Module 10a: Translations

Math Practice(s):

    -Model with mathematics.

    -Use appropriate tools strategically.

Learning Target(s):

    - Develop a definition of a translation through investigation.

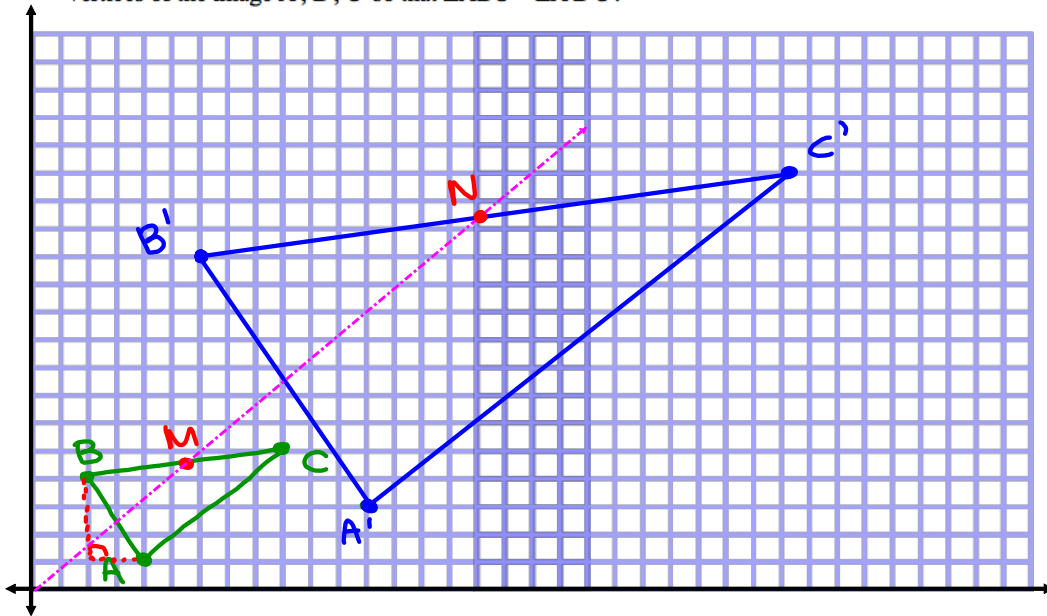   - Perform a translation using various tools; given a pre-image, draw an image.

Homework:

    HW#4: 10a #1-2

Nov 20-12:32 PM

Warm-up

1. △ABC has the following vertices: A (4, 1), B (2, 4), C (9, 5).

   A. Draw △ABC in the coordinate plane below, then dilate △ABC about the origin with a scale factor of 3 (Note: this dilation can be defined symbolically as D(a, b) = (3a, 3b)). Label the vertices of the image A', B', C' so that △ABC ~ △A'B'C'.

B. Use the Pythagorean Theorem to verify that A'B' = 3AB.

$$2^2 + 3^2 = AB^2 \qquad 6^2 + 9^2 = A'B'^2 \qquad A'B' = 3AB$$

$$AB = \sqrt{13} \qquad\qquad A'B' = \sqrt{117} \qquad\quad 3\sqrt{13} = 3 \cdot \sqrt{13}$$

$$\sqrt{9 \cdot 13}$$

$$\sqrt{9} \cdot \sqrt{13}$$

$$A'B' = 3\sqrt{13}$$

C. Use the Midpoint Formula to determine the coordinates of the midpoint of $\overline{BC}$ and label it M in your diagram above.

$$B(\underset{a}{2}, \underset{b}{4}) \quad C(\underset{c}{9}, \underset{d}{5})$$

$$M = \left(\frac{a+c}{2}, \frac{b+d}{2}\right) \rightarrow \left(\frac{2+9}{2}, \frac{4+5}{2}\right) \rightarrow (5.5, 4.5)$$

