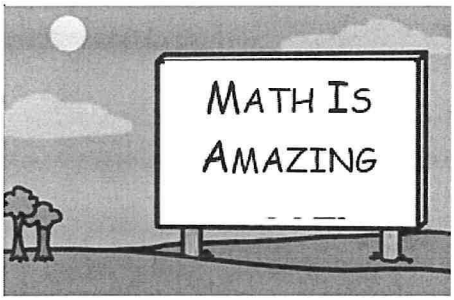
~ Graphing & Writing Inequalities ~ Packet of Fun

TLW Identify solutions of inequalities with one variable.

TLW Write and graph inequalities with one variable.

TLW define: inequality and solution of an inequality



An _____ is a statement that two quantities are not equal.
The quantities are compared by using the following signs:

$<$	$>$	$\leq$	$\geq$	$\neq$
$A < B$	$A > B$	$A \leq B$	$A \geq B$	$A \neq B$

Describe the solutions of each inequality in words.

1. $m > 3$ _____

2. $t \leq -11$ _____

3. $x < 74$ _____

4. $r \neq -9$ _____

5. $p \geq 0$ _____

6. $m \leq -436$ _____

Identifying Solutions of Inequalities

A _____ is any value of the variable that makes the inequality true.

Fill in the chart below stating whether or not the values of x are solutions of the given inequality.

x	-3	0	9.9	10	10.1	12
$x - 6 \stackrel{?}{\geq} 4$						
Solution?						

An inequality like $3 + x < 9$ has too many solutions to list.
You can use a graph on a number line to show all the solutions.

The solutions are shaded and an arrow shows that the solutions continue past those shown on the graph. To show that an endpoint is a solution, draw a _____ at the number.
To show an endpoint is not a solution, draw _____.

Let's try an example of each...I just like Inequalities,... Inequalities are my favorite.

WORDS	ALGEBRA	GRAPH
All real numbers less than 5		
All real numbers greater than -1		
All real numbers less than or equal to 3		
All real numbers greater than or equal to 0		
All real numbers not equal to -7		

Graphing Inequalities

Graph each inequality below on the line provided. Be sure to label your number line correctly.

1. $t \geq 15$

2. $h > -12$

3. $b < -7$

4. $w \neq -4$

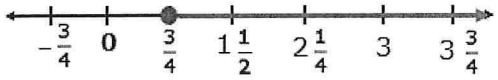
5. $h \leq -31$

6. $d > 17$

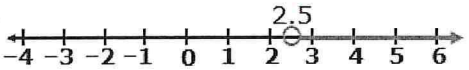
Writing an Inequality from a Graph

Write the inequality shown by each graph.

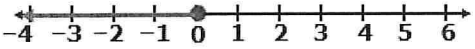
1. _____



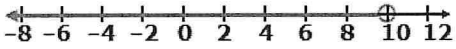
2. _____



3. _____



4. _____



Applications of Inequalities

Read each situation carefully and represent it by graphing and writing and inequality.

Reading Math

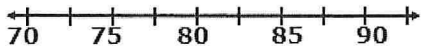
"No more than" means "less than or equal to."

"At least" means "greater than or equal to".

1. Ray's dad told him not to turn on the air conditioner unless the temperature is at least $85°F$. Define a variable and write an inequality for the temperatures at which Ray can turn on the air conditioner. Graph the solutions.

Let t represent the temperatures at which Ray can turn on the air conditioner.

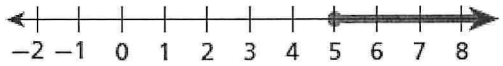
Turn on the AC when temperature	is at least	85°F

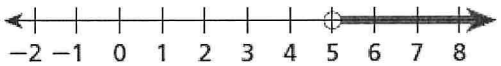
Inequality: _____ Graph of Solutions: 

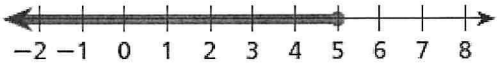
2. A store's employees earn at least $\$8.50$ per hour. Define a variable and write an inequality for the amount the employees may earn per hour. Graph the solutions. Let w represent an employee's wages.

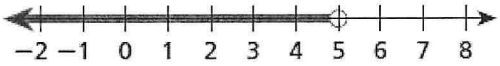
Inequality: _____ Graph of Solutions:

Match each inequality with its graph.

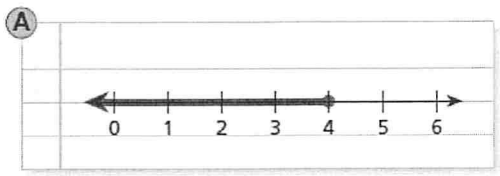
1. _____ $x \geq 5$ (a) 

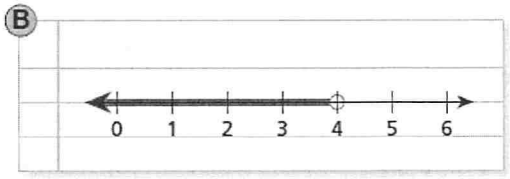
2. _____ $x < 5$ (b) 

3. _____ $x > 5$ (c) 

4. _____ $x \leq 5$ (d) 

5. Two students graphed the inequality $4 > b$. Which graph is incorrect? Explain the error.

A 

B 

Name: _____ Date: _____ Period: _____

3.1 Practice WS (1) Cookie Monster

GRAPH EACH INEQUALITY BELOW ON THE LINE PROVIDED. BE SURE TO LABEL YOUR NUMBER LINE CORRECTLY.

1. $x < -89$

2. $y \geq 4$

3. $f \neq 67$

4. $z > -43$

5. $h \leq -2$

6. $d > 51$

FOR EACH SITUATION, DEFINE A VARIABLE, WRITE AN INEQUALITY AND GRAPH THE SOLUTIONS.

7. Alexis sleeps more than 7 hours each night.
   Write an inequality to represent how much Alexis sleeps each night.

8. In 1955, the minimum wage in the U.S. was $0.75 per hour.
   Write an inequality to represent the cost of minimum wage in 1955.

DESCRIBE THE SOLUTIONS OF EACH INEQUALITY IN WORDS.

9. $m \geq -14$ _____

10. $t < 1$ _____

11. $c > -34$ _____

12. $d \leq 12$ _____

WRITE AN INEQUALITY TO BEST REPRESENT EACH SITUATION.

20. A citizen must be at least 35 years old in order to run for Presidency of the United States. Write an inequality to represent how old a human would need to be in order to run for President of the U.S.

21. A certain elevator can hold no more than 2,500 pounds. Write an inequality to represent how much the elevator can hold on any given day.

22. Kyle weighed 125 pounds before he started to play football. Write an inequality to represent what Kyle weighed before he started to play football.

23. You must be at least 50 inches tall to ride the Wild Tornado roller coaster. Write an inequality to represent how tall you would be if you were <u>unable</u> to ride the Wild Tornado roller coaster.

24. Children less than 12 years old must be accompanied by an adult inside the haunted house. Write an inequality to represent how old you must be to go in the haunted house without an adult.

25. Totland is an area of the amusement park for children who are 6 years old or younger. Write an inequality to represent the ages of children in which Totland is designed.

26. The Bumpy Cars will not be turned on if there are 5 or more empty cars. Write an inequality to represent when the Bumpy Cars will be turned on.

Name _____ Date _____ Class _____

LESSON 3-1

Practice B

Graphing and Writing Inequalities

Describe the solutions of each inequality in words.

1. $2m \geq 6$ _____

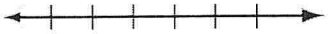
2. $t + 3 < 8$ _____

3. $1 < x - 5$ _____

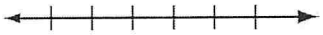
4. $-10 \geq \frac{1}{2}c$ _____

Graph each inequality.

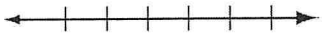
5. $x > -7$



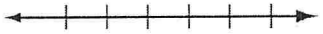
6. $p \geq 2^3$



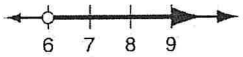
7. $4.5 \geq r$



8. $y < -\sqrt{14-5}$



Write the inequality shown by each graph.

9. 

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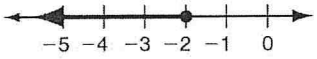
10. 

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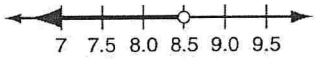
11. 

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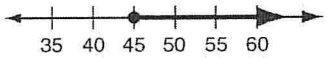
12. 

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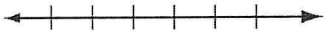
Define a variable and write an inequality for each situation. Graph the solutions.

13. Josephine sleeps more than 7 hours each night.



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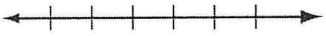
14. In 1955, the minimum wage in the U.S. was $0.75 per hour.



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~ Solving One-Step Inequalities ~
Packet of Fun

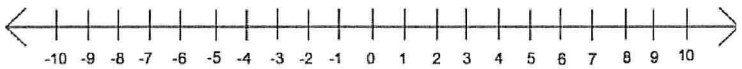
TLW solve one-step inequalities by using addition, subtraction, multiplication and division

TLW use context clues to write inequalities in real world situations

TLW love inequalities so much because they are just our favorite

Graph each inequality and write an inequality for each situation.

(a) The temperature must be at least $-10°F$.



_____

(b) The temperature feels like it is no more than $9°F$.

_____

Solve each equation.

(a) $-3a = 18$ (b) $x - 9 = -17$ (c) $\frac{x}{6} = -20$ (d) $m + 8 = -12$

Solving one-step inequalities is much like solving one-step equations. To solve an inequality, you need to isolate the variable using the properties of inequality and inverse operations.

Using Addition and Subtraction to Solve Inequalities

Solve each inequality and graph the solutions.

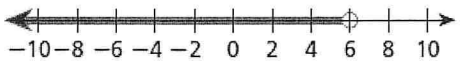
A $x + 9 < 15$

$x + 9 < 15$

$-9 \quad -9$

$x \quad < 6$

Since 9 is added to x, subtract 9 from both sides to undo the addition.



B $d - 3 > -6$

$d - 3 > -6$

$+3 \quad +3$

$d \quad > -3$

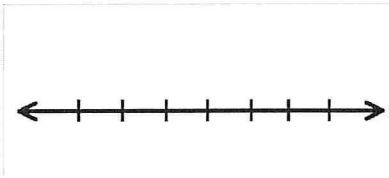
Since 3 is subtracted from d, add 3 to both sides to undo the subtraction.

