Name: Date:

In this activity, we will explore transformations of figures using matrices.

Open the applet: click here.

Take a few moments and explore the applet. Use the questions below to help guide your exploration.

1. What does matrix *M* represent?

_____

_____

2. What does matrix *M'* represent?

_____

_____

3. What does matrix *T* represent?

_____

_____

Move slider *a* in the positive direction to different values. Each time look at how the three matrices *M*, *M'* and *T* change.

4. Move slider *a* such that *a*=5. Record each matrix *M, M'* and *T* below.

a= , $M = \begin{bmatrix} & \\ & \end{bmatrix}$ $T = \begin{bmatrix} & \\ & \end{bmatrix}$ and $M' = \begin{bmatrix} & \\ & \end{bmatrix}$

5. What do you notice about the value of slider *a* and its relationship to the translation matrix T?

_____

_____

Name: Date:

Move the slider from *a*=5 to *a*=4.

6. Write the matrices *M*, *M′* and *T* when *a* = 4 below. What values in *M′* changed from those in problem 5? By how many units?

a= , $M=\begin{bmatrix} & \\ & \end{bmatrix}$ $T=\begin{bmatrix} & \\ & \end{bmatrix}$ and $M'=\begin{bmatrix} & \\ & \end{bmatrix}$

_____

_____

7. Write a matrix equation that shows how *M*, *T* and *M′* are related when *a*=4.

$\begin{bmatrix} & \\ & \end{bmatrix}+\begin{bmatrix} & \\ & \end{bmatrix}=\begin{bmatrix} & \\ & \end{bmatrix}$

8. What if *a* were negative? Which direction does the pre-image translate?

_____

9. Write a matrix equation showing the relationship between *M′* and *T* that represents the translation when *a* = -3.

$\begin{bmatrix} & \\ & \end{bmatrix}+\begin{bmatrix} & \\ & \end{bmatrix}=\begin{bmatrix} & \\ & \end{bmatrix}$

10. Which coordinate does *a* seem to affect? Make a conjecture on what coordinate *b* will affect.

_____

Conjecture: _____

Set *a* = 0 and *b* = 5.

11. Write the matrix equation that shows the relationship between *M*, *M′* and *T* below.

$\begin{bmatrix} & \\ & \end{bmatrix}+\begin{bmatrix} & \\ & \end{bmatrix}=\begin{bmatrix} & \\ & \end{bmatrix}$

Name: Date:

12. Write 3 general translation matrices *T* so that the first produces only a *horizontal shift to the right*, the second a *vertical shift down*, and the third *a shift to the left and up*. For each T, determine *a* and b.

Horizontal shift right: $T = \begin{bmatrix} & \\ & \end{bmatrix}$, $a=$ and $b=$.

Vertical shift down : $T = \begin{bmatrix} & \\ & \end{bmatrix}$, $a=$ and $b=$.

Shift left and up: $T = \begin{bmatrix} & \\ & \end{bmatrix}$, $a=$ and $b=$.

13. Write a general equation that we could use to find *M'* when given *M* and *T*.

14. Set $a = -2$ and $b = -3$ and write an equation that shows this translation below. State the direction of the shift.

$$\begin{bmatrix} & \\ & \end{bmatrix} + \begin{bmatrix} & \\ & \end{bmatrix} = \begin{bmatrix} & \\ & \end{bmatrix}$$