Transformations with Matrices

Points on a coordinate plane can be represented by matrices. The ordered pair (x,y) can be represented by the column matrix .

Likewise, polygons can be represented by palcing all of the column matrices of the coordinates of the vertices into one matrix called a ________ matrix.

Triangle ABC with vertices A(3,2), B(4,-2), and C(2,-1) can be represented by the following vertex matrix.

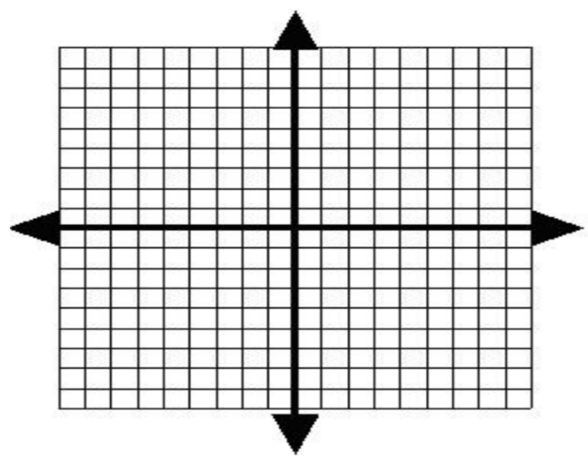
$$\begin{array}{cc} & \begin{matrix} A & B & C \end{matrix} \\ \Delta ABC = & \begin{bmatrix} \quad & \quad & \quad \end{bmatrix} \end{array}$$

Matrices can be used to perform transformations. ______________ are functions tht map points of a _________ onto its _______. If the image and preimage are congruent figures, the transformation is an _____________.

Translations:

A ____________ ocurrs when a figure is moved from one location to another without changing its size, shape, or orientation. You can ued matrix addition and a translation matrix to find the coordinates of a translated figure.

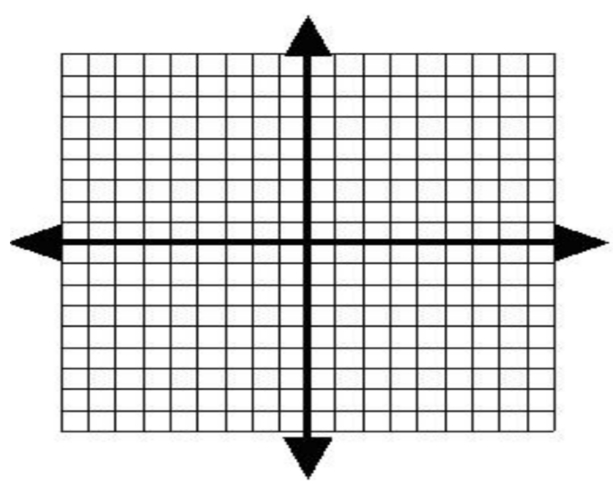
Example: Find the coordinates of the vertices of the image of ΔABC with (3,2), B(4,-2), and C(2,-1), if it is moved 3 units left, and 1 unit down. Be sure to write out the translation matrix. Then graph ΔABC and its image ΔA'B'C'.



Dilations:

When a geometric figure is enlarged or reduced, the transformation is called a __________. You can use scalar multiplication to perform dilations.

Example: Find the coordinates of the vertices of the image of ΔABC with (3,2), B(4,-2), and C(2,-1), if it has be reduced by a factor of ½. Be sure to write out the dilation matrix. Then graph ΔABC and its image ΔA'B'C'



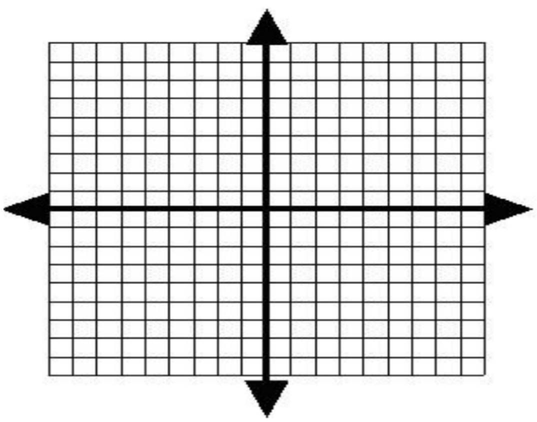
Reflections:

A ___________ occurs when every point of a figure is mapped to a corresponding image across a line of symmetry using a reflection matrix.