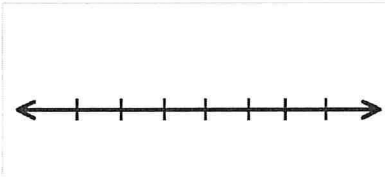
Solve each inequality and graph the solution on the number line provided.

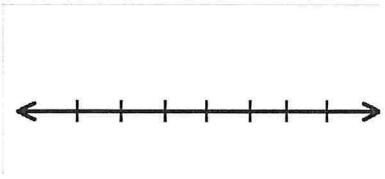
(a) $x + 4 > -7$

(b) $x - 8 < -1$

(c) $x - 12 \leq 3$



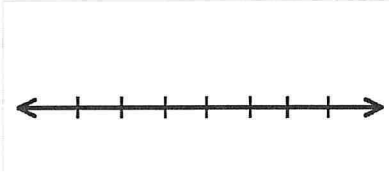


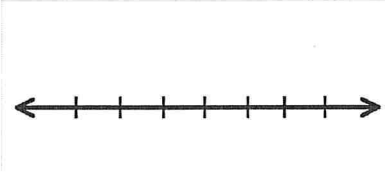


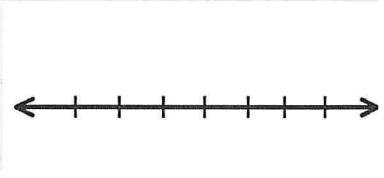
(d) $x - 1 > -7$

(e) $x + 83 < -11$

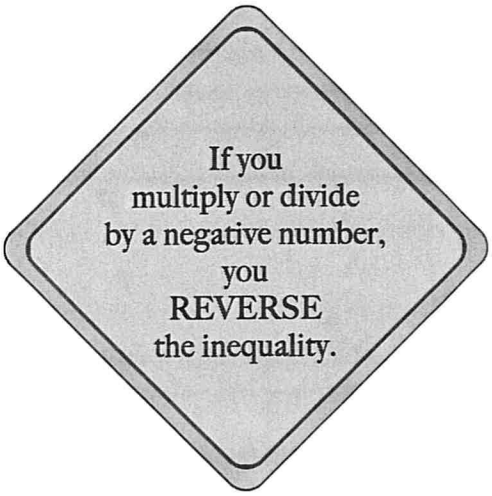
(f) $x - 12 \geq -3$







If you multiply or divide both sides of an inequality by a negative number, the resulting inequality is not a true statement. You need to reverse the inequality symbol to make the statement true.



Caution!

Do not change the direction of the inequality symbol just because you see a negative sign. For example, you do not change the symbol when solving $4x < -24$.

Solve each inequality and graph the solution on the number line provided.

(a) $2x > -70$

(b) $-8x \leq 24$

(c) $\frac{x}{9} \neq 4$

(d) $45x > -90$

(e) $\frac{x}{-5} < -11$

(f) $12x \geq 144$

Problem Solving

Example 1

Sami has a gift card. She has already used 14 of the total value, which was 30. Write, solve, and graph an inequality to show how much more she can spend.

Step 1: Understand the Problem: The answer will be an inequality and a graph that show all the possible amounts of money that Sami can spend.

Step 2: List the important information:
- Sami can spend up to, or *at most* 30.
- Sami has already spent 14.

Step 3: Make a plan: Write and solve an inequality

Let g represent the remaining amount of money Sami can spend.

Amount remaining	plus	amount used	is at most	$30.
g	+	14	$\leq$	30

Step 4: Write your answer in a complete sentence to be sure it answers the question and makes logical sense.

Example 2

Mrs. Lawrence wants to buy an antique bracelet at an auction. She is willing to bid no more than 550. So far, the highest bid is 475. Write and solve an inequality to determine the amount Mrs. Lawrence can add to the bid. Check your answer.

Step 1:

Step 2:

Step 3:

Step 4:

Example 3

A soccer coach plans to order more shirts for her team. Each shirt costs $\$9.85$. She has $\$77$ left in her uniform budget. What are the possible number of shirts she can buy?

Step 1:

Step 2:

Step 3:

Step 4:

Example 4

A pitcher holds 128 ounces of juice. What are the possible numbers of $10-ounce$ servings that one pitcher can fill?

Step 1:

Step 2:

Step 3:

Step 4:

Name: _____ Date: _____ Period: _____

ASMD Inequalities Practice WS (1) Oscar the Grouch

Solve each inequality.

1. $t+5<-10$

2. $n+4>8$

3. $q+2\geq 6$

4. $4x\leq 16$

5. $x-6<15$

6. $p-4>-2$

7. $r+3\neq 5$

8. $13x>-26$

9. $w+8\geq 12$

10. $43+n<62$

11. $r-2\geq -7$

12. $\frac{1}{2}x\geq -8$

13. $\frac{1}{4}x>-9$

14. $8+n\geq 2$

15. $140<t+3$

16. $-3x>27$

17. $81x\neq 81$

18. $14x\geq 28$

19. $m-10>0$

20. $-5x<30$

21. The rope Bobby brought with his camping gear is 100 inches long. Bobby needs to cut shorter pieces of rope that are each 18 inches long. What are the possible number of pieces Bobby can cut?

22. Tom saved $\$550$ to go on a school trip. The cost for a hotel room, including tax is $\$80$ per night. What are the possible numbers of nights Tom can stay at the hotel?

23. Ryan has a $\$20$ gift card for a health store where a smoothie costs $\$2.50$ with tax. What are the possible numbers of smoothies that Ryan can buy?

Solve each inequality and match the solution to the correct graph.

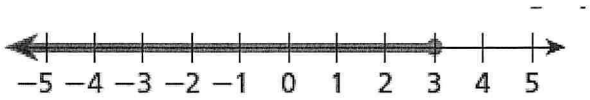
24. _____ $-0.5x \geq 1.5$

25. _____ $\frac{1}{9}x \leq -3$

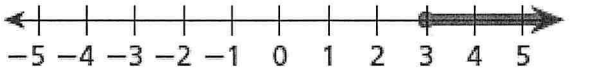
26. _____ $-13.5 \leq -4.5x$

27. _____ $\frac{x}{-6} \leq -\frac{1}{2}$

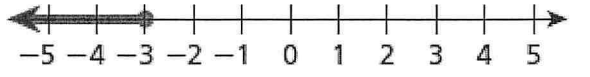
(a)



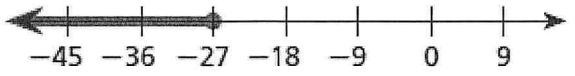
(b)



(c)



(d)



Name: _____ Date: _____ Period: _____

ASMD Inequalities Practice WS (2) Big Bird

Please read each question carefully and show all your work. Rectangle your final answer.

1. A local restaurant will deliver food to your house if the purchase amount of your order is at least $\$25$. The total for part of your order is $\$17.95$. Write and solve an inequality to determine how much more must spend for the restaurant to deliver you order.

2. The maximum load for a certain elevator is 2000 pounds. The total weight of the passengers on the elevator is 1400 pounds. A delivery man who weights 243 pounds enters the elevator with a crate of weight w. Write and solve and inequality to show the values of w that will not exceed the weight limit of the elevator.

3. The gas tank in Mandy's car holds at most 15 gallons. She has already filled the tank with 7 gallons of gas. She will continue to fill the tank with g gallons more. Write and solve an inequality that shows all values of g that Mandy can add to the car's tank.

4. $x+3\leq -1$

5. $\frac{1}{3}y\neq -8$

6. $w-1>-2$

7. $-2x<-18$

8. $t-5\leq 10$

9. $\frac{1}{7}y\neq -2$

10. $-30x>60$

11. $7+x>19$

12. $b+8\neq 15$

13. $-6x>-54$

14. $w-9>-11$

15. $\frac{1}{9}w\leq -7$

16. $x+5\leq -8$

17. $24=-24x$

18. $c-14>-13$

19. $-9x<-90$

Name _____ Date _____ Class _____

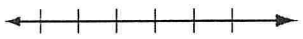
LESSON 3-2

Practice B

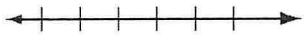
Solving Inequalities by Adding or Subtracting

Solve each inequality and graph the solutions.

1. $b + 8 > 15$

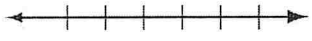


2. $t - 5 \geq -2$

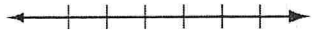


3. $-4 + x \geq 1$

4. $g + 8 < 2$



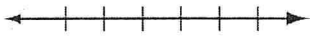
5. $-9 \geq m - 9$



6. $15 > d + 19$

Answer each question.

7. Jessica makes overtime pay when she works more than 40 hours in a week. So far this week she has worked 29 hours. She will continue to work h hours this week. Write, solve, and graph an inequality to show the values of h that will allow Jessica to earn overtime pay.



8. Henry's MP3 player has 512MB of memory. He has already downloaded 287MB and will continue to download m more megabytes. Write and solve an inequality that shows how many more megabytes he can download.

9. Eleanor needs to read at least 97 pages of a book for homework. She has read 34 pages already. Write and solve an inequality that shows how many more pages p she must read.

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Name _____ Date _____ Class _____

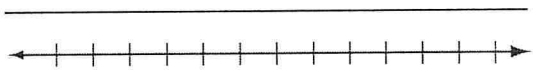
LESSON 3-3

Practice B

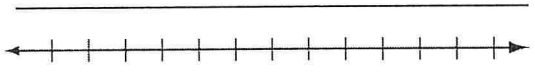
Solving Inequalities by Multiplying or Dividing

Solve each inequality and graph the solutions.

