ALGEBRA 1 NOTES
Section 3.1: Inequalities and Their Graphs

Objective: *To write, graph, and identify solutions of inequalities.*

Warm-Up Simplify each.

1. $\frac{4}{5} + \frac{3}{4}$

2. $-2\frac{2}{5} \cdot 1\frac{1}{4}$

3. $1\frac{4}{5} \div \frac{3}{4}$

Example 1 Write an inequality that represents each verbal expression.

a) w is greater than or equal to negative fifteen. _____

b) The quotient of m and ten is less than $\frac{2}{3}$. _____

Example 2 Determine if the value make the inequality true or false.

a) $4x - 3 \leq -9$; x = -2

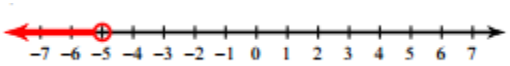
b) $\frac{3-n}{2} < 4$; n = -7

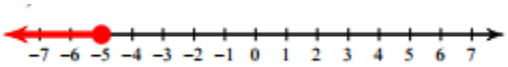
Example 3 Match each inequality with its graph.

1) $a \geq -5$

2) $-5 > m$

3) $-5 \geq v$

A. 

B. 

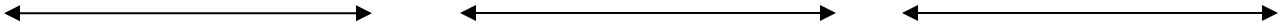
C. 

Example 4 Graph each inequality.

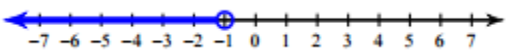
a) $t < -4$

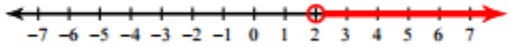
b) $f \leq -3$

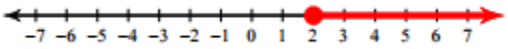
c) $m > \frac{-5}{3}$



Example 5 Write an inequality for each graph.

a) 

b) 

c) 

Example 6 Define a variable and write an inequality to model each situation.

a) The oldest dog lived to be at most 29 years old.

b) The student earned more than $5,000 working during the summer.

c) The movie theatre had a least 50 people in it.

ALGEBRA 1 NOTES

Section 3.2: Solving Inequalities using Addition and Subtraction

Objective: *To use addition or subtraction to solve inequalities*

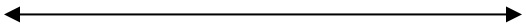
Warm-Up: Define a variable, write an inequality, and graph the inequality.

1. You need to have at least $250 to open a bank account at a particular bank.

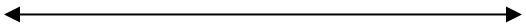
2. The restaurant can seat no more than 98 people.

Example 1 Solve each inequality and graph its solution.

a. $x + 7 < -9$



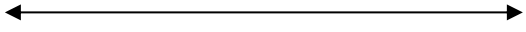
b. $12 \leq m - 8$



Example 2 Solve each inequality and graph its solution.

a. $y - 2 + 5 > 10$

b. $\frac{2}{3} \geq p - \frac{3}{5}$



Example 3 Solve each inequality and graph its solution.

a. $-4.2 + m < -3.5$

b. $\frac{1}{2} \geq h + 1\frac{3}{4}$

Example 4 (Question42 p. 175)
Your goal is to take at least 10,000 steps per day. According to your pedometer, you have walked 5274 steps. Define a variable, write an inequality, and solve the inequality to find out how many steps you can take to reach your goal.

Example 5 (Question44 p. 175)
You earn $250 per month from your part-time job. You are in a kayaking club that costs $20 per month, and you save at least $100 each month. Define a variable, write an inequality, and solve the inequality to find the possible amount you have left to spend each month.

