

Name: \_\_\_\_\_ Date: \_\_\_\_\_  
Algebra 2011-2012

# Inequalities & Sets

Name: \_\_\_\_\_

Teacher: \_\_\_\_\_

Pd: \_\_\_\_\_

# **Table of Contents**

**DAY 1:** (Ch. 3-1 to 3-3) **SWBAT:** Identify solutions to inequalities; write and graph inequalities with one variable

**Pgs: 1-5**

**HW: Page 6 & 7**

**DAY 2:** (Ch. 3-4 to 3-5) **SWBAT:** Identify solutions to inequalities; Solve two-step Inequalities

**Pgs: 8-11**

**HW: Page 12 & 13**

**DAY 3:** (Ch. 3-5) **SWBAT:** Identify solutions to inequalities; Solve multi-step Inequalities

**Pgs: 14-17**

**HW: Pages 18**

**DAY 4:** (Ch. 3-6) **SWBAT:** Solve compound inequalities with one variable.

**Graph solution sets of compound inequalities with one variable.**

**Pgs: 19-25**

**HW: Page 26 & 27**

- **DAY 5: Quiz: Day 1 to DAY 4**

**DAY 6: SWBAT: Determine Unions and Intersections of Sets**

**Pgs: 28-31**

**HW: Page 32**

**Day 7: SWBAT: Determine the Complement of a Subset**

**Pgs: 33-36**

**HW: Page 37**

**Day 8: SWBAT: Create Venn diagrams to solve problems with subsets**

**Pgs: 38-40**

**HW: Page 41 & 42**

- **DAY 9: Chapter 3 - Practice Test: Review using E-Clickers**

- **DAY 10: Chapter 3 Test**

## Writing & Graphing Inequalities - (Day1)

### Warm – Up

**Directions:** Compare. Write  $<$ ,  $>$ , or  $=$  in the box.

1)  $-3 \square 2$





2)  $6.5 \square 6.3$

3)  $\frac{1}{2} \square \frac{3}{4}$

4)  $0.25 \square \frac{1}{4}$

### Graphing Inequalities

To write and graph inequalities, you must connect words with symbols.  
Look at the information in the table below.

Symbol	Words	Graph
$<$	"less than"	
$\leq$	"less than or equal to" "no more than" "at most"	
$>$	"greater than"	
$\geq$	"greater than or equal to" "no less than" "at least"	

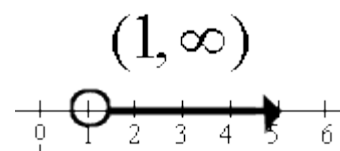
### Interval Notation

When using interval notation, the symbol:

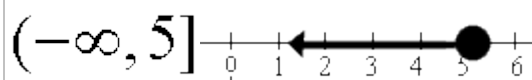
**(** means "not included" or "open".

**[** means "included" or "closed".

**Non-ending Interval:**  $(a, \infty)$  is interpreted as  $x > a$  where  $a$  is not included and infinity is always expressed as being "open" (not included).



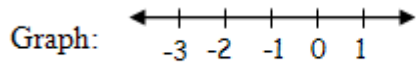
**Non-ending Interval:**  $(-\infty, b]$  is interpreted as  $x < b$  where  $b$  is included and again, infinity is always expressed as being "open" (not included).



### Example 1: Identifying Solutions to Inequalities and Graphing Inequalities

A)  $x \leq 1$

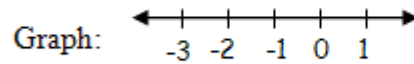
In words: \_\_\_\_\_



Interval Notation: \_\_\_\_\_

B)  $-1 < x$

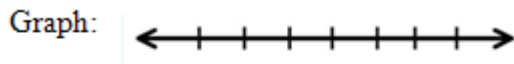
In words: \_\_\_\_\_



Interval Notation: \_\_\_\_\_

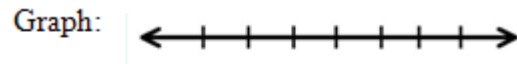
### Practice: Identifying Solutions to Inequalities and Graphing Inequalities

1)  $x < -1$



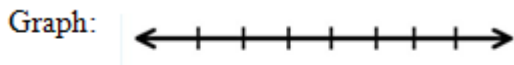
Interval Notation: \_\_\_\_\_

2)  $9 \leq p$



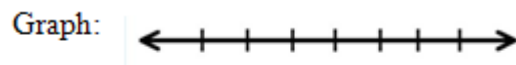
Interval Notation: \_\_\_\_\_

3)  $-4 < x$



Interval Notation: \_\_\_\_\_

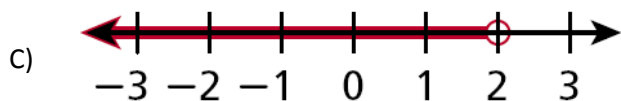
4)  $x \leq 16$



Interval Notation: \_\_\_\_\_

### Example 2: Writing Inequalities from a Graph

Write the inequality and the interval notation shown by the graph.

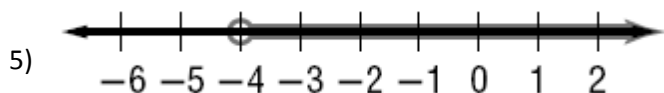


Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_

### Practice: Writing Inequalities from a Graph

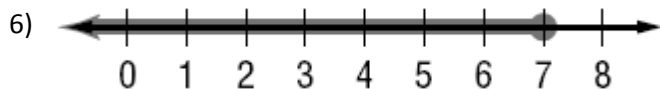
Write the inequality and the interval notation shown by the graph.



Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_

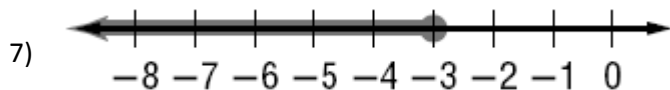
---



Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_

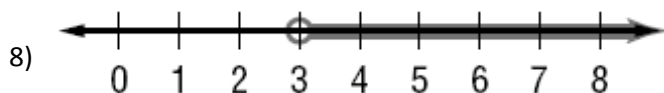
---



Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_

---



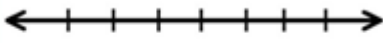
Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_

### Example 3: Solving One Step Inequalities

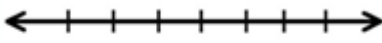
Solve the inequalities and graph the solutions. Write your solution using interval notation.

9.  $x + 12 < 20$

Graph: 

Interval Notation: \_\_\_\_\_

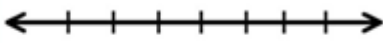
10.  $d - 5 > -7$

Graph: 

Interval Notation: \_\_\_\_\_



11.  $\frac{a}{-2} \geq 4$

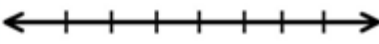
Graph: 

Interval Notation: \_\_\_\_\_

#### Practice

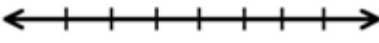
Solve the inequalities and graph the solutions. Write your solution using interval notation.

