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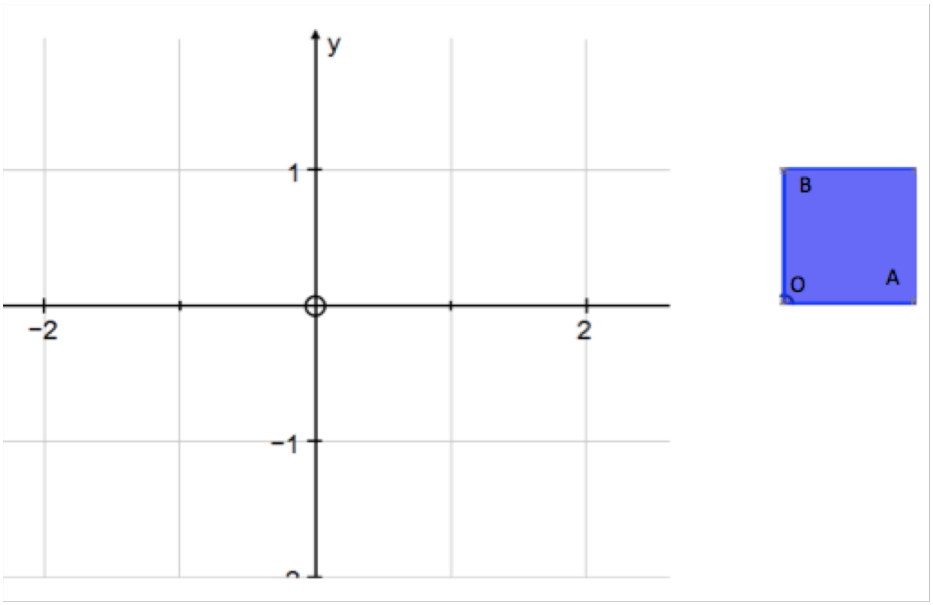
Lesson Plan on Matrix Transformations

Objectives
Students will be able:

- to form transformation matrices for reflection on x-axis, y-axis, $y = x$ and $y = -x$ using unit square
- to form transformation matrices for rotation $90°$, $-90°$ and $180°$ using uniit square
- to find reflectional and rotational image of a figure using matrices



First Part of the lesson plan: Forming transformation matrices

Activity Directions:

- Cut out the unit square and place it with O at the origin.
- Now move the square according to transformations on the table below and write down the new positions for corner A and B.
- Write the coordinates **for A** *down the first column and* **for B** *down the second column.*
- *Fill up the table*

Transformation	**Matrix**
1. Reflect on x-axis	$M_{ref_x} = \begin{bmatrix} \cdots & \cdots \\ \cdots & \cdots \end{bmatrix}$
2.Reflect on y-axis	$M_{ref_y} = \begin{bmatrix} \cdots & \cdots \\ \cdots & \cdots \end{bmatrix}$
3.Reflect in the line $y = x$	$M_{ref_{y=x}} = \begin{bmatrix} \cdots & \cdots \\ \cdots & \cdots \end{bmatrix}$
4.Reflect in the line $y = -x$	$M_{ref_{y=-x}} = \begin{bmatrix} \cdots & \cdots \\ \cdots & \cdots \end{bmatrix}$
5. Rotate 90° counterclockwise	$M_{90^\circ} = \begin{bmatrix} \cdots & \cdots \\ \cdots & \cdots \end{bmatrix}$
6. Rotate 180°	$M_{180^\circ} = \begin{bmatrix} \cdots & \cdots \\ \cdots & \cdots \end{bmatrix}$
7. Rotate 90° clockwise	$M_{-90^\circ} = \begin{bmatrix} \cdots & \cdots \\ \cdots & \cdots \end{bmatrix}$

Second Part of the Lesson:
Transform the figure using matrix multiplication

We have formed the transpormations matrices. Now we are going to transform the figures using matrix multiplications.

Here are the directions:

