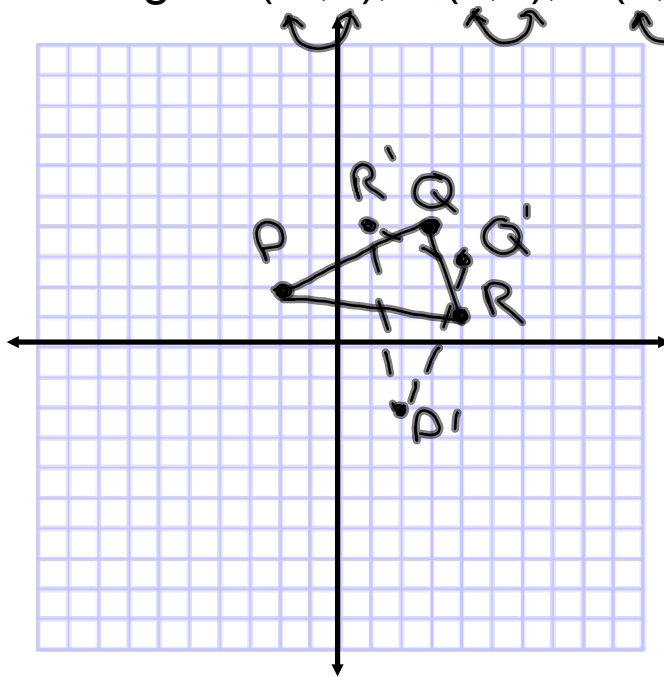


## Bellwork

### 02/24/2012

Graph the polygon and its reflection in the given line.

1. Triangle  $P(-2,2)$ ,  $Q(3,4)$ ,  $R(4,1)$  over  $y=x$ .



$$P'(2, -2)$$

$$Q'(4, 3)$$

$$R'(1, 4)$$

**Geometry**  
**9.4 Perform Rotations**  
**Standard(s): 9, 10**

**Vocabulary:**

**Center of Rotation:** A fixed point in which a figure is turned about.

**Angle of Rotation:** An angle formed by rays drawn from the center of rotation to a point and its image.

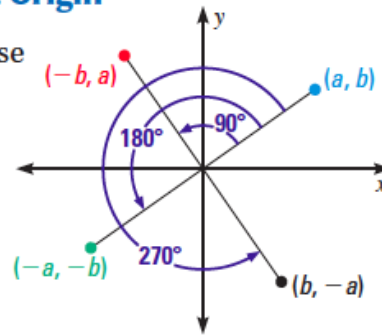
**KEY CONCEPT**

*For Your Notebook*

**Coordinate Rules for Rotations about the Origin**

When a point  $(a, b)$  is rotated counterclockwise about the origin, the following are true:

1. For a rotation of  $90^\circ$ ,  $(a, b) \rightarrow (-b, a)$ .
2. For a rotation of  $180^\circ$ ,  $(a, b) \rightarrow (-a, -b)$ .
3. For a rotation of  $270^\circ$ ,  $(a, b) \rightarrow (b, -a)$ .