12.  $\frac{x}{3} \geq -2$

Graph: 

Interval Notation: \_\_\_\_\_

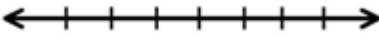
13.  $-9 \geq x - 3$

Graph: 

Interval Notation: \_\_\_\_\_







14.  $-9r < 27$

Graph: 

Interval Notation: \_\_\_\_\_

## SUMMARY

To write and graph inequalities, you must connect words with symbols.  
Look at the information in the table below.

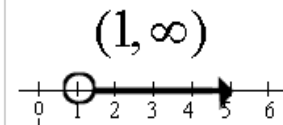
Symbol	Words	Graph
$<$	"less than"	
$\leq$	"less than or equal to" "no more than" "at most"	
$>$	"greater than"	
$\geq$	"greater than or equal to" "no less than" "at least"	

When using interval notation, the symbol:

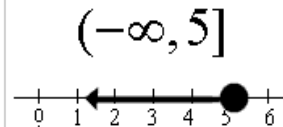
$($  means "not included" or "open".

$[$  means "included" or "closed".

**Non-ending Interval:**  $(a, \infty)$  is interpreted as  $x > a$  where  $a$  is not included and infinity is always expressed as being "open" (not included).



**Non-ending Interval:**  $(-\infty, b]$  is interpreted as  $x < b$  where  $b$  is included and again, infinity is always expressed as being "open" (not included).



## Exit Ticket

- Does the inequality sign change for any of the following?  
Answer YES or NO

- $2x > 10$
- $-3x \leq 12$
- $5 > -10x$
- $-16 < 4x$

- Which interval notation represents the set of all real numbers greater than 2 and less than or equal to 20?

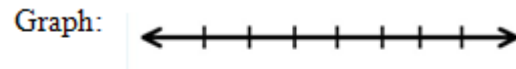
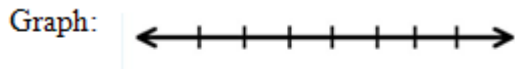
- $(2, 20)$
- $(2, 20]$
- $[2, 20)$
- $[2, 20]$

## Day 1 - Homework

**Directions:** Graph each inequality and express in interval notation.

1)  $7 < x$

3)  $t \leq -0.5$

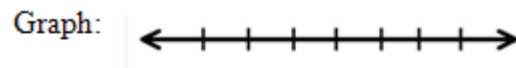
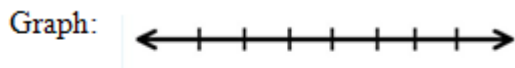


Interval Notation: \_\_\_\_\_

Interval Notation: \_\_\_\_\_

2)  $d > -12$

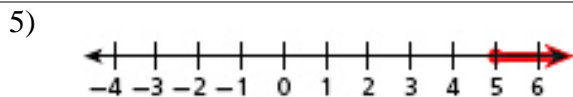
4)  $k \geq 5$



Interval Notation: \_\_\_\_\_

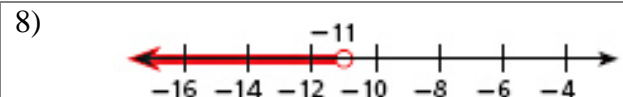
Interval Notation: \_\_\_\_\_

**Directions:** Write the inequality shown by each graph and express in interval notation.



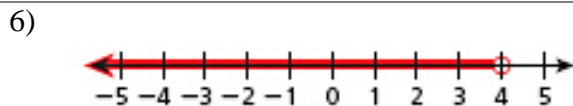
Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_



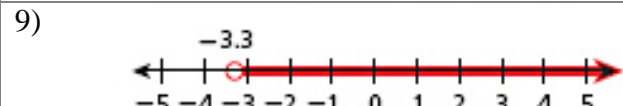
Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_



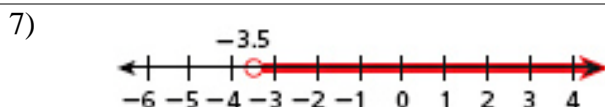
Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_



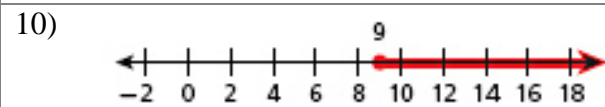
Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_



Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_



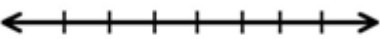
Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_



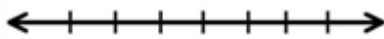
Solve each inequality and graph the solutions.

11)  $t - 12 \geq 16$

Graph: 

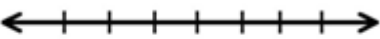
Interval Notation: \_\_\_\_\_

15)  $\frac{y}{6} \leq 2$

Graph: 

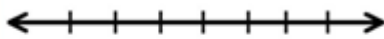
Interval Notation: \_\_\_\_\_

12)  $7x < -14$

Graph: 

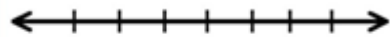
Interval Notation: \_\_\_\_\_

16)  $-8r < 16$

Graph: 


Interval Notation: \_\_\_\_\_

13)  $-30 > -5p$

Graph: 

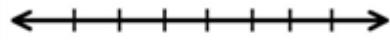
Interval Notation: \_\_\_\_\_

17)  $-\frac{p}{6} < -6$

Graph: 


Interval Notation: \_\_\_\_\_

14)  $\frac{3}{5}h \geq -3$

Graph: 

Interval Notation: \_\_\_\_\_

18)  $16 \leq h + 9$

Graph: 

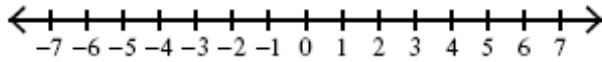
Interval Notation: \_\_\_\_\_

## Day 2 – Solving Multi-Step Linear Inequalities

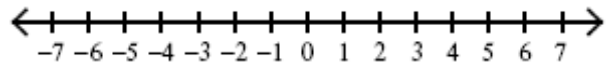
### Warm – Up

Draw a graph for each inequality.

1)  $x \leq 6$

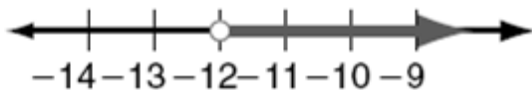


2)  $b > -6$



From each graph, write as an inequality and write in interval notation.

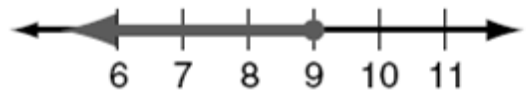
3)



(a) Inequality: \_\_\_\_\_

(b) Interval Notation: \_\_\_\_\_

4)



(a) Inequality: \_\_\_\_\_

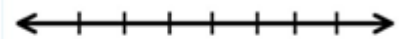
(b) Interval Notation: \_\_\_\_\_

---

### Example 1: Solve each inequality and graph the solutions.

a.  $2m + 1 > 13$

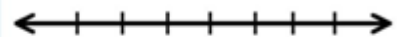
Graph:



Interval Notation: \_\_\_\_\_

b.  $4(x + 3) \leq 24$

Graph:



Interval Notation: \_\_\_\_\_



c.  $3 \leq 5 - 2x$

Graph:

Interval Notation: \_\_\_\_\_

d.  $\frac{w + 3}{2} > 6$

Graph:

Interval Notation: \_\_\_\_\_

---

Practice!