D. Draw the ray from the origin passing through M and label its intersection with B'C' as N. Use the Midpoint Formula to confirm that N is the midpoint of $\overline{B'C'}$.

$$B'(\underset{a}{6}, \underset{b}{12}) \quad C'(\underset{c}{27}, \underset{d}{15})$$

$$M = \left(\frac{a+c}{2}, \frac{b+d}{2}\right) \rightarrow \left(\frac{6+27}{2}, \frac{12+15}{2}\right) \rightarrow (16.5, 8.5)$$

Example 1:
To the right is ΔPRS and the dashed line is the graph of the equation $y = 2x$. Make a copy of ΔPRS on patty paper, and physically "slide" it along the line until vertex P reaches the point where its x-coordinate equals 3.

- Be careful not to tilt your triangle as you move it, so that the base of the resulting image is still parallel to the x-axis.

- Draw your image triangle and label its vertices P, R, and S in such a way that ΔPRS ≅ ΔP'R'S'.
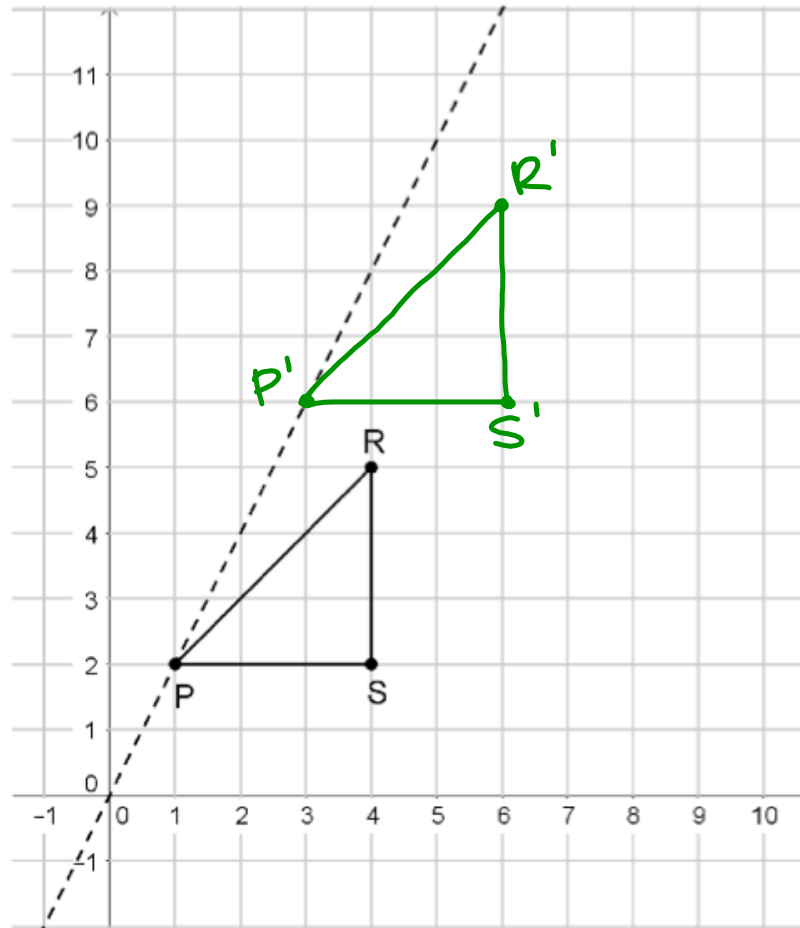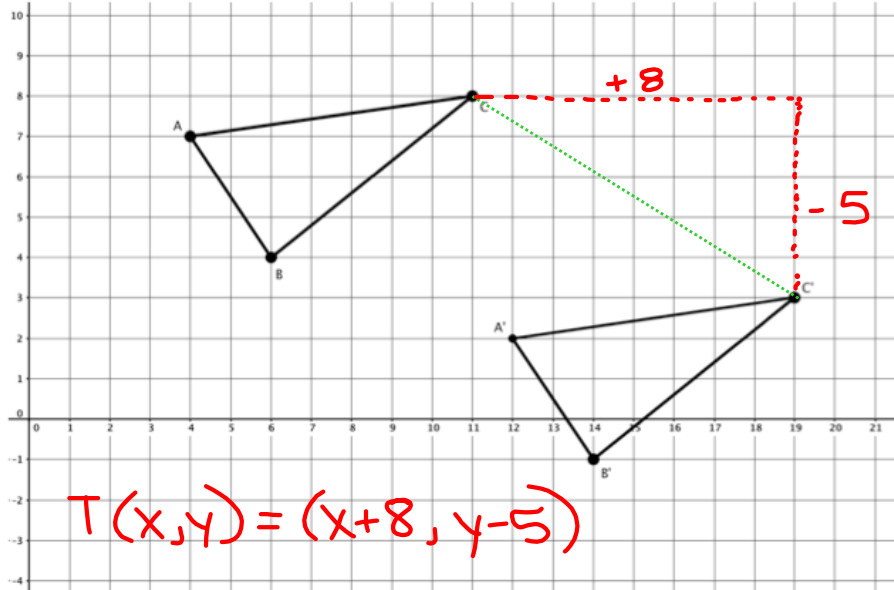
Translation