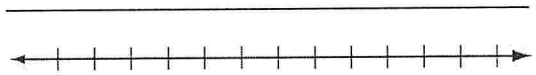
1. $4a > 32$



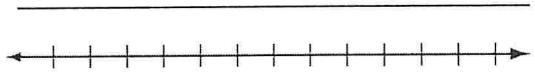
2. $-7y < 21$



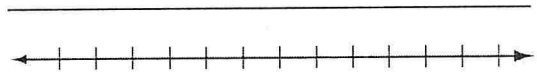
3. $1.5n \leq -18$



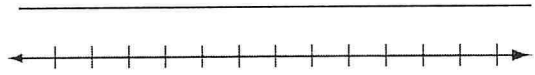
4. $-\frac{3}{8}c \geq 9$



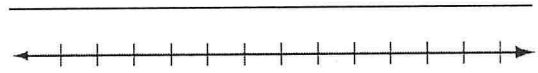
5. $\frac{y}{5} > 4$



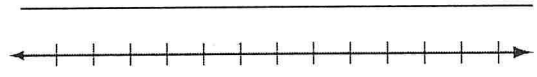
6. $2s \leq -3$



7. $-\frac{1}{3}b < -6$



8. $\frac{z}{-8} \geq -0.25$



Write and solve an inequality for each problem.

9. Phil has a strip of wood trim that is 16 feet long. He needs 5-foot pieces to trim some windows. What are the possible numbers of pieces he can cut?

_____

10. A teacher buys a 128-ounce bottle of juice and serves it in 5-ounce cups. What are the possible numbers of cups she can fill?

_____

11. At an online bookstore, Kendra bought 4 copies of the same book for the members of her book club. She got free shipping because her total was at least $50. What was the minimum price of each book?

_____

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Name _____ Date _____ Class _____

LESSON 3-2

Problem Solving

Solving Inequalities by Adding or Subtracting

Write the correct answer.

1. Sumiko is allowed to watch no more than 10 hours of television each week. She has watched 4 hours of television already. Write and solve an inequality to show how many more hours of television Sumiko can watch.

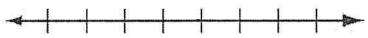
_____

2. A satellite will be released into an orbit of more than 400 miles above the Earth. The rocket carrying it is currently 255 miles above Earth. Write and solve an inequality to show how much higher the rocket must climb before it releases the satellite.

_____

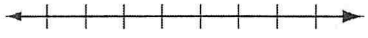
3. Wayne's homework is to solve at least 20 questions from his textbook. So far, he has completed 9 of them. Write, solve, and graph an inequality to show how many more problems Wayne must complete.

_____



4. Felix wants to get at least one hour of exercise each day. Today, he has run for 40 minutes. Write, solve, and graph an inequality that shows how much longer Felix needs to exercise to reach his goal.

_____



The high school has been raising money for charity and the class that raises the most will be awarded a party at the end of the year. The table below shows how much money each class has raised so far. Use this information to answer questions 5–7.

Class	Amount Raised ($)
Seniors	870
Juniors	650
Sophomores	675
First-Years	590

5. The school has a goal of raising at least $3000. Which inequality shows how much more money m they need to raise to reach their goal?

A $m \geq 215$ C $m \leq 215$

B $m < 215$ D $m > 2785$

6. The juniors would like to raise more money than the seniors. The seniors have completed their fundraising for the year. Which expression shows how much more money j the juniors must raise to overtake the seniors?

F $j \leq 220$ H $j \geq 220$

G $j < 220$ J $j > 220$

7. A local business has agreed to donate no more than half as much as the senior class raises. Which inequality shows how much money b the business will contribute?

A $\frac{1}{2}(870) \leq b$ C $\frac{1}{2}(870) \geq b$

B $870 \leq \frac{1}{2}b$ D $870 \geq \frac{1}{2}b$

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Name _____ Date _____ Class _____

LESSON 3-3

Problem Solving

Solving Inequalities by Multiplying or Dividing

Write and solve an inequality for each situation.

1. Karin has $3 to spend in the arcade. The game she likes costs 50¢ per play. What are the possible numbers of times that she can play?

_____

_____

2. Tyrone has $21 and wants to buy juice drinks for his soccer team. There are 15 players on his team. How much can each drink cost so that Tyrone can buy one drink for each person?

_____

_____

3. A swimming pool is 7 feet deep and is being filled at the rate of 2.5 feet per hour. How long can the pool be left unattended without the water overflowing?

_____

_____

4. Megan is making quilts that require 11 feet of cloth each. She has 50 feet of cloth. What are the possible numbers of quilts that she can make?

_____

_____

Alyssa, Reggie, and Cassie are meeting some friends at the movies and have stopped at the refreshment stand. The table below shows some of the items for sale and their prices. Use this information to answer questions 5–7.

Menu Item	Price($)
Popcorn	3.50
Drink	3.00
Hot Dog	2.50
Nachos	2.50
Fruit Snack	2.00

5. Alyssa has $7 and would like to buy fruit snacks for as many of her friends as possible. Which inequality below can be solved to find the number of fruit snacks f she can buy?

A $2f \leq 7$ C $7f \leq 2$

B $2f > 7$ D $7f < 2$

6. Reggie brought $13 and is going to buy popcorn for the group. Which answer below shows the possible numbers of popcorns p Reggie can buy for his friends?

F 0, 1, or 2 H 0, 1, 2, 3, or 4

G 0, 1, 2, or 3 J 0, 1, 2, 3, 4, or 5

7. The movie theater donates 12% of its sales to charity. From Cassie's purchases, the theater will donate at least $2.15. Which inequality below shows the amount of money m that Cassie spent at the refreshment stand?

A $m \geq 17.92$ C $m \geq 25.80$

B $m \leq 17.92$ D $m \leq 25.80$

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~ Solving Multi-Step Inequalities ~ Packet of Fun

TLW Solve inequalities that contain more than one operation.
TLW Solve inequalities that contain variable terms on both sides.
TLW Use inequalities to solve real-world application problems
TLW love solving multi-step inequalities because really, why wouldn't you????

Inequalities that contain more than one operation require more than one step to solve. Use inverse operations to undo the operations in the inequality one at a time.

Some inequalities have variable terms on both sides of the inequality symbol. You can solve these inequalities like you solved equations with variables on both sides.

Use the properties of inequality to "collect" all the variable terms on one side and all the constant terms on the other side.

For example:

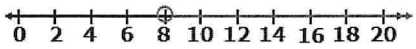
Solve the inequality and graph the solutions.

$45 + 2b > 61$

$45 + 2b > 61$
$-45 \quad -45$
$2b > 16$
$\frac{2b}{2} > \frac{16}{2}$
$b > 8$

Since 45 is added to 2b, subtract 45 from both sides to undo the addition.

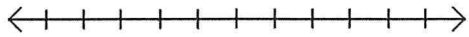
Since b is multiplied by 2, divide both sides by 2 to undo the multiplication.



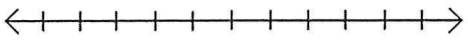
Let's Try a Bunch of Examples together to review our equation solving skills mixed with our inequality solving skills to see just how much fun we can have in one math class ☺

Solve the inequality and graph the solutions on the line provided.

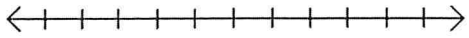
1. $8 - 3y \geq 29$



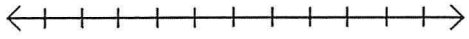
2. $-12 \geq 3x + 6$



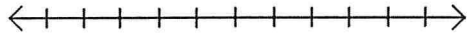
3. $\frac{x+5}{-2} > 3$



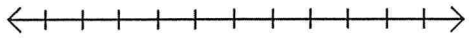
4. $\frac{1-2x}{3} \geq 7$



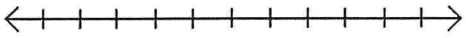
5. $2-(-10) > -4x$



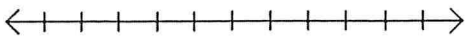
6. $-4(2-x) \leq 8$



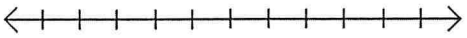
7. $\frac{2}{3}x + \frac{1}{2} > \frac{1}{3}$



8. $4x-3<2x+6$



9. $5x+1<-2x-6$



Application Examples Using Inequalities

Example 1

To rent a certain vehicle, Rent-A-Ride charges 55 per day with unlimited miles. The cost of renting a similar vehicle at We Got Wheels is 38 per day plus 0.20 per mile. For what number of miles in the cost at Rent-A-Ride less than the cost at We Got Wheels?

Step 1: Identify what you are looking for and assign a variable

Let _____ represent _____.

Step 2: Identify important information and list it below

Step 3: Write and solve the inequality.

Cost at Rent-A-Ride	must be less than	daily cost at We Got Wheels	plus	$0.20 per mile	times	# of miles.

Step 4: Logic Check – Write your answer in a complete sentence

Example 2

The average of Jim's two test scores must be at least 90% to make an A in the class. Jim got a 95% on his first test. What grades can Jim get on his second test to make an A in the class?

Step 1:

Step 2:

Step 3:

Step 4:

Example 3

The Home Cleaning Company charges $\$312$ to power-wash the siding of a house plus $\$12$ for each window. Power Clean charges $\$36$ per window, and the price includes power-washing the siding. How many windows must a house have to make the total cost from The Home Cleaning Company less expensive than Power Clean?

Step 1:

Step 2:

Step 3:

Step 4:

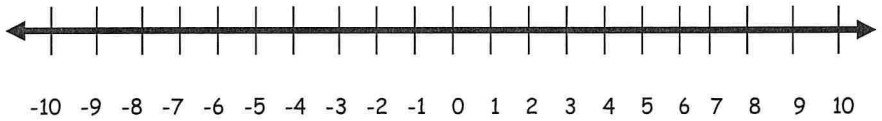
Name: _____ Date: _____ Core: _____

Solving Multi-Step Inequalities Practice WS (1) Snuffaluffagus

SOLVE EACH INEQUALITY AND GRAPH THE SOLUTION SET.