ALGEBRA 1 NOTES

Section 3.3: Solving Inequalities using Multiplication or Division

Objective: *To use operations to solve one-step inequalities*
To graph inequalities on the number line

Warm-Up Solve and graph each inequality.

a) $x - 5 > 6$ b) $-5 > x - 3$ c) $2.5^3 - 0.5 + x$



Compare the numbers → 0 5 10 15 20

What happens when we multiply by -1 → 0 -5 -10 -15 -20

***Solving inequalities, is the *SAME* process as solving an equation **EXCEPT**

when you _____or _____ both sides by a

_____, you MUST _____ the _____.

FLIP or DON'T FLIP Determine if the operation would "flip" or "don't flip" the inequality.

a) divide by -3 b) subtract 5 c) multiply by $\frac{1}{2}$ d) multiply by -2

Example 1 Solve and graph each inequality.

a) $-4 < \frac{1}{2}x$ b) $-2x < 10$ c) $\frac{x}{-2} < -1$



Example 2 Mixed Review - Solve and graph each inequality.

1) $12 < x + 5$

2) $3x \geq 10$

3) $-\frac{t}{6} < -12$

4) $x - 7 > -13$

5) $-45 > -9x$

6) $-7.3 \leq 1.3 + x$

Example 3 Inequality Word Problems: Set up an ***inequality*** for each situation and then solve.

a) The hard drive on your computer has a capacity of 120 gigabytes (GB). You have used 85 GB. You want to save some home videos to your hard drive. What are the possible sizes of the home video collection you can save?

b) You walk dogs in your neighborhood after school. You earn $4.50 per dog. How many dogs do you need to walk in order to earn at least $75.

ALGEBRA 1 NOTES
Section 3-4: Multi-Step Inequalities

Objective: *To solve multi-step inequalities*

Warm-Up: Solve each inequality and graph the solution.

1. $-5p < -10$

2. $-3 \geq \frac{m}{5}$

3. $-\frac{3}{4}x > 15$

4. $2n \leq -15$

RULE OF SOLVING INEQUALITIES: Complete the statement.

When you _____ or _____ by a _____

you **MUST** _____ the _____.

Example 1 Solve each inequality.

a. $9 + 4m > 21$

b. $-6x - 7 \leq 17$

<u>Example 2</u> Solve each inequality.

a. $-4 < 5 - 3n$

b. $50 > 8x + 10$

<u>Example 3</u> Solve each inequality.

a. $6x + 2(1 + 3x) \leq 14$

b. $167 < 6 + 7(2 - 7x)$

<u>Example 4</u> Solve each inequality.

a. $28 - p > 7(p - 4)$

b. $-5n - 6n \leq 8 - 8n - n$

When solving equations or inequalities, 3 cases can occur:

1.

2.

3.

<u>Example 5</u> Solve each inequality, if possible.

a. $2x - 8 \geq 2(x - 4)$

b. $2x - 8 \geq 2(x + 4)$

<u>Example 6</u> Solve each inequality, if possible.

a. $-5m + 6 < -5(m + 2)$

b. $6w - 4 \leq 2(3w - 2)$

<u>Example 7</u> In a community garden, you want to fence in a rectangular garden adjacent to your friend's garden. The width of the garden is 12 feet. You have at most 42 feet of fence. What are the possible lengths of your garden?

Example 8 A grandmother says that her grandson is two years older than her granddaughter, and together, they are at least 22 years old. How old are the grandson and the granddaughter?

Example 9 You want to make a rectangular banner that is 18 feet long. You have no more than 48 feet of trim for the banner. What are the possible widths of the banner?

ALGEBRA 1 NOTES
Section 3-6: Compound Inequalities

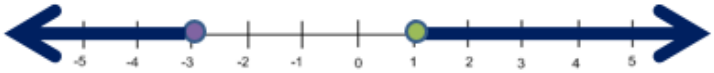
Objective: *To solve and graph compound inequalities*

