TOPIC: SOLVING LINEAR INEQUALITIES

Introduction to Linear Inequalities

◆ A **linear equation** with an _____ symbol instead of an equal sign is a **linear inequality**.

▶ Just like a linear eqn, the **solution** of a linear inequality is the value(s) of x that makes the inequality *true*.

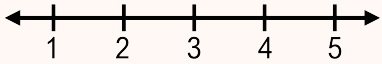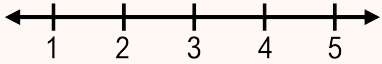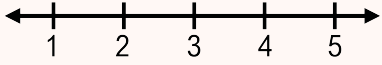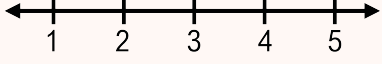| Recall	Linear Equation	New	Linear Inequality
	$ax + b = c$		$ax + b \quad c$
	$2x - 6 = 0$		$2x - 6 > 0$
	$x = 3$		$x > 3$
	Solution: _____ value		Solution: _____ of values
	$2(\mathbf{3}) - 6 = 0$		$2(\quad) - 6 > 0$
	$0 = 0 \checkmark$		> 0

TOPIC: SOLVING LINEAR INEQUALITIES

Representing Solutions to Linear Inequalities

◆ Since the solution to an inequality is a *range* of values, there are different ways to represent & visualize it.

▶ Exclude a value with parentheses **( )**. In interval notation, always use parentheses for _____.

▶ Include a value with square brackets **[ ]**.

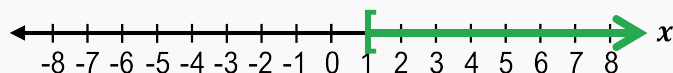| Inequality	Set Builder Notation	Number Line (Graph)	Interval Notation
$x > 3$	{ | } *"the set of x such that x is greater than 3"*		
$x \geq 3$	{ | }		
$x < 3$	{ | }		
$x \leq 3$	{ | }		

◆ When graphing, values can also be excluded with an open circle ○ or included with a closed circle ●.

TOPIC: SOLVING LINEAR INEQUALITIES

Which inequality matches the graph?
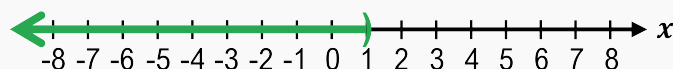
(*A*)

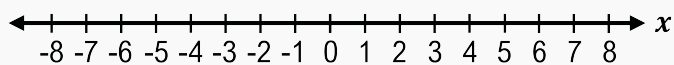A. $x \geq 1$

B. $x \leq 1$

C. $x > 1$

D. $x < 1$

(*B*)

A. $x \geq 1$

B. $x \leq 1$

C. $x > 1$

D. $x < 1$

Use the number line to graph the following inequality.
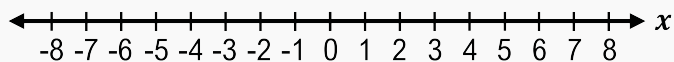
(*A*)

$x \geq 6$

(*B*)

$x \geq -7$

Write the following in interval notation.

(*A*)

$x \geq 0$

(*B*)

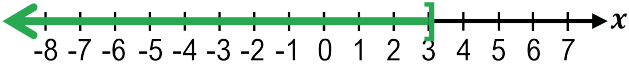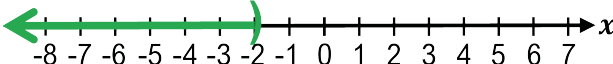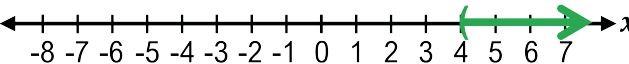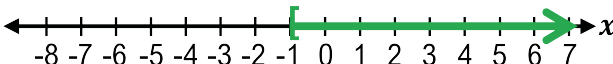$x < 7$

TOPIC: SOLVING LINEAR INEQUALITIES

Rewrite the following as an inequality statement.

(A)
$(-\infty, 2]$

(B)
$(1, \infty)$

EXAMPLE Match the inequalities, interval notation, and graphs in Column A with their corresponding items in Column B.

A	B
$x > -2$	$-1 \leq x$
$x \geq -5$	
$(4, \infty)$	$(-2, \infty)$
$(-\infty, 3]$	$[-5, \infty)$
	$(-\infty, -2)$

TOPIC: SOLVING LINEAR INEQUALITIES

Solving Linear Inequalities

◆ The *same* properties used to solve linear **equations** by isolating the variable can be used for linear **inequalities**.
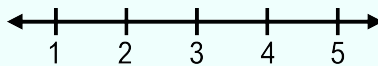
Property	If $a \quad b$, then…	Example
Addition & *Subtraction*	$a + c > b + c$	$x - 3 > 11$
	$a - c > b - c$	
Multiplication & *Division* *for _____ c*	$ac > bc$	$2 < \dfrac{x}{5}$
	$\dfrac{a}{c} > \dfrac{b}{c}$	
Multiplication & *Division* *for _____ c*	$ac \quad bc$	$-7x \geq 21$
	$\dfrac{a}{c} \quad \dfrac{b}{c}$	

◆ When multiplying or dividing by a **negative** number, you must _____ the inequality symbol.

EXAMPLE   Solve the given linear inequality, then graph your answer & express in interval notation.

$x + 8 \leq 12 - x$

TOPIC: SOLVING LINEAR INEQUALITIES

PRACTICE Solve the following linear inequalities using the addition and subtraction properties of equality.

(**A**)

$$5 \leq y + 3$$

(**B**)

$$x - 2.3 \leq 4.1$$

PRACTICE Solve the following linear inequalities and write the solution in interval notation.

(**A**)

$$7x + 3 < 2x + 13$$

(**B**)

$$2(x + 4) \leq 3(x - 1) + x$$

(**C**)

$$-\frac{5}{6}x < 3$$

EXAMPLE Solve the following inequalities.

(**A**)

$$2x - 5 < 2x + 10$$

(**B**)

$$x + 2 \geq x + 8$$