Inequalities

An **inequality** is a mathematical sentence that compares two quantities. We use the symbols and wording below to write inequalities.

Symbol	Meaning/Word Phrases	Example
<	is less than is fewer than is below	$3 < 5$
>	is greater than is more than is above	$8 > 4$
≤	is less than or equal to at most no more than	$7 \le 10$ $10 \le 10$
≥	is greater than or equal to at least no less than	$12 \ge 9$ $12 \ge 12$

Determining if a number is a solution to an inequality requires you to substitute the value into the inequality and check to see if the value makes the inequality true.

Example:

The "Dollar Savers" store sells everything less than $5. Would you be able to buy the following items at the "Dollar Savers" store? Use the inequality x < 5 to substitute. Circle Yes or No.

$2	$5	$4.50	$5.25
Yes No	Yes No	Yes No	Yes No

You Try:

1) To ride a roller coaster, you must be at least 48" tall. Write an inequality and substitute to determine who can ride the roller coaster. Circle Yes or No.

Silly Steve 40"	Cool Carl 36"	Laughing Lou 48"	Toothy Tim 52"
Yes No	Yes No	Yes No	Yes No

Circle all of the values that will satisfy each of the given inequalities.

2) y > 8   6   8   9   15

3) m ≤ 525   525   510   500   650

4) c < 22   12   25   30   22

5) f ≥ 80   81   0   75   80

6) g ≥ 27   27   26   25   20

7) n < 16   15   10   0   16

8) a > 48   36   48   24   64

9) z ≤ 100   55   3   110   100

Writing Inequalities

Inequalities can be written to represent many situations.

Examples:

There are at least 25 students in the auditorium.

$n \geq 25$ "at least" means greater than or equal to

          n represents the number of students in the auditorium

No more than 150 people can occupy the room.

$r \leq 150$ "no more than" means less than or equal to

          r represents the possible room capacity

You Try:

Write an inequality for each given situation.

1) You cannot eat more than 2 pieces of your Halloween candy per day.

2) There are less than 15 people in the room.

3) There are at most 12 books on a shelf.

4) There are fewer than 200 people at the game.

5) You must get at least 30 minutes of exercise each day.

6) You must be at least 15 years old to get your driver's permit.

7) A pony is less than 14.2 hands tall.

8) You must be over 12 years old to ride the go karts.

9) The pig weighs at most 220 pounds.

10) Every candy bar costs at least $2.20.

11) You must complete at least 80% of your homework to attend the Homework Stars Celebration.

12) There are no more than seven people on the boat.

13) More than 40 people attended the movie last night.

14) You must be under 54" to ride the kiddie rides at Six Flags.

15) Getting at least 8 hours of sleep at night keeps you healthy.

Graphing Inequalities

Inequalities can be graphed on a number line to illustrate all of the possible solutions.

**1st** draw a number line and include the number in your inequality.

2nd draw an open or closed dot on the number (depending on which inequality symbol is in the inequality. Use an open dot (○) if the inequality has the greater than (>) or less than (<) symbol. Use a solid dot (•) if the inequality has the greater than or equal to (≥) or less than or equal to (≤) symbol.

3rd draw a line and an arrow that shows all of the possible solutions.

Examples:

$n > 9$

Place an open dot at 9. Then draw a line and an arrow to the right.

The open dot means the number 9 is *not* included in the graph.
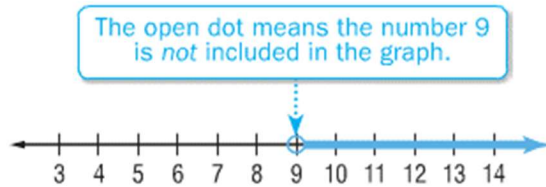
The values that lie on the line make the sentence true. All numbers greater than 9 make the sentence true.

equal to means included

$n \leq 10$

Place a closed dot at 10. Then draw a line and an arrow to the left.

The closed dot means the number 10 *is* included in the graph.
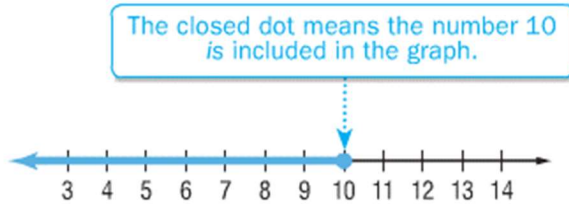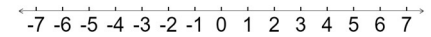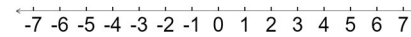
All numbers 10 and less make the sentence true.

TIP: If you keep the variable on the LEFT, the arrow at the end of your number line looks just like your inequality symbol.

