Name _____

3-1 Inequalities and Their Graphs

OBJECTIVE: I can write algebraic expressions

With the person sitting next to you, discuss the problem provided and document your response

By law, the height of a newly constructed building in Washington, D.C., can be no greater than the width of the adjacent street, plus 20 feet. Pennsylvania Avenue, shown at the right, is the widest street in Washington, D.C. What is the maximum allowable height of a new building? Explain your reasoning.

Lanes # → 8 10' = 8(10)

80'

Divider 48'

+43

123'

+ 20'

+ 20

143' is the tallest possible building

Essential Understanding

Essential Understanding An inequality is a mathematical sentence that uses an inequality symbol to compare the values of two expressions. You can use a number line to visually represent the values that satisfy an inequality.

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

Only 4 inequalities that would be used.

Example #1 Writing Inequalities

What inequality represents the verbal expression?

A all real numbers x | less than or equal to | 7

$x \quad \leq \quad 7$

$x \leq 7$

B 6 less than a number k | is greater than | 13.

← not equal

$K - 6 \quad > \quad 13$

$K - 6 > 13$

Your Turn to Work it Out

1. What is an inequality that represents the verbal expression?

all real numbers p greater than or equal to 1.5

$p \geq 1.5$

$p \geq 1.5$

Example #2 Identifying Solutions by Evaluating

A solution of an inequality is any number that makes the inequality true. The solutions of the inequality $x > 5$ are all real numbers x that are less than 5. You can evaluate an expression to determine whether a value is a solution of an inequality.

Is the number a solution of $2x + 1 > -3$?

A -3

$$2x + 1 \overset{?}{>} -3$$
$$2(-3) + 1 \overset{?}{>} -3$$
$$-6 + 1 \overset{?}{>} -3$$
$$-5 \not> -3$$

-3 is not a solution to $2x + 1 > -3$

B -1

$$2x + 1 \overset{?}{>} -3$$
$$2(-1) + 1 \overset{?}{>} -3$$
$$-2 + 1 \overset{?}{>} -3$$
$$-1 > -3$$

-1 is a solution for $2x + 1 > -3$

Your Turn to Work it Out

2. Consider the numbers -1, 0, 1, and 3. Which are solutions of $13 - 7y \leq 6$?

$y = -1$

$13 - 7y \leq 6$

$13 - 7(-1) \leq 6$

$13 + 7 \leq 6$

$20 \not\leq 6$

$y = 0$

$13 - 7y \leq 6$

$13 - 7(0) \leq 6$

$13 - 0 \leq 6$

$13 \not\leq 6$

$y = 1$

$13 - 7y \leq 6$

$13 - 7(1) \leq 6$

$13 - 7 \leq 6$

$6 \leq 6$

$y = 3$

$13 - 7y \leq 6$

$13 - 7(3) \leq 6$

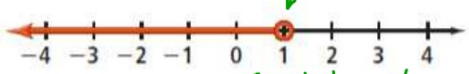
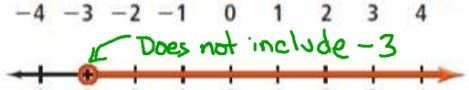
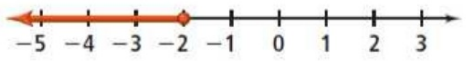
$13 - 21 \leq 6$

$-8 \leq 6$

1 and 3 are the solutions to $13 - 7y \leq 6$

Concept Understanding

You can use a graph to indicate all of the solutions of an inequality.

Inequality	Graph	
$n < 1$		The open dot shows that 1 is *not* a solution. Shade to the left of 1.
$a \geq 0$		The closed dot shows that 0 is a solution. Shade to the right of 0.
$f > -3$		The open dot shows that -3 is *not* a solution. Shade to the right of -3.
$-2 \geq x$		The closed dot shows that -2 is a solution. Shade to the left of -2.

Not including 1

Includes ϕ

Does not include −3

You can also write $-2 \geq x$ as $x \leq -2$.

$-2 \geq x$

x AI -2

$x \leq -2$

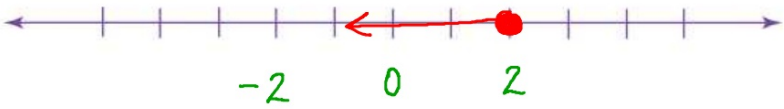
Example #3 Graphing an Inequality

What is the graph of $2 \geq a$?

$2 \geq a$

$2 \geq a$

$a \leq 2$



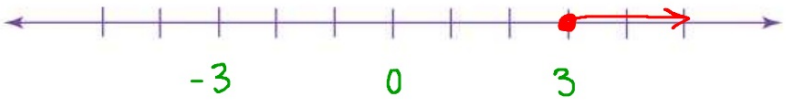
Your Turn to Work it Out

3. What is the graph of the inequality?

$3 \leq n$

$3 \leq n$

$n \geq 3$



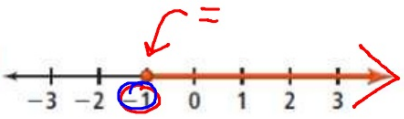
< > ≤ ≥

o o ● ●

Example #4 Writing an Inequality From a Graph

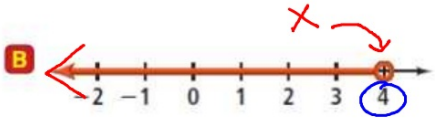
What inequality represents the graph?

A



$x \geq -1$

B

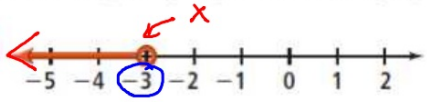


$x < 4$

Your Turn to Work it Out

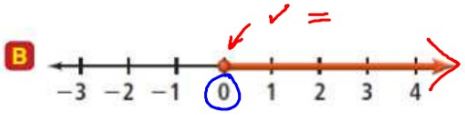
4. What inequality represents each graph?

A



$x < -3$

B



$x \geq 0$