

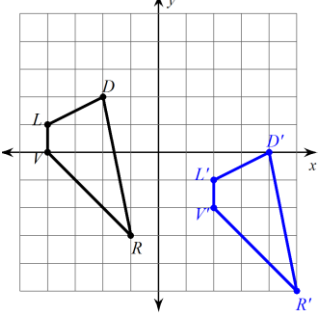
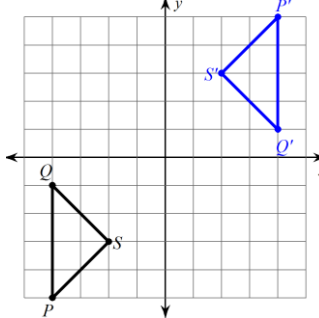
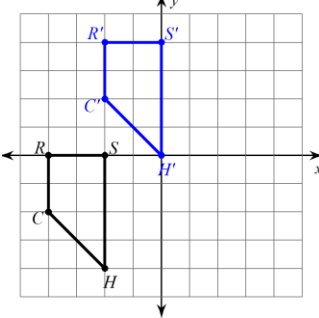
# 1.1 Translations

## Vocabulary

**Transformation:** An operation that \_\_\_\_\_ or \_\_\_\_\_ a figure in some way to produce a new figure. The three transformations are \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

<b>Translation:</b>	<b>Preimage ( A )</b>	vs.	<b>Image ( A' )</b>
	 <b>1</b>		 <b>2</b>

**Example 1:** Cross out the example that is NOT a translation. Then describe the remaining translations.

<p>A.</p> 	<p>B.</p> 	<p>C.</p> 
<div style="border: 1px dashed black; padding: 5px; display: inline-block;"> <p>* Use one matching point to help you find the rule for the translation.</p> </div>		

### THE MATHEMATICAL WAY TO DESCRIBE TRANSLATIONS...

<div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><b>Coordinate Notation</b>  <math>(x, y) \rightarrow (x \pm a, y \pm b)</math>                      left/right    up/down</p> </div>	<p><b>Ex:</b> left 3 units; up 7 units  <math>(x, y) \rightarrow (x - 3, y + 7)</math></p>
--	--

**Example 3: Rewrite the translation "mathematically"**

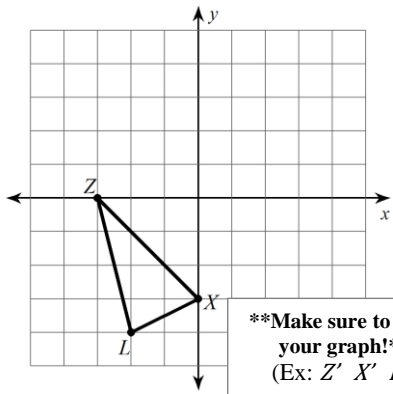
<p>1. left 15 units and up 24 units  <math>(x, y) \rightarrow (x \quad , y \quad )</math></p>	<p>2. right 8 units and down 4 units.  <math>(x, y) \rightarrow (x \quad , y \quad )</math></p>
---	---

**Example 4: Find the coordinates of the image without graphing.**

<p>1. Point <math>G(6, -3)</math> is translated 5 units to the left and 6 units up to form the point <math>G'</math>. What are the coordinates of <math>G'</math>?</p>	<p>2. What is the image of <math>H(-2, 6)</math> after the translation defined by <math>(x, y) \rightarrow (x + 2, y - 1)</math>?</p>
<p>3. Use the translation <math>(x, y) \rightarrow (x - 5, y + 1)</math> to find what point <math>(-2, -10)</math> translates to:</p>	<p>4. Use the translation <math>(x, y) \rightarrow (x - 3, y - 7)</math> to find what point <math>(1, 4)</math> translates to:</p>

**Example 5: Graph the translation using the rule given. Then list the coordinates of the image.**

1. 5 units right and 3 unit up



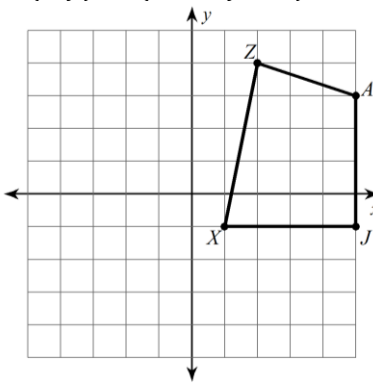
**\*\*Make sure to label your graph!\*\*  
(Ex: Z' X' L')**

