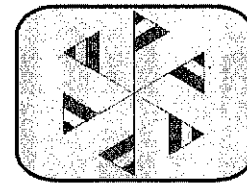
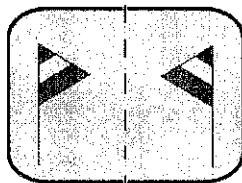
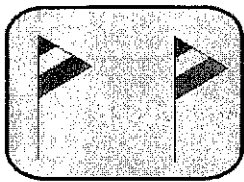


Geometry  
Translations

Name: Key Date: \_\_\_\_\_



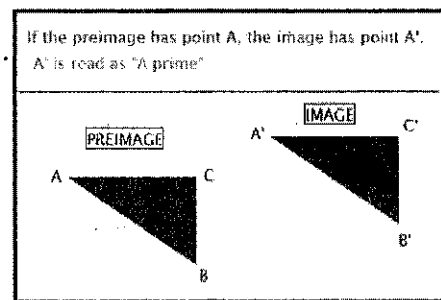
**Transformation:** The mapping, or movement, of all points of a figure in a plane according to a common operation, such as translation, reflection or rotation.

**Pre-image:** A figure before a transformation has taken place.

**Image:** The figure that results after a transformation.

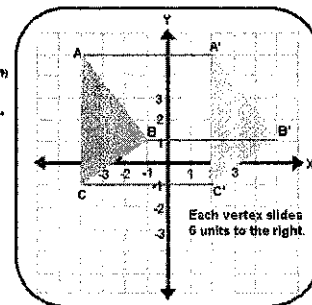
**Isometry:** A transformation that preserves congruence.

↳ same shape, same size



• A translation is a transformation where all the points of a figure are moved the same distance in the same direction.

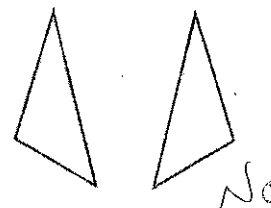
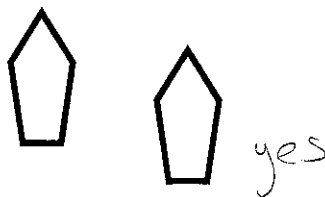
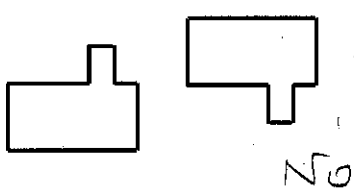
• The distance and direction are indicated by a ray called the translation vector.



• A vector is a quantity that has both length and direction, and can be thought of as a line with a starting point and an endpoint.

• A translation is an isometry so the image of a translated figure is congruent to the preimage.

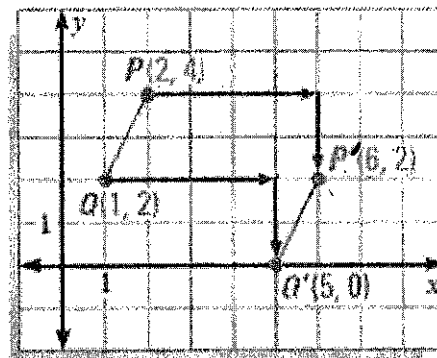
Tell whether each transformation appears to be a translation and explain.



## Translations in the Coordinate Plane

Often the rule for the translation will be given as  $(x, y) \rightarrow (x + a, y + b)$ . This is a shift  $a$  units horizontally in the  $x$ -direction and  $b$  units vertically in the  $y$ -direction.

For example, in the coordinate plane to the right shows the translation  $(x, y) \rightarrow (x + 4, y - 2)$  shifts each point 4 units to the right and 2 units down.

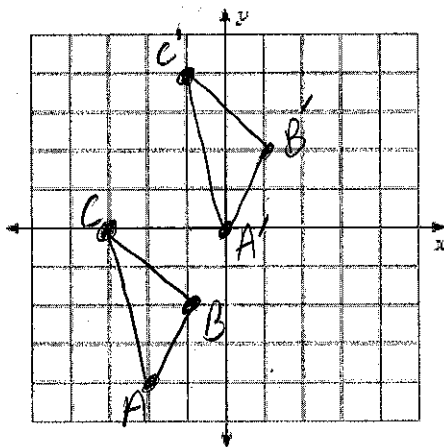


## Drawing Translations in the Coordinate Plane

Translate the triangle with the vertices  $A(-2, -4)$ ,  $B(-1, -2)$ , and  $C(-3, 0)$  using the rule  $(x, y) \rightarrow (x + 2, y + 4)$ .