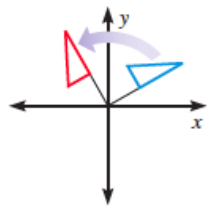
**KEY CONCEPT**

*For Your Notebook*

**Rotation Matrices (Counterclockwise)**

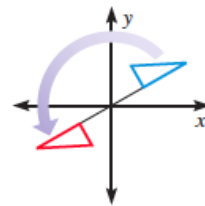
**90° rotation**

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



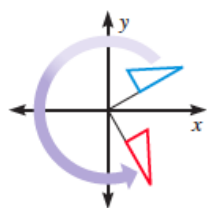
**180° rotation**

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



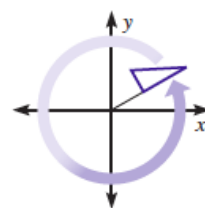
**270° rotation**

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



**360° rotation**

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



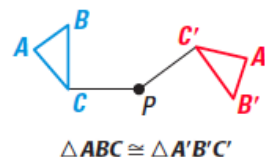
**THEOREM**

*For Your Notebook*

**THEOREM 9.3** Rotation Theorem

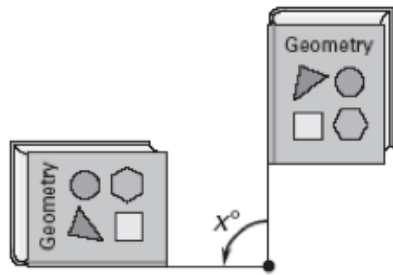
**A rotation is an isometry.**

*Proof:* Exs. 33–35, p. 604

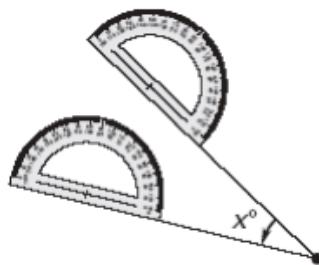


## Angle of Rotation

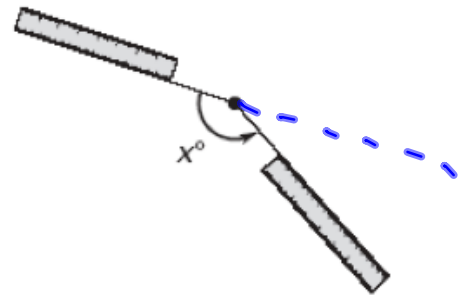
Match the diagram with the angle of rotation.



**B.  $90^\circ$**



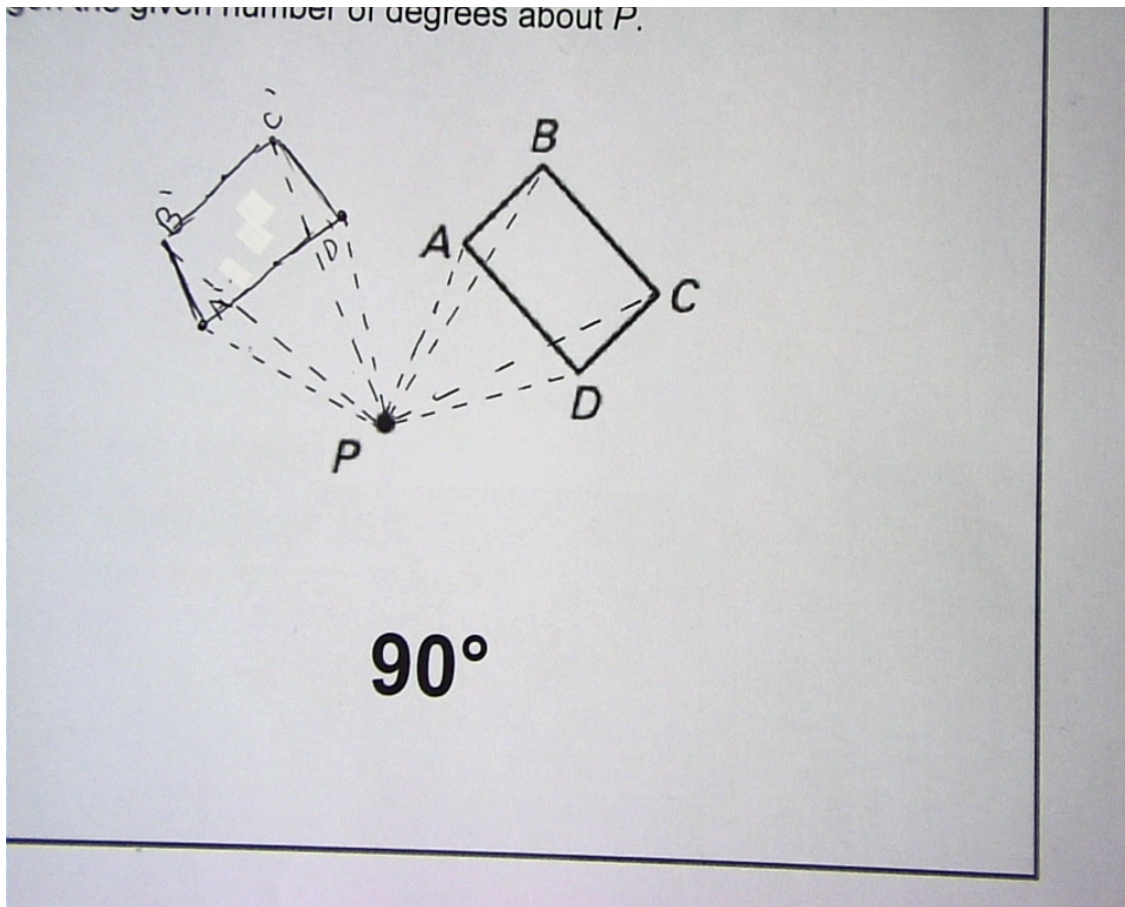
**A.  $30^\circ$**



**C.  $150^\circ$**

## Rotating a Figure

Trace the polygon and point  $P$  on paper. Then draw a rotation of the polygon the given number of degrees about  $P$ .