Warm-Up *Solve and graph each inequality.*

1. $5\,(3p-2) > 50$

2. $6 \quad \geq \quad -\frac{4}{5}n$

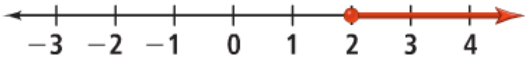
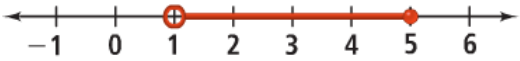
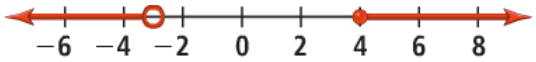
COMPOUND INEQUALITIES: "AND" vs. "OR" statements

"**and**"	Conjunction or intersection	Graph $-3 < x \leq 4$ 
"**or**"	Disjunction or union	Graph $x \leq -3$ *or* $x \geq 1$ 

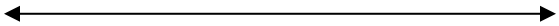
Example 1: Graph *-2 < x < 5*

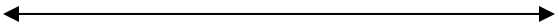
Example 2: Graph *x ≤ -2 or x > 5*

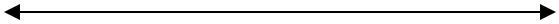
Interval Notation

Inequality	Graph	Interval Notation
$x \geq 2$		$[2, \infty)$
$x < 2$		$(-\infty, 2)$
$1 < x \leq 5$		$(1, 5]$
$x < -3$ or $x \geq 4$		$(-\infty, -3)$ or $[4, \infty)$

Example 3 Draw the graph and write the interval notation for each inequality.

a. $x \geq 5$ 

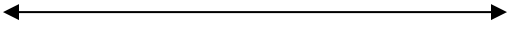
b. $-1 < x \leq 3$ 

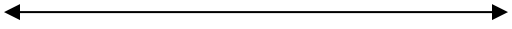
c. $x < 1$ *or* $x \geq 4$ 

Example 4 Solve and graph "***AND***" each compound inequality.
Write the solution in interval notation.

a) Solve $-6 < x + 3 < 4$

b) Solve $3 \leq \frac{n}{3} \leq 4$





Example 5 Solve and graph "**OR**" compound inequalities.
Write the solution in interval notation.

a) $2x < 8$ *or* $x - 1 > 12$

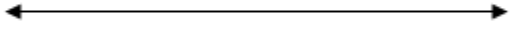
b) $-5n \geq 10$ *or* $\frac{n}{2} > 2$

Example 6 (Stem problem 48 on p. 205): The force exerted on a spring is proportional to the distance the spring is stretched from its relaxed position. Suppose you stretch a spring a distance of d inches by applying a force of F pounds. For your spring $\frac{d}{F} = 0.8$. You apply forces between 25 lb and 40 lb, inclusive.

Write an inequality that describe the ***distances*** the spring is stretched based on the force applied.

Special Cases:

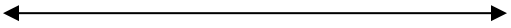
1. No Solution



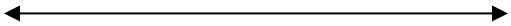
2. All Real Numbers

Example 7 Determine if the compound inequality is "AND" or "OR."
Solve and graph each compound inequality.
Write the solution in interval notation.

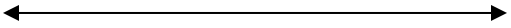
a) $-8 < 4z \leq 8$



b) $b - 12 < -15 \quad or \quad \frac{b}{3} > 1$



c) $-15x > 30 \quad or \quad x + 3 > 7$



d) $-5 \leq \frac{f}{2} \leq 1$

ALGEBRA 1 NOTES
Section 3.7: Absolute Value Equations/ Inequalities

Objectives:	To solve absolute value equations To solve and graph absolute value inequalities

Warm Up Evaluate.

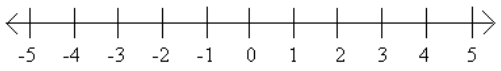
1. $|15|$ 2. $|-3|$ 3. $|12 - 18|$ 4. $-|-7|$

Complete each statement with <, =, or >. Use ORDER OF OPERATIONS.

5. $|3-7|$ _____ 4 6. $|-5|+2$_____ 6 7. $|7|-1$ _____ 8

Absolute Value: _____

An absolute value equation has a variable within the absolute value sign.
For example, $|x| = 3$. The answer for x can be 3 or -3.