1.  $5(z + 6) \leq 40$

2.  $-12 > -4x - 8$

3.  $\frac{3n - 8}{5} \geq 2$

Graph:

Interval Notation: \_\_\_\_\_

Graph:

Interval Notation: \_\_\_\_\_

Graph:

Interval Notation: \_\_\_\_\_

## **Example 2: Interpreting Solutions**

e. If the replacement set is the set of integers, find the solution set for the inequality  $x + 2 \geq 9$ .

[A]  $\{11, 12, 13, \dots\}$

[B]  $\{7\}$

[C]  $\{8, 9, 10, \dots\}$

[D]  $\{7, 8, 9, \dots\}$

---

f. In the set of positive integers, what is the solution set of the inequality  $2x - 3 < 5$ ?

1)  $\{0, 1, 2, 3\}$

2)  $\{1, 2, 3\}$

3)  $\{0, 1, 2, 3, 4\}$

4)  $\{1, 2, 3, 4\}$

---

g. Which value of  $x$  is in the solution set of the inequality  $-2(x - 5) < 4$ ?

1) 0

2) 2

3) 3

4) 5

---

Practice!

4. If the replacement set is the set of integers, find the solution set for the inequality  $2x + 12 \geq -3$ .

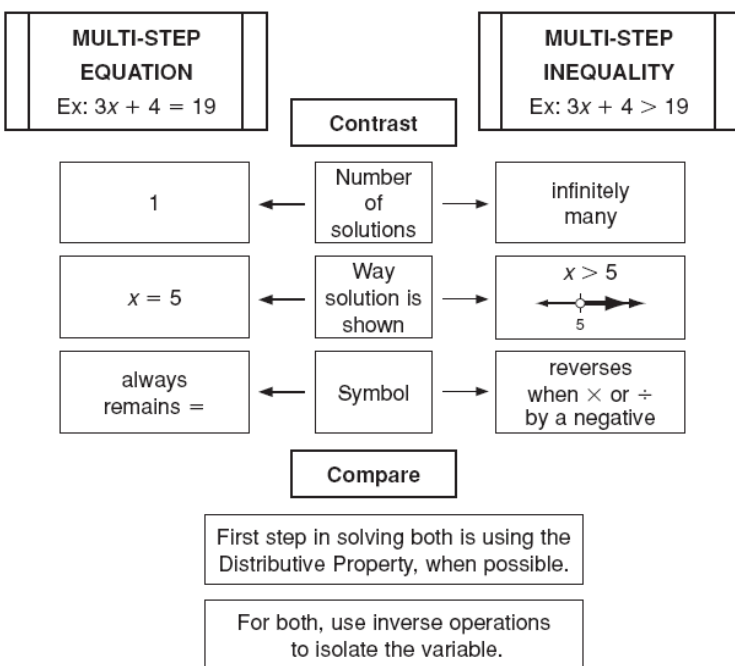
5. Which number is in the solution set of the inequality  $5x + 3 > 38$ ?

- 1) 5
- 2) 6
- 3) 7
- 4) 8

6. Which value of  $x$  is in the solution set of the inequality  $-4x + 2 > 10$ ?

- 1) -2
- 2) 2
- 3) 3
- 4) -4

## Summary



## CHALLENGE AND EXTEND

Solve each inequality and graph the solutions.

$$3(x + 2) - 6x + 6 \leq 0$$

## Exit Ticket

Which of these numbers is a solution for  $12 - x \leq 7$ ?

- [A] 2      [B] 1      [C] -3      [D] 5

## Day 2 - Homework:

1. Which of the following represents the solution set of the inequality  $4x + 6 \leq 26$ ?

(1)  $x \leq 5$

(3)  $x \geq 5$

(2)  $x \leq 8$

(4)  $x \geq 8$

---

2. Which of the following represents the solution set of the inequality  $-3x + 6 < 27$ ?

(1)  $x < -7$

(3)  $x > 7$

(2)  $x \leq -7$

(4)  $x > -7$

---

3. Which of the following is the solution set of the inequality  $10 \leq 4x - 14$ ?

(1)  $x \leq 6$

(3)  $x \geq -1$

(2)  $x \geq 6$

(4)  $x < -1$

---

4. Using the set of positive integers, what is the solution set of the inequality  $2x - 3 < 6$ ?

(1)  $\{0, 1, 2, 3\}$

(3)  $\{0, 1, 2, 3, 4\}$

(2)  $\{1, 2, 3\}$

(4)  $\{1, 2, 3, 4\}$

5. Which value of  $x$  is in the solution set of the inequality  $-2x + 5 > 17$ ?

(1) -8

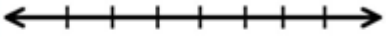
(3) -4

(2) -6

(4) 12

Solve each inequality, graph the solutions, and write your answers in interval notation.

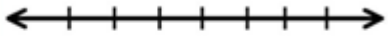
6.  $11y + 13 \geq -1$

Graph: 

Interval Notation: \_\_\_\_\_

---

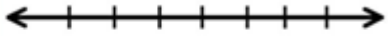
7.  $\frac{-3x + 6}{2} \leq 12$

Graph: 

Interval Notation: \_\_\_\_\_

---

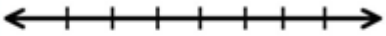
8.  $\frac{q}{7} + 1 > -5$

Graph: 

Interval Notation: \_\_\_\_\_

---

$2(t + 3) \geq 16$

Graph: 

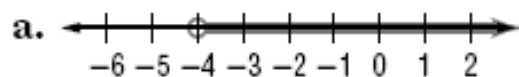
Interval Notation: \_\_\_\_\_

## Day 3 – Solving Multi-Step Linear Inequalities

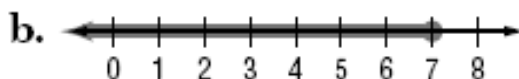
### Warm - Up:

Match each inequality with its corresponding graph.

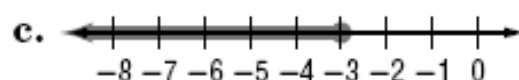
1.  $-8 \geq x - 15$



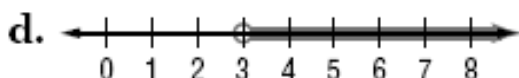
2.  $4x + 3 < 5x$



3.  $8x > 7x - 4$



4.  $12 + x \leq 9$

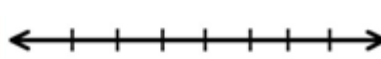


---

**Solve Multi-Step Inequalities** To solve linear inequalities involving more than one operation, undo the operations in reverse of the order of operations, just as you would solve an equation with more than one operation.

Example 1: Combining like terms.

$.9n - 24n + 45 > 0$

Graph: 

Interval Notation: \_\_\_\_\_

### Set-Builder Notation

Example:  $\{x : x > 2\}$  (We read this as “the set of all  $x$  such that  $x$  is greater than 2.”)