Z' ( , )

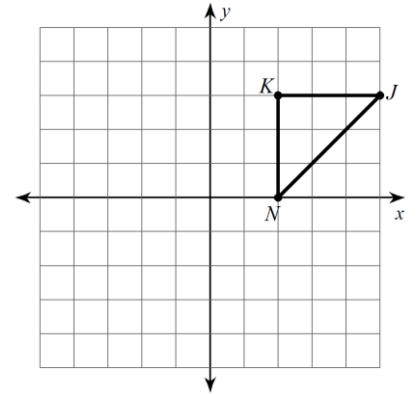
X' ( , )

L' ( , )

2.  $(x, y) \rightarrow (x - 3, y - 2)$

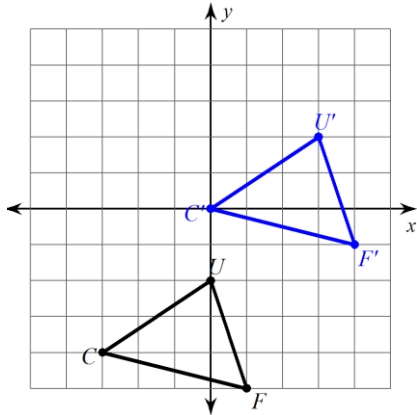


3.  $(x, y) \rightarrow (x - 6, y)$

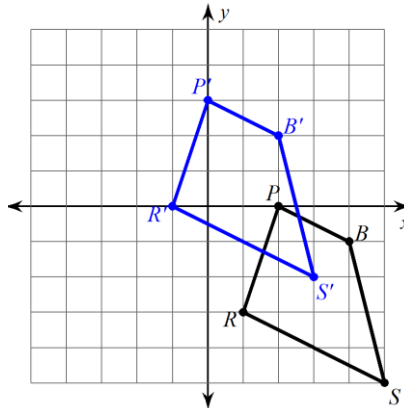


**Example 6: Describe the transformation using coordinate notation.**

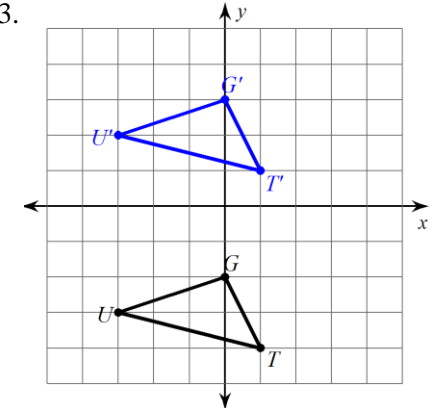
1.



2.

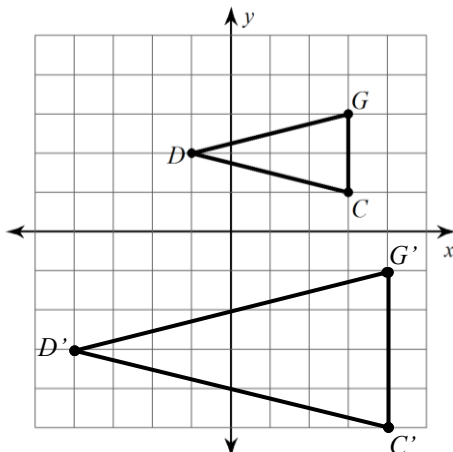


3.

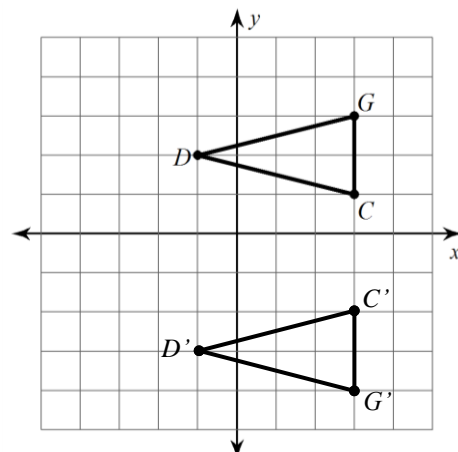


**Critical thinking: Partner up and discuss!**

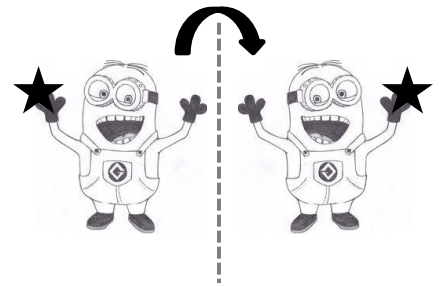
1. Is the following a translation? Why or why not?



