

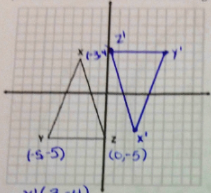
Geometry CC - Unit 4  
 Lesson 4: Translations  
 M1 L16 Day 1

Homework: HW Handout 4.4 # 1-7

HW Answers 4.3 Day 2

Name the coordinates of the vertices of the image after the given rotation and then graph the image. You do not have to use any tools to complete this process.

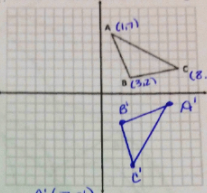
1. Rotate  $180^\circ$  clockwise about the origin



$X(3,4)$   
 $Y(6,5)$   
 $Z(0,5)$

$X'(3,-4)$   
 $Y'(6,-5)$   
 $Z'(0,-5)$

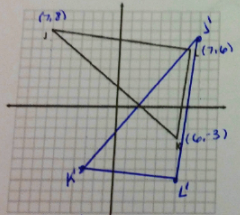
2. Rotate  $90^\circ$  clockwise about the origin



$A(1,1)$   
 $B(3,2)$   
 $C(8,3)$

$A'(7,-1)$   
 $B'(2,-3)$   
 $C'(3,-8)$

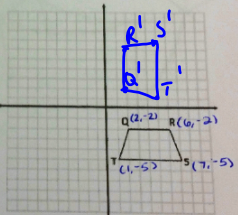
3. Rotate  $270^\circ$  counterclockwise about the origin



$J(2,2)$   
 $K(4,-3)$   
 $L(6,-7)$   
 $M(7,6)$

$J'(8,7)$   
 $K'(-3,-6)$   
 $L'(6,-7)$

4. Rotate  $270^\circ$  clockwise about the origin



$P(2,-2)$   
 $Q(4,-2)$   
 $R(6,-2)$   
 $S(7,-5)$

$P'(2,2)$   
 $Q'(2,6)$   
 $R'(5,7)$   
 $S'(5,1)$

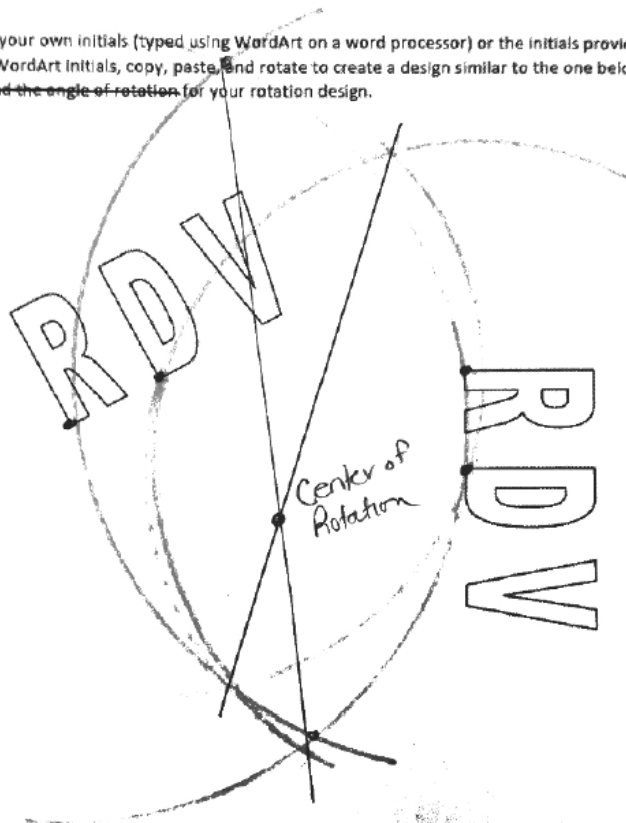
5. Is the reflection of a figure across the x-axis equivalent to the rotation of that same figure  $180^\circ$  about the origin? Explain why or why not and include drawings if needed.

No: Reflection  $(x,y) \rightarrow (x,-y)$   
 Rotation  $(x,y) \rightarrow (-x,-y)$   
 The x-value is negated on a rotation, but not on the reflection, so they aren't the same.

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6.

Use either your own initials (typed using WordArt on a word processor) or the initials provided below. If you create your own WordArt initials, copy, paste, and rotate to create a design similar to the one below. Find the center of rotation and the angle of rotation for your rotation design.