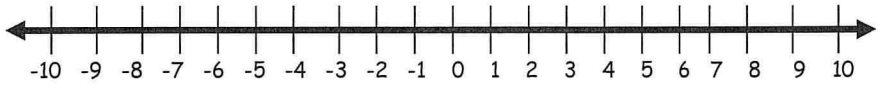
1. $6x-3>21$ _____

2. $5>4x-7$ _____

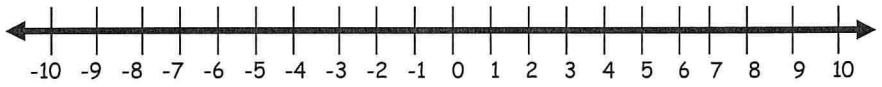


3. $3(3c-4)\geq 15$ _____

4. $-5x-10\geq -10$ _____

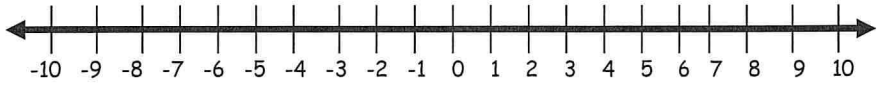


5. $-15>-3x-45$ _____

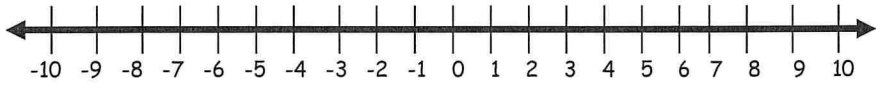


6. $-6(3t+2)\leq 6$ _____

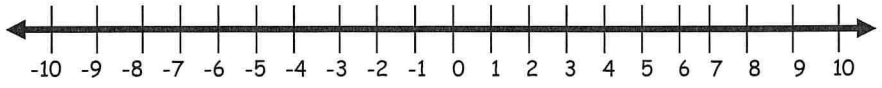
7. $5x-1>9$ _____



8. $4x-7<9$ _____



9. $5x-3>2(3+x)$ _____



10. A sales representative is given a choice of two paycheck plans. One choice includes a monthly base pay of $300 plus 10% commission on his sales. The second choice is a monthly salary of $1200. For what amount of sales would the representative make more money with the first plan?

11. One cell phone company offers a plan that costs $29.99 and includes unlimited night and weekend minutes. Another company offers a plan that costs $19.99 and charges $0.35 per minute during nights and weekends. For what numbers of night and weekend minutes does the second company's plan cost more than the first company's plan?

12. A full year membership to a gym costs $325 upfront with no monthly charge. A monthly membership costs $100 upfront and $30 per month. For what numbers of months is it less expensive to have a monthly membership?

In 13 – 15, write an inequality for each statement. Solve the inequality and graph the solutions.

13. one-half of a number, increased by 9 is less than 33

14. six is less than or equal to the sum of 4 and -2x

15. the product of 4 and the sum of a number and 12 is at most 16

16. Which statement is modeled by $2p+5<11$? 16. _____

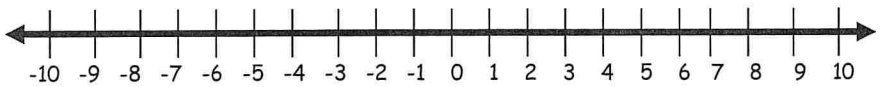
(a) the sum of 5 and 2 times p is at least 11
(b) five added to the product of 2 and p is less than 11
(c) two times p plus 5 is at most 11
(d) the product of 2 and p added to 5 is 11

Name: _____ Date: _____ Core:_____

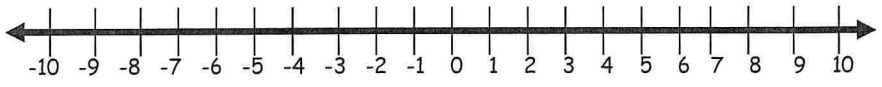
Solving Multi-Step Inequalities Practice WS (2) Grover

SOLVE EACH INEQUALITY AND GRAPH THE SOLUTION SET.

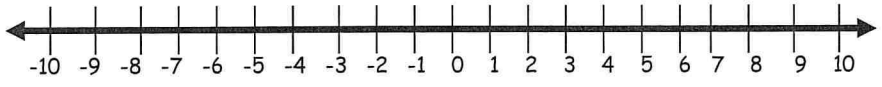
1. $-9-e>3e+11$ _____



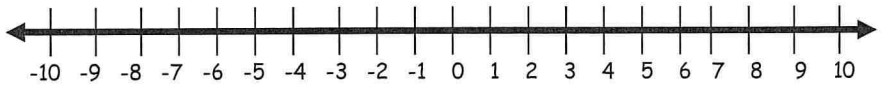
2. $3(2x+4)\geq 7x+8$ _____



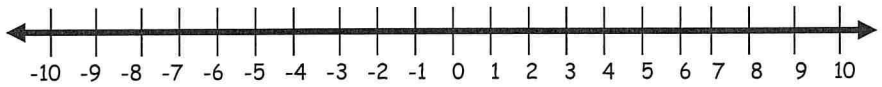
3. $7m+9\leq 5(m+3)$ _____



4. $5x-20>2x+1$ _____



5. $2(k+4)\leq 3(2k-4)$ _____



6. $5c+2<2c-7$ _____

7. $3(x-3)\geq 4x-12$ _____

8. $12d<d+11$ _____

9. $5x\geq -20$ _____

10. The school band will sell pizzas to raise money for new uniforms. The supplier charges $100 plus $4 per pizza. If the band members sell the pizzas for $7 each, how many pizzas will they have to sell to make a profit?

11. Ian wants to promote his band on the internet. Site A offers website hosting for $4.95 per month with a $49.95 startup fee. Site B offers website hosting for $9.95 per month with no startup fee. For how many months would Ian need to keep the website for Site B to be less expensive than Site A?

12. The Home Cleaning Company charges $312 to power-wash the siding of a house plus $12 for each window. Power Clean charges $36 per window, and the price includes power-washing the siding. How many windows must a house have to make the total cost from The Home Cleaning Company less expensive than Power Clean?

In 13 – 15, write an inequality to represent each relationship. Solve and graph your solution.

13. four more than twice a number is greater than two-thirds of the number

14. ten less than five times a number is less than six times the number decreased by eight

15. the sum of a number and twenty is less than four times the number decreased by one

Name _____ Date _____ Class _____

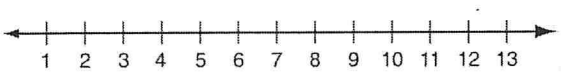
LESSON 3-4

Practice B

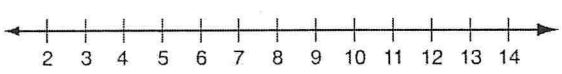
Solving Two-Step and Multi-Step Inequalities

Solve each inequality and graph the solutions.

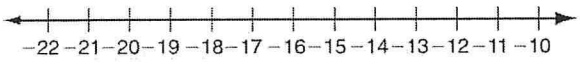
1. $-3a + 10 < -11$



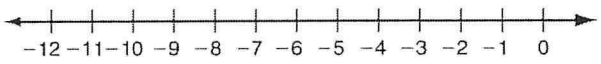
2. $4x - 12 \geq 20$



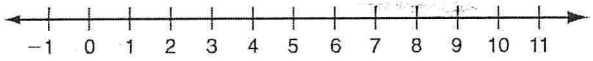
3. $\frac{2k-3}{-5} > 7$



4. $-\frac{1}{5}z + \frac{2}{3} \leq 2$

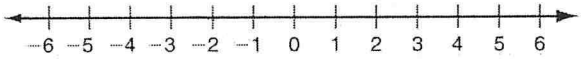


5. $6(n - 8) \geq -18$

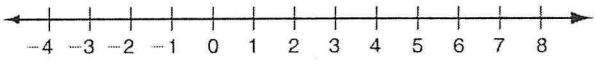


6. $10 - 2(3x + 4) < 11$

7. $7 + 2c - 4^2 \leq -9$



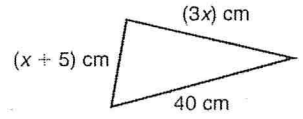
8. $15p + 3(p - 1) > 3\,(2^3)$



Write and solve an inequality for each problem.

9. A full-year membership to a gym costs $325 upfront with no monthly charge. A monthly membership costs $100 upfront and $30 per month. For what numbers of months is it less expensive to have a monthly membership?

10. The sum of the lengths of any two sides of a triangle must be greater than the length of the third side. What are the possible values of x for this triangle?



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Name _____ Date _____ Class _____

LESSON 3-4

Problem Solving

Solving Two-Step and Multi-Step Inequalities

Write and solve an inequality for each situation.

1. Jillene is playing in a basketball tournament and scored 24 points in her first game. If she averages over 20 points for both games, she will receive a trophy. How many points can Jillene score in the second game and receive a trophy?

_____

_____

2. Marcus has accepted a job selling cell phones. He will be paid $1500 plus 15% of his sales each month. He needs to earn at least $2430 to pay his bills. For what amount of sales will Marcus be able to pay his bills?

_____

_____

3. A 15-foot-tall cedar tree is growing at a rate of 2 feet per year beneath power lines that are 58 feet above the ground. The power company will have to prune or remove the tree before it reaches the lines. How many years can the power company wait before taking action?

_____

_____

4. Binh brought $23 with her to the county fair. She purchased a $5 T-shirt and now wants to buy some locally grown plants for $2.50 each. What are the numbers of plants that she can purchase with her remaining money?

_____

_____

Benedict, Ricardo, and Charlie are considering opportunities for summer work. The table below shows the jobs open to them and the pay for each. Use this information to answer questions 5–7.

Job	Pay
Mowing Lawns	$15 per lawn
Baby-Sitting	$5.50 per hour
Tutoring	$9 per session

5. Benedict has saved $91 from last year and would like to baby-sit to earn enough to buy a mountain bike. A good quality bike costs at least $300. What numbers of hours h can Benedict baby-sit to reach his goal?

A $h \geq 14$ C $h \geq 38$

B $h \geq 23$ D $h \geq 71$

6. Ricardo has agreed to tutor for the school. He owes his older brother $59 and would like to end the summer with at least $400 in savings. How many sessions s can Ricardo tutor to meet his goal?

F $s \geq 31$ H $s \geq 51$

G $s \geq 38$ J $s \geq 83$

7. Charlie has agreed to mow his neighbor's lawn each week and will also baby-sit some hours. If he makes $100 or more each week, his parents will charge him rent. How many hours h should Charlie agree to baby-sit each week to avoid paying rent?

A $h \leq 15$ C $h \leq 21$

B $h \geq 15$ D $h \geq 21$

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Name _____ Date _____ Class _____

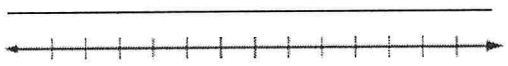
LESSON 3-5

Practice B

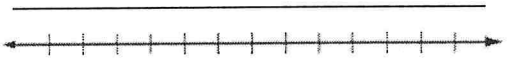
Solving Inequalities with Variables on Both Sides

Solve each inequality and graph the solutions.