There are 3 parts to Set-Builder Notation


1. Curly Braces:  $\{ \}$
2. Variable:  $x$
3. Inequality:  $x \leq 5$

The solution to  $.9n - 24n + 45 > 0$  in set builder notation is \_\_\_\_\_



### Practice

a.  $5(k + 8) - 7 \leq 23$

Graph: 


Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_

---

Example 2: Variable on both sides of the equal sign.

$$4k + 15 > -2k + 3$$

Graph: 


Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_

---

b. Practice

$$-6(w + 1) < 2(w + 5)$$


Graph: 

Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_

Example 3: Complex Multi-Step Inequalities

$$2(2h + 2) < 2(3h + 5) - 12$$

Graph: 


Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_

---

Practice

$$3e + 2(4e + 2) \leq 2(6e + 1)$$


Graph: 

Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_

---

c.  $4x - 7(2x + 8) \leq 3x - 5.$

Graph: 

Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_

## Challenge

Write an inequality to solve the problem below.

Two times the sum of a number and four is no more than three times the sum of the number and seven decreased by four.

## SUMMARY

Variables must be collected on the same side of an inequality before the inequality can be solved. If you collect the variables so that the variable term is positive, you will not have to multiply or divide by a negative number.

**Solve  $x > 8(x - 7)$ .**

**Collect the variables on the left.**

$$x > 8(x - 7)$$

$$x > 8x - 56$$

*Distribute.*

$$\frac{-8x}{-7x} \frac{-8x}{-7x}$$

*Add  $-8x$  to both sides.*

$$\frac{-7x}{-7} > \frac{-56}{-7}$$

*Divide both sides by  $-7$ .*

$$x < 8$$

*Reverse the sign.*

**Solve  $x > 8(x - 7)$ .**

**Collect the variables on the right.**

$$x > 8(x - 7)$$

$$x > 8x - 56$$

*Distribute.*

$$\frac{-x}{0} \frac{-x}{0}$$

*Add  $-x$  to both sides.*

$$\frac{+56}{56} \frac{+56}{56}$$

$$56 > 7x$$

$$\frac{56}{7} > \frac{7x}{7}$$

*Divide both sides by  $7$ .*

$$8 > x$$

$$x < 8$$

Notice that if you want to have the variable on the left to make graphing solutions easier, you may still need to switch the inequality sign, even if you did not multiply or divide by a negative number.

## Exit Ticket

Which choice represents the solution to the inequality below?

$$12x + 5 \geq 17x - 10$$

**A.**  $\{x \mid x \leq -3\}$

**B.**  $\{x \mid x \geq 3\}$

**C.**  $\{x \mid x \geq -3\}$

**D.**  $\{x \mid x \leq 3\}$

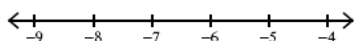
## Day 3 –HW

Solve each inequality. Graph the solutions and write your answer in interval and set-builder notation.

1.  $-3x + 2x \leq 6$

Interval Notation: \_\_\_\_\_

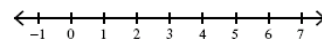
Set Builder Notation: \_\_\_\_\_



5.  $4k - 4 - 3k > 13 - 7k - 1 + 8$

Interval Notation: \_\_\_\_\_

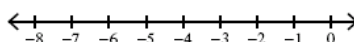
Set Builder Notation: \_\_\_\_\_



2.  $3 - 6n - 4 < 17$

Interval Notation: \_\_\_\_\_

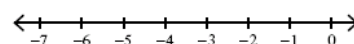
Set Builder Notation: \_\_\_\_\_



6.  $-30 + 5x > 4(6 + 8x)$

Interval Notation: \_\_\_\_\_

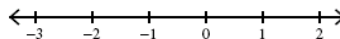
Set Builder Notation: \_\_\_\_\_



3.  $-9 \geq -8(1 + 6v) - 1$

Interval Notation: \_\_\_\_\_

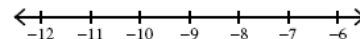
Set Builder Notation: \_\_\_\_\_



7.  $5n + 7(-6 - n) > 4(n + 3)$

Interval Notation: \_\_\_\_\_

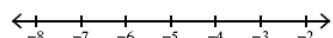
Set Builder Notation: \_\_\_\_\_



4.  $-p + 6p \leq 4 + 6p$

Interval Notation: \_\_\_\_\_

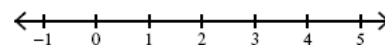
Set Builder Notation: \_\_\_\_\_



8.  $x - 8 + 3x + 2 < -6(8x - 7) + 4(8x - 2)$

Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_

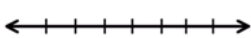


## Day 4 - Solving Compound Inequalities

### Warm – Up

**Directions:** Solve each inequality and graph the solution.

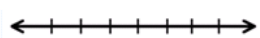
1)  $x + 8 > 3x$

Graph: 

Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_

2)  $-(2 + 2m) - 2 > 6$

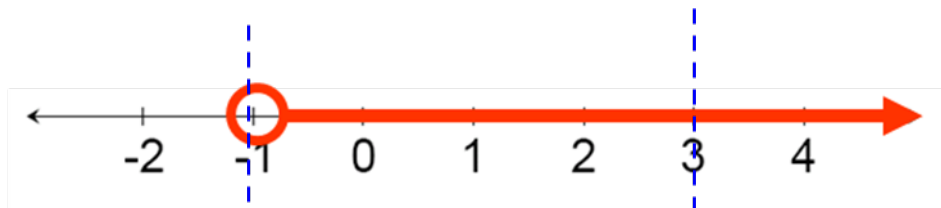
Graph: 

Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_

You can graph the solutions of a compound inequality involving **AND** by using the idea of an overlapping region.

$x > -1$



$x \leq 3$



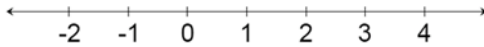
The overlapping region is called the **intersection**

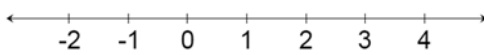


Intersection =  $-1 < x \leq 3$

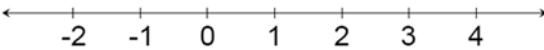
How do you think we can write this solution using interval notation? \_\_\_\_\_

**Ex 1** : Graph the intersection

$$x \geq 0$$
A horizontal number line with arrows at both ends, labeled with integers from -2 to 4. A solid vertical tick mark is drawn at 0.

$$x \leq 4$$
A horizontal number line with arrows at both ends, labeled with integers from -2 to 4. A solid vertical tick mark is drawn at 4.

Intersection

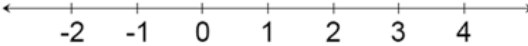
A horizontal number line with arrows at both ends, labeled with integers from -2 to 4. Solid vertical tick marks are drawn at 0 and 4. The segment of the line between 0 and 4 is highlighted with a thick black line.

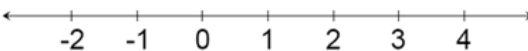
Write the solution as an inequality: \_\_\_\_\_

Write the solution in interval notation: \_\_\_\_\_

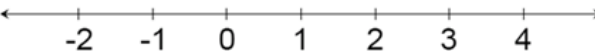
---

**Practice:** Graph the intersection

$$x > -1$$
A horizontal number line with arrows at both ends, labeled with integers from -2 to 4. An open circle is drawn at -1, and the line to the right of -1 is shaded with a thick black line.

$$x < 2$$
A horizontal number line with arrows at both ends, labeled with integers from -2 to 4. An open circle is drawn at 2, and the line to the left of 2 is shaded with a thick black line.