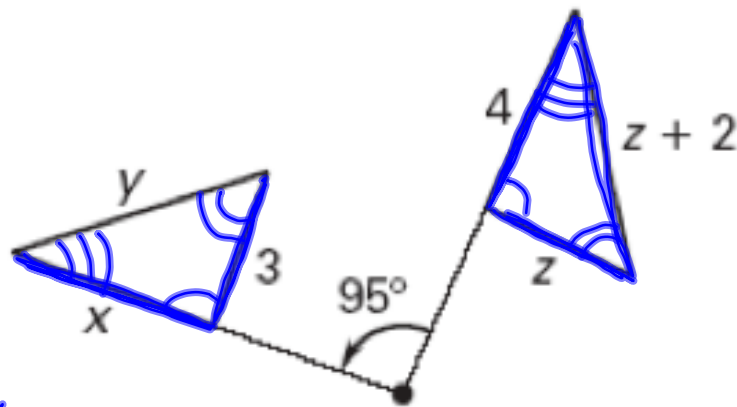


## Using Algebra with Rotations

Find the variables within the angle of rotation.

$$\begin{aligned}x &= 4 \\z &= 3 \\y &= 5\end{aligned}$$

$$\begin{aligned}z + 2 &= y \\3 + 2 &= y\end{aligned}$$

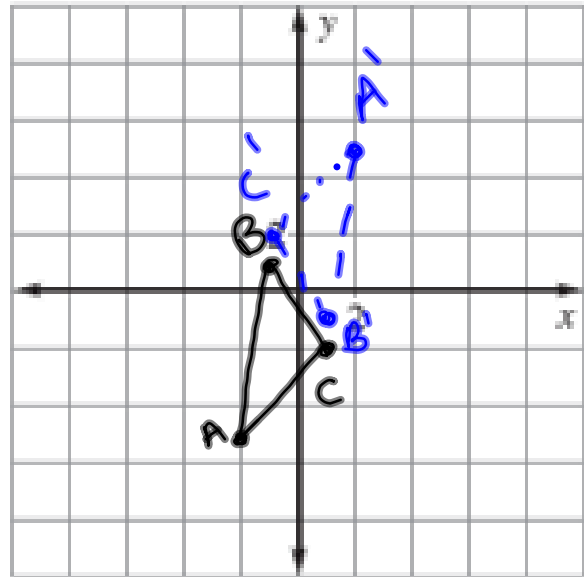


## Using Matrices

Find the image matrix that represents the rotation of the polygon about the origin. Then graph the polygon and its image.

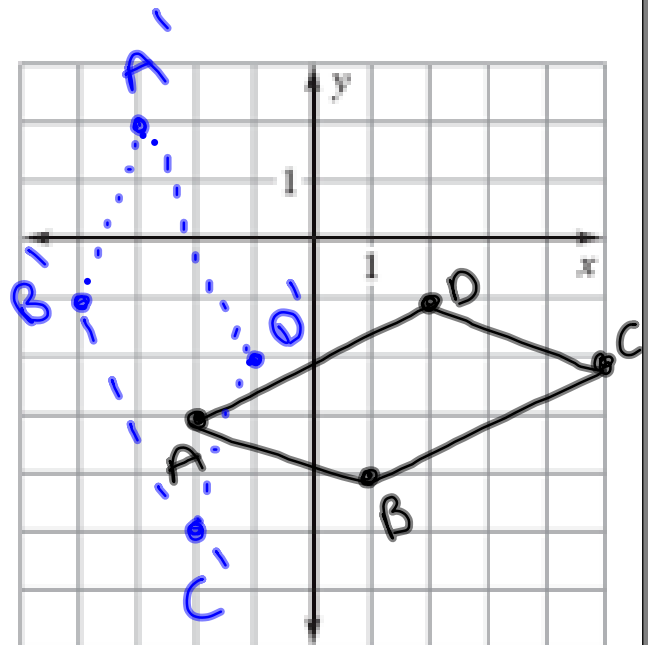
$$\begin{array}{ccc} A & B & C \\ \begin{bmatrix} -2 & -1 & 1 \\ -5 & 1 & -2 \end{bmatrix} & & 180^\circ \end{array}$$

$$\begin{array}{ccc} A' & B' & C' \\ \begin{bmatrix} 2 & -1 & -1 \\ 5 & -1 & 2 \end{bmatrix} & & \end{array}$$



$$\begin{array}{cccc} A & B & C & D \\ \begin{bmatrix} -2 & 1 & 5 & 2 \\ -3 & -4 & -2 & -1 \end{bmatrix} & & & 270^\circ \end{array}$$

$$\begin{array}{cccc} A' & B' & C' & D' \\ \begin{bmatrix} -3 & -4 & -2 & -1 \\ +2 & -1 & -5 & -2 \end{bmatrix} & & & \end{array}$$



# Homework Assignment

## Worksheet 9.4B

