

Precalc

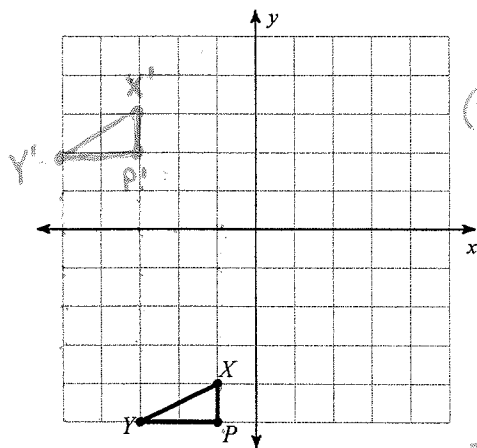
Transformations Using Matrices

Name Key

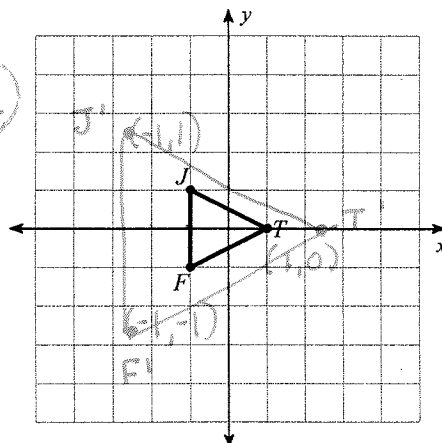
Date _____ Period _____

- Specify the coordinates of the figure using matrices
- Show the translation matrix that would be used to translate the figure as specified
- Graph the image of the figure using the given transformation

- translation: 2 units left and 7 units up
- dilation of 2.5



$(-3, 3), (-5, 2), (-3, 2)$

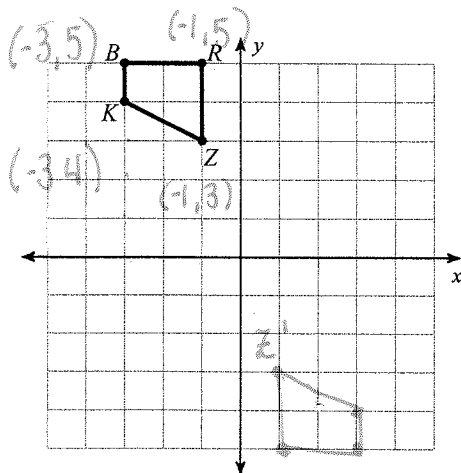


$(2.5, 0), (-2.5, 2.5), (-2.5, -2.5)$

$$\begin{bmatrix} -1 & -3 & -1 \\ -4 & -5 & -5 \end{bmatrix} + \begin{bmatrix} 2 & -2 & -2 \\ 7 & 7 & 7 \end{bmatrix} = \begin{bmatrix} -3 & -5 & -3 \\ 3 & 2 & 2 \end{bmatrix}$$

$$2.5 \begin{bmatrix} 1 & -1 & -1 \\ 0 & 1 & -1 \end{bmatrix} = \begin{bmatrix} 2.5 & -2.5 & -2.5 \\ 0 & 2.5 & -2.5 \end{bmatrix}$$

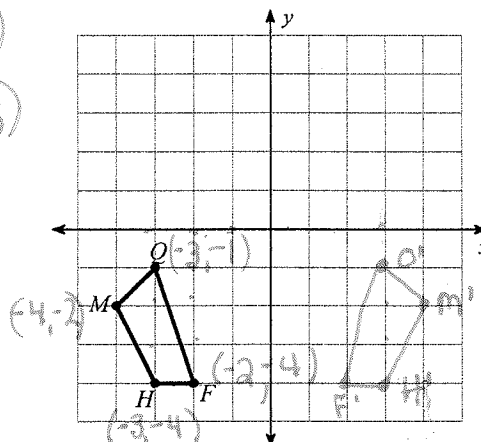
- rotation 180° about the origin



$(3, -5), (1, -5)$

$(3, -4), (1, -3)$

- reflection across the y-axis



$$\begin{bmatrix} \cos 180 & \sin 180 \\ -\sin 180 & \cos 180 \end{bmatrix} \begin{bmatrix} -3 & -1 & -3 & -1 \\ 5 & 5 & 4 & 3 \end{bmatrix}$$

$$\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} -3 & -4 & -3 & -2 \\ -1 & -2 & -4 & -4 \end{bmatrix} = \begin{bmatrix} 3 & 4 & 3 & 2 \\ -1 & -2 & -4 & -4 \end{bmatrix}$$

Find the coordinates of the vertices of each figure after the given transformation.

