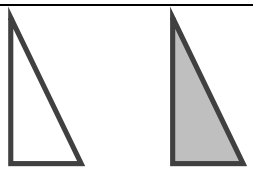
TRANSLATIONS

Ready (Summary)	Set (Goals)
We will experiment with translations, and learn some properties of this isometry. We will use translations to create 3-dimensional figures.	• Visualize, and then perform translations using patty paper and coordinates. • Explore properties of translations. • Apply translations to draw figures.

Go (Warmup)

Under a translation transformation, the original figure (shaded) is mapped to its image (unshaded). Shade the original figure blue and its image red.

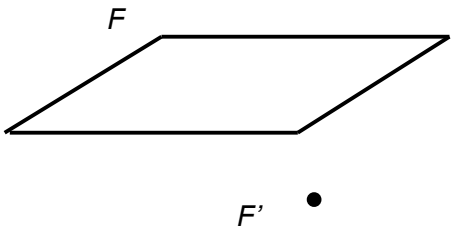
		Transformation S
1.	Label the vertices of the original figure SAW and its image S'A'W'	
2.	Describe steps that map the figure to its image.	
3.	Do these figures appear congruent?	
4.	Are the letters of the triangle and its image in the same order, when read clockwise?	
5.	Identify the transformation.	

VISUALIZING TRANSLATIONS

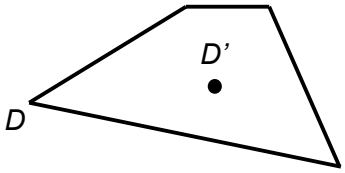
A translation of the plane shifts all points on the plane in the same direction and in the same distance. That is, given a vector (directed segment) $\vec{v}$, the image P' of a point P is the point for which $\overline{PP'}$ is is parallel to to $\vec{v}$ and $PP' = |\vec{v}|$.

- Draw each figure on patty paper with pencil markings on both sides of the paper.
- Shade the figure blue.
- Given the figure and one point on the image, imagine a translation of the figure.
- Perform the translation using patty paper, and record. Shade the image red.
- Label the vertices. Draw arrows to show the translation for all vertices of the shape.

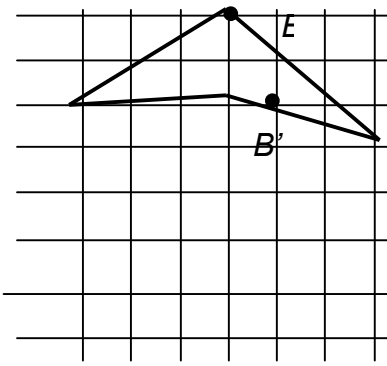
1. Slide FROG → F'R'O'G'



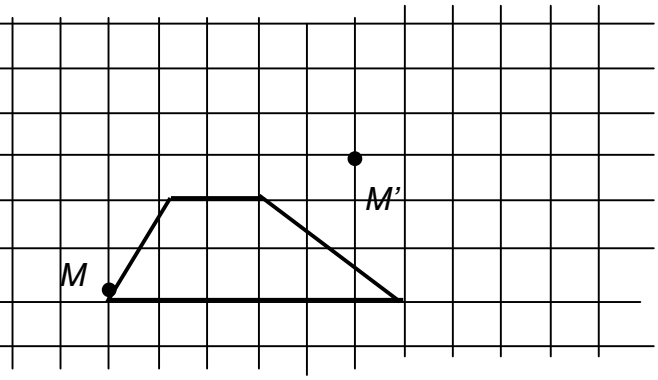
2. Slide *DUCK* → *D'U'C'K'*



3. BIRD → B'I'R'D'



4. Slide *MOTH → M'O'T'H'*

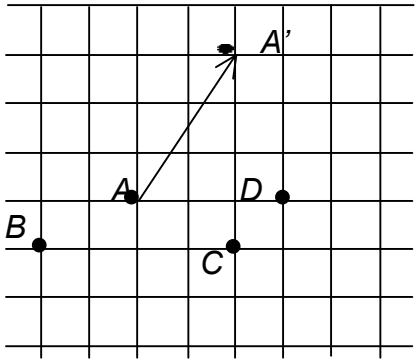


3. Was your thinking about the translation in problems 1 and 2 (no grid) different from your thinking about translations in problems 3 and 4 (grid)? Explain.

TRANSLATIONS IN THE COORDINATE PLANE

We can use arrows (called vectors) to show a translation.

Vector *AA'* translates point *A* to its image *A'*, which is two units to the right and three units up.



We can write $\overrightarrow{AA'} = \langle 2,\ 3 \rangle$.

1. Find the image of *B* under the translation described by $\langle 2,\ 3 \rangle$. Label it *B'*

2. Find the image of *C* under the translation described by $\langle 2,\ 3 \rangle$. Label it *C'*

3. Find the image of *D* under the translation described by $\langle 2,\ 3 \rangle$. Label it *D'*

4. Connect points *A, B, C,* and *D* to form quadrilateral *ABCD*. Shade this figure blue. Connect points A', B', C', D' to form a quadrilateral *A'B'C'D'*. Shade this figure red. How are the quadrilaterals related?

