What is an Inequality?

It is an equation that instead of an "=", it has one of the following:

$<, >, \leq, \geq$

Lesson 1.4: Linear Inequalities

Inequalities have one of the following:

$<, >, \leq, \geq$

To "solve" means to find all values of the variable for which the statement is true.

The values are called ***Solutions***. The set of all solutions is called the ***solution set***.

Lesson 1.4: Linear Inequalities

Give me three examples of inequalities:

1. $7x > 2$

2. $7x + 3x > 5x$

3. $3x \geq 17$

Lesson 1.4: Linear Inequalities

When we find the solution, we can put the answers in **SET NOTATION** (like we've done before), or in something called **INTERVAL NOTATION**.

Practice Set Notation:

EX: Write $x = 5$ in set notation.

roster

$\{5\}$

set builder

$\{x \mid x=5\}$

EX: Write $x > 5$ in set notation.

$\{x \mid x>5\}$

Interval Notation:

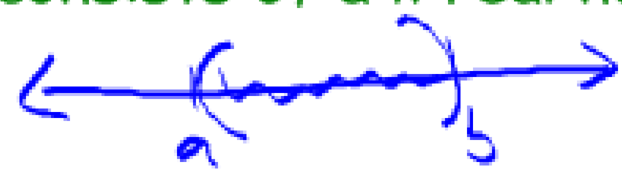
Assume $a<b$ where a and b are real numbers.

Closed Interval:

denoted by **[a, b]**, consists of all real numbers x for which **$a \le x \le b$**.

Open Interval:

denoted by **(a, b)**, consists of a ll real numbers x for which **$a < x < b$**.



Half-Open, Half-Closed Intervals:

denoted by (a, b] for all real numbers x for which $a < x \le b$ and [a, b) for all real numbers x for which $a \le x < b$.

Interval Notation cont:

If we have (a, b) or (a, b] or [a, b), then:

"a" is called the left end point.

"b" is called the right end point.

Name the end points of the following:

a.) (3, 5)

left right

b.) [-2, 5]

left right

Lesson 1.4: Linear Inequalities

What if we don't have an end point?

For example: $x > 4$

It just goes on forever.... What number is "forever"? Can you think of one?

∞ (infinity)

Write in interval notation:

$(4, \infty)$

Lesson 1.4: Linear Inequalities

look pg 91

Intervals including ∞:

(a, b)	$\{x \mid a < x < b\}$	
[a, b]	$\{x \mid a \leq x \leq b\}$	
[a, b)	$\{x \mid a \leq x < b\}$	
(a, b]	$\{x \mid a < x \leq b\}$	
$[a, \infty)$	$\{x \mid x \geq a\}$	
(a, ∞)	$\{x \mid x > a\}$	
$(-\infty, a]$	$\{x \mid x \leq a\}$	
$(-\infty, a)$	$\{x \mid x \leq a\}$	
$(-\infty, \infty)$	{x| x is a real number}	

Lesson 1.4: Linear Inequalities

Let's do some examples.

Write in interval notation.

EX 1: $-2 \leq x \leq 4$

$[-2, 4]$

EX 2: $1 < x \leq 5$

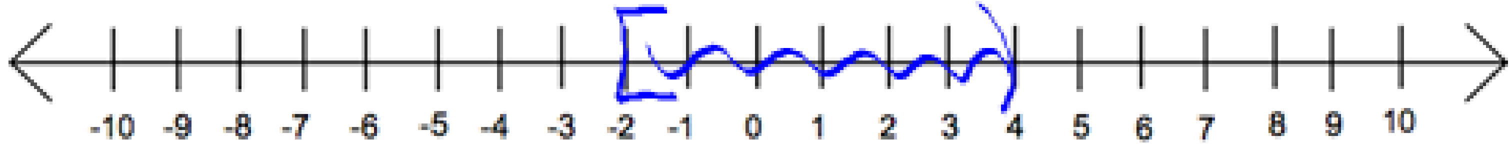
$(1, 5]$

Lesson 1.4: Linear Inequalities

$< \quad > \quad \leq \quad \geq$

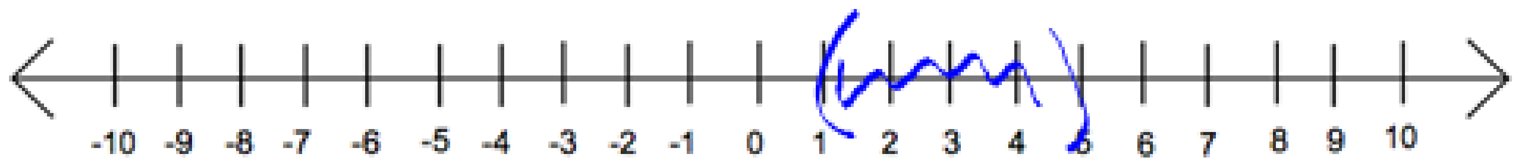
Write in Inequality notation and graph:

Ex 3: [-2, 4)



$\boxed{-2 \leq x < 4}$

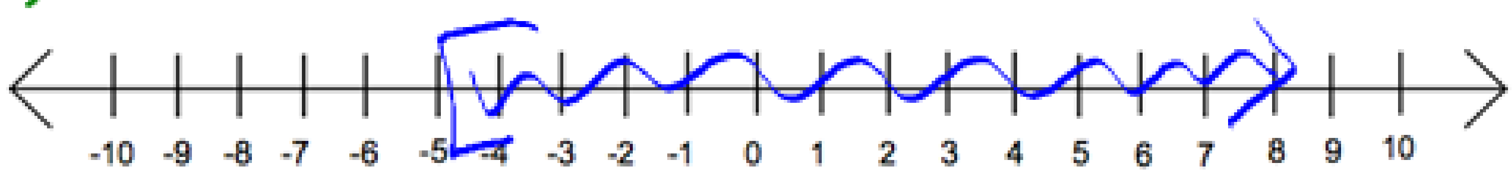
Ex 4: (1, 5)



$\boxed{1 < x < 5}$

Ex 5: [-5, ∞)

$\boxed{x \geq -5}$



Lesson 1.4: Linear Inequalities

If we have $5 > 3$,

What would happen if we added 6 to both sides?
Would the inequality still be true?

Would the it still be true if we subract 4 from both sides?

If we have $2 < 7$,

Would the inequality still be true IF we add 6 to both sides?

What if we subtract 4 from both sides?

A general way to say this is if we have ***a***, ***b***, and ***c***, then we have

1. if $a > b$, then $a+c > b+c$ and $a-c > b-c$
2. if $a < b$, then $a+c < b+c$ and $a-c < b-c$

Lesson 1.4: Linear Inequalities

If we have $4 > 1$,

What would happen if we multiplied by 6 on both sides?
Would the inequality still be true?

Would the it still be true if we divided by 4 on both sides?

If we have $-1 < 3$,

Would the inequality still be true IF we multiplied by 6 on both sides?

What if we divided by 3 on both sides?

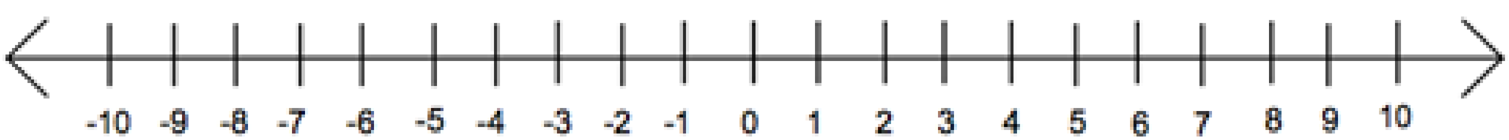
A general way to say this is if we have ***a***, ***b***, and ***c***, then we have

1. if $a > b$, then $a \bullet c > b \bullet c$ and $a/c > b/c$
2. if $a < b$, then $a \bullet c < b \bullet c$ and $a/c < b/c$

Lesson 1.4: Linear Inequalities

Let's solve some examples and then graph them. (Watch out for those negatives! *What should you do if to the </> if you divide or multiply by a negative?)* *Write answers in Set notation and Interval Notation.*

1. $6x + 3 > 5x - 2$



Lesson 1.4: Linear Inequalities

Let's solve some examples and then graph them. (Watch out for those negatives! *What should you do if to the </> if you divide or multiply by a negative?)* *Write answers in Set notation and Interval Notation.*