*right 2 up 4*

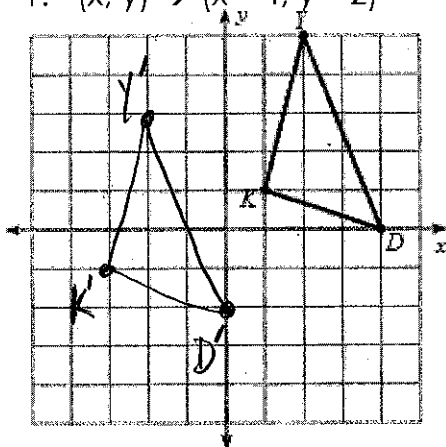
OR Vector  $\langle 2, 4 \rangle$



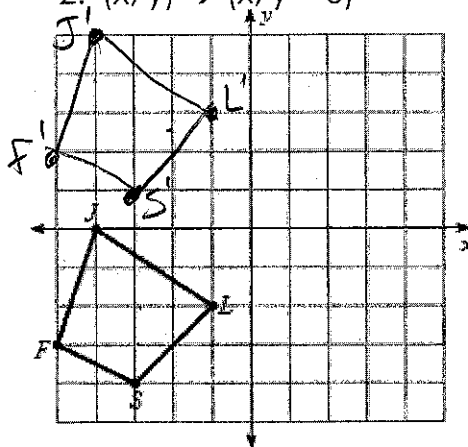
You Try!

Translate the figure with the given vertices using the rule.

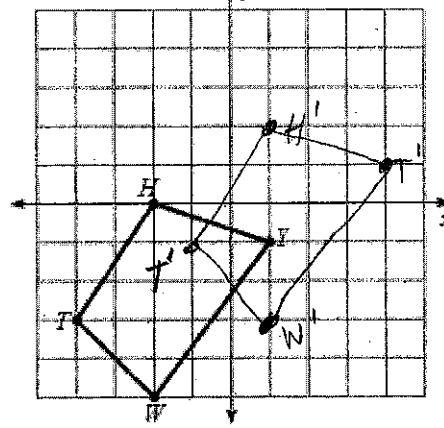
1.  $(x, y) \rightarrow (x - 4, y - 2)$  *left 4 down 2*



