Case 1: Switching the Signs

- When solving inequalities, if you **multiply or divide by a negative** you must switch the signs.

- Switching the signs:
  - Less than becomes Greater than $<$ **switches to** $>$
  - Greater than becomes Less than $>$ **switches to** $<$
  - Less than or equal to becomes Greater than or equal to $\leq$ **switches to** $\geq$
  - Greater than or equal to becomes Less than or equal to $\geq$ **switches to** $\leq$

Division Property for Inequalities

Caution! Dividing by a negative number

$$-5x < 20$$

Same if multiplying?

$$\frac{-5x}{-5} < \frac{20}{-5} \rightarrow x > -4$$

Notice: Sign CHANGED

Multiplication Property for Inequalities

YES!

Caution! When you multiply by a negative number…

…the sign CHANGES

$$\frac{-x}{5} > 2$$

$$\frac{(-5)-x}{1} > \frac{2(-5)}{5}$$

$$x < -10$$

Solving One-Step Inequalities

Let's try some on our own …… ready?

Solving One-Step Inequalities #1

$$x + 6 \leq 7$$

Solving One-Step Inequalities #2

$$3 \leq x - 5$$

Solving One-Step Inequalities #3

$$-3x \geq -15$$

Solving One-Step Inequalities #4

$$x - 9 > -5$$

Answers for #1 - #4

1. $x \leq 1$
2. $8 \leq x$ or $x \geq 8$
3. $x \leq 5$
4. $x > 4$

Solving One-Step Inequalities #5

$$\frac{1}{2}x \geq -3$$

Solving One-Step Inequalities #6

$$-3 > \frac{x}{-7}$$

Solving One-Step Inequalities #7

$$5 + x \geq 7$$

Solving One-Step Inequalities #8

$$\frac{x}{3} > 5$$

Answers for #5 - #8

5. $x \geq -6$
6. $21 < x$ or $x > 21$
7. $x \geq 2$
8. $x > 15$

Day 3 Solving Multi-Step Inequalities

Solving Inequalities

- Follow same steps used to solve equations:

$$3x + 4 < 13$$
$$-4 \quad -4$$
$$\frac{3x}{3} < \frac{9}{3}$$
$$x < 3$$

Practice

- $-2x + 5 \geq 15$
- $17 - 3x < 41$
- $14 > \frac{-x}{-4} + 4$
- $\frac{-x}{-5} \leq 7$

Time to Practice!

- Solve:

$$6x - 8 > 22$$

Practice Problem 1

$$-4 - 5v < -29$$

Practice Problem 2

$$-1 + 4x \leq 31$$

Practice Problem 3

$$-2 + r > -1$$

$$\underline{\qquad\qquad}$$

$$9$$

Practice Problem 4

$$-52 < 8 - 5k$$

Practice Problem 5

$$8 - 7n > -20$$

Practice Problem 6

$$-9 \geq -8 + v$$

$$-6$$