A **translation** is a function that moves each point of a geometric figure a fixed distance, a units in the x-direction and b units in the y-direction (in the Cartesian Plane).

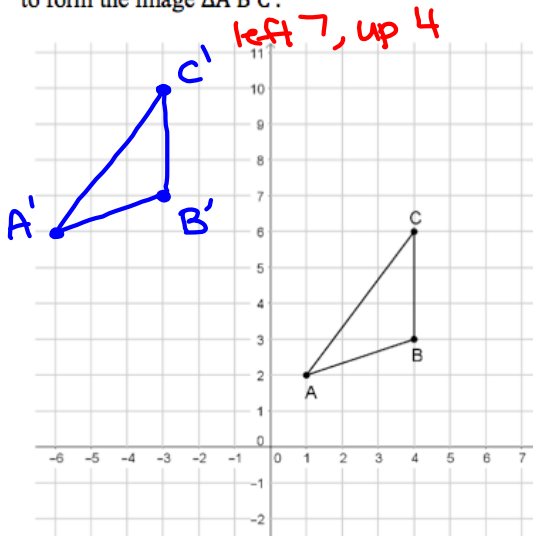This can be represented symbolically as

$$T(x, y) = (x + a, \; y + b)$$

Example 2:
How was ΔABC translated to form ΔA'B'C'? Express the translation in symbolic form.

$+8$

-5

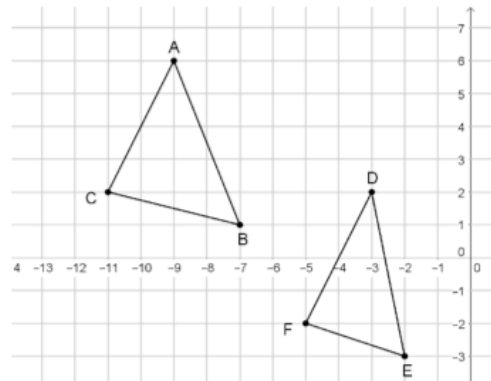$$T(x,y) = (x+8, y-5)$$

Example 3:
Translate ΔABC such that $T(x, y) = (x - 7, y + 4)$
to form the image ΔA'B'C'.

left 7, up 4

Example 4:
Is ΔDEF a translation of ΔABC? If it is not,
explain why.

ΔDEF is not a translation
of ΔABC, because:
• The slope of $\overline{AB}$ is diff.
then the slope of $\overline{DE}$,
showing the Δs are not
≅.
• The translation from
corresponding points
are not the same, i.e.

$$T_{AD}(x,y) = (x+6, y-4)$$
$$T_{BE}(x,y) = (x+5, y-4)$$