

Algebra 1 Student Notes

2.1 Write and Graph Inequalities

Learning Outcomes: I can write inequalities from graphs or sentences.

I can graph inequalities.

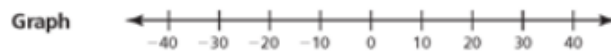
EXPLORATION 1

 Writing and Graphing Inequalities

Work with a partner. Write an inequality for each statement. Then sketch the graph of the numbers that make each inequality true.

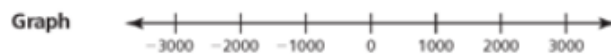
a. Statement The temperature t in Sweden is at least -10°C .

Inequality



b. Statement The elevation e of Alabama is at most 2407 feet.

Inequality



2.1

ATTENDING TO PRECISION

To be proficient in math, you need to communicate precisely. You also need to state the meanings of the symbols you use.

EXPLORATION 2

 Writing Inequalities

Work with a partner. Write an inequality for each graph. Then, in words, describe all the values of x that make each inequality true.



Tell whether -4 is a solution of each inequality.

a. $x + 8 < -3$

b. $-4.5x > -21$

Chapter 2 Solving Linear Inequalities

Examples:

Graph each inequality.

a. $y \leq -3$

b. $2 < x$

c. $x > 0$

Practice:

Graph the inequality.

7. $b > -8$

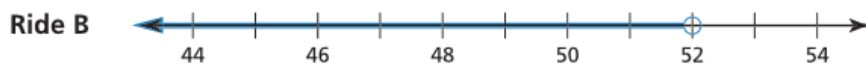
8. $1.4 \geq g$

9. $r < \frac{1}{2}$

10. $v \geq \sqrt{36}$

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- 1) The graphs show the height restrictions h (in inches) for two rides at an amusement park. Write an inequality that represents the height restriction of each ride.



- 2) Write both inequalities in set builder notation:

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Write an inequality:

- 1) Twice a number increased by 5 is not fewer than 10
- 2) Twice the sum of a number and 5 is at most -8
- 3) Half a number decreased by 7 is more than 20
- 4) Your age has to be at least 16 to get a drivers license

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2.2 Solving Inequalities by Addition and Subtraction

Addition Property of Equality If $a = b$ then $a + c = b + c$
If $a = b$ then $a - c = b - c$

Addition Property of Inequalities If $a > b$ then $a + c > b + c$
If $a < b$ then $a + c < b + c$

Ex. 1: Solve the inequality $x - 5 < 9$

Set builder notation:

Check the solution:

Graph the solution



Chapter 2 Solving Linear Inequalities

★ Subtraction Property of Inequalities

If $a > b$ then $a - c > b - c$

If $a < b$ then $a - c < b - c$

Ex. 2: Solve: $x + 3 > -2$

Ex. 3: Solve: $-3 > x - (-5)$

Write all inequality solutions with the variable on the left!

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Inequality Verbal Expressions:

Examples: A number decreased by 8 is at most 14.

A number increased by 7 is no less than 2.

graphing: _____ circle for $<$ and $>$
_____ circle for \leq and \geq

You try: solve, set builder notation, graph

1. $9 \leq b + 4$ 2. $t - 7 > 5$ 3. $7 + 3 > x - (-4)$

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Chapter 2 Solving Linear Inequalities

A circuit overloads at 1800 watts of electricity. You plug a microwave oven that uses 1100 watts of electricity into the circuit.

- Write and solve an inequality that represents how many watts you can add to the circuit without overloading the circuit.
- In addition to the microwave oven, which of the following appliances can you plug into the circuit at the same time without overloading the circuit?

Appliance	Watts
Clock radio	50
Blender	300
Hot plate	1200
Toaster	800

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2.3 Solving Inequalities Using Multiplication and Division

WARM-UP: Review

$$6x = 18$$

$$\frac{2}{5}x = 9$$

$$\frac{x}{3} = 9$$

What happens to the signs?

$$10 > -15$$

$$10 > -15$$

$$10 > -15$$

$$10 > -15$$

Chapter 2 Solving Linear Inequalities

★ Whenever you _____ or _____ both sides of an inequality by a _____, then the inequality sign needs to be _____.

Examples:

What are we multiplying both sides by?

1. $\frac{x}{3} \geq -8$

What are we multiplying both sides by?

2. $\frac{x}{-2} \leq 4$

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3. $3x < -15$

4. $\frac{2}{3}x > -6$

5. $-6 \geq -\frac{4}{5}x$

6. Four-fifths of a number is at most twenty. Write an inequality and solve it.

7. You earn \$9.50 per hour at your summer job. Write and solve an inequality that represents the numbers of hours you need to work to buy a digital camera that costs \$247.

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2.4 Solving Multi-Step Inequalities

$$-7x + 5 = -23 \quad \text{verses} \quad -7x + 5 > -23$$

2.4

Examples:

a) $9r + 15 \leq 24 + 10r$

b) $\frac{4x - 2}{5} > -4$

c) $3(z + 1) + 11 < -2(z + 13)$

Your Turn:

d) $5n - 3(n - 6) \geq 0$

e) $3 + 5t \leq 3(t + 1) - 4(2 - t)$

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Unique solutions.

