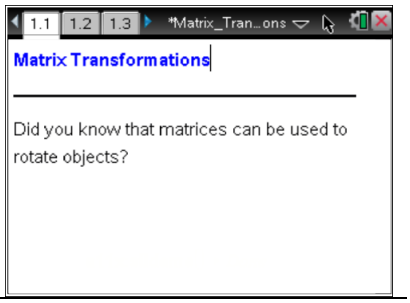
Matrix Transformations
Student Activity

Name _____

Class _____

Open the TI-Nspire document *Matrix_Transformations.tns.*

Matrices are the most amazing objects. They organize information in a concise manner. While matrices are mainly used to solve equations, did you know that they can be used to rotate objects? Read on and discover how.



Move to page 1.2.

Press ctrl ▶ and ctrl ◀ to navigate through the lesson.

1. Grab and move a vertex of the polygon in Quadrant I.
   a. How are the polygons in Quadrants I and IV related?

   b. If the coordinates of a vertex in Quadrant I are (3, 9), what are the coordinates of the corresponding vertex in Quadrant IV? What would it be for any point labeled (x, y)?

   c. If the coordinates of a vertex in Quadrant I are (x, y), what are the coordinates of the corresponding vertex in Quadrant IV?

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2. Every polygon has a matrix representation of $\begin{bmatrix} x_1 & x_2 & x_3 & \dots \\ y_1 & y_2 & y_3 & \dots \end{bmatrix}$. Write the matrix representation of the polygon in Quadrant I.

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3. The polygon in Quadrant I has its matrix notation displayed at the bottom of the screen and is being multiplied by the displayed matrix. The product of the matrices is also displayed.
   a. Why does multiplying by $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ result in an identity?

b. Grab and move the sliders for each element of the 2×2 matrix until the polygon in Quadrant I is a reflection of the polygon in Quadrant IV. What 2×2 matrix results in a reflection over the *x*-axis?

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4. Grab and move a vertex of the polygon in Quadrant I.
   a. How are the polygons in Quadrants I and II related?

   b. If the coordinates of a vertex in Quadrant I are (12, 1), what are the coordinates of the corresponding vertex in Quadrant II?

   c. If the coordinates of a vertex in Quadrant I are (*x*, *y*), what are the coordinates of the corresponding vertex in Quadrant II?

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5. Grab and move the sliders for each element of the multiplication matrix until the polygon in Quadrant I is a reflection of the polygon in Quadrant II.
   a. What 2×2 matrix results in a reflection over the *y*-axis?

   b. Why does this matrix multiplication result in a reflection over the *y*-axis?

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6. Grab and move a vertex of the polygon in Quadrant I.
   a. How are the polygons in Quadrants I and II related?

   b. If the coordinates of a vertex in Quadrant I are (3, 9), what are the coordinates of the corresponding vertex in Quadrant II?

c. If the coordinates of a vertex in Quadrant I are (x, y), what are the coordinates of the corresponding vertex in Quadrant II?

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7. Grab and move the sliders for each element of the multiplication matrix until the polygon in Quadrant I is a rotation of the polygon in Quadrant II.

   a. What 2×2 matrix results in a 90° rotation about the origin?

   b. Why does this matrix multiplication result in a 90° rotation about the origin?

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8. Grab and move a vertex of the polygon in Quadrant I.
   a. How are the polygons in Quadrants I and III related?

   b. If the coordinates of a vertex in Quadrant I are (3, 9), what are the coordinates of the corresponding vertex in Quadrant III?

   c. If the coordinates of a vertex in Quadrant I are (x, y), what are the coordinates of the corresponding vertex in Quadrant III?

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9. Grab and move the sliders for each element of the multiplication matrix until the polygon in Quadrant I is a rotation of the polygon in Quadrant III.

   a. What 2×2 matrix results in a 180° rotation about the origin?

   b. Why does this matrix multiplication result in a 180° rotation about the origin?