5. Put point *M* on your grid so that *M* is the midpoint of segment $\overline{BC}$. Find its image *M'*.

6. A <u>translation</u> is an isometry. Use the translation above to give examples of each property of isometries.

   a. Distance is preserved.

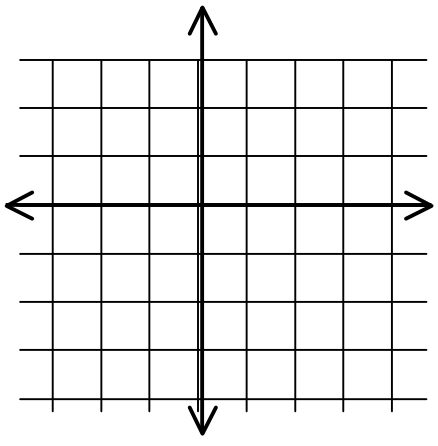
   b. Parallelism is preserved

   c. Angle measure is preserved.

   d. Collinearity is preserved.

   e. Betweenness is preserved

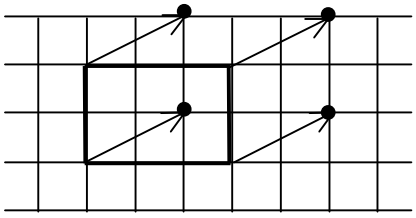
7. Locate points *Q*(-1, 1), *R*(0,0) and *S*(4, -1) on the graph at the right. Connect them to form triangle *QRS*. Shade it blue. Then find the image of triangle *QRS* under the translation $\langle -1,\ -3 \rangle$. Shade it red.

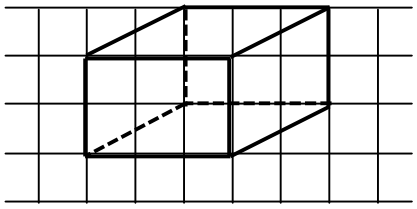


DRAWING FIGURES IN THREE DIMENSIONS

Translation vectors make it easy to draw three-dimensional figures.

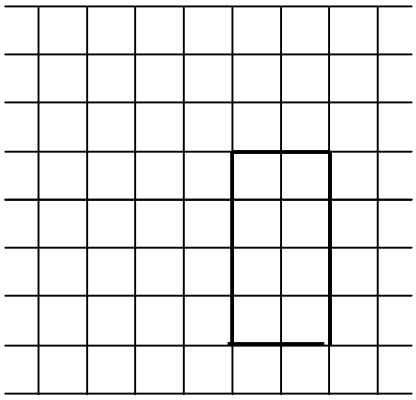
Example: Use a rectangle and the translation vector $\langle 2, 1 \rangle$ to draw a box.



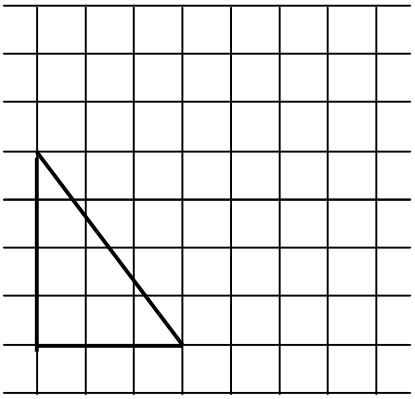


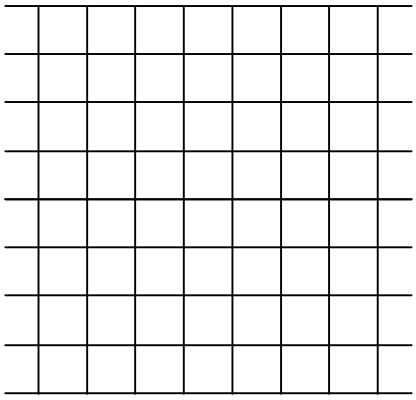
Draw three-dimensional looking figures. Begin with the given shape. Use the given translation vector.

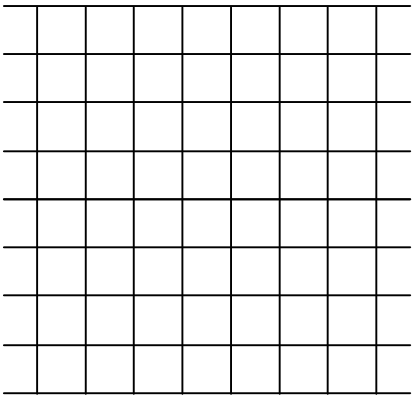
1. Use $\langle -1, 3 \rangle$.

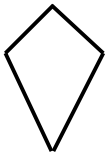


2. Use $\langle 5, 2 \rangle$.







3. Use $\langle 2, -3 \rangle$. 	4. Draw any polygon. Use $\langle 2, 2 \rangle$.