**Activity 1.7.2b Understanding Isometries**

For this version of the activity, use this geogebra file:

<http://tube.geogebra.org/material/show/id/755053>

In this investigation, you will be studying six transformations and making observations on the angle measures, side lengths, and areas of the preimages and images of figures. The six transformations are

* Translation
* Rotation
* Reflection
* Dilation
* Stretch
* Shear

1. Make sure the slider to the right on “Translate/rotate/reflect”. You can move the points to create any shape.  
  
2. Click the box to show the *translated object* (in quadrant 2)

3. Use the check boxes in quadrant 1 to show the angle measures. What do you notice about the angle measures in original and translated shapes?

Use the check boxes in quadrant 1 to show the distance. What do you notice about the lengths of the sides in original and translated shapes?

Use the check boxes in quadrant 1 to show the area. What do you notice about the areas in the original and translated shapes?

4. Click the box to show the *rotated object* (in quadrant 3)  
  
5. What do you notice about the angle measures in original and rotated shapes?

What do you notice about the lengths of the sides in original and rotated shapes?

What do you notice about the areas in the original and rotated shapes?

6. Click the box to show the *reflected object* (in quadrant 4)

7. What do you notice about the angle measures in original and reflected shapes?

What do you notice about the lengths of the sides in original and reflected shapes?

What do you notice about the areas in the original and reflected shapes?

8. Move the slider on the right to “Dilate (shrink/enlarge)”  
  
9. Drag the slider (in quadrant 3) to show the dilated shape  
  
10. What do you notice about the angle measures in original and dilated shapes?

What do you notice about the lengths of the sides in original and dilated shapes?

What do you notice about the areas in the original and dilated shapes?

11. Move the slider on the right to “Stretch”. *(Imagine you take a piece of modeling clay and stretch it between your hands. The shape resembles the previous shape, but is now stretched out).*  
12. Drag the slider (in quadrant 3) to show the stretched shape.  
  
13. What do you notice about the angle measures in original and stretched shapes?

What do you notice about the lengths of the sides in original and stretched shapes?

What do you notice about the areas in the original and stretched shapes?

14. Move the slider on the right to “Shear”. *(Imaging taking a shape and putting it in italics. The base is the same, but the top is shifted.* R vs. *R.*  
15. Drag the sliders to show the sheared shapes.  
  
16. What do you notice about the angle measures in original and sheared shapes?

What do you notice about the lengths of the sides in original and sheared shapes?

What do you notice about the areas in the original and sheared shapes?

17. Congruent figures are the same size and shape. Do all transformations lead to congruent figures? If not, clarify which transformations do result in congruent figures and which do not.

18. Reflections, rotations, and translations belong to a category of transformation called an **isometry**. Dilations, stretches, and shears are not isometries. Based on your observations, how would you define an isometry?

19. Summarize what you have learned

* Isometries are transformations that preserve \_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_ are isometries.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_ are not isometries.
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** figuresare figures for which one can be mapped onto the other through a sequence of isometries.