2.  $(x, y) \rightarrow (x, y + 5)$  *up 5*

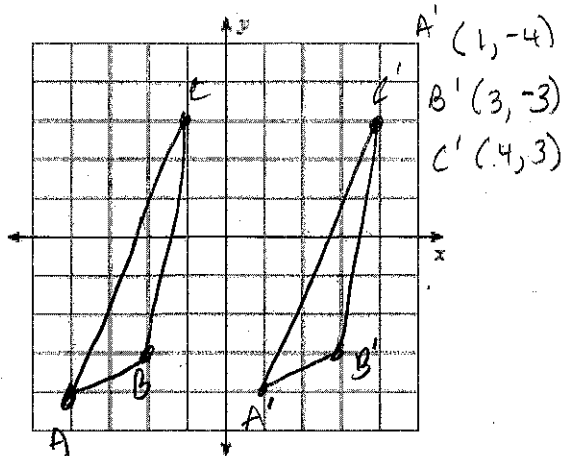


3.  $(x, y) \rightarrow (x + 3, y + 2)$  *right 3 up 2*



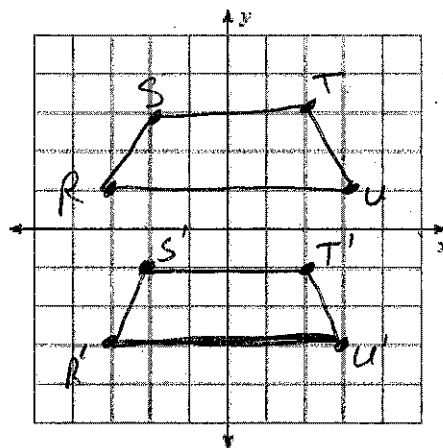
4.  $A(-4, -4), B(-2, -3), C(-1, 3);$

$(x, y) \rightarrow (x + 5, y) \quad \angle S, 0^\circ$



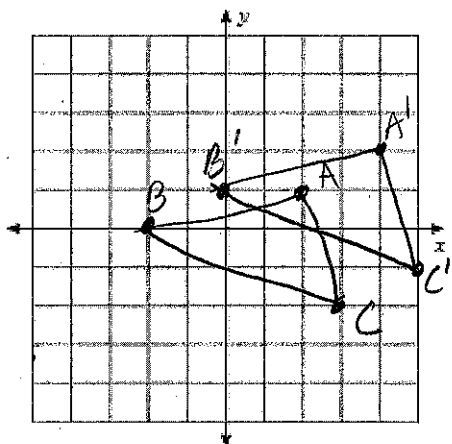
5.  $R(-3, 1), S(-2, 3), T(2, 3), U(3, 1);$

$(x, y) \rightarrow (x, y - 4)$



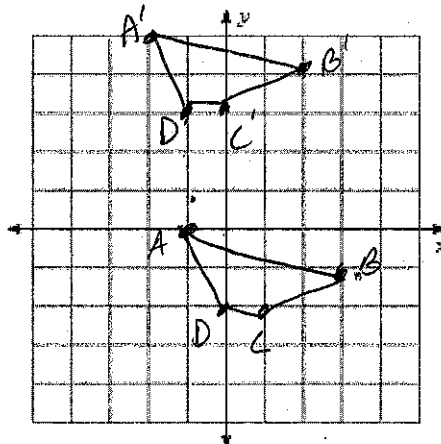
6.  $A(2, 1), B(-2, 0), C(3, -2);$

$(x, y) \rightarrow (x + 2, y + 1)$



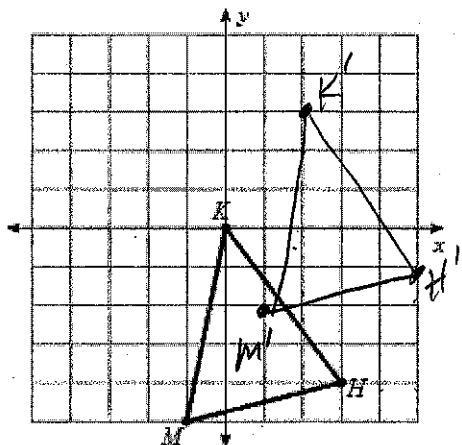
7.  $A(-1, 0), B(3, -1), C(1, -2), D(0, -2);$

$(x, y) \rightarrow (x - 1, y + 5)$

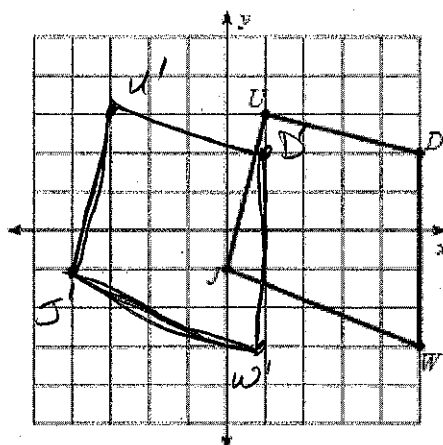


What about this notation? These are called vectors!

8.  $\langle 2, 3 \rangle \quad (x, y) \rightarrow (x + 2, y + 3)$



9.  $\langle -4, 0 \rangle \quad (x, y) \rightarrow (x - 4, y)$



Now write the rules for both of the translations above (numbers 8 & 9).