Intersection

A horizontal number line with arrows at both ends, labeled with integers from -2 to 4. Open circles are drawn at -1 and 2. The segment of the line between -1 and 2 is shaded with a thick black line.

Write the solution as an inequality: \_\_\_\_\_

Write the solution in interval notation: \_\_\_\_\_

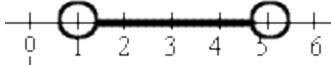
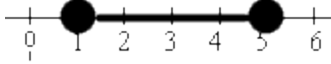
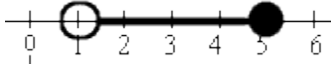
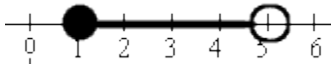
Compound Inequalities

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 inequality**.

NOTE the following symbols:

**Λ** means AND

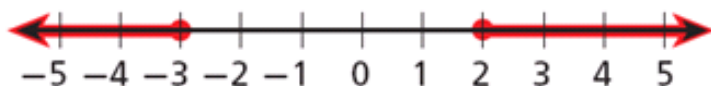
**V** means OR

Interval Notation: (description)	(diagram)
<b>Open Interval:</b> $(a, b)$ is interpreted as $a < x < b$ where the endpoints are NOT included. (While this notation resembles an ordered pair, in this context it refers to the interval upon which you are working.)	$(1, 5)$ 
<b>Closed Interval:</b> $[a, b]$ is interpreted as $a \leq x \leq b$ where the endpoints are included.	$[1, 5]$ 
<b>Half-Open Interval:</b> $(a, b]$ is interpreted as $a < x \leq b$ where a is not included, but b is included.	$(1, 5]$ 
<b>Half-Open Interval:</b> $[a, b)$ is interpreted as $a \leq x < b$ where a is included, but b is not included.	$[1, 5)$ 

$2 \leq x < 6$	as an inequality.
$[2, 6)$	in interval notation.

## Example 2: Writing Compound Inequalities from a Graph

(a)

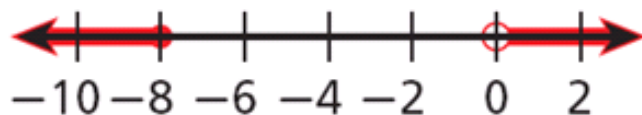


Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_

(b)

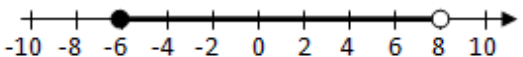
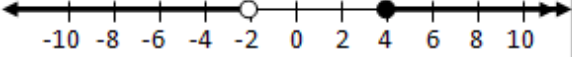
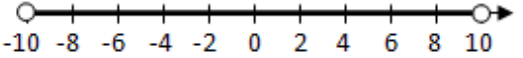
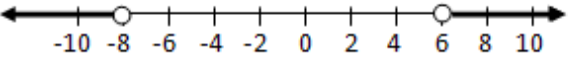


Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_

## Practice: Writing Compound Inequalities from a Graph

	Graphed Interval	Set Builder Notation	Interval Notation
1)			
2)			
3)			
4)			

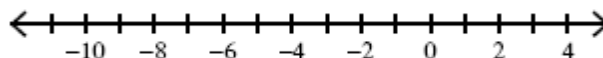
**Example 3:** Solve the following compound inequality and graph the solution.

$$-5 < x + 1 < 2$$

Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_

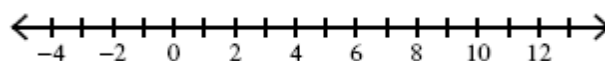


$$5 \leq 4x + 1 \leq 13$$

Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_





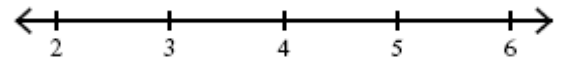
## Practice

$$8 < 3x - 1 \leq 11$$

Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_



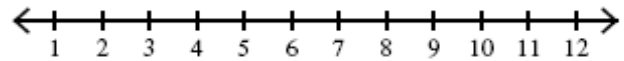
---

$$-9 \leq x - 10 \leq -5$$

Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_



---

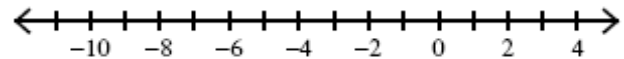
**Example 4:** Solve the following compound inequality and graph the solution.

$$8 + t \geq 7 \text{ OR } 8 + t < 2$$

Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_



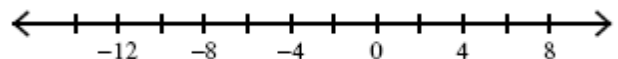
---

$$7 - 4x > 47 \text{ or } 5x - 1 > 24$$

Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_



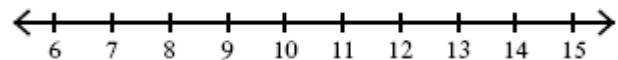
Practice: Solve the following compound inequality and graph the solution.

$$2 + 5m \geq 52 \text{ or } 7 - m > -2$$

Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_

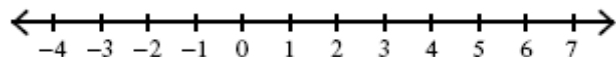


$$4 - 7k < -3k - 4 \text{ or } 5k + 2 \leq 8 - k$$

Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_

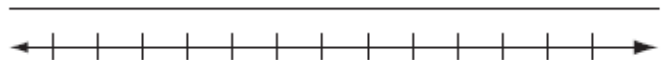
Set Builder Notation: \_\_\_\_\_



### Challenge

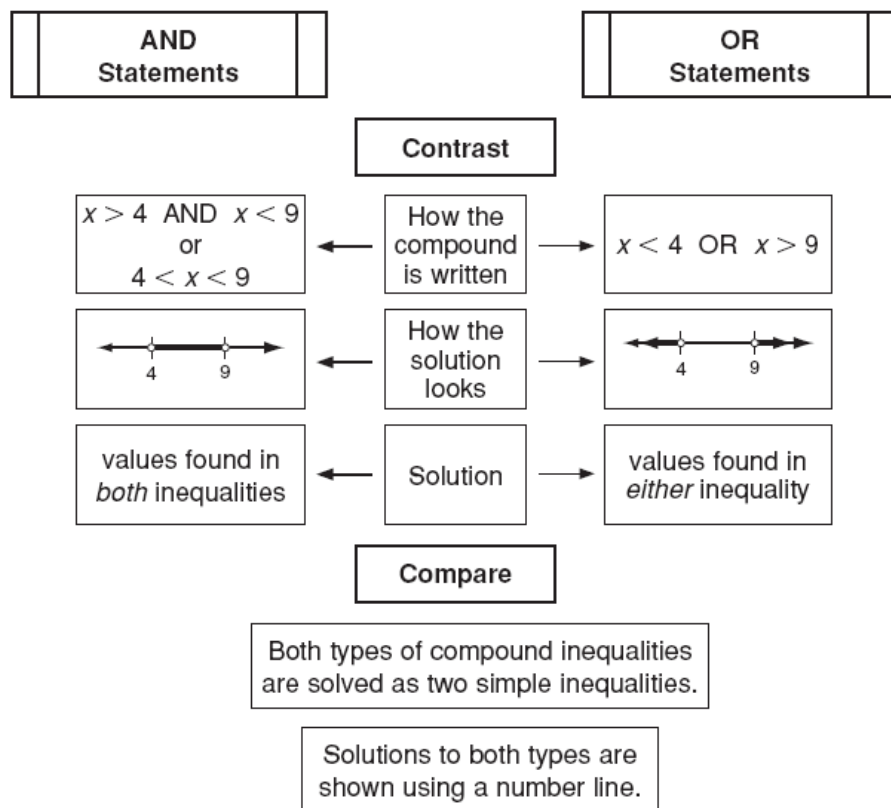
The United States Postal Service charges a “nonmachinable surcharge” for first-class mail if the length of the envelope (parallel to the address) divided by the height of the envelope is less than 1.3 or more than 2.5. Charlene has an envelope with a height of 3.5 inches. Write a compound inequality to show the lengths in inches for which Charlene will have to pay the surcharge.