2. Is the following a translation? Why or why not?



# 1.2 Reflections



Reflection:	Line of Symmetry:
-------------	-------------------

**Example 1:** How many lines of symmetry does each figure have? Draw all lines of symmetry.

1.	2.	3.	4.
5.	6.	7.	8.

## Example 2

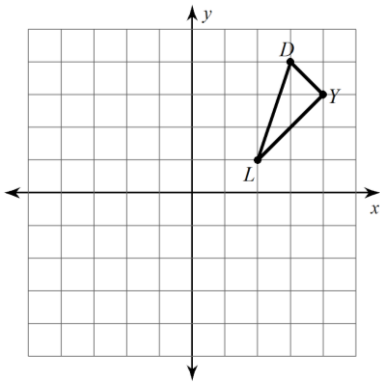
1. Triangle $GQS$ is reflected across the ___-axis.	2. The letter $W$ is reflected across the ____ - axis.	
3. Reflect point $K$ across the $x$ -axis.	4. Reflect point $P(2, -3)$ across the $y$ -axis.	5. Reflect point $D(-4, -4)$ across the $x$ -axis.

## Error Analysis

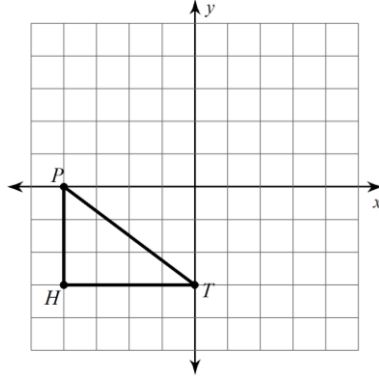
1. On a quiz Charlie reflected the triangle below across the $y$ -axis, but it was marked wrong. Describe his error.	2. Jenna reflected the triangle below across the $x$ -axis. Describe her error.
--	---

**Example 3: Graph the reflection described. Then list the coordinates of the image.**

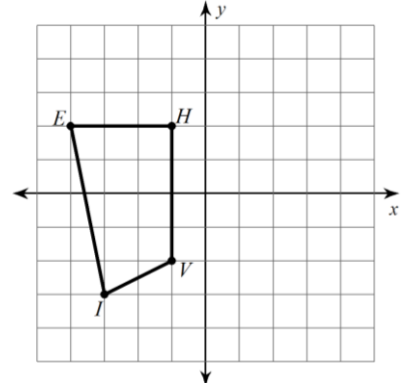
1. Reflection in the  $x$ -axis



2. Reflection in the  $y$ -axis

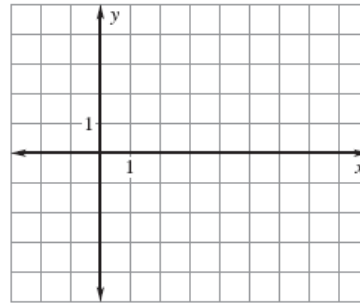


3. Reflection in the  $y$ -axis



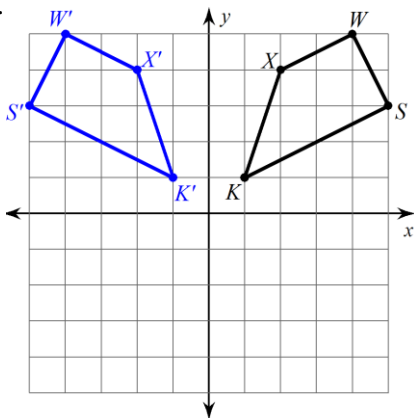
4. Graph  $\triangle PET$  with vertices  $P(2, 4)$ ,  $E(4, 1)$ , and  $T(7, 4)$ . Then reflect  $\triangle PET$  across the  $x$ -axis and graph  $\triangle P'E'T'$ . Label the coordinates on the side.