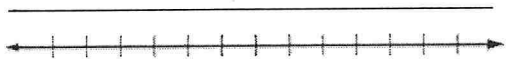
1. $2x + 30 \geq 7x$



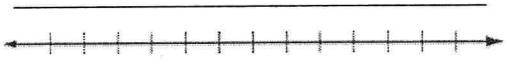
2. $2k + 6 < 5k - 3$



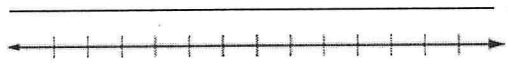
3. $3b - 2 \leq 2b + 1$



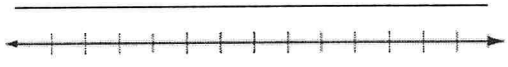
4. $2(3n + 7) > 5n$



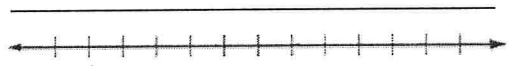
5. $5s - 9 < 2(s - 6)$



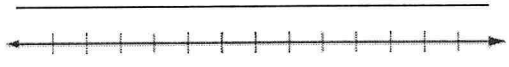
6. $-3(3x + 5) \geq -5(2x - 2)$



7. $1.4z + 2.2 > 2.6z - 0.2$



8. $\frac{7}{8}p - \frac{1}{4} \leq \frac{1}{2}p$



Solve each inequality.

9. $v + 1 > v - 6$

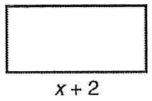
10. $3(x + 4) \leq 3x$

11. $-2(8 - 3x) \geq 6x + 2$

Write and solve an inequality for each problem.

12. Ian wants to promote his band on the Internet. Site A offers website hosting for $4.95 per month with a $49.95 startup fee. Site B offers website hosting for $9.95 per month with no startup fee. For how many months would Ian need to keep the website for Site B to be less expensive than Site A?

13. For what values of x is the area of the rectangle greater than the perimeter?



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Name _____ Date _____ Class _____

LESSON 3-5

Problem Solving

Solving Inequalities With Variables on Both Sides

Write and solve an inequality for each situation.

1. Rosa has decided to sell pet rocks at an art fair for $5 each. She has paid $50 to rent a table at the fair and it costs her $2 to package each rock with a set of instructions. For what numbers of sales will Rosa make a profit?

_____

_____

2. Jamie has a job paying $25,000 and expects to receive a $1000 raise each year. Wei has a job paying $19,000 a year and expects a $1500 raise each year. For what span of time is Jamie making more money than Wei?

_____

_____

3. Sophia types 75 words per minute and is just starting to write a term paper. Patton already has 510 words written and types at a speed of 60 words per minute. For what numbers of minutes will Sophia have more words typed than Patton?

_____

_____

4. Keith is racing his little sister Pattie and has given her a 15 foot head start. She runs 5 ft/sec and he is chasing at 8 ft/sec. For how long can Pattie stay ahead of Keith?

_____

_____

The table below shows the population of four cities in 2004 and the amount of population change from 2003. Use this table to answer questions 5–6.

5. If the trends in this table continue, after how many years y will the population of Manchester, NH, be more than the population of Vallejo, CA? Round your answer to the nearest tenth of a year.

   A $y > 0.2$ C $y > 34.6$

   B $y > 6.4$ D $y > 78.6$

6. If the trends in this table continue, for how long x will the population of Carrollton, TX be less than the population of Lakewood, CO? Round your answer to the nearest tenth of a year.

   F $x < 11.7$ H $x < 20.1$

   G $x < 14.6$ J $x < 28.3$

City	Population (2004)	Population Change (from 2003)
Lakewood, CO	141,301	–830
Vallejo, CA	118,349	–1155
Carrollton, TX	117,823	+1170
Manchester, NH	109,310	+261

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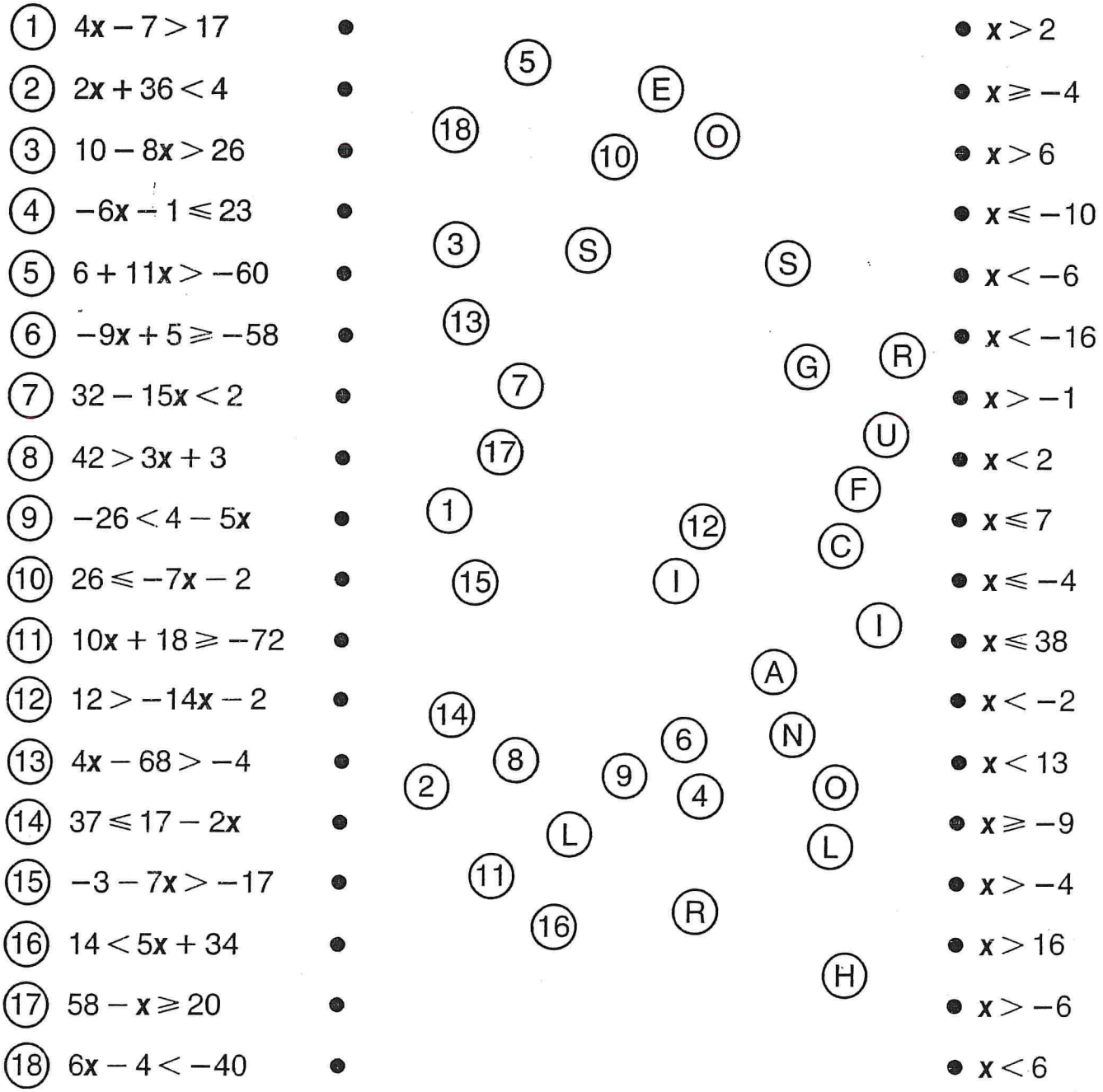
In Music, What Does "Allegro" Mean?

Solve each inequality below. Draw a straight line connecting it to the inequality that describes the solution set. The line will cross a number and a letter. Write the letter in the matching numbered box at the bottom of the page.



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

OBJECTIVE 2–b: To solve inequalities of the form $ax + b > c$, where a is an integer.

~ Section 3.6 Notes ~
Solving Compound Inequalities

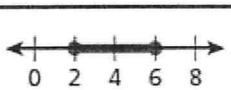
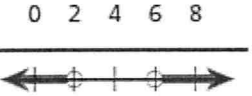
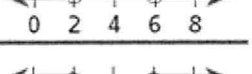
TLW solve compound inequalities with one variable.

TLW graph solution sets of compound inequalities with one variable.

TLW realize that "C" might be for "cookie" but also for "compound inequality" because even Cookie Monster loves compound inequalities

The inequalities you have seen so far are simple inequalities. When two simple inequalities are combined into one statement by the words AND or OR, the result is called a _____.

Compound Inequalities

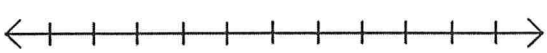
WORDS	ALGEBRA	GRAPH
All real numbers greater than 2 AND less than 6	$x > 2$ AND $x < 6$ $2 < x < 6$	
All real numbers greater than or equal to 2 AND less than or equal to 6	$x \geq 2$ AND $x \leq 6$ $2 \leq x \leq 6$	
All real numbers less than 2 OR greater than 6	$x < 2$ OR $x > 6$	
All real numbers less than or equal to 2 OR greater than or equal to 6	$x \leq 2$ OR $x \geq 6$	

Example 1

The pH level of a popular shampoo is between 6.0 and 6.5 inclusive. Write a compound inequality to show the pH levels of this shampoo. Graph the solutions.

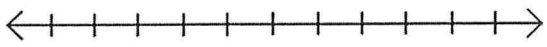
Let p be the pH level of the shampoo.

6.0 is less than or equal to pH level is less than or equal to 6.5



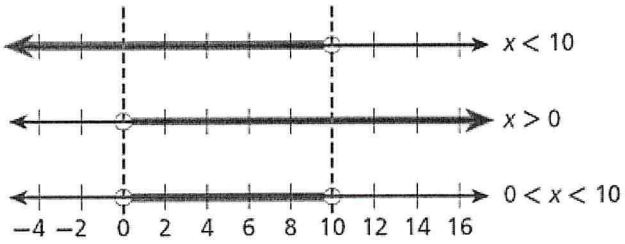
Example 2

The free chlorine in a pool should be between 1.0 and 3.0 parts per million inclusive. Write a compound inequality to show the levels that are within this range. Graph the solutions.



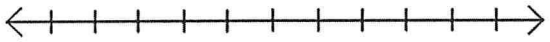
Why compound inequalities are graphed the way they are... the AND version

You can graph the solutions of a compound inequality involving AND by using the idea of an overlapping region. The overlapping region is called the **intersection** and shows the numbers that are solutions of both inequalities.

