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3–1 Inequalities and Their Graphs

A ___solution___ of an inequality is any number that makes the inequality true. For example, the solution of the inequality $x < 3$ are all numbers that are ___less than 3___.

Example 1: Identifying Solutions by Mental Math

Is each number a solution of: $x \leq 7$?

a. 9 no b. 2 yes c. –10 yes d. 7 yes

√ Understanding Check:

Is each number a solution of:

$x \geq -4.1$	a. –5	b. –4.1 y	c. 8 y	d. 0 y
$x < -3$	a. –5 y	b. –4.1 y	c. 8	d. 0
$x \leq -.5$	a. . 3	b. –1/2 y	c. – .2	d. –6 y

Example 2: Identifying Solutions by Evaluating

Is each number a solution of $-5x + 2 > 13$?

a. –4	Steps	b. 3
$-5x + 2 > 13$	← substitute →	$-5x + 2 > 13$
$-5(-4) + 2 > 13$	← simplify →	$-5(3) + 2 > 13$
$20 + 2 > 13$	← compare →	$-15 + 2 > 13$
$22 > 13$		$-13 > 13$
yes	Say if it is a solution	no

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√ Understanding Check:

Is each number a solution of $6x - 3 > 10$?

a. 1	b. 2	c. 3	d. 4
no	no	yes	yes

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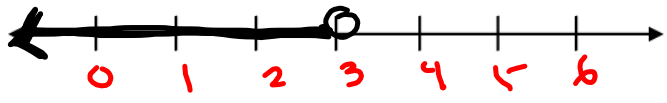
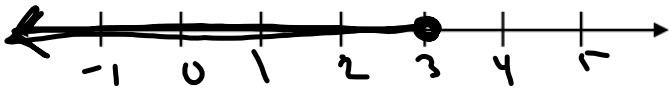
Example 3: Graphing Inequalities

You can use a graph (number line) to indicate **all** of the **solutions** of an inequality.

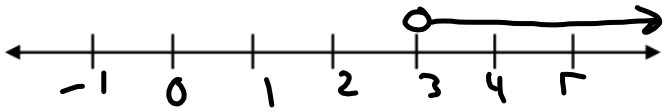
$x < 3$



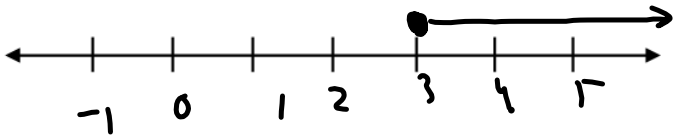
$x \leq 3$



$x > 3$



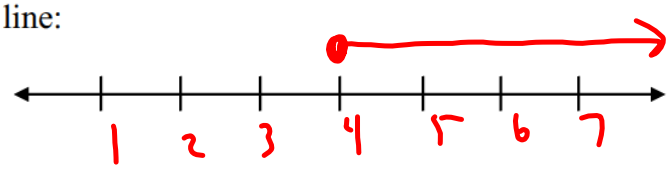
$x \geq 3$



Sometimes you will see an inequality written this way: $-2 < x$
It means the same as **x > -2**. So before graphing, it helps to **reverse** the inequality so the variable is on the **left**.

Graph on a number line:

$4 \leq m$



Remember:

Use **open** **point** for < and >.

Use **closed** **point** for ≤ and ≥.

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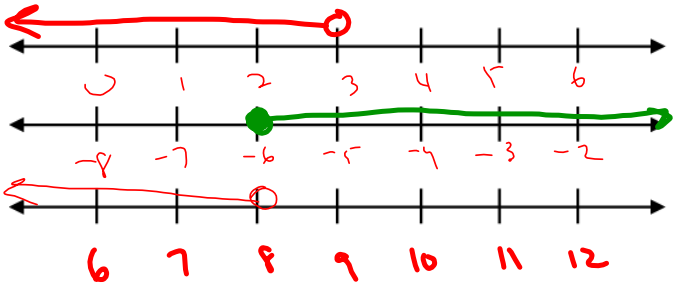
√ Understanding Check:

a. Graph: $a < 3$

b. Graph: $n \geq -6$

c. Graph: $8 > p$



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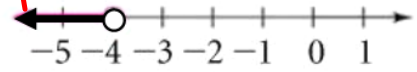
Example 4: Writing an Inequality From a Graph

Write an inequality for each graph.

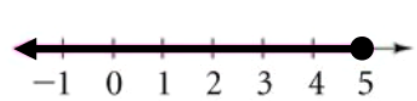
$x < -4$

a.



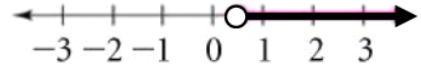
$x \leq 5$

b.



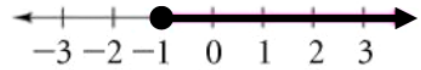
$x > .5$

c.



$x \geq -1$

d.

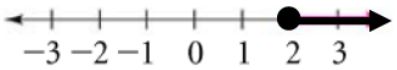


$-1 \leq x$

√ Understanding Check

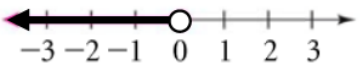
$x \geq 2$

a.



$x < 0$

b.



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Example 5: Application

Define and write a variable and write an inequality for each situation.

a.

Let s = driving speed (mph)

The sign indicates that $s \leq 55$

b.

Let p = pay

The sign indicates that $p \geq 9$

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The words "at most" are often used to indicate all values less than and equal to than a value.

The words "at least" are often used to indicate all values greater than and equal to than a value.

√ Understanding Check:

Translate to an inequality:

a. You must be at least 16 to get a driver's license.

Let a = age. $a \geq 16$

b. You can be at most 12 to play on the Mc Donald's playground.

Let x = age. $x \leq 12$

c. To earn an A in this class, your grade percent must be more than 89.5 %.

Let A = grade to get A. $A > 89.5$