Date: _____

6.4 Notes Solve Compound Inequalities

Goal • Solve and graph compound inequalities.

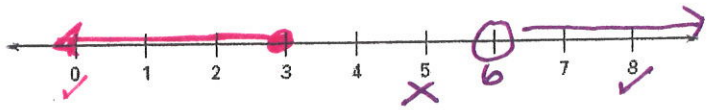
VOCABULARY: Compound inequality 2 INEQUALITIES CONNECTED WITH "AND" or "OR."

Example 1 *Write and graph compound inequalities*

Translate the verbal phrase into a COMPOUND INEQUALITY. Then graph the inequality.

a. All real numbers that are less than or equal to 3 or greater than 6.

$x \leq 3$ OR $x > 6$



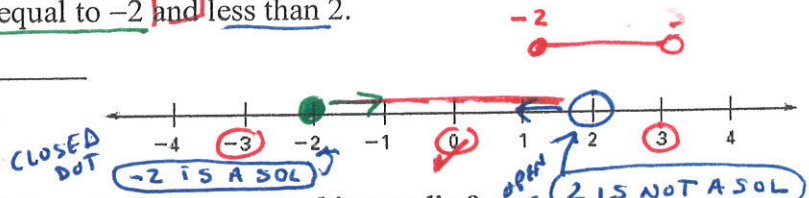
Which of the following numbers are solutions to this compound inequality?

FOR "OR" ONLY 1 OF THE INEQ MUST BE TRUE

x= 0	x=5	x=8
$0 \leq 3$ OR $0 > 6$	$5 \leq 3$ OR $5 > 6$	$8 \leq 3$ OR $8 > 6$
T F	F F	F T
x=0 IS A SOLUTION		x=8 IS A SOLUTION

b. All real numbers that are greater than or equal to –2 and less than 2.

$x \geq -2$ AND $x < 2$



Which of the following numbers are solutions to this compound inequality?

FOR "AND" BOTH INEQ'S MUST BE TRUE

x= –3	x=0	x=3
$-3 \geq -2$ AND $-3 < 2$	$0 \geq -2$ AND $0 < 2$	$3 \geq -2$ AND $3 < 2$
F T	T T	T F
	x=0 IS a solution	

Translate the verbal phrase into a COMPOUND INEQUALITY. 2) Graph the inequality. 3) Write the COMPOUND INEQUALITY as a SINGLE INEQUALITY.

c. All real numbers that are greater than –8 and less than or equal to –3.

- Compound Inequality: $x > -8$ AND $x \leq -3$
- Graph it:

- Single Inequality: $-8 < x \leq -3$

EQUIVALENT STMTS

"AND" may be written as a Compound or single INEQ

VOCABULARY

- The solution of an "AND" COMPOUND INEQUALITY is the INTERSECTION of the 2 individual inequalities. To find the INTERSECTION, determine where the two graphs of the individual inequalities OVERLAP.
- The solution of an "OR" COMPOUND INEQUALITY is the UNION of the 2 individual inequalities. Solve the 2 inequalities separately and COMBINE the solutions TOGETHER.

Example 2 *Solve a compound inequality with "and"*

Solve $3x - 3 \geq 15$ and $3x - 3 < 24$. Graph your solution.

$3x - 3 \geq 15$ and $3x - 3 < 24$

$+3 \quad +3 \qquad +3 \quad +3$

$\frac{3x}{3} \geq \frac{18}{3} \qquad \frac{3x}{3} < \frac{27}{3}$

$x \geq 6$ AND $x < 9$

Solve the compound inequality.

Add 3 to each expression.

Divide each expression by 3.

THE SOLUTION MUST INCLUDE "AND"!!!

The solutions are all real numbers Greater than or equal to 6 **and** less than 9.

Graph your solution.

The solution can also be written as a single "and" inequality: $6 \leq x < 9$.

Example 3 *Solve a single inequality with "and"*

Solve $15 < -7x + 1 < 50$. Graph your solution.