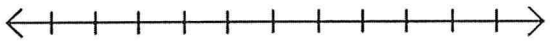


Solve the compound inequality and graph the solutions.

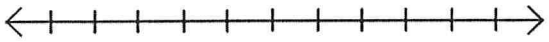
(a) $-5 < x+1 < 2$



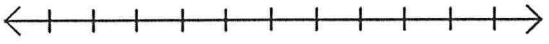
(b) $8 < 3x-1 \leq 11$



(c) $-9 < x-10 < -5$

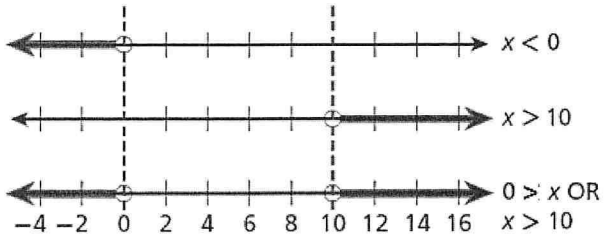


(d) $-4 \leq 3x+5 < 11$



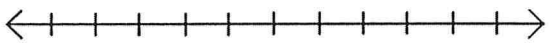
Why compound inequalities are graphed the way they are... the OR version

You can graph the solutions of a compound inequality involving OR by using the idea of combining regions. The combine regions are called the **union** and show the numbers that are solutions of either inequality.

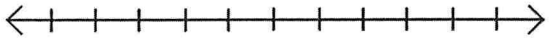


Solve the compound inequality and graph the solutions.

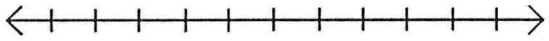
(a) $4x \leq 20$ or $3x > 21$



(b) $2 + x < 12$ or $x + 5 \geq 19$



(c) $7x \geq 21$ or $2x < -2$

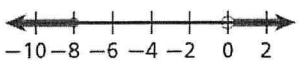


Every solution of a compound inequality involving AND must be a solution of both parts of the compound inequality. If no numbers are solutions of *both* simple inequalities, then the compound inequality has no solutions.

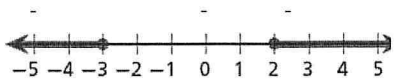
The solutions of a compound inequality involving OR are not always two separate sets of numbers. There may be numbers that are solutions of both parts of the compound inequality.

Write the compound inequality shown by the graph.

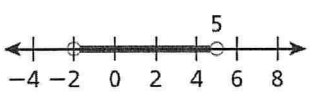
(a) _____



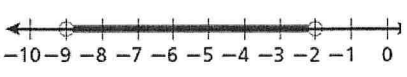
(b) _____



(c) _____



(d) _____



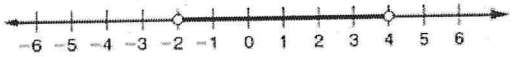
Name _____ Date _____ Class _____

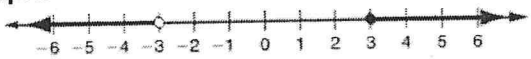
LESSON 3-6

Practice B

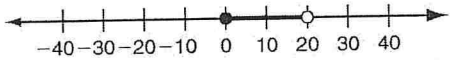
Solving Compound Inequalities

Write the compound inequality shown by each graph.

1. 

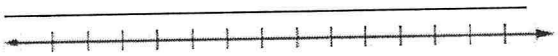
2. 

3.

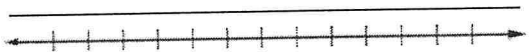
4. 

Solve each compound inequality and graph the solutions.

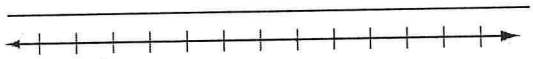
5. $-15 < x - 8 < -4$



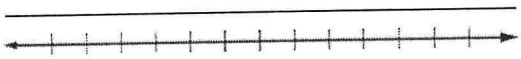
6. $12 \leq 4n < 28$



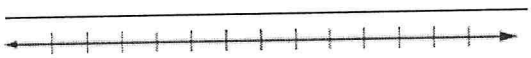
7. $-2 \leq 3b + 7 \leq 13$



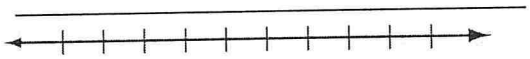
8. $x - 3 < -3$ OR $x - 3 \geq 3$



9. $5k \leq -20$ OR $2k \geq 8$

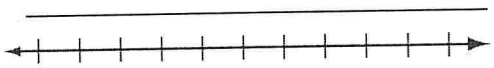


10. $2s + 3 \leq 7$ OR $3s + 5 > 26$

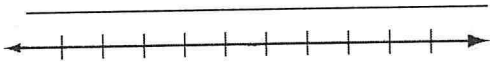


Write a compound inequality for each problem. Graph the solutions.

11. The human ear can distinguish sounds between 20 Hz and 20,000 Hz, inclusive.



12. For a man to box as a welterweight, he must weigh more than 140 lbs, but at most 147 lbs.



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Name _____ Date _____ Class _____

LESSON 3-6

Problem Solving

Solving Compound Inequalities

Write and solve an inequality for each situation.

1. The Mexican Tetra is a tropical fish that requires a water temperature between 68 and 77 degrees Fahrenheit, inclusive. An aquarium is heated 8 degrees so that a Tetra can live in it. What temperatures could the water have been before the heating?

_____

_____

2. Nerissa's car can travel between 380 and 410 miles on a full tank of gas. She filled her gas tank and drove 45 miles. How many more miles can she drive without running out of gas?

_____

_____

3. A local company is hiring trainees with less than 1 year of experience and managers with 5 or more years of experience. Graph the solutions.

_____

_____

4. Marty's allowance is doubled and is now between \$10 and \$15, inclusive. What amounts could his allowance have been before the increase? Graph the solutions.

_____

_____

The elliptical orbits of planets bring them closer to and farther from the Sun at different times. The closest (perihelion) and furthest (aphelion) points are given for three planets below. Use this data to answer questions 5–7.

Planet	Perihelion (in 10^6 km)	Aphelion (in 10^6 km)
Uranus	2741.3	3003.6
Neptune	4444.5	4545.7
Pluto	4435.0	7304.3

5. Which inequality represents the distances (in 10^6 km) d from the sun to Neptune?

   A $d \leq 4444.5$

   B $d \leq 4545.7$

   C $4444.5 \leq d \leq 4545.7$

   D $d = 4444.5$ OR $d \geq 4545.7$

6. A NASA probe is traveling between Uranus and Neptune. It is currently between their orbits. Which inequality shows the possible distance p from the probe to the Sun?

   F $1542.1 < p < 1703.2$

   G $2741.3 < p < 4545.7$

   H $3003.6 < p < 4444.5$

   J $7185.8 < p < 7549.3$

7. At what distances o do the orbits of Neptune and Pluto overlap?

   A $4435.0 \leq o \leq 4444.5$

   B $4435.0 \leq o \leq 4545.7$

   C $4444.5 \leq o \leq 7304.3$

   D $4545.7 \leq o \leq 7304.3$

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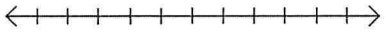
Name: _____ Date: _____ Period: _____

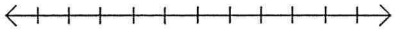
Section 3.6 Practice WS (1) Bert & Ernie

Solve each compound inequality and graph the solutions.

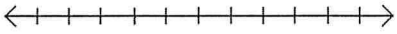
1. $-3 < x+2 < 7$



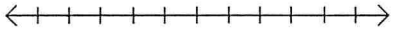
2. $5 \le 4x+1 \le 13$



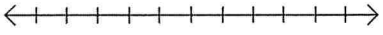
3. $2 < x+2 < 5$



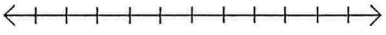
4. $11 < 2x+3 < 21$



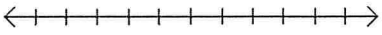
5. $x+2 < -6$ OR $x+2 > 6$



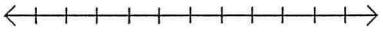
6. $x-1 < 0$ OR $x-1 > 4$



7. $x+2 < 3$ OR $x+3 > 7$

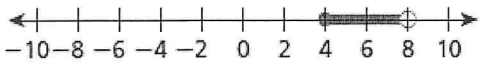


8. $x-1 < -1$ OR $x-5 > -1$



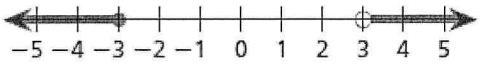
Write the compound inequality shown by each graph.

9.



_____

10.



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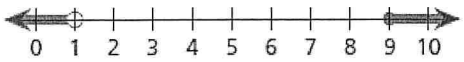
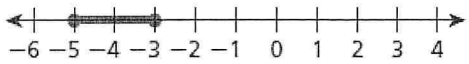
11. 

12. 

13. An iguana needs to live in a warm environment. The temperature in a pet iguana's cage should be between $70°F$ and $95°F$ inclusive. Write a compound inequality to show the temperatures that are within the recommended range. Graph the solutions.

In 14 – 19, write an inequality for the statement and draw its graph.

14. *x is between* 5 *and* 9

15. *x is at least* -6 *and at most* 2

16. *x is between* -4 *and* -1

17. *x is less than* 3 *but is at least* 1

18. *x is more than* -3 *but is at most* -2

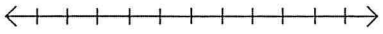
19. *x is more than* 0 *but is at most* 5

Name: _____ Date: _____ Period: _____

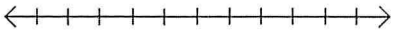
Section 3.6 Practice WS (2) Sesame Street

Solve each compound inequality and graph the solutions.