- rotation 90° clockwise about the origin

$$\begin{bmatrix} \cos 90 & \sin 90 \\ -\sin 90 & \cos 90 \end{bmatrix} \begin{bmatrix} -4 & 1 & -2 \\ -4 & -3 & -5 \end{bmatrix} = \begin{bmatrix} -4 & -3 & -5 \\ 4 & -1 & 2 \end{bmatrix}$$

- translation: 5 units left and 5 units up

$$\begin{bmatrix} 2 & 0 & 1 & 4 \\ -3 & 0 & 0 & -2 \end{bmatrix} + \begin{bmatrix} -5 & -5 & -5 & -5 \\ 5 & 5 & 5 & 5 \end{bmatrix} = \begin{bmatrix} -3 & -5 & -4 & -1 \\ 2 & 5 & 5 & 3 \end{bmatrix}$$

7) dilation of 0.25

$$0.25 \begin{bmatrix} -1 & 2 & -1 \\ 1 & 2 & -1 \end{bmatrix} = \begin{bmatrix} -0.25 & 0.5 & -0.25 \\ 0.25 & 0.5 & -0.25 \end{bmatrix}$$

8) reflection across $y = x$

$$\begin{bmatrix} -5 & -2 & -1 \\ -2 & 0 & -3 \end{bmatrix} = \begin{bmatrix} -2 & 0 & -3 \\ -5 & -2 & -1 \end{bmatrix}$$

9) rotation 180° about the origin

$$\begin{bmatrix} \cos 180 & \sin 180 \\ -\sin 180 & \cos 180 \end{bmatrix} \begin{bmatrix} 0 & 2 & 5 \\ -3 & -1 & -5 \end{bmatrix}$$

$$= \begin{bmatrix} 0 & -2 & -5 \\ 3 & 1 & 5 \end{bmatrix}$$

10) dilation of 0.5

$$0.5 \begin{bmatrix} -1 & 1 & 2 \\ 0 & 1 & -1 \end{bmatrix} = \begin{bmatrix} -0.5 & 0.5 & 1 \\ 0 & 0.5 & -0.5 \end{bmatrix}$$

Write a rule to describe each transformation.

11) $\begin{bmatrix} 1 & 1 & 4 & 5 \\ 2 & 3 & 2 & 1 \end{bmatrix}$
to

dilation of 0.5

$$\begin{bmatrix} 0.5 & 0.5 & 2 & 2.5 \\ 1 & 1.5 & 1 & 0.5 \end{bmatrix}$$

12) $\begin{bmatrix} -4 & -3 & -1 \\ -3 & 1 & 0 \end{bmatrix}$
to

$$\begin{bmatrix} 3 & 3 & 3 \\ 0 & 0 & 0 \end{bmatrix}$$

Right 3 units

13) $\begin{bmatrix} 1 & 3 & 4 & 5 \\ 0 & 3 & 2 & -3 \end{bmatrix}$
to

Reflection over the y-axis

$$\begin{bmatrix} -1 & -3 & -4 & -5 \\ 0 & 3 & 2 & -3 \end{bmatrix}$$

14) $\begin{bmatrix} -3 & 1 & 0 \\ 2 & 5 & 3 \end{bmatrix}$
to

Rotation 90° clockwise about origin

$$\begin{bmatrix} 2 & 5 & 3 \\ 3 & -1 & 0 \end{bmatrix}$$

15) $\begin{bmatrix} -3 & -1 & 0 \\ -5 & -2 & -3 \end{bmatrix}$
to

Translation

1 Rt
3 up

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

$$+ \begin{bmatrix} 1 & 1 & 1 \\ 3 & 3 & 3 \end{bmatrix}$$

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

rotation 180° about origin

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