$P(2, 4)$	$\rightarrow$
$E(4, 1)$	$\rightarrow$
$T(7, 4)$	$\rightarrow$

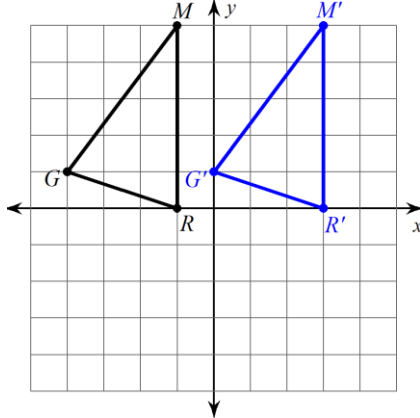


**Example 4: Describe the transformation**

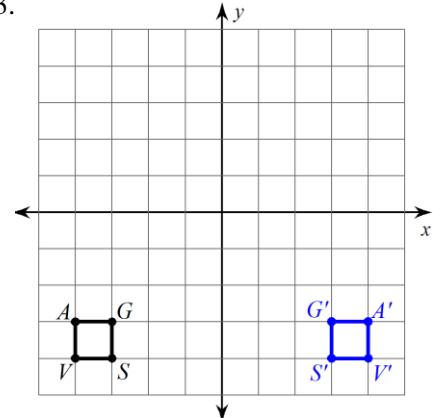
1.



2.



3.



# 1.3

# Rotations



<b>Rotation:</b>	<b>Center of Rotation:</b>
------------------	----------------------------

<p><b>Direction</b></p> <p>Clockwise      Counterclockwise</p>	<p><b>Degree</b></p> <ul style="list-style-type: none"> <li>• A full rotation is <math>360^\circ</math></li> <li>• every <math>90^\circ</math> rotation <math>\Rightarrow</math> one quadrant over  <math>\Rightarrow</math> order switches  <math>(a, b) \rightarrow (b, -a)</math></li> <li>• <math>180^\circ =</math> two <math>90^\circ</math> rotations</li> </ul>	
--	---	--

**Example 1: Graph the rotation and list the coordinates of the image.**

<p>1. <math>90^\circ</math> clockwise</p>	<p>2. <math>180^\circ</math> counterclockwise</p>	<p>3. <math>90^\circ</math> counterclockwise</p>
---	---	--

4. Find the coordinates of the image of the triangle shown below after a  $90^\circ$  clockwise rotation. Then graph it.

1<sup>st</sup> : List the coordinates of the preimage

2<sup>nd</sup> : Use the coordinate rule:  
 $(x, y) \rightarrow (\underline{\quad}, \underline{\quad})$

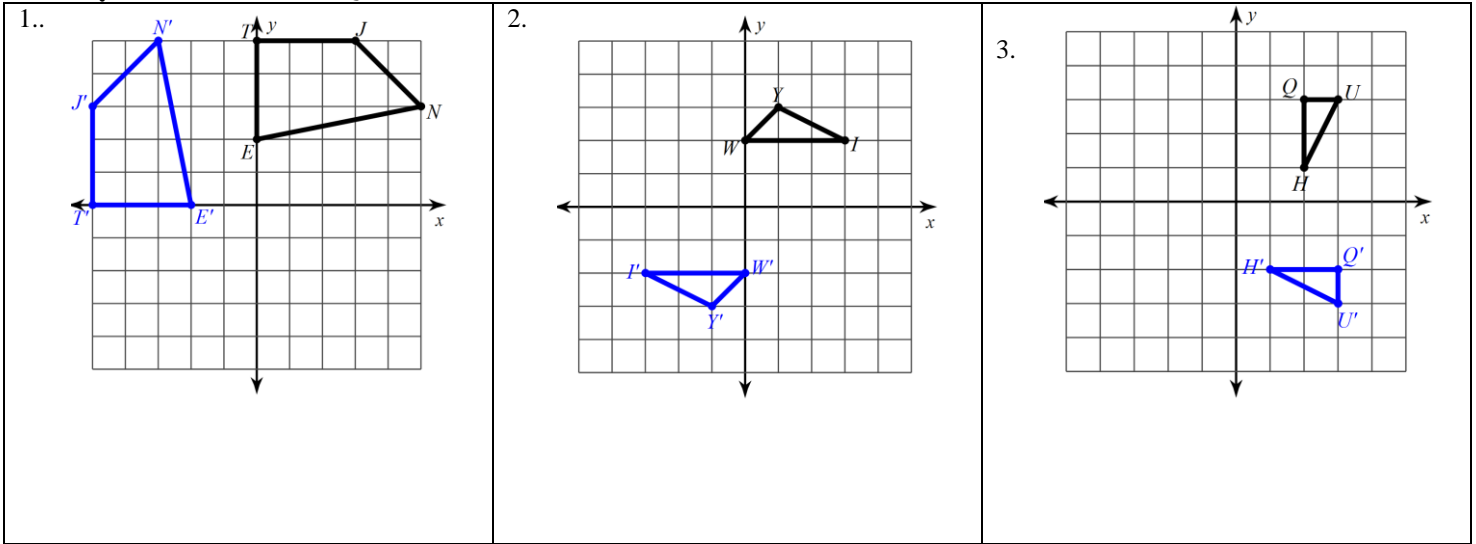
3<sup>rd</sup> : Apply the rule to each vertex.