1. $-1 < x+1 < 1$

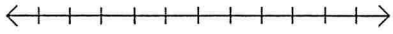


2. $1 \le 2x-5 \le 7$

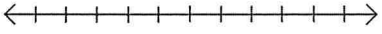


3. $-2 < x-2 < 2$

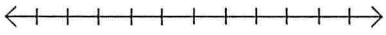
4. $5 < 3x-1 < 17$



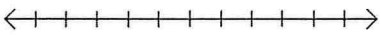
5. $x-4 < -7$ OR $x+3 > 4$



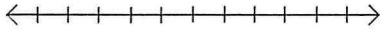
6. $2x+1 < 1$ OR $x+5 > 8$



7. $x+1 < 2$ OR $x+5 > 8$

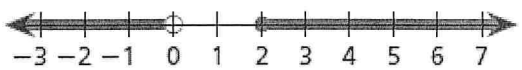


8. $x+3 < 0$ OR $x-2 > 0$



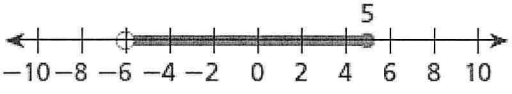
Write the compound inequality shown by each graph.

9.



_____

10.



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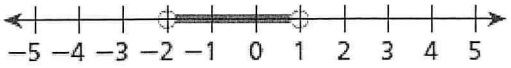
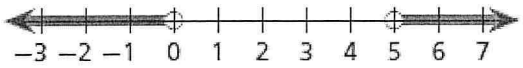
11. 

12. 

13. Earth's atmosphere is made up several layers. A layer called the stratosphere extends from about 16 km above Earth's surface to about 50 km above Earth's surface. Write a compound inequality to show the altitudes that are within the range of the stratosphere. Graph the solutions.

In 14 – 19, write an inequality for the statement and draw its graph.

14. *x is between* 1 *and* 7

15. *x is at least* −3 *and at most* 0

16. *x is between* −8 *and* 2

17. *x is more than* 2 *but is at most* 10

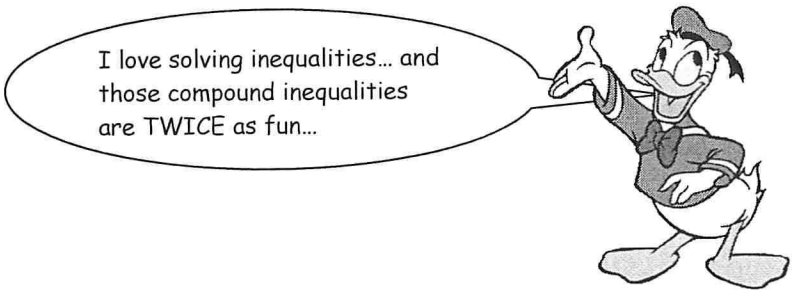
18. *x is less than* −5 *but is at least* −8

19. *x is more than* −1 *but is at most* 5

Name: _____ Date: _____ Period: _____

Inequalities Practice Mania 25 pts.

Directions:
Solve each problem. Put the answer on the indicated line. Graph if necessary. And for an extra point, write something NICE about math AFTER the last problem on this sheet.



In 1 – 3, sketch a graph of the inequality. PLEASE NUMBER YOUR NUMBER LINES!!!!

1. $x > -\sqrt{81}$

2. $-8x \geq 24$

3. $-19 + x \neq 2x$

In 4 – 9, solve the inequality. Then match its solution with one of the graphs.

4. $-1 \leq x$

5. $-\sqrt{1} \neq x$

6. $-3 + x > -4$

7. $-x > 1$

8. $-36x \geq 36$

9. $x - 6 \leq -5$

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

(a)

(b)

(c)

(d)

(e)

(f)

19. The average of Sena's two test scores must be at least 80 to make a B in math class. Sena got an 82 on her first test. What grades can Sena get on her second test to make a B in math class?

(a) Inequality: _____ (b) Solution: _____

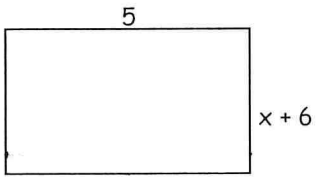
(c) Statement: _____

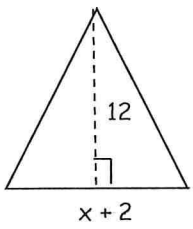
20. A full year membership to a gym costs $240 upfront with no monthly charge. A monthly membership costs $100 and $16 per month. For what numbers of months is it less expensive to have a monthly membership?

(a) Inequality: _____ (b) Solution: _____

(c) Statement: _____

21. Write and solve an inequality to find the values of x for which the area of the rectangle is greater than the area of the triangle.





(a) Inequality: _____ (b) Solution: _____

(c) Statement: _____

~ Section 3.7 Notes ~
Solving Absolute Value Inequalities

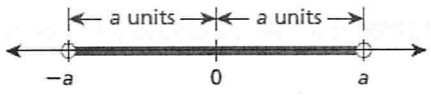
TLW solve inequalities in one variable involving absolute-value expressions

TLW use previous knowledge of solving absolute value equations and apply that knowledge to what was recently learned with respect to inequalities

When an inequality contains an absolute-value expression, it can be written as a compound inequality. The inequality $|x| < 5$ describes all real numbers whose distance from 0 is less than 5 units. The solutions are all numbers between -5 and 5, so $|x| < 5$ can be written as $-5 < x < 5$, which is the compound inequality.

Know it! Note

Absolute-Value Inequalities Involving <

WORDS	NUMBERS
The inequality $\|x\| < a$ (when $a > 0$) asks, "What values of x have an absolute value less than a?" The solutions are numbers between $-a$ and a.	$\|x\| < 5$ $-5 < x < 5$ $x > -5$ AND $x < 5$
GRAPH	**ALGEBRA**
	$\|x\| < a$ (when $a > 0$) $-a < x < a$ $x > -a$ AND $x < a$

The same properties are true for inequalities that use the symbol $\leq$.

Solve each inequality and graph the solutions. Then write the solutions as a compound inequality.

Just like solving absolute value equations, when you solve absolute value inequalities, isolate the absolute-value expression.

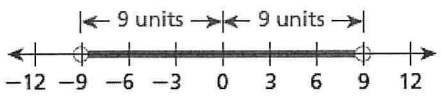
$|x| + 3 < 12$

$|x| + 3 < 12$

$-3 \quad -3$

$|x| < 9$

Since 3 is added to $|x|$, subtract 3 from both sides to undo the addition.



Think, "The distance from x to 0 is less than 9 units."

$x > -9$ AND $x < 9$

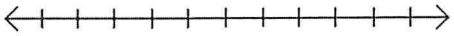
$-9 < x < 9$

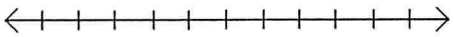
Write as a compound inequality.

Now let's try some together...
Solve each inequality and graph the solutions. Then write the solutions as a compound inequality.

(a) $|x|-7<-3$

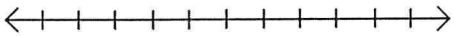
(b) $2|x|\le 6$

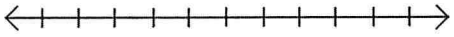




(c) $|x+3|-4.5\le 7.5$

(d) $|x|+12<15$

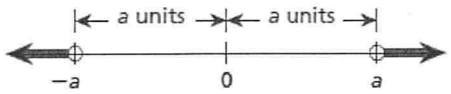




The inequality $|x|>5$ describes all real numbers whose distance from 0 is greater than 5 units. The solutions are all numbers less than -5 or greater than 5. The inequality $|x|>5$ can be written as the compound inequality $x<-5$ OR $x>5$.

Know it! Note

Absolute-Value Inequalities Involving >

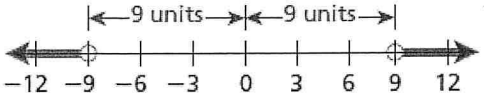
WORDS	NUMBERS
The inequality $\|x\| > a$ (when $a > 0$) asks, "What values of x have an absolute value greater than a?" The solutions are numbers less than $-a$ or greater than a.	$\|x\| > 5$ $x < -5$ OR $x > 5$
GRAPH	**ALGEBRA**
	$\|x\| > a$ (when $a > 0$) $x < -a$ OR $x > a$

The same properties are true for inequalities that use the symbol ≥.

Solve each inequality and graph the solutions. Then write the solutions as a compound inequality.

$|x| + 5 > 14$
$|x| + 5 > 14$
$\quad -5 \quad -5$
$|x| \quad > 9$

Since 5 is added to $|x|$, subtract 5 from both sides to undo the addition.



Think, "The distance from x to 0 is greater than 9 units."

$x < -9$ OR $x > 9$

Write as a compound inequality.

Now let's try some together...
Solve each inequality and graph the solutions. Then write the solutions as a compound inequality.

(a) $|x| - 20 > -13$

(b) $|x - 8| + 5 \geq 11$

(c) $|x| - 7 > -1$

(d) $|x| + 10 \geq 12$

Algebra 1A Name_____

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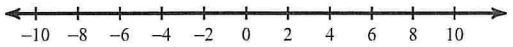
Solving Absolute Value Inequalities

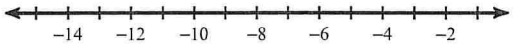
Date_____ Period____

Solve each inequality and graph its solution.

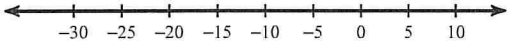
1) $|10k| \geq 70$



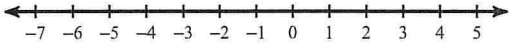
2) $|n + 7| > 3$



3) $|10 + x| > 19$

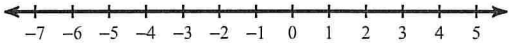


4) $|-5m - 4| \geq -49$

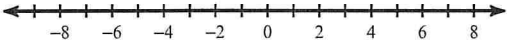


5) $|1 - 10n| \geq -89$

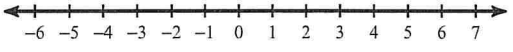
6) $|6 - 7x| \geq -15$



7) $|10k + 2| \geq 38$



8) $|3 - 2b| > -19$



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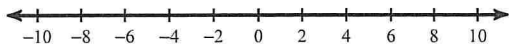
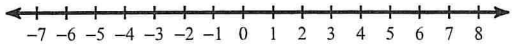
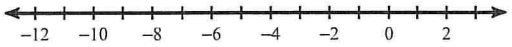
9) $-3\left|\frac{n}{7}\right| \leq -3$



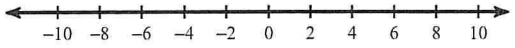
10) $\frac{|x-7|}{6} < -3$



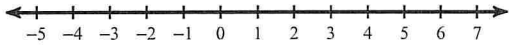
11) $|r+4| - 4 < 1$



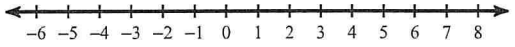
12) $\left|\frac{r}{8}\right| + 1 \leq 2$



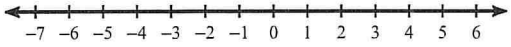
13) $|5n| - 2 \geq -47$



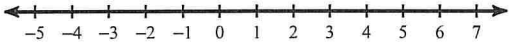
14) $6|3x-6| < 90$



15) $\frac{|3m+1|}{3} \leq 4$



16) $\frac{|6n+8|}{9} \geq -2$



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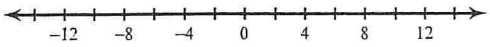
Name_____

Absolute Value Inequalities

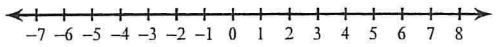
Date_____ Period____

Solve each inequality and graph its solution.