You Try:

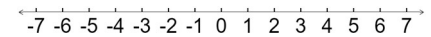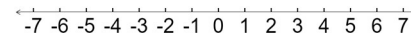*Graph the following inequalities on a number line. Then write a _word phrase_ to describe each inequality.*
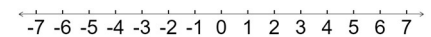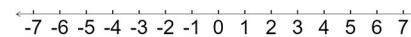
1) $n \leq -5$

-7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7

2) $n \leq 5$

-7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7

3) $n < 1$

-7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7

4) $r > 2$

-7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7

5) $n > 5$

-7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7

6) $n \leq -2$

-7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7

7) $n \geq -7$

-7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7

8) $n < 0$

-7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7
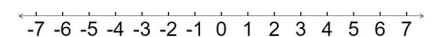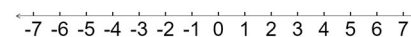
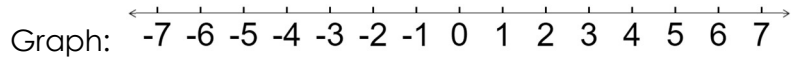*Write the inequality AND graph for each problem below in 7 - 10*

7) Fetty Wap has **at least 3 fans** in Mrs. Ledesma's 3rd period math class.
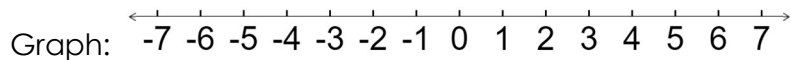
Inequality: _____

Graph: -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7

8) Mr. Shaw should send Mrs. Shaw **more than 6 roses per day**.
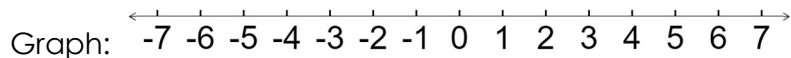
Inequality: _____

Graph: -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7
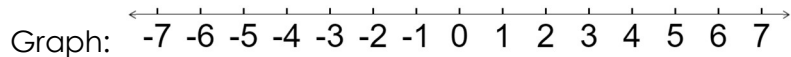
9) Shawn snuck into a G Rated movie because he thought you had to be **at most 7 years old**.

Inequality: _____

Graph: -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7

10) When trick or treating, Daniella's dream came true. A lady told her she could take **no less than 5 pieces of candy**.

Inequality: _____

Graph: -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7

Write an inequality for each situation, and graph on a number line.

1) Students must score at least 800 to pass the CRCT.

2) You must be shorter than 48" to ride the kiddie train.

3) You should brush your teeth at least twice a day.

4) A good credit score is higher than 699.

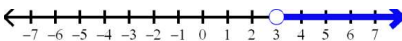5) Classes can have no more than 34 students.
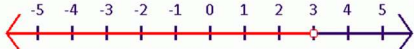
6) AJ needs to save more than $500.
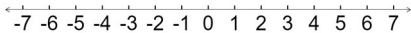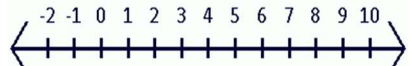
7) A book costs less than $20

More Inequalities Practice

1) Which number is a solution to the inequality below? $x > 4$ a) 1 b) 2 c) 4 d) 5	2) Which number is NOT a solution to the inequality below? $x \leq 8$ a) 6 b) 7 c) 8 d) 9
3) Which statement describes "a number more than 22"? a) $x < 22$ b) $x > 22$ c) $x \leq 22$ d) $x \geq 22$	4) Which statement describes "a number less than or equal to 43"? a) $x < 43$ b) $x > 43$ c) $x \leq 43$ d) $x \geq 43$
5) Which statement describes " a number no more than 17"? a) $x < 17$ b) $x > 17$ c) $x \leq 17$ d) $x \geq 17$	6) Which statement describes "at least 32"? a) $x < 32$ b) $x > 32$ c) $x \leq 32$ d) $x \geq 32$
7) Which number is a solution to x + 4 > 12 a) 3 b) 5 c) 7 d) 9	8) Which number is **NOT** a solution to $x - 3 < 10$ a) 7 b) 8 c) 10 d) 14
9) Which number is a solution to $3x > 12$ a) 4 b) 5 c) 2 d) 3	10) Which number is **NOT** a solution to $2x \leq 10$ a) 3 b) 4 c) 5 d) 6
11) Which inequality matches the graph below? -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 a) n > 1 b) $n \leq 1$ c) $n \geq 1$ d) $n \geq -1$	12) Which inequality matches the graph below? -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 a) v > -3 b) v > 3 c) $v \leq -3$ d) v < 3

13) Which inequality matches the graph below? -5 -4 -3 -2 -1 0 1 2 3 4 5 a) x > 3 b) x < 3 c) $x \leq 3$ d). $x \geq 3$	14) Which inequality matches the graph below? -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 a) n < 0 b) $n \leq 0$ c) $n \geq 0$ d) n > 0
15) Solve x + 11 > 19	16) Graph the solution to the inequality from question #15. -2 -1 0 1 2 3 4 5 6 7 8 9 10
17) Solve $x - 3 \leq 5$	18) Graph the solution to the inequality from question #17. -2 -1 0 1 2 3 4 5 6 7 8 9 10
19) Solve 3x < 12	20) Graph the solution to the inequality from question #19. -2 -1 0 1 2 3 4 5 6 7 8 9 10
21) Solve $\frac{x}{4} \geq 2$	22) Graph the solution to the inequality from question #21. -2 -1 0 1 2 3 4 5 6 7 8 9 10
23. Write an inequality for this statement "x is less than or equal to 7".	24. Write an inequality for this statement "x is greater than -9"