4<sup>th</sup> : Graph the image

Preimage	Image

<p>5. If <math>F(17, -31)</math> is rotated <math>90^\circ</math> counterclockwise about the origin, what are the coordinates of <math>F'</math>.</p>	<p>6. If <math>J(-22, -87)</math> is rotated <math>180^\circ</math> clockwise about the origin, what are the coordinates of <math>J'</math>.</p>
---	--

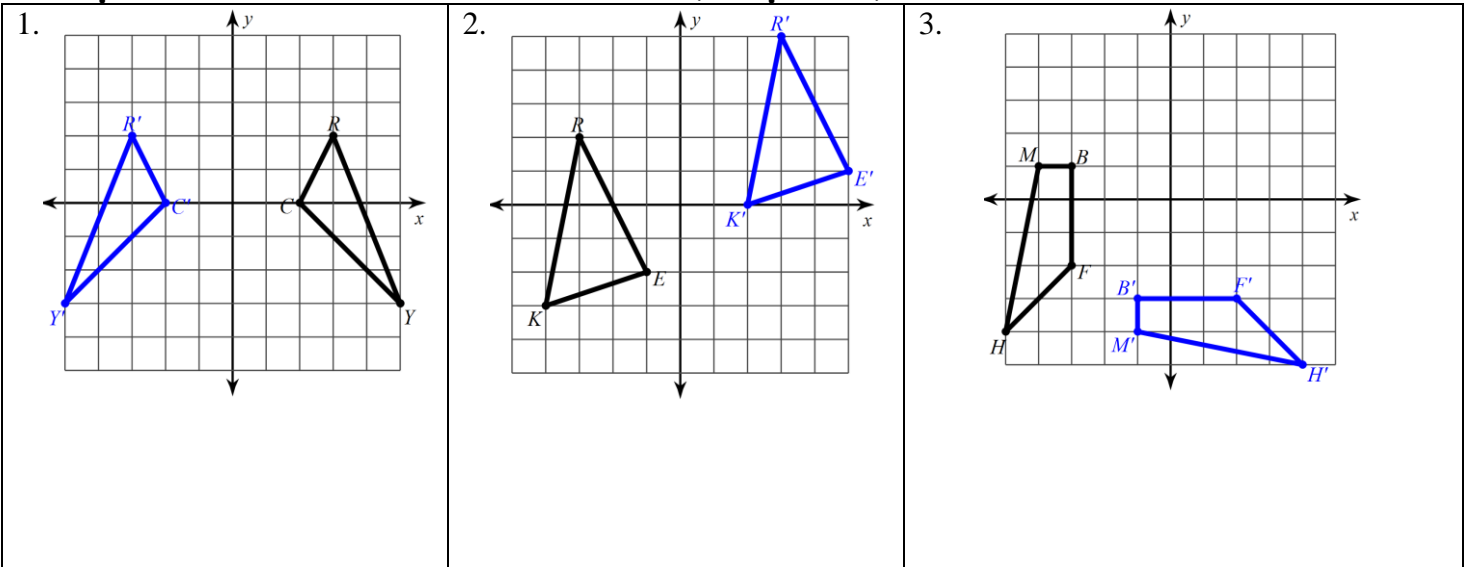
### Example 4: Describing Rotations

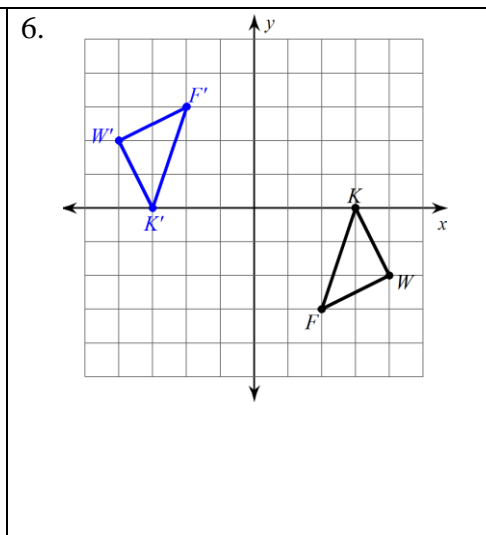
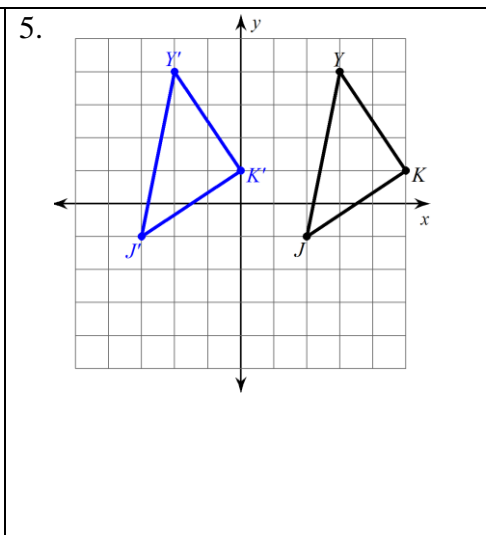
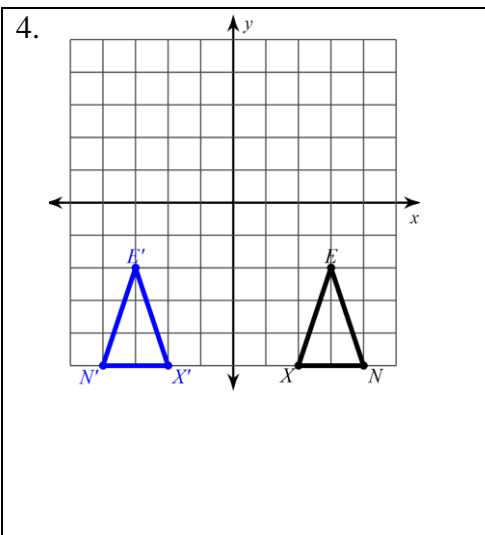


### DESCRIBING TRANSFORMATIONS (What you need!!!)

	Translations	Reflections	Rotations
<b>What to look for</b>	<ul style="list-style-type: none"> <li>Shapes face the same direction, points are in corresponding spots</li> </ul>	<ul style="list-style-type: none"> <li>Points are directly across from each other, equidistant</li> </ul>	<ul style="list-style-type: none"> <li>Points are on crack...</li> </ul>
<b>What to write</b>	<ul style="list-style-type: none"> <li>Coordinate notation</li> </ul>	<ul style="list-style-type: none"> <li>Line of reflection</li> </ul>	<ul style="list-style-type: none"> <li>Degree</li> <li>Direction</li> </ul>
<b>Example</b>	<p>Ex: translation  <math>(x, y) \rightarrow (x - 2, y + 8)</math></p>	<p>Ex: reflection in the <math>x</math>-axis</p>	<p>Ex: rotation <math>90^\circ</math> counter-clockwise about the origin</p>
<b>Hint!</b>	<b>HINT!</b> count the spaces horizontally then vertically from the preimage to the image	<b>HINT!</b> Fold your paper to help you find the reflection line	<b>HINT!</b> Count the # of quadrants the figure moves across

### Example 5: Describe the transformations. (Be specific)





**Example 6: Word problems**

1. If  $P(-3, 6)$  is translated using the rule  $(x, y) \rightarrow (x + 4, y - 8)$ , what are the coordinates for  $P'$ ?

