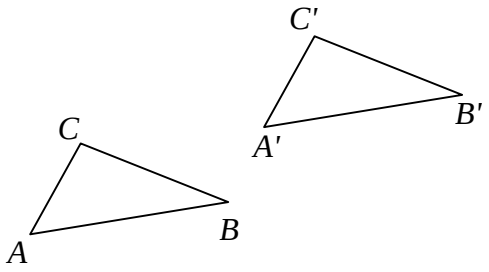
**Geometry Notes TG - 3: Translations**

## Translations

A *translation* is a

In a *translation*, all points in the plane move




**Properties of Translations:**

1. For any two points $P$ and $Q$ and their images $P'$ and $Q'$,

2. Distances are preserved.

3. Angle measures are preserved.

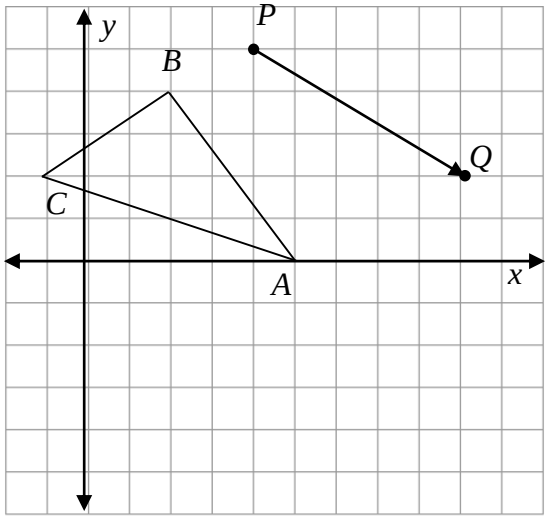
## Translations with Coordinates

Ex: $\Delta ABC$ has vertices at $A(5, 0)$, $B(2, 4)$ and $C(-1, 2)$. Draw $\Delta A'B'C'$, the image of $\Delta ABC$ under the transformation $T_{\overrightarrow{PQ}}$ translation.

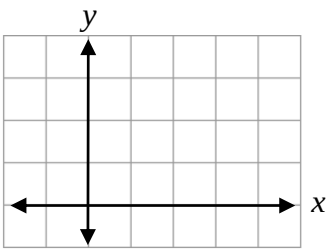
$A(5, 0) \rightarrow A'$

$B(2, 4) \rightarrow B'$

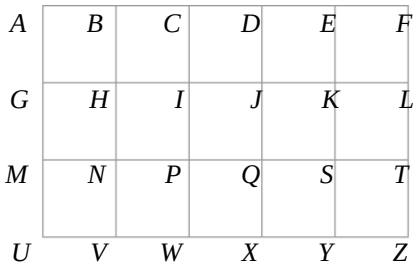
$C(-1, 2) \rightarrow C'$



Ex: $T_{-5,2}(4,1)$




Ex: Consider the transformation $T_{\overline{TJ}}$ .




a. What does $T_{\overline{TJ}}$ mean?

b. Find the image of *W*.

c. Find the image of $\overline{KS}$ .

d. Find the *preimage* of $\overline{HI}$ .

e. What is an alternate symbolic notation for this translation?

Ex: On the same chart above, find

a. $R_J(C)$ =

b. $r_{\overline{CW}}(M)$ =

c. $R_{Q,90°}(D)$ =

**Geometry HW: Transformations – 3 Translations**

1. Find the image of the point (3, 5) under the translation $(x, y) \rightarrow (x + 2, y - 4)$.

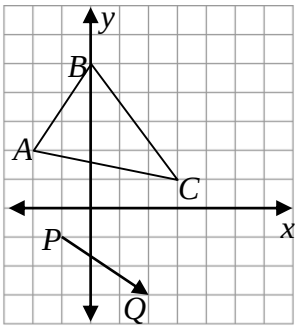
2. Find the image of (1, –3) under the translation $T_{2, -1}$.

3. Find the rule for the translation under which the image of $A(3, 8)$ is $A'(5, 5)$.

4. Under a given translation, the image of (4, 2) is (6, –1).
   a. Find the image of (–2, 5) under the same translation.

   b. Find the *preimage* of (3, –4) under the same translation.

5. In the diagram at right, $\Delta ABC$ has vertices $A(-2, 2)$, $B(0, 5)$ and $C(3, 1)$. Vector $\overrightarrow{PQ}$ has initial point $P(-1, -1)$ and terminal point $Q(2, -3)$. State the coordinates of the vertices of $\Delta A'B'C'$, the image of $\Delta ABC$ after the transformation $T_{\overrightarrow{PQ}}$.



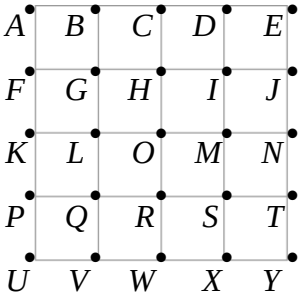

6. Under the translation $P(x, y) \rightarrow P'(x + 4, y + 3)$,
   a. What is the distance between any point $P$ and its image $P'$?

   b. What is the slope of the line $PP'$?

7. In the diagram at right, the image of $A$ under a certain translation is $L$. Under the same translation,

   a. what is the image of $H$?  b. what is the image of $\overline{LO}$?

   c. what is the *preimage* of $M$?



8. a. **On graph paper,** graph $\Delta ICE$ having vertices $I(-3, 1)$, $C(-1, 0)$, and $E(-1, 4)$

   b. Graph $\Delta I'C'E'$, the image of $\Delta ICE$ under a line reflection in the $y$-axis.

   c. Graph $\Delta I''C''E''$, the image of $\Delta I'C'E'$ after a line reflection in the line $x = 3$.

   d. Name the single transformation that is equivalent to $r_{y\text{-axis}}$ followed by $r_{x=3}$.

9. a. Find the coordinates of $P'$, the image of $P(x, y)$ after a translation $T_{a,b}$.

   b. Find the slope of $\overline{PP'}$.

   c. Find the length of $\overline{PP'}$.