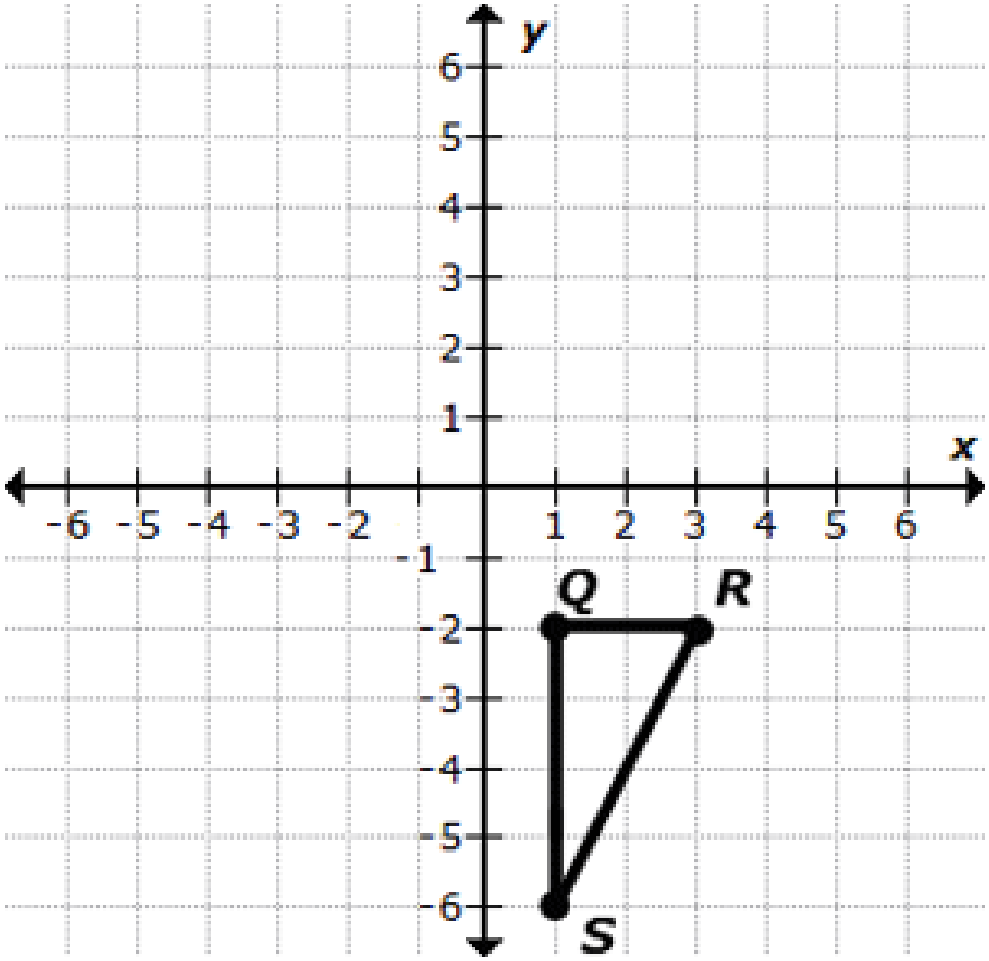
1. ABC is a triangle with the given vertices $Q(1, -2), R(3, -2), S(1, -6)$

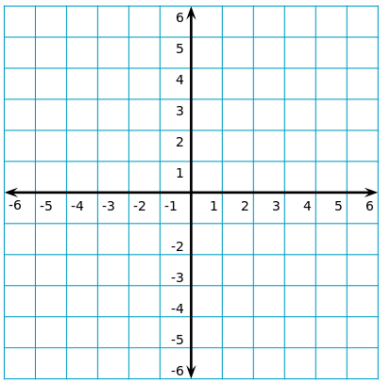
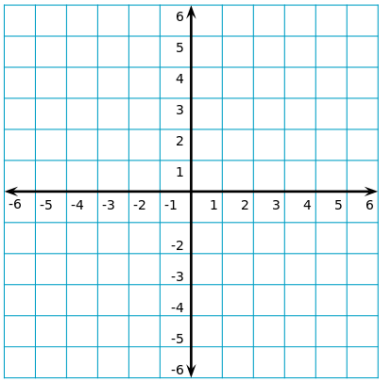
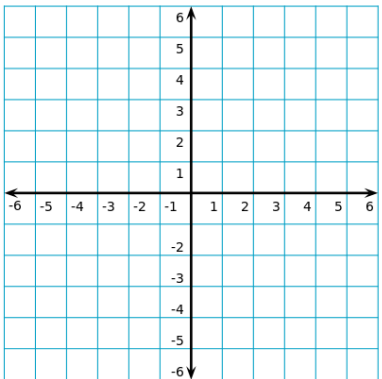
2. Form the figure matrix using coordinates of the triagle. Write the coordinates **for Q** *down the first column,* ***for R*** *down the second column, and* **for S** *down the third column.*

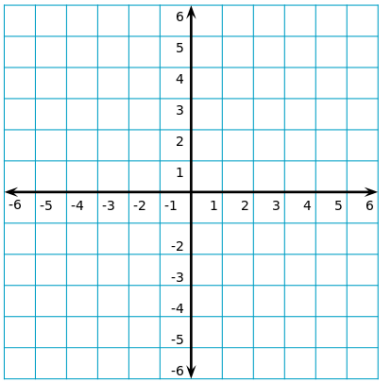
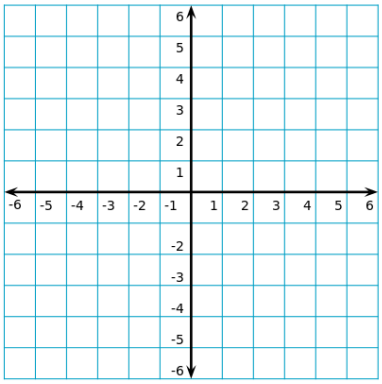
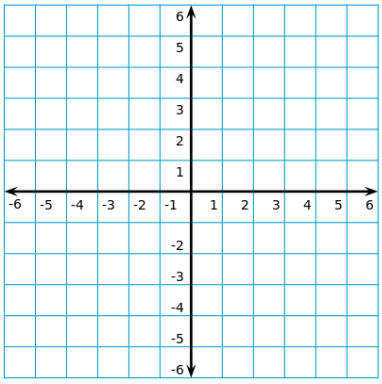
3. *Multiply the matrix with the each transformation matrix*