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**Translation Activity**

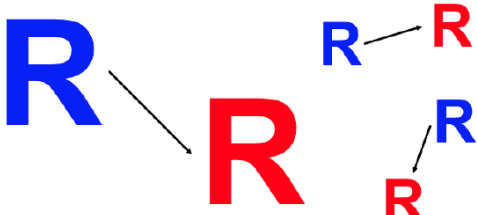
- Sit in your seat facing forward.
- Remember exactly how you are sitting:
  - Where are your hands?
  - Where are your feet?
  - Are you slouching or sitting upright?
  - Are you smiling?
- When I say "GO!" move to a new seat in the classroom.

**Discussion**

- Why is it important to know every single detail about how you were originally sitting?  
 A translation is a rigid motion. The movement must maintain the size and shape. The preimage is congruent to the image.
- If the classroom was on a coordinate plane, how would you describe your movement?  
 Right: positive on the x-axis  
 Left: negative on the x-axis  
 Up: positive on the y-axis  
 Down: Negative on the y-axis
- Did you take the shortest route to your new position? Describe the route you took.

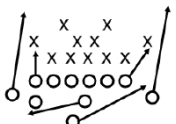
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**Translation (Slide or Glide)**  
 Transformation that moves all points of the preimage the same distance and in the same direction to create the image.

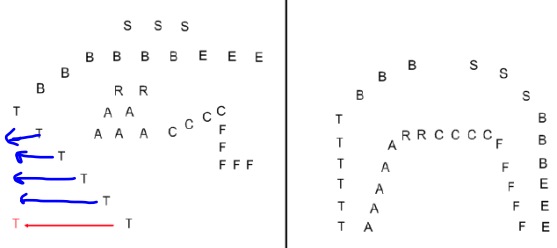


**Real World Translations**

Football Plays



Marching Band Routines




*Draw the translation for a band member to get to their new spot.*

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**Translation Vector** - Shows the **direction** and the **distance** each point needs to be translated

Translate the figure along the translation vector ( $\vec{v}$ ).  
 Point  $x'$  is a translation of point  $x$  along the translation vector  $\vec{v}$ .



The translation vector is **parallel** to the translation line because they are going in the exact same direction, and it is the same line, just in a different location.

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**Notation**

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In a translation, points move the same **DIRECTION** and the same **DISTANCE**.  
 Vectors are used to describe translations because they have direction and magnitude (distance)

**Vector Notation:  $\langle a, b \rangle$**

Example: 6 units left (x), and 2 units up (y)  
 Vector:  $\langle -6, 2 \rangle$

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A translation can also be expressed by describing the horizontal and vertical shifts in the coordinate plane in terms of the original x and y values.

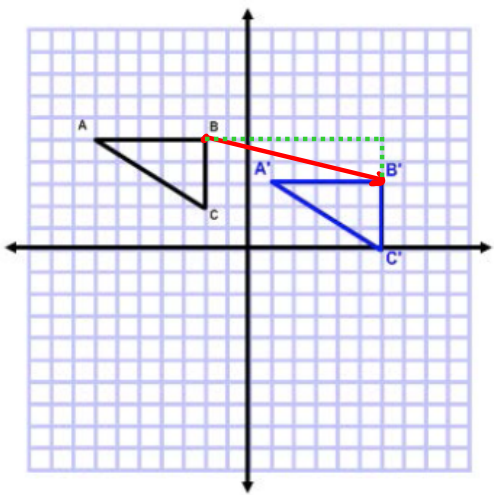
**Coordinate Notation:  $(x, y) \longrightarrow (x + a, y + b)$**

Example: 4 units right (x), and 7 units down (y)  
 Coordinate Notation:  $(x, y) \longrightarrow (x + 4, y - 7)$

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**Describe the translation using coordinate notation and vector notation.**

1)