Example 1 Solve.

a. $|x| = 5$ b. $|x| = 12$ c. $|x| = -4$

PART 1: Steps for Solving Absolute Value *EQUATIONS*:

1. **ISOLATE** - isolate the absolute value
2. **SEPARATE** - separate into *TWO* equations
3. **SOLVE** - solve each equation

Example 2 Solve the absolute value equation, and check your answers.

$|x| + 5 = 11$ Check:

Example 3 Solve each absolute value equation, and check your answers mentally.

a. $3\,|x| = 15$

b. $4 = 3|x| - 2$

Example 4 Solve the absolute value equation, and check your answers mentally.

$3|x + 2| - 1 = 8$

Example 5 Solve the absolute value *equation*, and check your answers mentally.

$3\,|4x - 1| - 5 = 10$

Part 2: Solving Absolute Value *INEQUALITIES*:

$If \quad \begin{matrix} |x| < \# \\ |x| \leq \# \end{matrix} \quad then \rightarrow$

$If \quad \begin{matrix} |x| > \# \\ |x| \geq \# \end{matrix} \quad then \rightarrow$

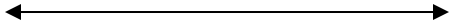
Basic Rules of Rewriting Absolute Value *INEQUALITIES*:

To solve an inequality in the form $|x| < c$

To solve an inequality in the form $|x| > c$

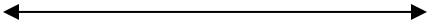
Example 6 Solve the absolute value *inequality*, then graph your solution.

$|2x - 1| < 5$



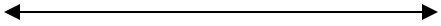
Example 8 Solve the absolute value *inequality*, then graph your solution.

$2|2x - 5| + 1 \geq 15$

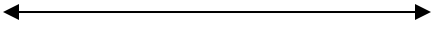


Example 9 Solve the absolute value *inequality*, then graph your solution.

a. $6|2x + 4| > 30$



b. $|2x + 2| - 5 \leq 15$



ALGEBRA 1 Name _____
CHAPTER 3 REVIEW Date _____

Determine if the given value makes the inequality true or false.

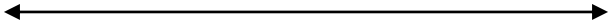
1. $-5x + 7 \geq 15;\ x = -2$

2. $\frac{8 - 3m}{4} < 0;\ m = 2$

Solve and graph each inequality.

3. $12 < n + 8$

4. $-\frac{x}{3} \geq -12$



5. $\frac{2a - 16}{5} \geq 2$

Solve and graph each inequality.

6. $\frac{3}{2} \leq \frac{x}{4} + 1$

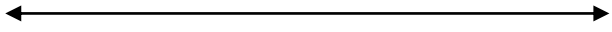
7. $\frac{3 - 4m}{2} \geq 6$

8. $3(-x - 6) < 2(2x + 8) + 1$

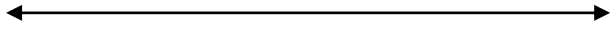
9. Explain the difference between an “and” compound inequality versus an “or” compound inequality.

Solve each compound inequality and graph the solution set.

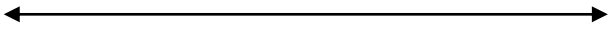
10. $2 + 3x > 8 \quad or \quad 4 - 7x \geq -17$



11. $1 \leq \frac{2y + 3}{4} < 3$



12. $|-4x + 8| \leq 16$



13. $\left|\frac{3 - 2x}{5}\right| > 1$

For each word problem, define a variable, write an inequality, solve and answer in a sentence.

14. Juan want to buy two shirts and a pair of jeans. Each shirt costs $18.50.
    If Juan wants to spend at most $78, how much can he spend on a pair of jeans.

15. A farmer wants to enclose a large rectangular plot of land for a garden. He wants the perimeter of the garden to be at least 200 feet. He also would like the length of the garden to be 40 feet more than twice the width. What are the minimum dimensions that the farmer should consider?