Graph the solutions.



## Summary

There are two types of compound inequalities: AND statements and OR statements. The chart below shows their similarities and differences.



## Exit Ticket

Which inequality is represented in the accompanying graph?

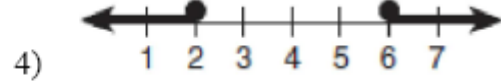
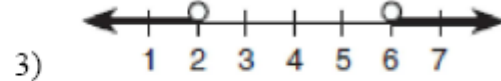
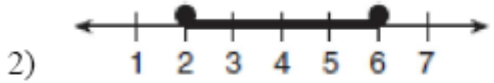
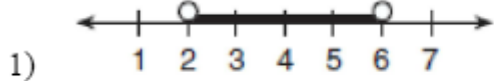


- |                       |                    |
|-----------------------|--------------------|
| 1) $-3 \leq x < 4$    | 3) $-3 < x < 4$    |
| 2) $-3 \leq x \leq 4$ | 4) $-3 < x \leq 4$ |

## Day 4 - Compound Inequalities HW

**Directions:** Circle your answer.

1) Which graph represents the solution set for  $2x - 4 \leq 8$  and  $x + 5 \geq 7$ ?



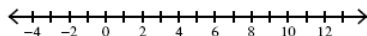
**Directions:** Solve the inequality, graph the solution, express in interval notation and set builder notation.

2)  $n - 10 \geq 0$  or  $-5 + n < -6$

Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_

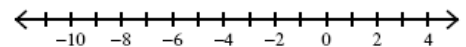


4)  $-20 \leq -6m - 2 \leq 58$

Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_

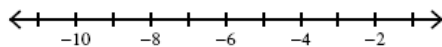


3)  $6x > -36$  or  $3x \leq -24$

Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_

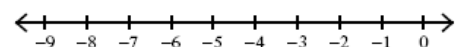


5)  $-53 < 9v + 1 < -26$

Inequality: \_\_\_\_\_

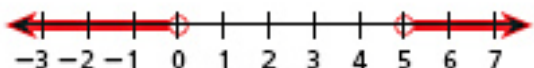
Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_



**Directions:** Write a compound inequality from the graph provided and express solution in interval notation.

6)

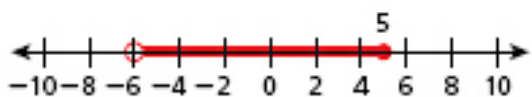


Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_

7)

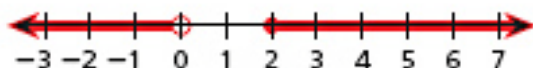


Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_

8)



Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_

9)



Inequality: \_\_\_\_\_

Interval Notation: \_\_\_\_\_

Set Builder Notation: \_\_\_\_\_

## SET THEORY – Day 6

**SWBAT: Determine Unions and Intersections of Sets**

### Warm – Up

Use interval notation to represent the set of numbers. Rewrite each in set – builder notation.

A.  $-1 < x \leq 2$

C.  $(-\infty, 4]$

B.  $3 \leq x \leq 10$

D.  $(-2, \infty)$

A **set** is a collection of objects called **elements**.

The elements included in {...} are in roster form.

**Example 1: Directions:** Insert an  $\in$  or  $\notin$  to make each statement true. (Does the element exist in the set?)

1) purple \_\_\_\_\_ {orange, blue, green, red, yellow}

2) E \_\_\_\_\_ {R, O, G, E, R}

**Practice 1: Directions:** Insert an  $\in$  or  $\notin$  to make each statement true. (Does the element exist in the set?)

3) red \_\_\_\_\_ {orange, blue, green, red, yellow}

4) K \_\_\_\_\_ {K, E, V, I, N}

5) 6 \_\_\_\_\_ {1, 3, 5, 7, 9}

6) H \_\_\_\_\_ {H, O, P, E}

7) 0 \_\_\_\_\_ {-1, 1, -2, 2, -3, 3, -4, 4}

The union of sets A and B is the set of all elements that are in both A and B. To indicate the union of sets A and B, write  $A \cup B$ . The union of two sets can be thought of as the “joining” of the sets (any element in either set must appear in their union).

Example 2: **Finding the Union of Two Sets**

Find the union of the sets.

1)  $A = \{0, 2, 4, 8, 16\}$  and  $B = \{2, 4, 6, 8\}$

2)  $M = \{x : x < 10\}$  and  $P = \{x : x > 5\}$

Practice: **Finding the Union of Two Sets**

Find the union of the sets.

1)  $J = \{-3, -2, -1\}$  and  $K = \{0, 1, 2, 3\}$

2)  $A = \{3, 6, 9\}$  and  $B = \{2, 4, 6, 8\}$

3)  $R = \{x \mid x > 3\}$  and  $S = \{x \mid x > 7\}$

4)  $C = \{x \mid x \leq -1\}$  and  $D = \{x \mid -1 < x \leq 0\}$

The **intersection** of sets A and B is the set of all elements that are in both A and B. To indicate the intersection of sets A and B, write  $A \cap B$ .

A set with no elements is called the empty set, or the null set. The symbol for the null set is  $\emptyset$ .

Example 3: **Finding the Intersection of Two Sets**

Find the intersection of the sets.

1)  $X = \{5, 6, 7, 8, 9\}$  and  $Y = \{1, 3, 5\}$

2)  $S = [0, 3)$  and  $T = [-1, \infty)$

Practice: **Finding the Intersection of Two Sets**

Find the intersection of the sets.

1)  $F = \{1, 3, 5, 7\}$  and  $G = \{2, 4, 6, 8\}$

2)  $M = \{7, 8, 9, 10\}$  and  $N = \{5, 6, 7, 8, 9\}$

3)  $P = (-3, -1]$  and  $V = (-2, -1)$

4)  $X = [-4, 5)$  and  $Y = (2, 10]$



**Challenge Problem:**

Given:  $X = \{1, 2, 3, 4\}$

$$Y = \{2, 3, 4, 5\}$$

$$Z = \{3, 4, 5, 6\}$$

What is the intersection of sets  $X$ ,  $Y$ , and  $Z$ ?

