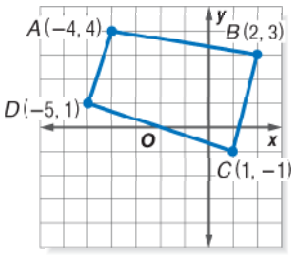
Lesson 8-7

Example 1

First, represent each vertex of quadrilateral *ABCD* with a 2 × 1 matrix. Then combine these matrices into a single 2 × 4 matrix.



Solution

The vertices can be represented as follows:

$$\begin{bmatrix} -4 \\ 4 \end{bmatrix}, \begin{bmatrix} 2 \\ 3 \end{bmatrix}, \begin{bmatrix} 1 \\ -1 \end{bmatrix}, \begin{bmatrix} -5 \\ 1 \end{bmatrix}$$

Putting the column matrices into a single 2 × 4 matrix you have the following.

$$\begin{bmatrix} -4 & 2 & 1 & -5 \\ 4 & 3 & -1 & 1 \end{bmatrix}$$

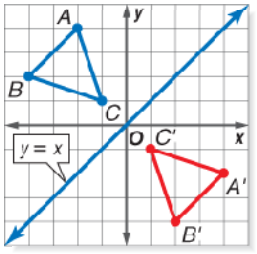
Each column refers to one vertex of the quadrilateral.

Example 2

Find the reflection image of $\triangle ABC$ with vertices at $A(-2, 4)$, $B(-4, 2)$, and $C(-1, 1)$ when the triangle is reflected over the line $y = x$. Use matrices.

Solution

Triangle ABC can be represented by $\begin{bmatrix} -2 & -4 & -1 \\ 4 & 2 & 1 \end{bmatrix}$.



The matrix representing a reflection over the line $y = x$ is $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$.

Multiply the two matrices.

$$\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} -2 & -4 & -1 \\ 4 & 2 & 1 \end{bmatrix}$$

So the image of $\triangle ABC$ is $\begin{bmatrix} 4 & 2 & 1 \\ -2 & -4 & -1 \end{bmatrix}$

Example 3

GRAPHIC ART An artist is creating a border using design software. To create the basic pattern, she enters the coordinates for $\triangle XYZ$ with vertices $X(0, 0)$, $Y(2, 5)$, and $Z(4, 2)$. She wants to draw the triangle reflected over the x-axis. Find the coordinates of the reflection image using matrices.

Solution

Let $\begin{bmatrix} 0 & 2 & 4 \\ 0 & 5 & 2 \end{bmatrix}$ represent the triangle.

Then multiply by $\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$, the matrix for a reflection over the x-axis.

$$\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} 0 & 2 & 4 \\ 0 & 5 & 2 \end{bmatrix} = \begin{bmatrix} 0 & 2 & 4 \\ 0 & -5 & -2 \end{bmatrix}$$