Chapter 9

Linear Inequalities

Unit Overview

In this unit you will:

1) **Represent linear inequalities verbally, algebraically, and graphically.**

2) **Calculate and verify the solutions to linear inequalities.**

3) **Compare how solving linear inequalities is similar to solving linear equations.**

4) **Model and solve problems involving linear inequalities.**

What are *inequalities*?

While equations compare two expressions that are equal, *inequalities* compare two expressions that may not be equal.

While equations always contain an "equals" sign (=), inequalities may use one of the following symbols:

$$>\ ,\quad <\ ,\quad \geq\ ,\quad \leq\ ,\quad \neq$$

Reading Inequalities

Inequality	Meaning
$a > b$	a is greater than b
$a < b$	a is less than b
$a \geq b$	a is greater than or equal to b
$a \leq b$	a is less than or equal to b
$a \neq b$	a is not equal to b

Example: Using $>$, $<$, $\geq$, $\leq$

Which of the inequality symbols could be placed between the two numbers to form a true statement?

$-18 \;?\; 5$ $<$

$14 \;?\; 14$ $\leq$ or $\geq$

$-3 \;?\; -7$ $>$

When a variable is used in an inequality, it represents an unknown set of numbers, each of which could replace the variable and make the inequality a true statement.

Ex. $n > 6$

The "n" represents all of the numbers that are greater than 6, such as 7 or 8 or 100 or 1000, etc. There are an infinite number of possible numbers to replace "n".

Number Sets:

Natural numbers - start at 1, go up by 1

{ 1, 2, 3, 4, 5, ... }

Whole numbers - start at 0, go up by 1

{ 0, 1, 2, 3, 4, 5, ... }

Integers - positive and negative whole numbers

{..., -3, -2, -1, 0, 1, 2, 3, ... }

Example:

List 3 whole numbers that could replace each variable:

$x < 7$ 5, 0, 6

$a \geq 2$ 2, 3, 6

Example:

List 3 integers that could replace each variable:

$x < -5$ $-8, -11, -97$

$n \geq -1$ $-1, 0, 3$

Reading Inequalities

Inequalities can be written and read in both directions:

$x > 8$ and $8 < x$ are both the same inequality.

What is the second way we can write each of these inequalities:

$H < 1.3$	**$-4 > y$**	**$m \geq -12$**
$1.3 > H$	$y < -4$	$-12 \leq m$

1. Translate each word statement into symbols.

a) 5 is greater than 2.

$5 > 2$

b) 7 is less than 20.

$7 < 20$

c) 5 multiplied by 3.

$(5)(3)$

d) 9 is equal to $\frac{18}{2}$.

$9 = \frac{18}{2}$

2. Write each mathematical statement in words.

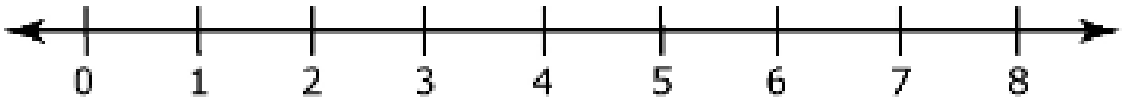
a) $4 < 8$ 4 is less than 8

b) $8 > 2$ 8 is greater than 2

c) $14 \div 2$ 14 divided by 2

d) $4 \neq \frac{8}{3}$ 4 is not equal to $\frac{8}{3}$

3. List all of the whole numbers satisfying each condition. Use the number line to help you.



a) between 6 and 3

4 and 5

b) between −2 and 2

0, 1

c) between 4.6 and 7.1

5, 6, 7

d) less than 4

0, 1, 2, 3

4. Write two expressions showing the relationship between the given numbers. Use both the less than, <, and greater than, >, symbols.

a) 1 and 7 $1 < 7$ $7 > 1$

b) 4 and –1 $4 > -1$ $-1 < 4$

c) 3 and 3.5 $3 < 3.5$ $3.5 > 3$

d) 0 and 1 $0 < 1$ $1 > 0$

5. List the whole numbers that satisfy each statement.

a) $x < 4$ 0, 1, 2, 3

b) between 4 and 8 5, 6, 7

c) $t > 11$ 12, 13, 14 ...

d) $a < 15$ 0, 1, 2, ..., 12, 13, 14

Assignment

Handout #1 - 5

(answer key on weebly and Edsby)