**Summary:**

**THE UNION AND INTERSECTION OF TWO SETS**

For two sets,  $A$  and  $B$ , their union,  $\cup$ , and their intersection,  $\cap$ , are given by:

(1) **Union:**  $A \cup B = \{x : x \in A \text{ or } x \in B\}$       (2) **Intersection:**  $A \cap B = \{x : x \in A \text{ and } x \in B\}$

**Exit Ticket:**

Given:  $A = \{3, 6, 9, 12, 15\}$

$$B = \{2, 4, 6, 8, 10, 12\}$$

What is the union of sets  $A$  and  $B$ ?

- 1)  $\{6\}$
- 2)  $\{6, 12\}$
- 3)  $\{2, 3, 4, 8, 9, 10, 15\}$
- 4)  $\{2, 3, 4, 6, 8, 9, 10, 12, 15\}$

## Homework

**Directions:** Insert an  $\in$  or  $\notin$  to make each statement true. (Does the element exist in the set?)

1) green \_\_\_\_\_ {orange, blue, green, red, yellow}

2) Y \_\_\_\_\_ {A, E, I, O, U}

3) 5 \_\_\_\_\_ {1, 3, 5, 7, 9}

**Find the union and intersection of each pair of sets.**

1)  $A = \{\text{red, blue, yellow}\}$  and  $B = \{\text{green, red}\}$

Union

Intersection

2)  $X = \{-10, -8, -6, -4, -2\}$  and  $Y = \{-4, -2, 0, 2, 4\}$

Union

Intersection

3)  $L = \{x \mid 0 \leq x \leq 10\}$  and  $M = \{x \mid 5 \leq x \leq 15\}$

Union

Intersection

4)  $A = (0, 2)$  and  $B = [2, 5)$

Union

Intersection

5)  $F = \{x \mid x > 3\}$  and  $G = \{x \mid x \leq 5\}$

Union

Intersection

6)  $K = (-\infty, -1)$  and  $L = (-6, 2)$

Union

Intersection

## SET THEORY – Day 7

**SWBAT: Determine the Complement of a Subset**

### Warm – Up

Write the union and intersections of each pair of sets.

1)  $A = \{a, e\}$

$$B = \{a, b, c\}$$

$$C = \{a, x, y, z\}$$

2)  $A = \{1, 2, 3\}$

$$B = \{-5, -3, -2, 0\}$$

$$C = \{-2, 0, 2, 3\}$$

$$\text{Let } B = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$$

$$A = \{3, 6, 9\}$$

Set A is a **subset** of set B, since every element in set A is also an element of set B.  
The notation is:  $A \subset B$

Set B on the other hand would **not be a subset** of A, since every element in set B is not an element of set A. The notation is:  $B \not\subset A$

The **empty set** is denoted with the symbol:  $\emptyset$  or  $\{ \}$

The **complement** of a set can be represented with several differing notations.  
The complement of set A can be written as:  $A^c$  or  $A^1$

**Example 1:**

Let  $U$  (the universal set) =  $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$  (a subset of the positive integers)

$$A = \{2, 4, 6, 8\}$$

$$B = \{1, 2, 3, 4, 5\}$$

1)  $A \cap B =$

2)  $A \cup B =$

3)  $A^c =$

4)  $B^c =$

5)  $A \subset B =$  YES or NO

**Practice**

1)  $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

$$A = \{2, 4, 6, 8, 10\}$$

$$B = \{1, 2, 3, 4, 5, 6\}$$

1)  $A \cap B =$

2)  $A \cup B =$

3)  $A^c =$

4)  $B^c =$

5)  $A \subset B =$  YES or NO

2)  $U = \{-5, -3, -1, 0, 1, 3, 5\}$

$$A = \{0, 1, 3, 5\}$$

$$B = \{-5, -3, -1, 0\}$$

1)  $A \cap B =$

2)  $A \cup B =$

3)  $A^c =$

4)  $B^c =$

5)  $A \subset B =$  YES or NO

**Example 2:** Suppose that the universe in each of the following is the set of real numbers. State the complement of each set using set-builder notation.

$$\{x : x \geq 4\}$$

**Practice:** Suppose that the universe in each of the following is the set of real numbers. State the complement of each set using set-builder notation.

- $\{x : x < -3\}$

- $\{x : x \geq -2\}$

**Example 3:** Suppose that the universe in each of the following is the set of real numbers. State the complement of each set using interval notation.

$$(-\infty, 3]$$

**Practice:** Suppose that the universe in each of the following is the set of real numbers. State the complement of each set using interval notation.

- $(-2, \infty)$

- $[-4, 9)$

**Determine if A is a subset of B. If so, find the complement of A in B.**

$$A = (0, \infty)$$

$$B = (-\infty, \infty)$$

### Challenge Problem:

$$U = \{-5, -3, -1, 0, 1, 3, 5\}$$

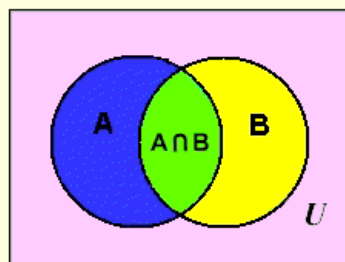
$$A = \{0, 1, 3, 5\}$$

$$B = \{-5, -3, -1, 0\}$$

1.  $(A \cap B)^c =$

2.  $(A \cup B)^c =$

### Summary:



If we cut out sets  $A$  and  $B$  from the picture above, the remaining region in  $U$ , the universal set, is labeled  $(A \cup B)^c$  and is called the **complement** of the union of sets  $A$  and  $B$ .

A complement of a set is all of the elements (in the universe) that are NOT in the set.

**NOTE\*:** The **complement** of a set can be represented with several differing notations.  
The complement of set  $A$  can be written as

$A^c$  or  $A'$  or  $\overline{A}$  or  $\sim A$

### Exit Ticket:

If the universal set is {pennies, nickels, dimes, quarters}, what is the complement of the set {nickels}?

- 1)  $\{ \}$
- 2) {pennies, quarters}
- 3) {pennies, dimes, quarters}
- 4) {pennies, nickels, dimes, quarters}

## Homework

1)  $U = \{2, 4, 6, 8, 10, 12, 14, 16, 18, 20\}$

$$A = \{2, 4, 8, 16\}$$

$$B = \{6, 8, 10, 12, 14, 16\}$$

- $A \cup B =$
- $A \cap B =$
- Is  $A \subset B$ ? = Yes or No
- $B^c =$
- $A^c =$

•

2)  $U = \{10, 20, 30, 40, 50, 60\}$

$$A = \{10\}$$

$$B = \{10, 40, 60\}$$

- $A \cup B =$
- $A \cap B =$
- Is  $A \subset B$ ? = Yes or No
- $A^c =$
- $B^c =$

3) Given:

$$\text{Set } A = \{(-2, -1), (-1, 0), (1, 8)\}$$

$$\text{Set } B = \{(-3, -4), (-2, -1), (-1, 2), (1, 8)\}.$$

What is the intersection of sets  $A$  and  $B$ ?

5) In the set of real number, the complement of the set  $[5, \infty)$  would be which of the following?

(1)  $(5, \infty)$

(3)  $(-\infty, 5)$

(2)  $(-5, \infty)$

(4)  $(-\infty, 5]$

4) Suppose that the universe in each of the following is the set of real numbers. State the complement of each set. Use set-builder notation.