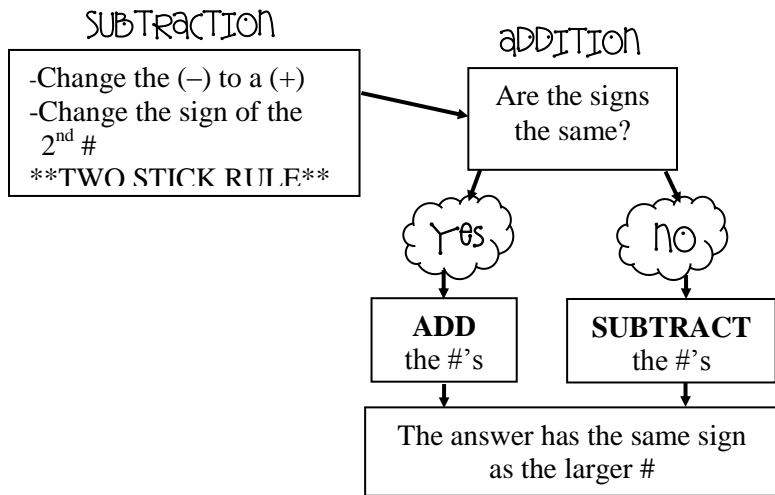
2. If  $N(3, -1)$  is rotated  $90^\circ$  counterclockwise about the origin, what are the coordinates of  $N'$ ?

3. If  $H(-6, -2)$  is reflected across the  $y$ -axis, what are the coordinates of  $H'$ ?

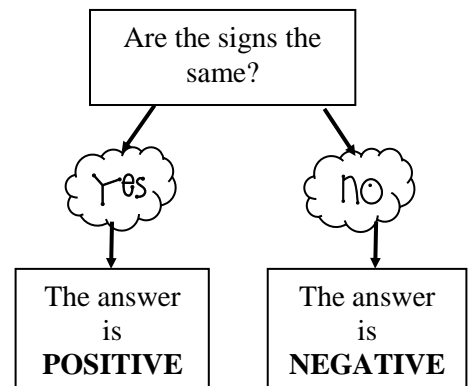
# 1.4 Integers and Equations

Let's review out integer rules!

## Adding and Subtracting Integers



## Multiplying and Dividing Integers



### Example 1: Simplify

1. $-3 + (-8)$	2. $-10 - 18$	3. $(-11)(-2)$	4. $-54 \div (-9)$	5. $12 - (-7)$
6. $6 + (-4)$	7. $3(-8)$	8. $\frac{24}{-3}$	9. $-5 + 17$	10. $-9 - (-4)$

## SOLVING EQUATIONS

### 1. Distribute

### 2. Combine like terms

- Same sign  $\rightarrow$  add them
- Different sign  $\rightarrow$  subtract them

### 3. Get the variable by itself

- inverse (opposite) operations

Solve:

$$7x + 40 = 4(x + 4) - 5x$$

*Distribute*

$$7x + 40 = 4x + 16 - 5x$$

*Combine like terms*

$$7x + 40 = -x + 16$$

*Addition*

$$+x \quad +x$$

$$8x + 40 = 16$$

*Subtraction*

$$-40 \quad -40$$

$$\frac{8x}{8} = \frac{-24}{8}$$

*Division*

$$x = -3$$

### Example 2: Solve the equation.

1. $x + 18 = 24$	2. $5p - 16 = 54$	3. $8n - 3n - 4 = 21$
4. $5 = \frac{x}{2} + 1$	5. $8(k + 3) = 88$	5. $\frac{x}{3} + 18 = 13$



$$7. 14x + 8 = 10x - 12$$

$$8. 12 + 14b - 5b = 4b - 8$$

$$9. 2x + 9 + 5x + 4 = 90$$

$$10. 5(x + 2) = x + 6(x - 3)$$

$$11. 2(7x + 1) = 68 + 3x$$

$$12. 7(b + 2) - 4b = 2(b + 10)$$

# 1.5 Algebra Proofs

## Vocabulary

Proof	Two-column proof	
	Statement	Reason
	1. 2.	1. 2.

## Algebraic Properties of Equality

If $a = b$ , then $a + c = b + c$	
If $a = b$ , then $a - c = b - c$	
If $a = b$ , then $a \cdot c = b \cdot c$	
If $a = b$ , then $a \div c = b \div c$	
If $ax + bx$ , then $(a + b)x$	
If $a(b + c)$ , then $ab + ac$ .	

