a. Rectangle *ABCD* with vertices
   A(−7, 4), *B*(−7, 1), *C*(−2, 1),
   and *D*(−2, 4) represents the
   bed in Jackson's room. Graph
   the figure and its image after
   a clockwise rotation of 90°
   about vertex *C*. Then give the
   coordinates of the vertices
   for rectangle *A′B′C′D′*.
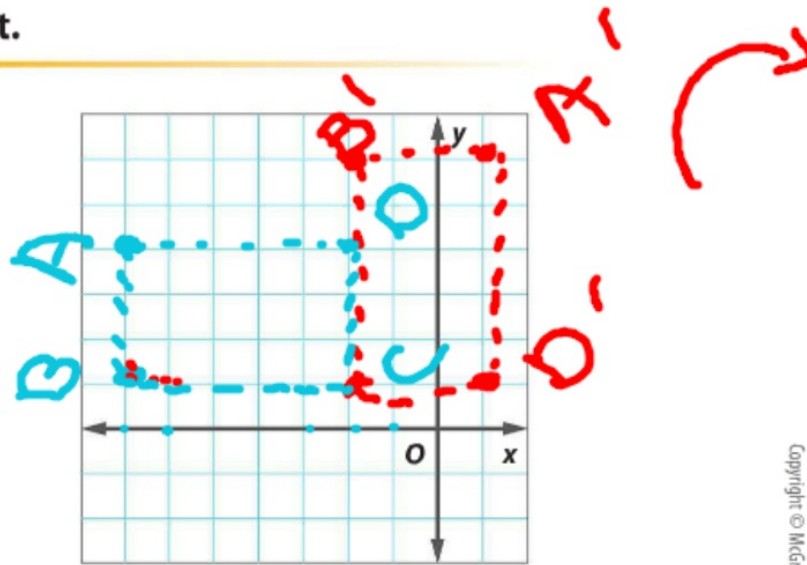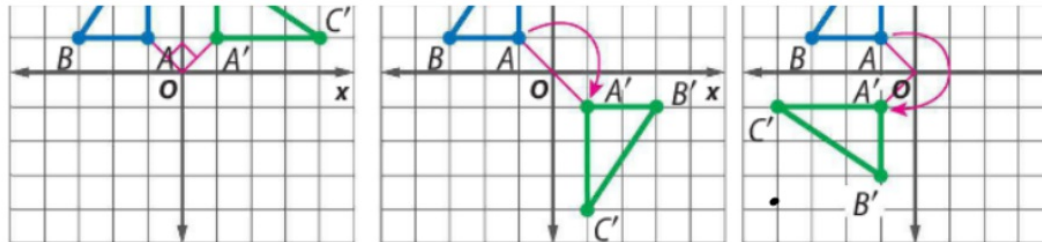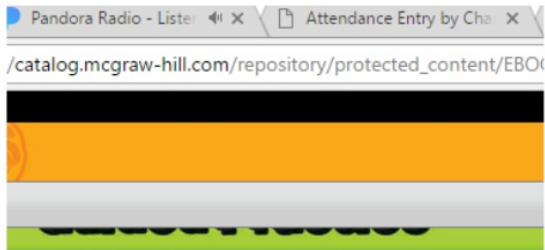
Triangle *XYZ* has vertices *X*(3, −1), Y **Symbols**
and its image after each rotation. Th
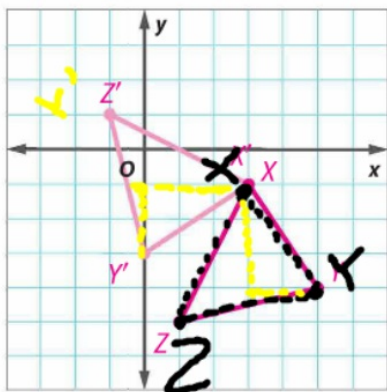**for △*X′Y′Z′*.** (Examples 1 and 2)

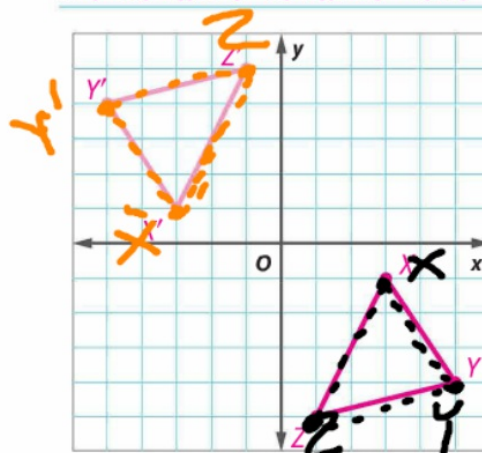$$(x, y) \rightarrow (y, -x) \qquad (x, y) \rightarrow (-x, -y) \qquad (x, y) \rightarrow (-y, x)$$

1. 270° counterclockwise about vertex *X*

$X'(3, -1)$, $Y'(0, -3)$, $Z'(-1, 1)$

2. 180° clockwise about the origin

$X''(-3, 1)$, $Y''(-5, 4)$, $Z''(-1, 5)$

$(3, -1)$

$(5, -4)$

$(1, -5)$

3. **ⓔ Building on the Essential Question** What is the difference between rotating a figure about a given point that is a vertex and rotating the same figure about the origin if the rotation is less than 360°?