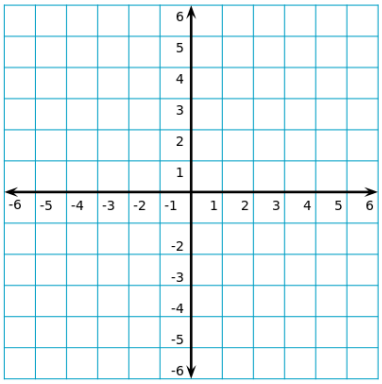
4. *Figure out the coordinates of the imaage from the produc and draw the image on the coordinate plane*

Here is the figure:



Perform the operation	Figure out coordinates, draw the image, and name the transformation
a. $\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix} \times \begin{bmatrix} 1 & 3 & 1 \\ -2 & -2 & -6 \end{bmatrix} =$	
b. $\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix} \times \begin{bmatrix} 1 & 3 & 1 \\ -2 & -2 & -6 \end{bmatrix} =$	
c. $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix} \times \begin{bmatrix} 1 & 3 & 1 \\ -2 & -2 & -6 \end{bmatrix} =$	

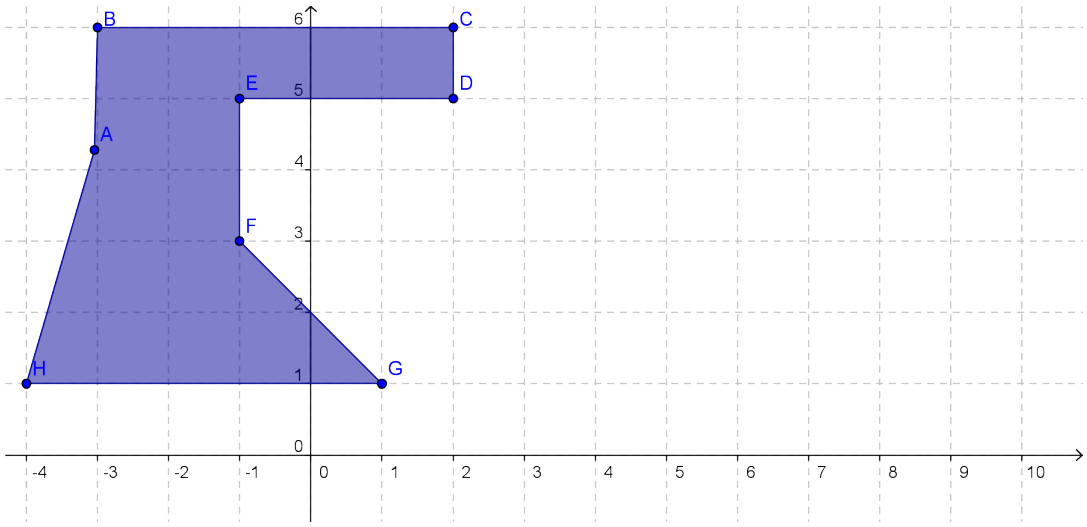
Perform the operation	Figure out coordinates, draw the image, and name the transformation
d. $\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix} \times \begin{bmatrix} 1 & 3 & 1 \\ -2 & -2 & -6 \end{bmatrix} =$	
e. $\begin{bmatrix} 1 & 0 \\ 0 & 3 \end{bmatrix} \times \begin{bmatrix} 1 & 3 & 1 \\ -2 & -2 & -6 \end{bmatrix} =$	
f. $\begin{bmatrix} \cos 90^\circ & -\sin 90^\circ \\ \sin 90^\circ & \cos 90^\circ \end{bmatrix} \times \begin{bmatrix} 1 & 3 & 1 \\ -2 & -2 & -6 \end{bmatrix} =$	

Perform the operation	Figure out coordinates, draw the image, Name transformation
h. $\begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix} \times \begin{bmatrix} 1 & 3 & 1 \\ -2 & -2 & -6 \end{bmatrix} =$	

Third Part of the Lesson:

Students are going to solve an aplication question in this part of the lesson. Here is the application problem:

Perform the indicatated transformation to the figure below using matrices.



1. Reflect the figure with respet to x-axis
2. Reflect the figure with respecto y-axis
3. Reflect the figure with respecto $y = x$
4. Reflect the figure with respecto $y = -x$
5. Rotate the figure $90°$ counterclockwise
6. Rotate the figure $180°$ counterclockwise
7. Rotate the figure $-90°$ clockwise
8. Dialate the figure by $r = \frac{1}{2}$