Activity 3 – Transformation Matrices

1. Open the Geometer’s Sketchpad file labeled Rotations.

Type in different angle values to rotate the figure about the origin. Observe the values in the transformation matrix and note how they change as you change the angle of rotation. Now check some special angles. Can you write a generic matrix for rotation using trigonometric functions?

|  |  |
| --- | --- |
| cos(θ) | -sin(θ) |
| sin(θ) | cos(θ) |

What operation did we use to rotate using this matrix?

Multiplication.

1. Open the Geometer’s Sketchpad file labeled Translation.

Drag the point E around to translate the figure in that direction. Do a horizontal translation. Now do a vertical translation. What do you notice about the values in the translation matrix T? Why does this happen?

For horizontal translation, bottom row is all 0s. For vertical translation, top row is all 0s. This happens because the points have their x-coordinates in the first row and y-coordinates in the second row.

This time we were using addition. Briefly justify why.

In a translation, every point of the shape is shifted the same amount. So we should add the same amount to each x and y value of each point.

1. Open the Geometer’s Sketchpad file labeled Reflections

Follow the directions in the applet, inputting the four matrices on the left for T and observing the reflection. Note that this is again multiplication

Now input your own numbers into the top left entry of the translation matrix. What’s happening? What if you enter your own numbers for a2,2?

The first stretches horizontally (with a reflection if negative) while the second stretches vertically (again with a reflection if negative).

Do the same for a1,2 and a2,1. What affect do these entries seem to have?

Stretching and reflecting.