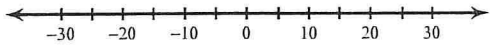
1) $\left|\frac{n}{4}\right| \leq 3$



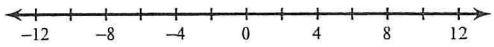
2) $|-9v| \leq 54$



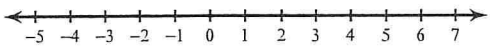
3) $\left|\frac{x}{6}\right| \geq 5$



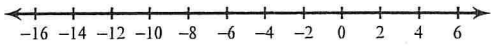
4) $|-6b| \leq 60$



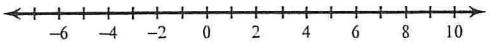
5) $|-8n| < 32$



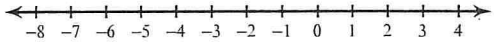
6) $|x + 5| < 9$



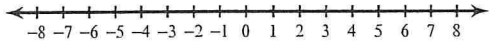
7) $|4v - 9| \leq 27$



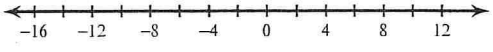
8) $|10 + 4x| < 14$



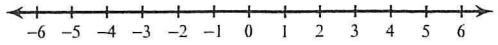
9) $|3 - 9a| \leq 60$



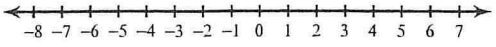
10) $|7x + 4| \geq 74$



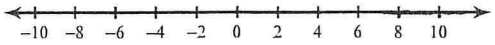
11) $|n| - 3 > -2$



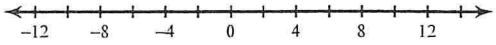
12) $|k| - 6 \leq -1$



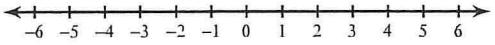
13) $|n| + 4 < 12$



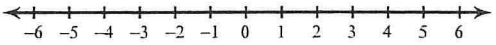
14) $|x| + 7 > 16$



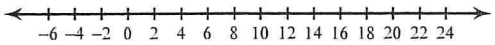
15) $|p| - 3 \leq 0$



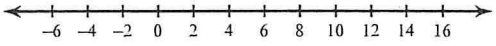
16) $|m| + 5 < 9$



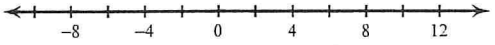
17) $|b - 8| + 10 > 22$



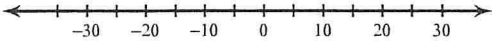
18) $\dfrac{|x-4|}{5} \leq 2$



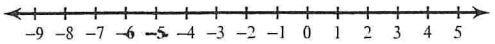
19) $-3 + |n - 2| > 5$



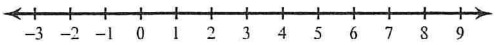
20) $\dfrac{|3+r|}{7} \leq 5$



21) $\dfrac{|2+3x|}{2} \geq 5$



22) $8 + |4v - 7| \geq 17$



Name: _____ Date: _____ Period: _____

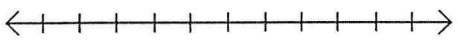
Section 3.7 Practice WS (1) Kermit

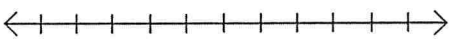
Solve each absolute value inequality and graph the solutions.

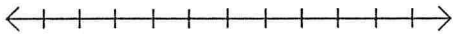
1. $|x|-5\le -2$

2. $|x|-6>16$

3. $|3x|+2<8$



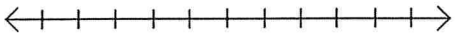


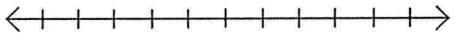


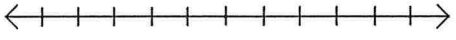
4. $|x+5|-4.5\ge 7.5$

5. $|x+1|-7.8<6.2$

6. $|x|+2.9>8.6$

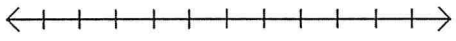




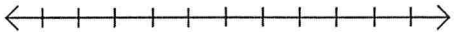


Write and solve an absolute value inequality for each expression. Graph the solutions on a number line.

7. all numbers whose absolute value is less than or equal to 15



8. all numbers that have an absolute value greater than 7



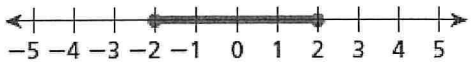
Tell whether the given value of x is a solution of the inequality.

9. $|x|>3$; $x=-5$

10. $|2x|\le 8$; $x=6$

11. $|x-1.2|<5.4$; $x=6.6$

Write an absolute value inequality for each graph.

12. 

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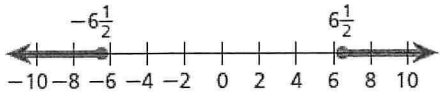
13. 

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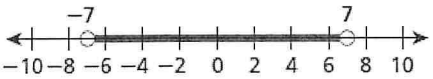
14. 

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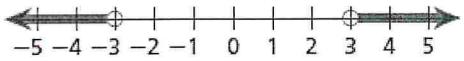
15. 

_____

16. A student solved the absolute value inequality below. Find and explain the error(s) in the student's work. What is the correct answer?

$|x - 6| + 3 \geq 8$

$|x - 6| + 3 \geq 8$

$-3 \quad -3$

$|x - 6| \geq 5$

$-5 \geq x - 6 \geq 5$

$+6 \quad +6 \quad +6$

$1 \geq x \geq 11$

Name _____ Date _____ Class _____

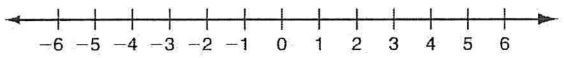
LESSON 3-7

Practice B

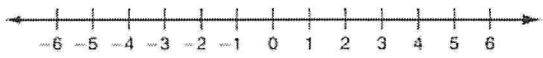
Solving Absolute-Value Inequalities

Solve each inequality and graph the solutions.

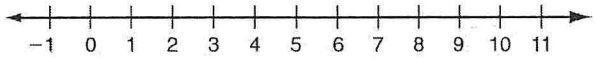
1. $|x| - 2 \leq 3$



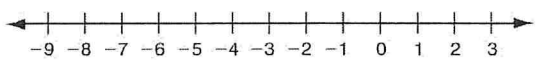
2. $|x + 1| + 5 < 7$



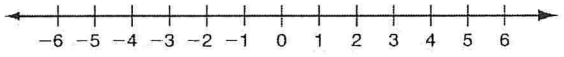
3. $3|x - 6| \leq 9$



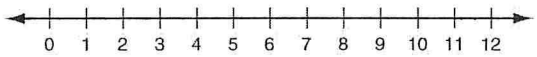
4. $|x + 3| - 1.5 < -2.5$



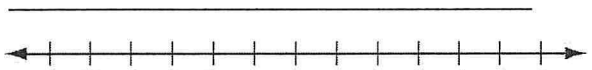
5. $|x| + 17 > 20$



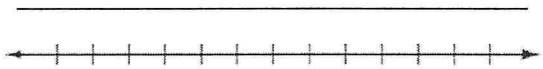
6. $|x - 6| - 7 > -3$



7. $\frac{1}{2}|x + 5| \geq 2$



8. $2|x - 2| \geq 3$



9. The organizers of a drama club wanted to sell 350 tickets to their show. The actual sales were no more than 35 tickets from this goal. Write and solve an absolute-value inequality to find the range of the number of tickets that may have been sold.

_____

10. The temperature at noon in Los Angeles on a summer day was 88 °F. During the day, the temperature varied from this by as much as 7.5 °F. Write and solve an absolute-value inequality to find the range of possible temperatures for that day.

_____

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Name _____ Date _____ Class _____

LESSON 3-7

Problem Solving

Solving Absolute-Value Inequalities

Write the correct answer.

1. A carpenter cuts boards that are 2 meters long. It is acceptable for the length to differ from this value by at most 0.05 meters. Write and solve an absolute-value inequality to find the range of acceptable lengths.

_____

_____

2. During a workout, Vince tries to keep his heart rate at 134 beats per minute. His actual heart rate varies from this value by as much as 8 beats per minute. Write and solve an absolute-value inequality to find Vince's range of heart rates.

_____

_____

3. Mai thinks of a secret number. She says that her secret number is more than 11 units away from 50. Write an absolute-value inequality that gives the possible values of Mai's number.

_____

4. Boxes of cereal are supposed to weigh 15.3 ounces each. A quality-control manager finds that the boxes are no more than 0.4 ounces away from this weight. Write an absolute-value inequality that gives the range of possible weights of the boxes.

_____

The table gives the typical lifespan for several mammals. Use the table for questions 5-7. Select the best answer.

5. Which absolute-value inequality gives the number of years a goat may live?

   A $|x - 6| \leq 11$ C $|x - 24| \leq 6$

   B $|x - 15| \leq 9$ D $|x - 30| \leq 9$

7. The inequality $|x - 17| \leq c$ gives the number of years a panda may live. What is the value of c?

   A 3 C 14

   B 6 D 20

6. Which mammal has a lifespan that can be represented by the absolute-value inequality $|x - 12.5| \leq 2.5$?

   F Antelope H Otter

   G Koala J Wolf

Mammal	Lifespan (years)	Mammal	Lifespan (years)
Antelope	10 to 25	Otter	15 to 20
Goat	6 to 24	Panda	14 to 20
Koala	10 to 15	Wolf	13 to 15

Source:
http://www.sandiegozoo.org/animalbytes/a-mammal.html

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