Mathematics

Worksheet

Grade: 10

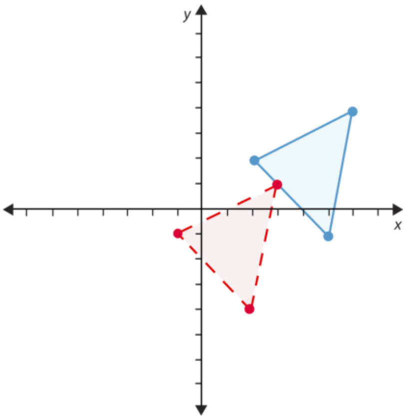
Topic: Transformation

Subtopic: Translation and Reflection

Translation

When you perform translations, you slide a figure left or right, up or down. This means that on the coordinate plane, the coordinates for the vertices of the figure will change.

To graph a translation, perform the same change for each point.



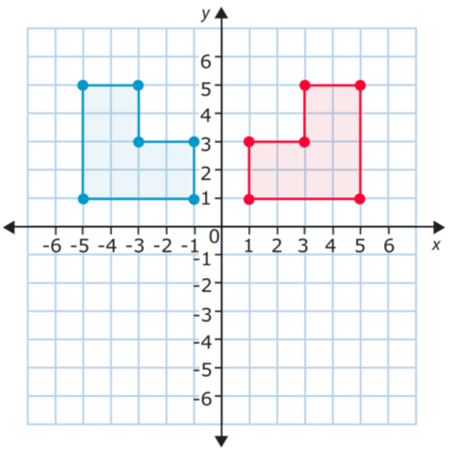
TRANSLATIONS: Note the following:

a. Translations are a slide or shift.

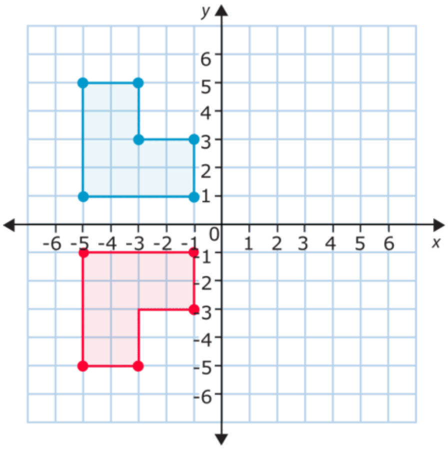
b. Translations can be achieved by performing two composite reflections over parallel lines.
c. Translations are isometric, and preserve orientation.
d. Coordinate plane rules: (x, y) ◊ (x ± h, y ± k) where h and k are the horizontal and vertical shifts. Note: If movement is left, then h is negative. If movement is down, then k is negative.

Reflection

You can identify a reflection by the changes in its coordinates. In a reflection, the figure flips across a line to make a mirror image of itself. Take a look at the reflection below.

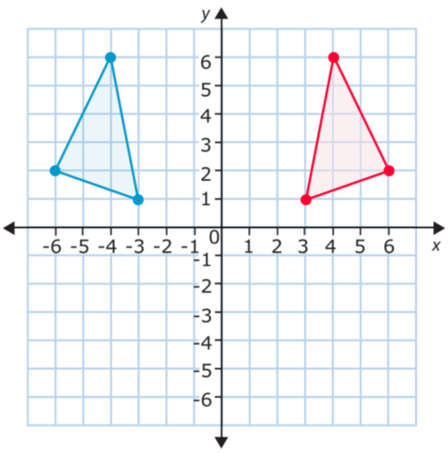


Figures are usually reflected across either the x− or the y−axis. In this case, the figure is reflected across the y−axis**.** If you compare the figures in the first example vertex by vertex, you see that the x−coordinates change but the y−coordinates stay the same. This is because the reflection happens from left to right across the y−axis. When you reflect across the x−axis, the y−coordinates change and the x−coordinates stay the same. Take a look at this example.



In the figure above the coordinates for the upper-left vertex of the original figure are (-5, 5). After you reflect it across the x–axis, the coordinates for the corresponding vertex are (-5, -5). How about the lower-right vertex? It starts out at (-1, 1), and after the flip it is at (-1, -1). As you can see, the x–coordinates stay the same while the y–coordinates change. In fact, the y–coordinates all become the opposite integers of the original y–coordinates. This indicates that this is a vertical (up/down) reflection or a reflection over the x–axis.

In a horizontal (left/right) reflection or a reflection over the y–axis, the x–coordinates would become integer opposites. Let's look at an example.



This is a reflection across the y−axis. Compare the points. Notice that the y−coordinates stay the same. The x−coordinates become the integer opposites of the original x−coordinates. Look at the top point of the triangle, for example. The coordinates of the original point are (-4, 6), and the coordinates of the new point are (4, 6). The x−coordinate has switched from -4 to 4.

You can recognize reflections by these changes to the x− and y−coordinates. If you reflect across the x−axis, the y−coordinates will become opposite. If you reflect across the y−axis, the x−coordinates will become opposite.

You can also use this information to graph reflections. To graph a reflection, you need to decide whether the reflection will be across the x−axis or the y−axis, and then change either the x− or y−coordinates.

REFLECTIONS: Note the following:

a. Reflections are a flip.
b. The flip is performed over the “line of reflection.” Lines of symmetry are examples of lines of reflection.
c. Reflections are isometric, but do not preserve orientation.
d. Coordinate plane rules: Over the x-axis: (x, y) ◊ (x, –y) Over the y-axis: (x, y) ◊ (–x, y) Over the line y = x: (x, y) ◊ (y, x) Through the origin: (x, y) ◊ (–x, –y)