Examples:

a) $3x + 1 = 3x + 1$

b) $3x + 1 < 3x + 2$

Your Turn:

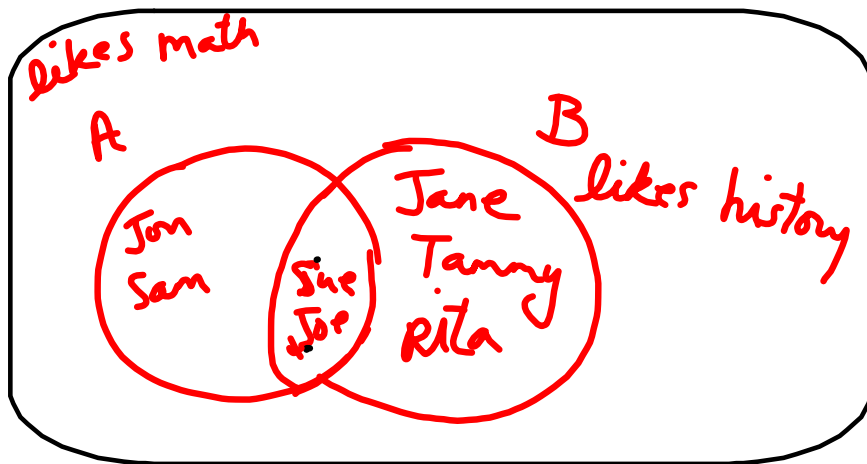
c) $3x + 7 < 3x + 2$

d) $3x + 1 < 3x + 1$

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2.5 Solving Compound Inequalities

WARM-UP:



Who likes math **OR** history?

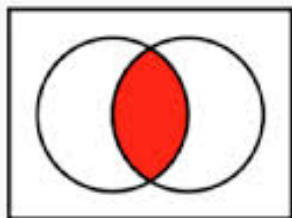
Who likes math **AND** history?

2.5

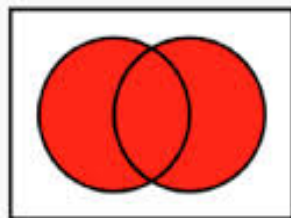
Conjunction Words

OR “Union” (solution must work for one **or** the other inequality)

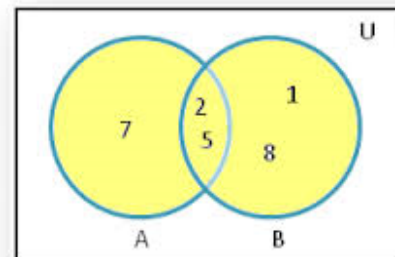
AND “Intersection” (solution must work for **both** inequalities at the same time)



Intersection of two sets
 $A \cap B$



Union of two sets
 $A \cup B$

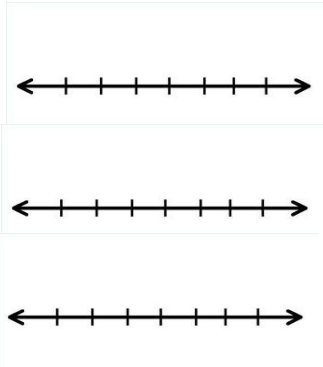


$$A \cup B = \{1, 2, 5, 7, 8\}$$

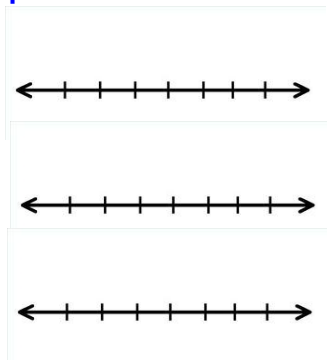
How would you write the intersection of the 2 sets:

Chapter 2 Solving Linear Inequalities

Ex.1: Graph the solution set of $y \geq 5$ and $y < 12$.

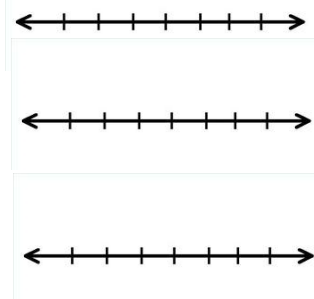


Graph the solution set of $y \geq 5$ or $y < -2$.



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Ex. 2 Solve: $7 < z + 2 \leq 11$.



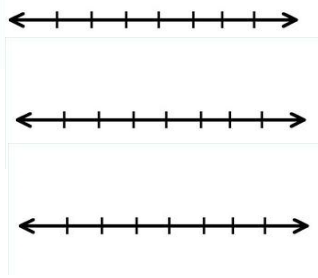
Ex. 3: A ski resort has several types of hotel rooms and several types of cabins. The hotel rooms cost at most \$89 per night, and the cabins cost at least \$109 per night. Write and graph a compound inequality that describes the amount a guest would pay per night at the resort.