- $\{x : x < -12\}$
- $\{x : x > 8\}$
- $\{x : x < -3 \text{ or } x \geq 6\}$

## Venn Diagrams with Set Theory (Day 8)

SWBAT: Create Venn diagrams to solve problems with subsets

### Warm – Up

Write the intersection of the following sets:

$\{5,6,7\}$  and  $\{5,6,7,8\}$

Write the union of the following sets:

$\{3,7,11,15\}$  and  $\{2,6,10,14\}$

Write the intersection of the following sets:

$\{4,5,9,11\}$  and  $\{1,3,6,7\}$

A **Venn diagram** is a visual aid used to assist us in sorting through the logic of certain types of questions. Venn diagrams show the relationships between different sets.

**EXAMPLE 1:** Use the Venn diagram below to answer each of the following.

(a) How many elements are contained in  $A \cap B$ ? \_\_\_\_\_

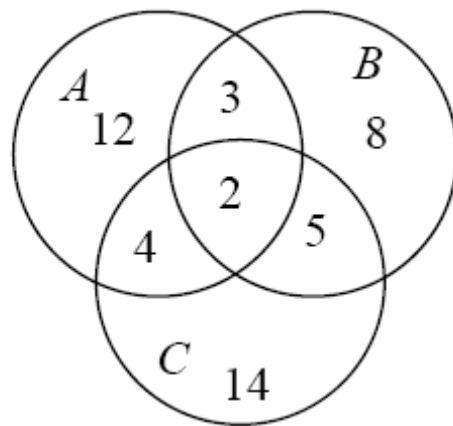
(b) How many elements are contained in  $A \cup C$ ? \_\_\_\_\_

(c) How many elements are contained in  $A^c$ ? \_\_\_\_\_

(d) How many elements are contained in  $B^c$ ? \_\_\_\_\_

(e) How many elements are contained in  $A \cap B \cap C$ ? \_\_\_\_\_

(f) How many elements are contained in  $A \cup B \cup C$ ? \_\_\_\_\_





**Practice:** Use the Venn diagram below to answer each of the following.

(a) How many elements are contained in  $A \cap B \cap C$ ? \_\_\_\_\_

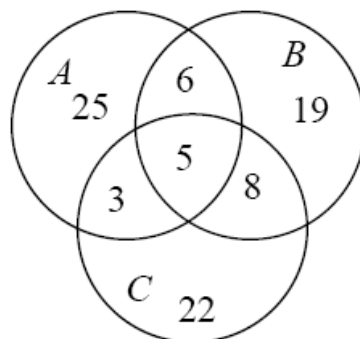
(b) How many elements are contained in  $A \cup B \cup C$ ? \_\_\_\_\_

(c) How many elements are contained in  $C \cap B$ ? \_\_\_\_\_

(d) How many elements are contained in  $B \cup C$ ? \_\_\_\_\_

(e) How many elements are contained in  $A^c$ ? \_\_\_\_\_

(f) How many elements are contained in  $B^c$ ? \_\_\_\_\_



**EXAMPLE 2:** Create a Venn diagram below to answer the following question.

In a class of 50 students, 18 take Chorus, 26 take Band, and 2 take both Chorus and Band. How many students in the class are not enrolled in either Chorus or Band?

**Practice:** Create a Venn diagram below to answer each of the following questions.

1. In a school of 320 students, 85 students are in the band, 200 students are on sports teams, and 60 students participate in both activities. How many students are not involved in either band or sports?
2. In Clark Middle School, there are 60 students in seventh grade. If 25 of these students take art only, 18 take music only, and 9 do not take either art or music, how many take both art and music?

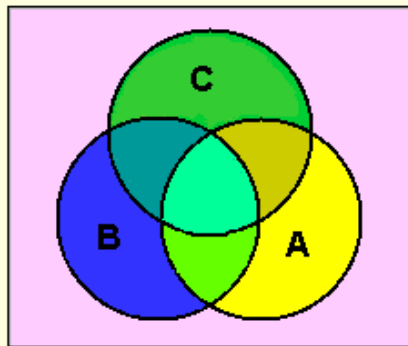
**Challenge:** Create a Venn diagram below to answer the following question.

A veterinarian surveys 26 of his patrons. He discovers that 14 have dogs, 10 have cats, and 5 have fish. Four have dogs and cats, 3 have dogs and fish, and one has a cat and fish. If no one has all three kinds of pets, how many patrons have none of these pets?

### Summary:

Sets are often represented in pictorial form with a circle containing the elements of the set. Such a depiction is called a **Venn Diagram**.

A **Venn diagram** is a drawing, in which circular areas represent groups of items usually sharing common properties. The drawing consists of two or more circles, each representing a specific group or set. This process of visualizing logical relationships was devised by John Venn (1834-1923).



Each Venn diagram begins with a rectangle representing the **universal** set. Then each set of values in the problem is represented by a circle. Any values that belong to more than one set will be placed in the sections where the circles overlap.

### Exit Ticket

Out of 18 people in the Glee club, 11 have dogs and 7 have cats. Four people have both cats and dogs. How many club members have only cats?

- [A] 4      [B] 3      [C] 7      [D] 5

### HOMEWORK:

1. Use the Venn diagram below to answer each of the following.

(a) How many elements are contained in  $T \cap B$ ? \_\_\_\_

Sports Watched on Television

(b) How many elements are contained in  $T \cup F$ ? \_\_\_\_

(c) How many elements are contained in  $T^c$ ? \_\_\_\_

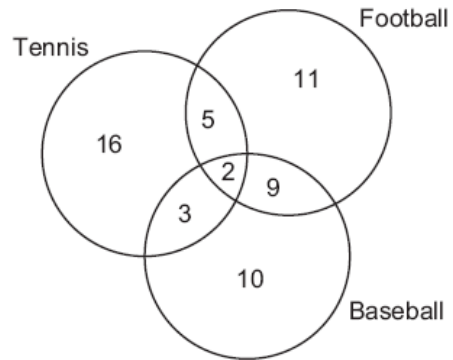
(d) How many elements are contained in  $B^c$ ? \_\_\_\_

(e) How many elements are contained in  $F^c$ ? \_\_\_\_

(f) How many elements are contained in  $T \cap B \cap F$ ? \_\_\_\_

(g) How many elements are contained in  $T \cup B \cup F$ ? \_\_\_\_

(h) (Challenge) How many elements are contained in  $(T \cup B) \cap F$ ? \_\_\_\_



2. In a survey of 400 teenage shoppers at a large mall, 240 said they shopped at Abernathy's, 210 said they shopped at Bongo Republic, and 90 said they shopped at both stores. How many of the teenage shoppers surveyed did not shop at either store?

3. There are 1200 people working in an office building. 750 people get to work by using an automobile, 900 people get to work using public transportation, and 650 people get to work by using both an automobile and public transportation. How many people get to work without using an automobile or public transportation?
4. A store selling major appliances has 550 sales this week. 300 sales are for appliances only, 10 sales are for extended service agreements only, and 100 sales are for appliances and extended services agreements. How many sales are not for appliances nor extended service agreements?
5. Eighteen students sing in the chorus and twelve play in the jazz band. Five students are in both the chorus and the band. What is the total number of students who participate in these activities?