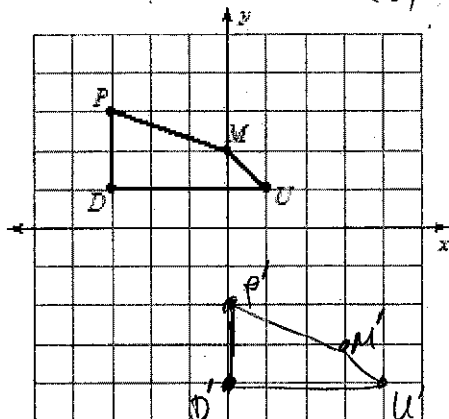
10. Which is the image and which is the pre-image (1 or 2)?

Pre-image  $\triangle 2$       Image  $\triangle 1$

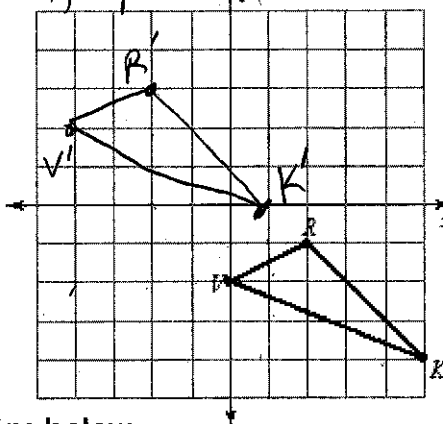
How do you know? Image is labeled with "prime" notation

(Classwork/Homework) Let's practice what we've learned ...

1.  $(x, y) \rightarrow (x+3, y-5)$    
*right 3 down 5*   
 $\langle 3, -5 \rangle$



2.  $(-4, 4) \rightarrow (x, y) \rightarrow (x-4, y+4)$    
*left 4, up 4*



3. Use the translation  $(x, y) \rightarrow (x+5, y-9)$  for the questions below.

What is the translation vector?  $\langle 5, -9 \rangle$

What is the image of A (-6, 3)?  $A'(-1, -6)$       What is the image of B (4, 8)?  $B'(9, -1)$

What is the image of A' from above, which would be called A''?  $(4, -15)$

What is the pre-image of K'(12, 7)?  $(7, 16)$  (\*Think about this - you want to find K)

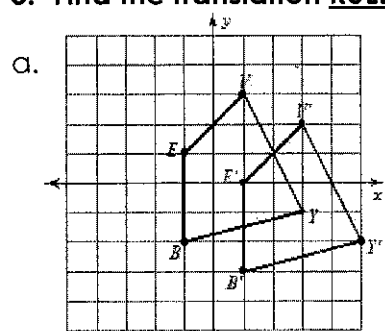
4. If the vertices of  $\triangle ABC$  are A(-6, -7), B(-3, -1), and C(5, 2), find the vertices of  $\triangle A'B'C'$  after each of the translations below.

a.  $(x, y) \rightarrow (x-2, y-7)$        $A' = (-8, -14)$ ,       $B' = (-5, -8)$ ,       $C' = (3, -5)$

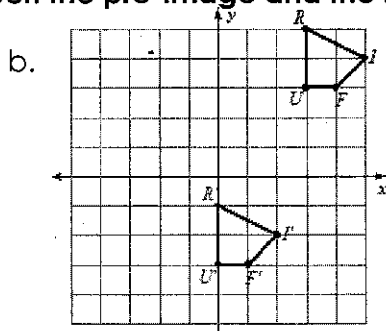
b.  $(x, y) \rightarrow (x, y-3)$        $A' = (-6, -10)$ ,       $B' = (-3, -4)$ ,       $C' = (5, -1)$

c.  $(x, y) \rightarrow (x+5, y+8)$        $A' = (-1, 1)$ ,       $B' = (2, 7)$ ,       $C' = (10, 10)$

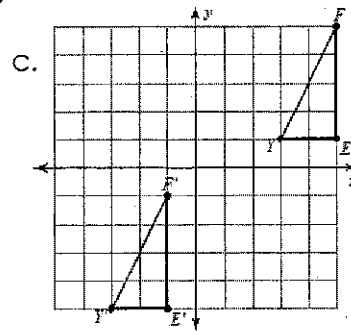
5. Find the translation RULE between the pre-image and the image.



$(x, y) \rightarrow (x+2, y-1)$



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



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