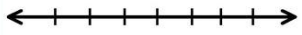
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Chapter 2 Solving Linear Inequalities

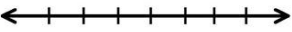
Ex.4 $4k - 7 < 25$ Or $12 - 9k \geq 30$



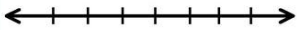
Ex. 5 graph $x > -2$ and $x < -3$



Ex. 6 graph $x > -3$ or $x < -2$

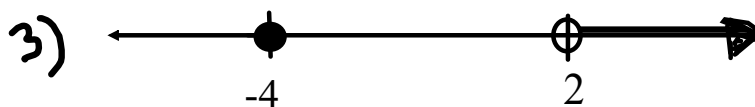
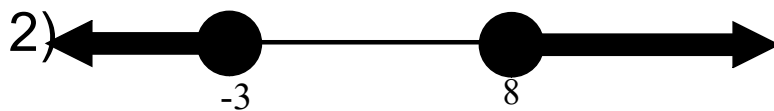


Ex. 7 graph $2 < x < 5$



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Write the compound inequality for each.



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2.6 Solving Absolute Value Inequalities

Warm-up:

$$|3| =$$

$$|x| = 2$$

$$|-3| =$$

$$|x| = 9.5$$

$$|-5.2| =$$

$$|4.6| =$$

$$|x| = 4$$

2.6

$|x| = 3$ All numbers that are 3 units from 0.
 x could be ____ or ____ graph would look like



$|x| < 3$ All numbers that are within 3 units from 0. x
 could be ____ AND ____ graph would look like



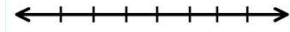
$|x| > 3$ All numbers that are more than 3 units from 0.
 x could be ____ OR ____ graph would look like



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Chapter 2 Solving Linear Inequalities

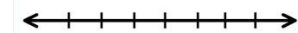
$|x - 1| < 3$ All numbers that are within 3 units from 1. x could be _____ AND _____ graph would look like



Here is how you solve $|x - 1| < 3$

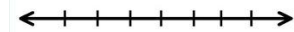
What is this asking: $|x - (-1)| < 3$

Solve and graph:



What is this asking: $|x + 1| < 3$

Solve and graph:

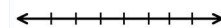


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What is this asking: $|x - (-1)| > 3$

Which numbers are

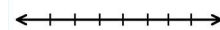
Solve and graph:



What is this asking: $|2x - 4| > 6$

(Which numbers can you double and be more than _____ units from _____.)

Solve and graph:



Check that you can double the numbers graphed and the doubled value is more than 6 units from 4.

Dec 16-8:53 AM

Chapter 2 Solving Linear Inequalities

$$\text{a) } |3y - 3| > 9$$

Steps to solve inequalities with ABSOLUTE VALUE:

- A) Write the inequality without absolute value signs
- B) Write again but reverse arrow and take opposite of number after the inequality sign
- C) Solve and graph - no solution and all numbers is a possibility

$$\text{b) } |2z - 9| \leq 1$$

$$\text{c) } |3 - 2r| > 7$$

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Your Turn:

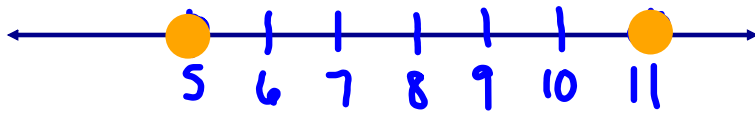
$$\text{d) } |2x - 4| > -5$$

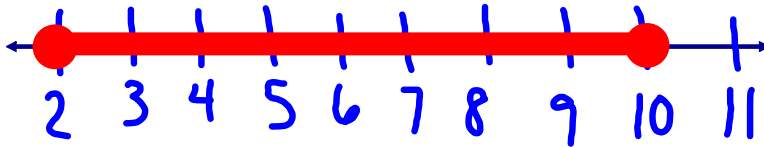
$$\text{e) } |5x + 1| \leq -2$$

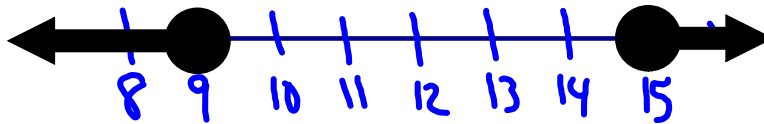
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Chapter 2 Solving Linear Inequalities

Write an open sentence involving absolute value for each graph below:







Jan 3-1:09 PM

How far? $|x|$ Starting point?

Distance from Zero

Absolute Value

A number line from -4 to 4. Points are marked at -4, -3, -2, -1, 0, 1, 2, 3, 4. Points at -4, -3, -2, -1 are red. Point at 0 is green. Points at 1, 2, 3, 4 are blue.

= Exactly
 > More than
 < Less than

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