TOPIC: LINEAR INEQUALITIES IN ONE VARIABLE

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
$2(3) - 6 = 0$	$2(\quad) - 6 > 0$
$0 = 0$ ✓	> 0

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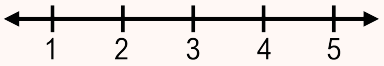
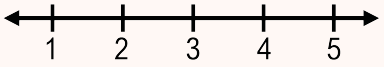
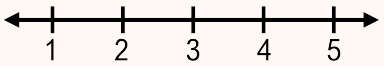
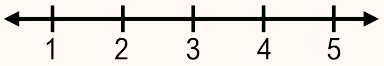
Representing Solutions to Linear Inequalities

◆ 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 ●.

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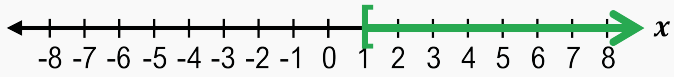
PRACTICE Which inequality matches the graph?

(A)



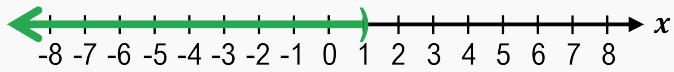
A. $x \geq 1$

B. $x \leq 1$

C. $x > 1$

D. $x < 1$

(B)



A. $x \geq 1$

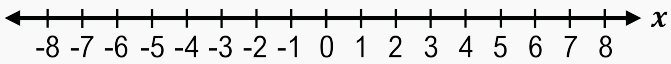
B. $x \leq 1$

C. $x > 1$

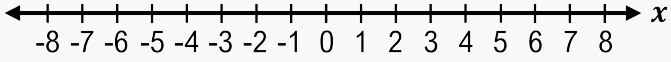
D. $x < 1$

PRACTICE Use the number line to graph the following inequality.

(A) $x \geq 6$



(B) $x \geq -7$



PRACTICE Write the following in interval notation.

(A) $x \geq 0$

(B) $x < 7$

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PRACTICE Rewrite the following as an inequality statement.

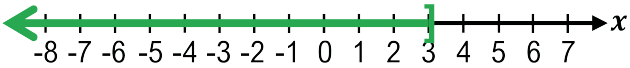
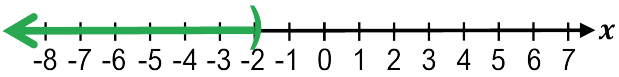
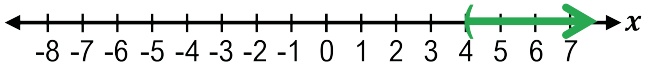
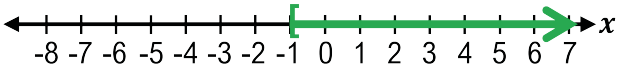
(A)

$(-\infty, 2]$

(B)

$(1, \infty)$

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

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

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Solving Linear Inequalities

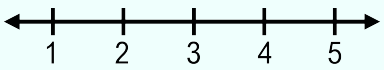
◆ The *same* properties used to solve linear **equations** by isolating the variable can be used for linear **inequalities**.

Property	If a b, then…	Example
Addition & Subtraction	$a + c > b + c$	$x - 3 > 11$
	$a - c > b - c$	
Multiplication & Division for _____ c	$ac > bc$	$2 < \frac{x}{5}$
	$\frac{a}{c} > \frac{b}{c}$	
Multiplication & Division for _____ c	ac bc	$-7x \geq 21$
	$\frac{a}{c}$ $\frac{b}{c}$	

◆ 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.

$x + 8 \leq 12 - x$



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

$(\boldsymbol{A})$ $5 \leq y + 3$

$(\boldsymbol{B})$ $x - 2.3 \leq 4.1$

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

$(\boldsymbol{A})$ $7x + 3 < 2x + 13$

$(\boldsymbol{B})$ $2(x + 4) \leq 3(x - 1) + x$

$(\boldsymbol{C})$ $-\frac{5}{6}x < 3$

EXAMPLE Solve the following inequalities.

$(\boldsymbol{A})$ $2x - 5 < 2x + 10$

$(\boldsymbol{B})$ $x + 2 \geq x + 8$