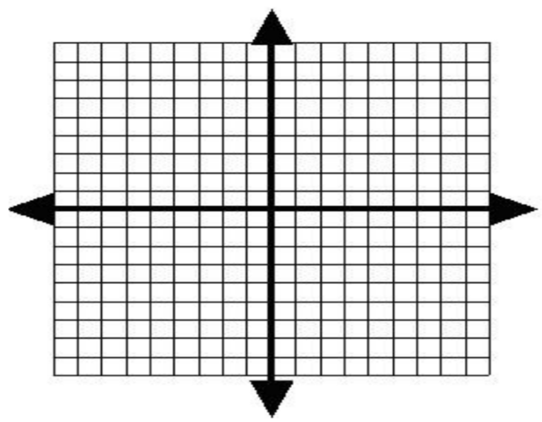
Reflections				
For a reflection line over the	x-axis	y-axis	Line y = x	Line y = -x
Multiply the vertex matrix on the left by:				
Quick way to check	(x,-y)	(-x, y)	(y,x)	(y, -x)

Example: Find the coordinates of the vertices of the image ΔABC with (3,2), B(4,-2), and C(2,-1). Be sure to write out the reflection matrix. Then graph ΔABC and its image ΔA'B'C.

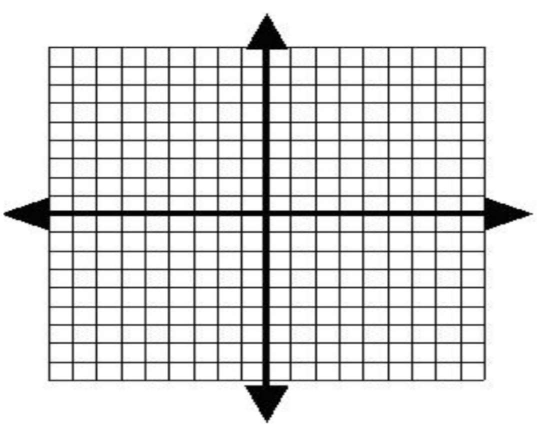
a) x-axis



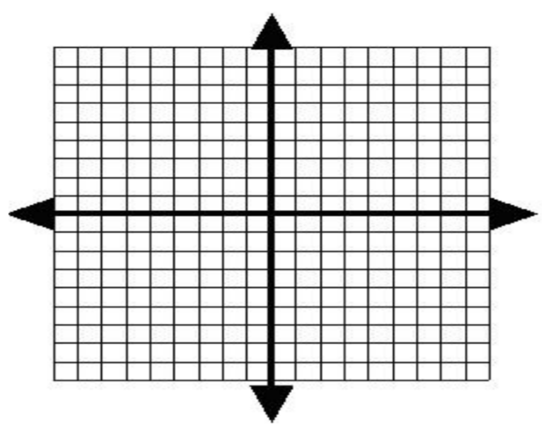
b) y-axis



c) y = x



d) y = -x



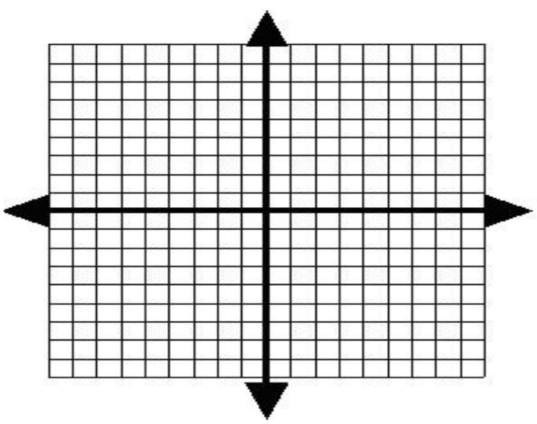
Rotations:

A ____________ occurs when a figure is moved around a center point, usually the origin. To determine the vertices of a figure's image by rotation, multiply its vertex matrix by a rotation matrix.

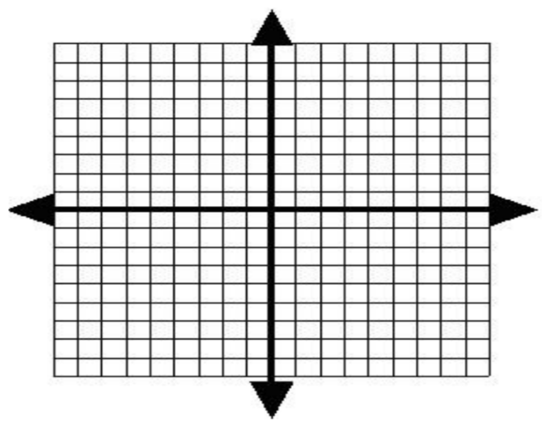
Rotations			
For a counterclockwise (CCW) rotation about the origin of	90°	180°	270°
Multiply the vertex matrix on the left by:			
Quick way to check	(-y, x)	(-x, -y)	(y, -x)
Same as clockwise (CW) rotation about the origin of	270°	Doesn't change	90°

Example: Find the coordinates of the vertices of the image ΔABC with (3,2), B(4,-2), and C(2,-1). Be sure to write out the rotation matrix. Then graph ΔABC and its image ΔA'B'C.

a) **90° CCW**



b) **180° CCW**



c) **270° CCW**