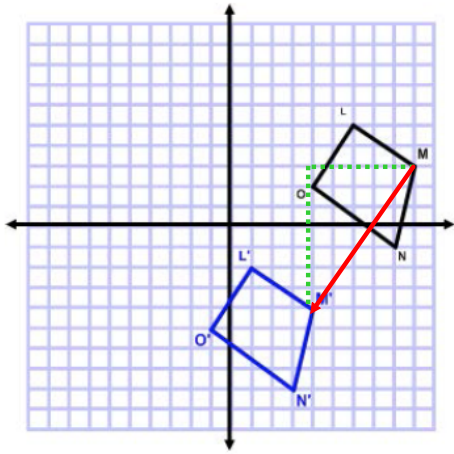


Coordinate Notation:  
 $(x, y) \longrightarrow (x + 8, y - 2)$

Vector Notation:  
 $\langle 8, -2 \rangle$

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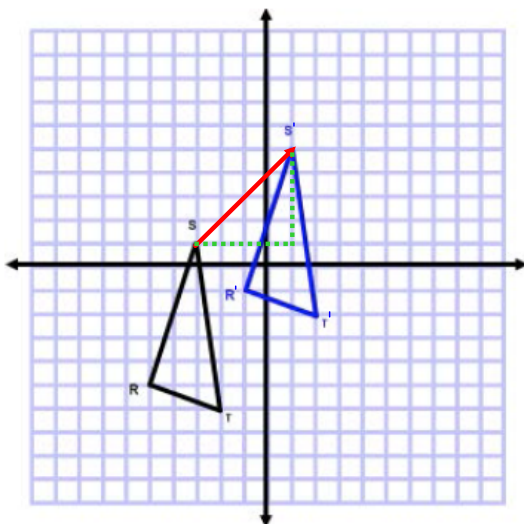
2)



Coordinate Notation:  
 $(x,y) \rightarrow (x-5, y-7)$   
Vector Notation:  
 $\langle -5, -7 \rangle$

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3)

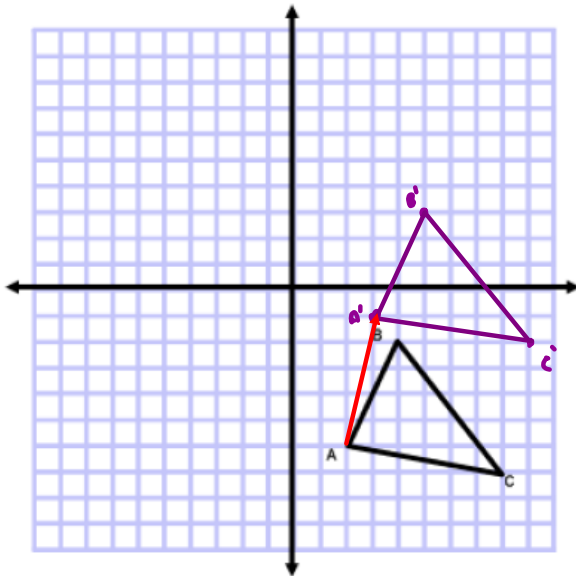


Coordinate Notation:  
 $(x,y) \rightarrow (x+4, y+4)$   
Vector Notation:  
 $\langle 4, 4 \rangle$

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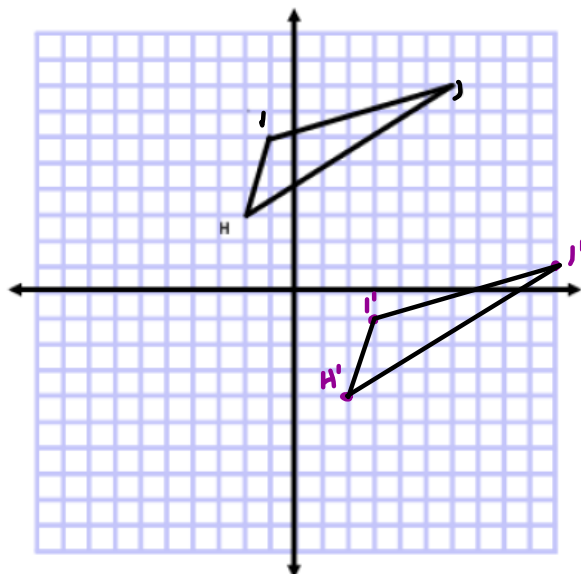
Draw the image on the coordinate plane after the translation.

- 1) Translation:  $\langle 1, 5 \rangle$   $(x+1, y+5)$  or right 1, up 5



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- 2) Translation:  $(x, y) \rightarrow (x + 4, y - 7)$  right 4, down 7



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3)

Draw both the preimage and the image (after the translation) on the coordinate plane.

