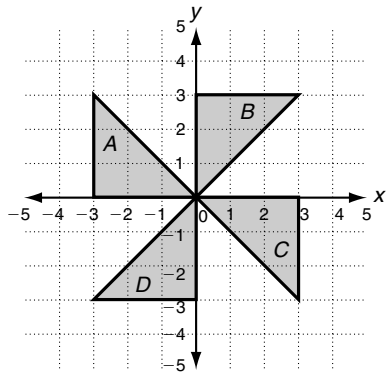
Name _____ Date _____ Class _____

LESSON 4-3

Problem Solving

Using Matrices to Transform Geometric Figures

The shaded parts of the figure show the pattern of a quilt.



1. What directions would you give Sherrill to help her draw triangle *A* on a grid?

Solution:

Draw a triangle with vertices at (0, 0),

(−3, _____) and (_____, 3).

2. a. What rotation (transformation) can be used on triangle *A* to create triangle *B*?

_____

b. What transformation matrix can be used to create triangle *B*?

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

3. a. What rotation transformation can be used on triangle *A* to create triangle *C*?

_____

b. What rotation transformation matrix can be used to create triangle *C*?

_____

4. a. What rotation transformation can be used on triangle *A* to create triangle *D*?

_____

_____

b. What transformation matrix can be used to create triangle *D*?

_____

5. A rectangle is represented by the matrix $R = \begin{bmatrix} 0 & 0 & 3 & 3 \\ 0 & 5 & 5 & 0 \end{bmatrix}$

The rectangle is transformed by adding matrix *M* to *R*. The transformed rectangle is represented by the matrix $P = \begin{bmatrix} 2 & 2 & 5 & 5 \\ 3 & 8 & 8 & 3 \end{bmatrix}$

What is matrix *M*?

A $\begin{bmatrix} 2 \\ 3 \end{bmatrix}$

B $\begin{bmatrix} 2 & 3 \end{bmatrix}$

C $\begin{bmatrix} 2 & 2 & 2 & 2 \\ 3 & 3 & 3 & 3 \end{bmatrix}$

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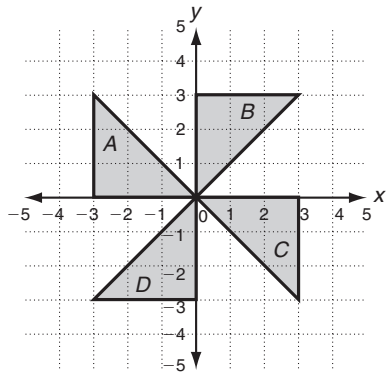

1. What directions would you give Sherrill to help her draw triangle *A* on a grid?

Solution:

Draw a triangle with vertices at (0, 0),

(−3, 0) and (−3, 3).

2. a. What rotation (transformation) can be used on triangle *A* to create triangle *B*?

Rotate 90° clockwise about the origin

b. What transformation matrix can be used to create triangle *B*?

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

3. a. What rotation transformation can be used on triangle *A* to create triangle *C*?

Rotate 180° about the origin

b. What rotation transformation matrix can be used to create triangle *C*?

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

4. a. What rotation transformation can be used on triangle *A* to create triangle *D*?

Rotate 90° counterclockwise about the origin

b. What transformation matrix can be used to create triangle *D*?

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

5. A rectangle is represented by the matrix $R = \begin{bmatrix} 0 & 0 & 3 & 3 \\ 0 & 5 & 5 & 0 \end{bmatrix}$

The rectangle is transformed by adding matrix *M* to *R*. The transformed rectangle is represented by the matrix $P = \begin{bmatrix} 2 & 2 & 5 & 5 \\ 3 & 8 & 8 & 3 \end{bmatrix}$

What is matrix *M*?

A $\begin{bmatrix} 2 \\ 3 \end{bmatrix}$

B $\begin{bmatrix} 2 & 3 \end{bmatrix}$

C $\begin{bmatrix} 2 & 2 & 2 & 2 \\ 3 & 3 & 3 & 3 \end{bmatrix}$