### Example 1

1. Given: $3(k - 2) = 18$ Prove: $k = 8$	Statements	Reasons
2. Given: $2x - 9 = 5x + 12$ Prove: $x = -7$	Statements	Reasons
3. Given: $\frac{x}{6} + 3 = 8$ Prove: $x = 30$	Statements	Reasons

<p>4. Given: <math>19x - 8 - 3x = 15x - 19</math>            Prove: <math>x = -11</math></p>	<p style="text-align: center;">Statements</p> <hr/>	<p style="text-align: center;">Reasons</p> <hr/>
<p>5. Given: <math>3(4x - 1) = 8x + 17</math>            Prove: <math>x = 5</math></p>	<p style="text-align: center;">Statements</p> <hr/>	<p style="text-align: center;">Reasons</p> <hr/>
<p>6. Given: <math>8(b + 1) - 3b = 2b - 1</math>            Prove: <math>b = -3</math></p>	<p style="text-align: center;">Statements</p> <hr/>	<p style="text-align: center;">Reasons</p> <hr/>

**REVIEW: Describe the transformation**

<p>1.</p>	<p>2.</p>	<p>3.</p>
-----------	-----------	-----------

# 1.6 Solving Inequalities and Absolute Value Equations

## SOLVING INEQUALITIES

Solve the same way you would solve any equation

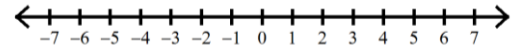
\* **There is only one extra rule:**

When you multiply or divide both sides by a **NEGATIVE #** you need to FLIP the symbol

## SIMPLE INEQUALITY GRAPHS

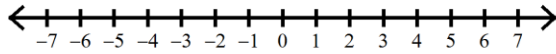
$<, >$   $\Rightarrow$  open circle

$\leq, \geq$   $\Rightarrow$  closed circle

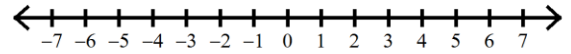


**Example 1: Solve the inequality and graph its solution.**

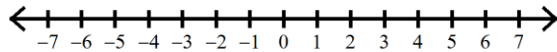
1.  $m + 7 \geq 10$



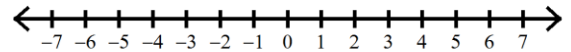
2.  $-3x < 18$



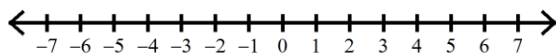
3.  $4x - 1 > -17$



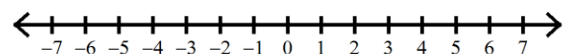
4.  $7 - 3x \leq 16$



5.  $-10 > -2(2x - 9)$



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



What was **ABSOLUTE VALUE** again???

Ex1:  $|9| =$

Ex 2:  $|-9| =$

So if  $|x| = 9$ , solve for  $x$ .

## ABSOLUTE VALUE EQUATIONS

\* You can use the fact that the expression in the absolute value symbol can be either \_\_\_\_\_ or \_\_\_\_\_ to help you solve your equation.

**Ex:**  $|x - 2| = 5$        $x - 2$  can be either positive or negative, so...

$$\begin{array}{l} x - 2 = +5 \\ x = 7 \end{array} \quad \text{and} \quad \begin{array}{l} x - 2 = -5 \\ x = -3 \end{array}$$

### Example 1: solve the equations

1.  $|x + 3| = 9$

2.  $\left|\frac{x}{9}\right| = -3$

3.  $|6x - 4| = 2$

4.  $|2x - 4| - 8 = 10$

5.  $4|x + 8| = 56$

6.  $\frac{|x+5|}{-16} = -1$

# 1.7 Solving and Absolute Value Inequalities

## ABSOLUTE VALUE INEQUALITIES

\* When solving an inequality you need to \_\_\_\_\_ the inequality symbol for the negative equation.

Ex:  $|x + 3| < 8$        $x + 3$  can be either positive or negative, so...

$$\begin{array}{l} x + 3 < +8 \\ x < 5 \end{array} \quad \text{and} \quad \begin{array}{l} x + 3 > -8 \\ x > -11 \end{array}$$

Flip the symbol

### Example 2: solve the inequalities

1.  $|x + 14| \leq 13$

2.  $|2x - 9| > 11$

3.  $|-7m| \geq 56$

4.  $|4x + 2| - 1 \geq 5$

5.  $\frac{|6x|}{8} < 4$

6.  $|2x + 5| - 1 \leq 6$