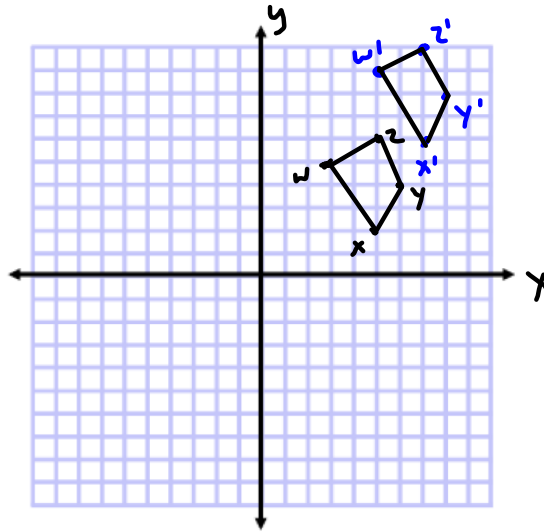
Quadrilateral WXYZ with vertices  $W(3, 5)$ ,  $X(5, 2)$ ,  $Y(6, 4)$ , and  $Z(5, 6)$  with a translation of  $\langle 2, 4 \rangle$ . right 2, up 4

$w'(5,9)$

$x'(7,6)$

$y'(8,8)$

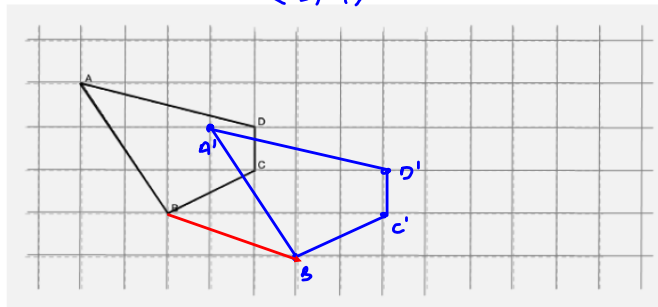
$z'(7, 10)$



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4) Translate the image one unit down and three units right. Draw the vector that defines the translation.

$\langle 3, -1 \rangle$

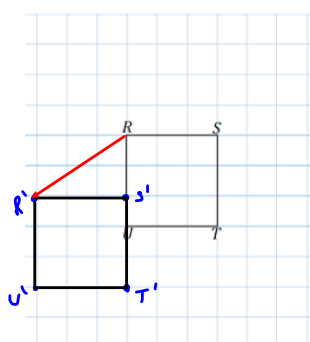


5)

2 units down and 3 units left.

$\langle -3, -2 \rangle$

Draw the vector that defines the translation.



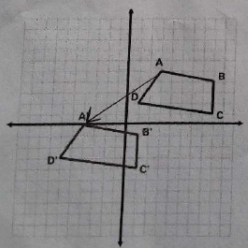
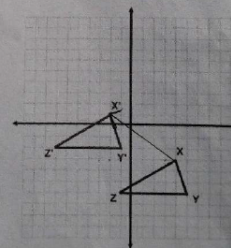
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Geometry CC - Unit 4  
 Lesson 4: Translations  
 M1 L16 Day 2

Homework: HW Handout 4.4 # 8 & 9

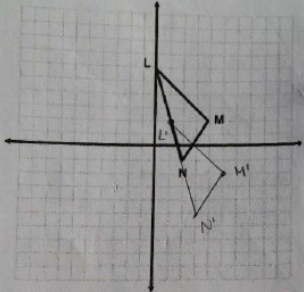
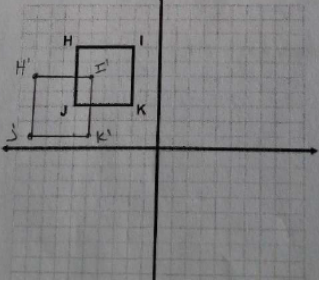
HW Answers 4.4 Day 1

Describe the translation using coordinate notation and vector notation.

