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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:



① $x \geq -4.1$

a. -5
no

b. -4.1
yes

c. 8
yes

d. 0
yes

② $x < -3$

a. -5
yes

b. -4.1
yes

c. 8
no

d. 0
no

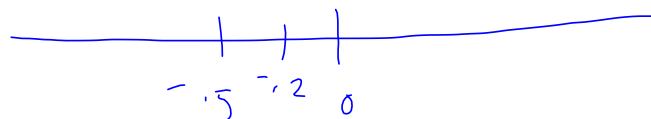
③ $x \leq -.5$

a. .3
no

b. -1.2
yes

c. -.2
no

d. -.6
yes



Example 2: Identifying Solutions by Evaluating

Is each number a solution of

$$-5x + 2 > 13?$$

a. -4

Steps

b. 3

$$-5x + 2 > 13$$

$$-5x + 2 > 13$$

$$-5(-4) + 2 > 13$$

 \leftarrow substitute \rightarrow \leftarrow simplify \rightarrow \leftarrow compare \rightarrow

$$20 + 2 > 13$$

$$22 > 13$$

yes \leftarrow answer yes or no

$$-5(3) + 2 > 13$$

$$-15 + 2 > 13$$

$$-13 > 13$$

no**page 38****Understanding Check:**Is each number a solution of $6x - 3 > 10$?

a. 1

b. 2

c. 3

d. 4

$$6(1) - 3 > 10$$

$$3 > 10$$

no

$$6(2) - 3 > 10$$

$$12 - 3 > 10$$

$$9 > 10$$

no

$$6(3) - 3 > 10$$

$$18 - 3 > 10$$

$$15 > 10$$

yes

$$6(4) - 3 > 10$$

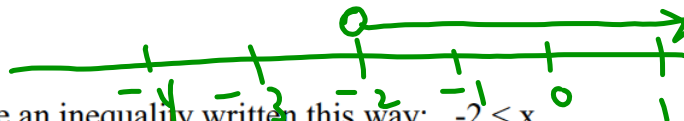
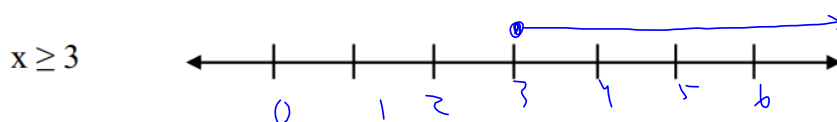
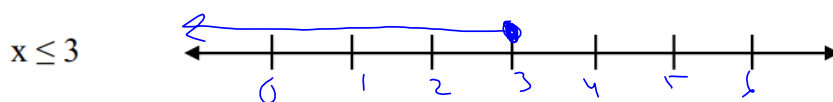
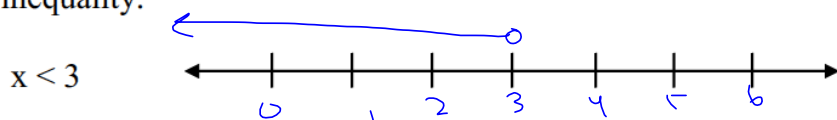
$$21 > 10$$

yes

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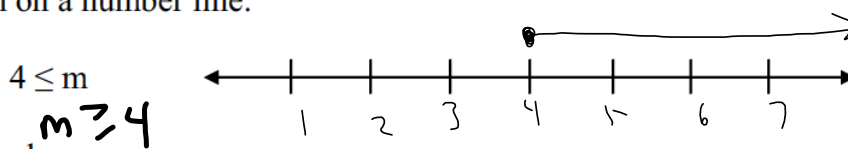
Example 3: Graphing Inequalities

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



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:

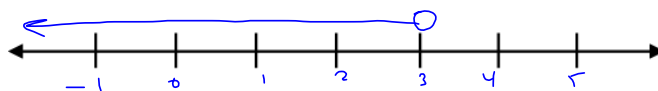
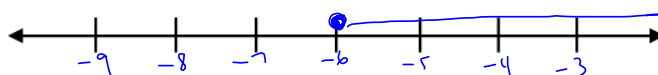
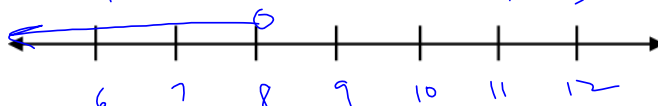


Remember:

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

Use closed point for \leq and \geq .

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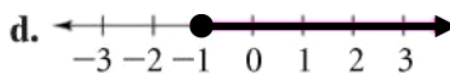
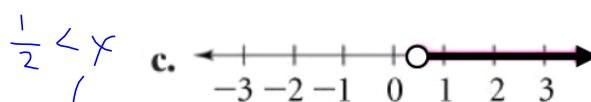
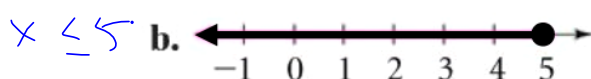
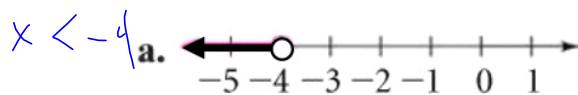
✓ Understanding Check:a. Graph: $a < 3$ b. Graph: $n \geq -6$ c. Graph: $8 > p$ 

↓
 $p < 8$

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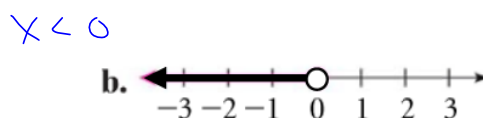
Example 4: Writing an Inequality From a Graph

Write an inequality for each graph.



$x > \frac{1}{2}$

$-1 \leq x$
 $x \geq -1$

Understanding Check

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Example 5: Application

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

a.



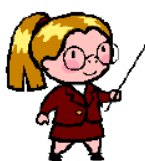
Let $s =$ speed
The sign indicates that $s \leq 55$

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 $a = \text{age}$. $a \geq 16$

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

let $x = \text{age}$. $x \leq 12$

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

let $p = \text{grade for A}$. $p > 89.5$