Sample answer: If you rotate the figure about one of the vertices, that point stays the same. If you rotate the same figure about the origin, all of the points are different unless one of the vertices is the origin.

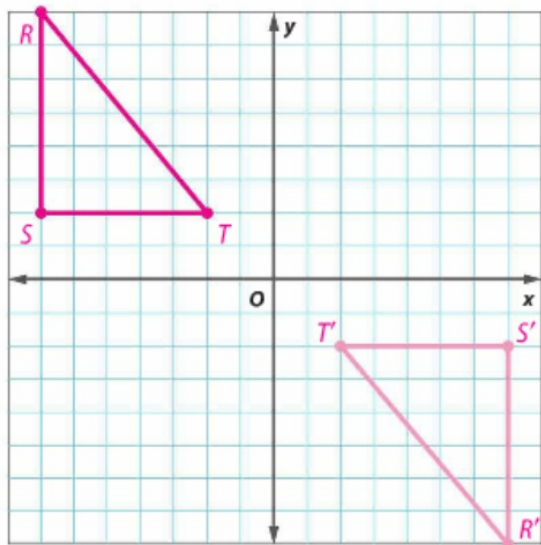**1** Triangle *RST* represents the placement of Tyra's tricycle in the driveway and has vertices $R(-7, 8)$, $S(-7, 2)$, and $T(-2, 2)$. Graph the figure and its rotated image after a clockwise rotation of 180° about the origin. Then give the coordinates of the vertices for triangle *R'S'T'*. (Example 2)
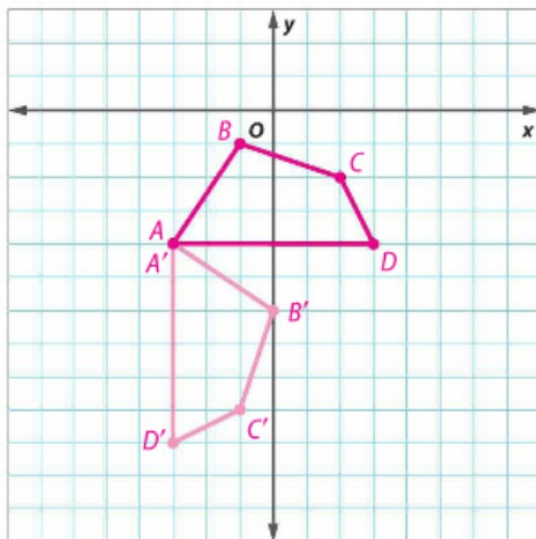
$R'(7, -8)$, $S'(7, -2)$, $T'(2, -2)$

Show your work.

2. Quadrilateral *ABCD* has vertices at $A(-3, -4)$, $B(-1, -1)$, $C(2, -2)$, and $D(3, -4)$. Graph quadrilateral *ABCD* and its image after a 90° clockwise rotation about vertex *A*. Then give the coordinates of the vertices of the image. (Example 1)

$A'(-3, -4)$, $B'(0, -6)$, $C'(-1, -9)$, $D'(-3, -10)$

3. CCSS **Model with Mathematics** A partial hubcap is shown. Copy and complete the figure so that the completed hubcap has rotational symmetry of 90°, 180°, and 270°.
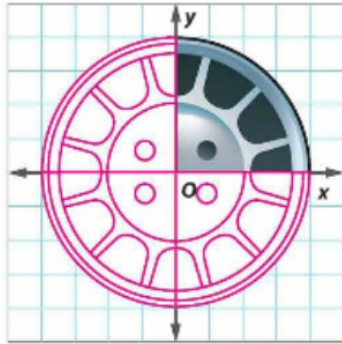
4. The right isosceles triangle *PQR* has vertices *P*(3, 3), *Q*(3, 1), and *R*(*x, y*) and is rotated 90° counterclockwise about the origin. Find the missing vertex of the triangle. Then graph the triangle and its image. **Sample answer:**

$R(x, y) = R(\underline{\quad 1 \quad}, \underline{\quad 1 \quad})$
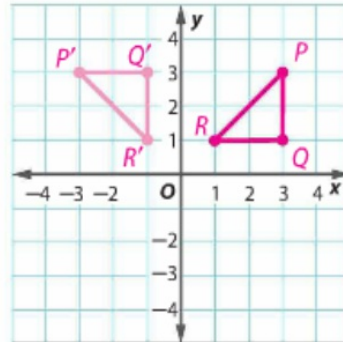
5 Which capital letters in VIRGINIA produce the same letter after being rotated 180°? **I and N**