$15 < -7x + 1 < 50$

$-1 \quad -1 \quad -1$

$14 < -7x < 49$

$\frac{14}{-7} > \frac{-7x}{-7} > \frac{49}{-7}$

$-2 > x > -7$

Rewrite

Solve the inequality.

Subtract 1 from each of the 3 parts of the inequality.

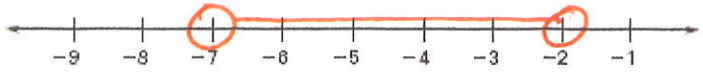
Divide each expression by -7 and reverse the symbols

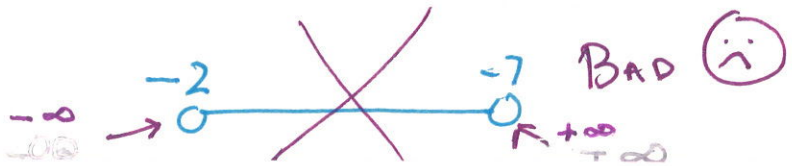
Rewrite the inequality with "<" and "≤" symbols.

$-7 < x < -2$ Read inside out

The solutions are all real numbers Greater than −7 **and** Less than −2.

Graph your solution.





Example 4 *Solve a compound inequality with "or"*

Solve $5x + 6 \leq -9$ *or* $2x - 8 > 12$. Graph your solution.

$5x + 6 \leq -9$ *or* $2x - 8 > 12$

$-6 \quad -6 \qquad +8 \quad +8$

$\frac{5x}{5} \leq \frac{-15}{5} \qquad \frac{2x}{2} > \frac{20}{2}$

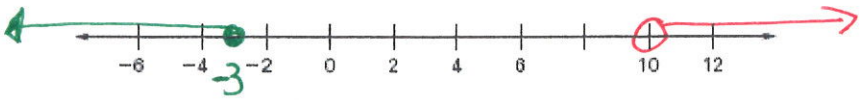
Solve the inequality.

Use addition or subtraction property of inequality.

Use division property of inequality.

$x \leq -3$ OR $x > 10$ ← You must include "OR"!!!

The solutions are all real numbers lessthan or EQUAL TO -3 or Greater than 10.



✔ *Checkpoint* **Solve the inequality. Graph your solution.** DO HW LIKE THIS

1. $-3 \leq -2x + 1 < 11$

$-1 \quad -1 \quad -1$

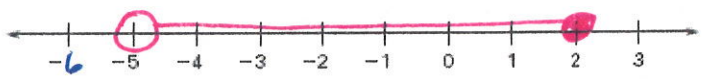
$\frac{-4}{-2} \leq \frac{-2x}{-2} < \frac{10}{-2}$

remember to switch symbols

$2 \geq x > -5$

rewrite with $<, \leq$!!!

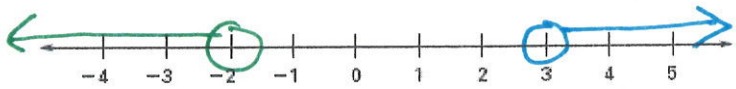
$-5 < x \leq 2$



2. $9x + 1 < -17$ or $7x - 12 > 9$

$-1 \quad -1 \qquad +12 \quad +12$

$\frac{9x}{9} < \frac{-18}{9} \qquad \frac{7x}{7} > \frac{21}{7}$



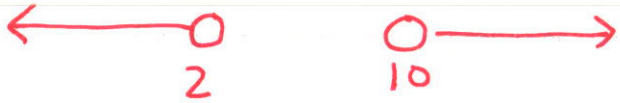
$x < -2$ OR $x > 3$

Special Cases

GRAPH AND DETERMINE SOLUTION

1) "And" Special Case

$X < 2$ AND $X > 10$



∴ "AND" means INTERSECT!

Since the 2 inequalities DO NOT INTERSECT THERE IN NO SOLUTION.

X = NO SOLUTION ← is the answer

2) "Or" Special Case

$X < 10$ OR $X > 2$

∴ "OR" means the UNION!

Since the 2 INEQUALITIES OVER LAP, THE ENTIRE NUMBER LINE IS COVERED THEREFORE:

X = ALL REAL NUMBERS