2. -3x - 4 < 14

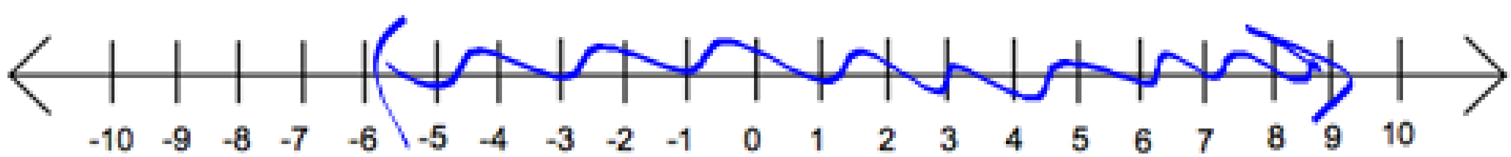
$$\begin{array}{r} -3x - 4 < 14 \\ +4 \quad +4 \\ \hline -3x < 18 \end{array}$$

$$\frac{-3x}{-3} < \frac{18}{-3}$$

$$x > -6$$

$\boxed{\{x \mid x > -6\}}$ set

$\boxed{(-6, \infty)}$ Interval



Lesson 1.4: Linear Inequalities

Let's solve some examples and then graph them. (Watch out for those negatives! *What should you do if to the </> if you divide or multiply by a negative?)* *Write answers in Set notation and Interval Notation.*

3. $-3(4x + 7) < 21$

$$-12x - 21 < 21$$

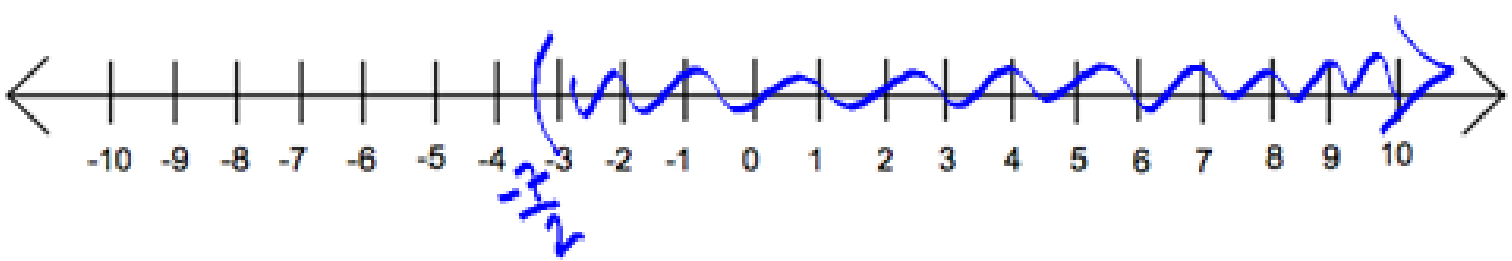
$$\underline{\quad +21 \quad +21}$$

$$\frac{-12x}{-12} < \frac{42}{-12}$$

$$x > -\frac{7}{2}$$

$$\frac{42}{12} = \frac{7 \cdot 6}{2 \cdot 6}$$

$$\boxed{\begin{array}{c} \{x \mid x > -\frac{7}{2}\} \\ (-\frac{7}{2}, \infty) \end{array}}$$



Lesson 1.4: Linear Inequalities

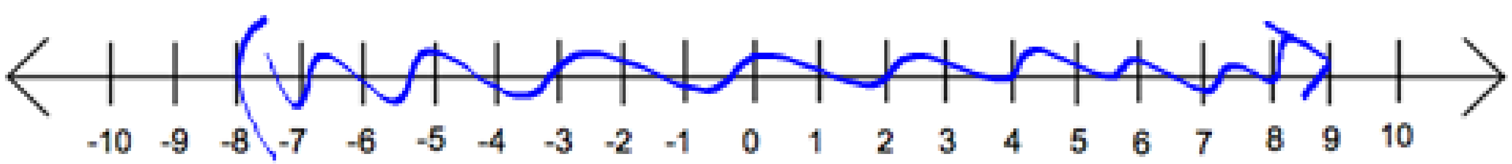
Let's solve some examples and then graph them. (Watch out for those negatives! *What should you do if to the </> if you divide or multiply by a negative?*) *Write answers in Set notation and Interval Notation.*

4. $\cancel{6}^{2}\left(\dfrac{2x+1}{\cancel{3}_{1}}\right) > \left(\dfrac{x-2}{\cancel{2}_{1}}\right)\cancel{6}^{3}$

$$2(2x+1) > 3(x-2)$$

$$\begin{array}{rcl} 4x+2 & > & 3x-6 \\ -3x\quad -2 & & -3x\quad -2 \\ \hline x & > & -8 \end{array}$$

$$\boxed{\begin{array}{c} \{x \mid x > -8\} \\ (-8, \infty) \end{array}}$$



Lesson 1.4: Linear Inequalities

Homework:

Pg. 97: 4-8 all, 9-27 odds, 32-36 evens,
61, 67, 74

(21 problems)