- 1) A point moved 6 units right and 2 units down.  
 $(x, y) \rightarrow (x+6, y-2)$   
 $\langle 6, -2 \rangle$
- 2) A triangle moved 4 units up.  
 $(x, y) \rightarrow (x+0, y+4)$   
 $\langle 0, 4 \rangle$
- 3) A point moved 8 units up and 5 units left.  
 $(x, y) \rightarrow (x-5, y+8)$   
 $\langle -5, 8 \rangle$
- 4)   
 $(x, y) \rightarrow (x-7, y-5)$   
 $\langle -7, -5 \rangle$
- 5)   
 $(x, y) \rightarrow (x-6, y+4)$   
 $\langle -6, 4 \rangle$

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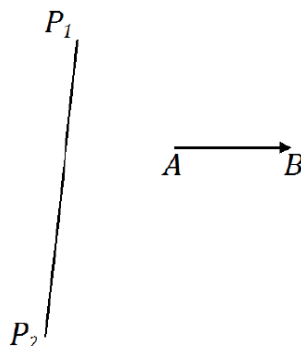
Draw the image on the coordinate plane after the translation.

- 6) Translation:  $\langle 1, -4 \rangle$   

- 7) Translation:  $(x, y) \rightarrow (x-2, y-3)$   


Oct 21-10:21 AM

## Constructing Translations

- 1) Use your compass and straightedge to apply  $T_{\vec{AB}}$  to segment  $P_1P_2$ .

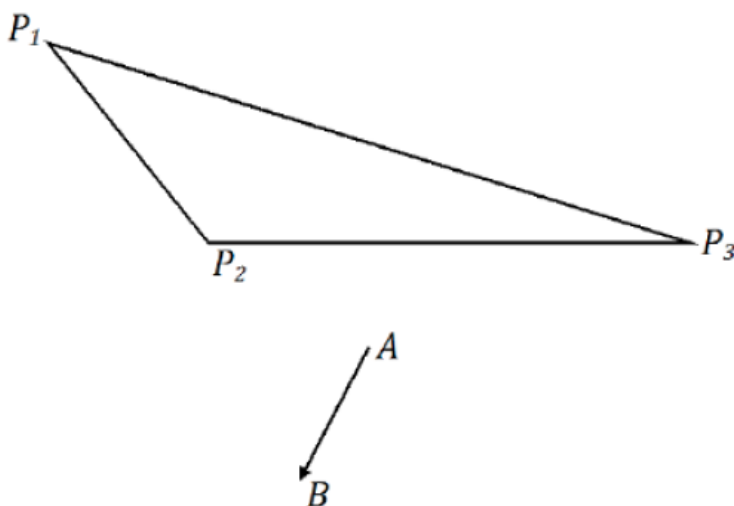


## Steps

- 1) Draw a circle at each vertex of the original image with a radius equal to the length of the ray you are translating with.
- 2) Then measure off from the endpoint of the ray to the first vertex of the original and using this same setting draw an arc with the same radius with its center at the end of the ray. Repeat this process for each vertex in the original image.
- 3) Connect the vertices of the image as in the original image.

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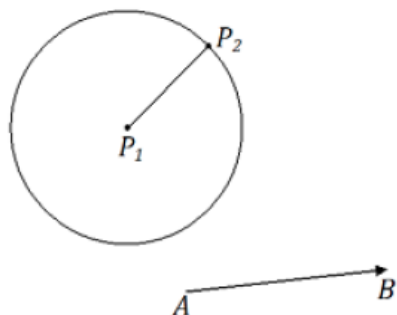
- 2) Use your compass and straightedge to apply  $T_{\vec{AB}}$  to  $\triangle P_1P_2P_3$ .



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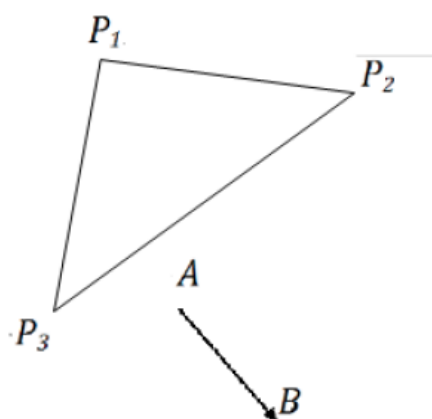


- 3) Use your compass and straightedge to apply  $T_{\overline{AB}}$  to the circle below (center  $P_1$ , radius  $\overline{P_1P_2}$ ).



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- 4) Use your compass and straightedge to apply  $T_{\overline{AB}}$  to  $\triangle P_1P_2P_3$ .



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