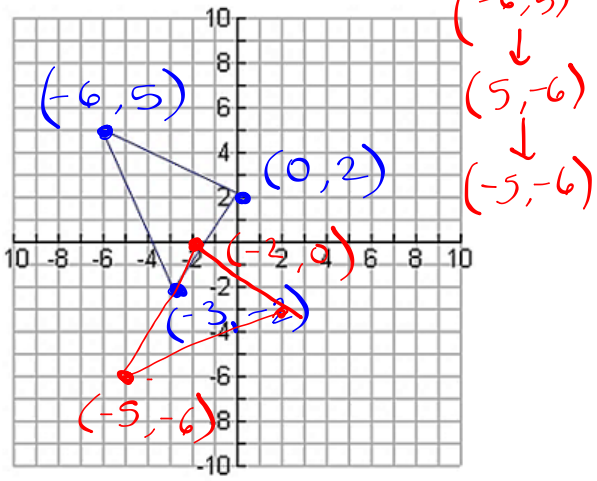
180 $(x,y) \rightarrow (-x,-y)$

90 ccw
270 cw $(x,y) \rightarrow (-y,x)$

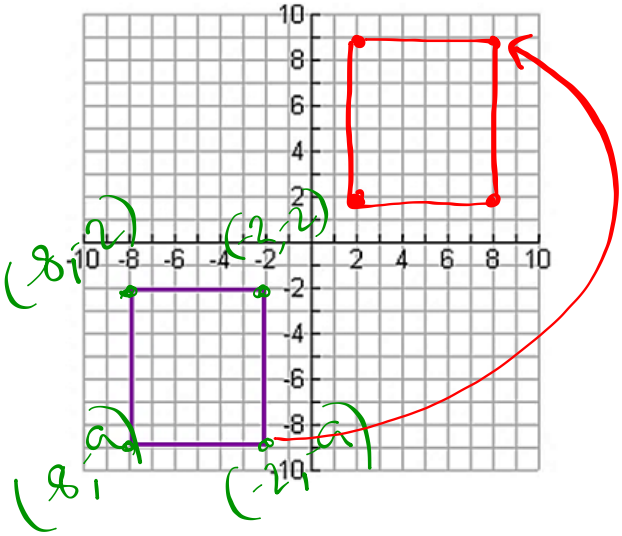
90 cw
270 ccw $(x,y) \rightarrow (y,-x)$

Practice with Rotations

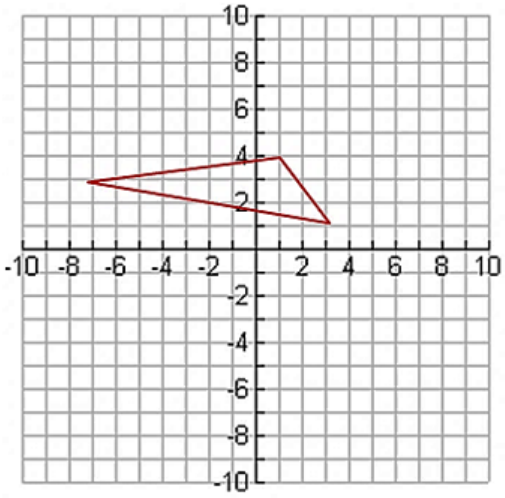
a. Rotate 90° CCW



b. Rotate 180° CCW



c. Rotate 90° CW

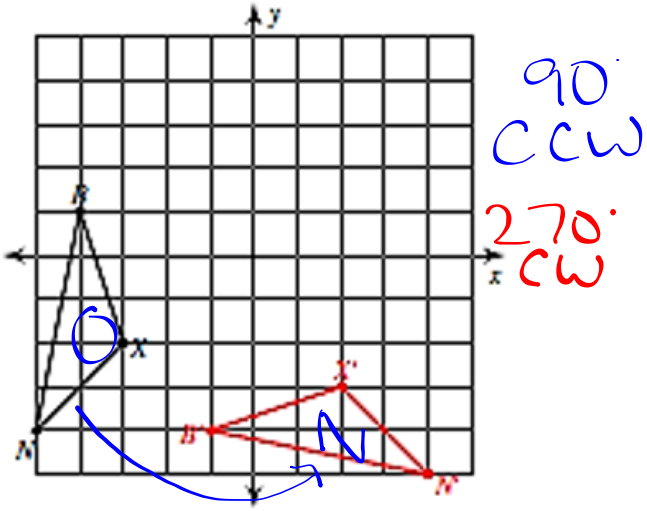


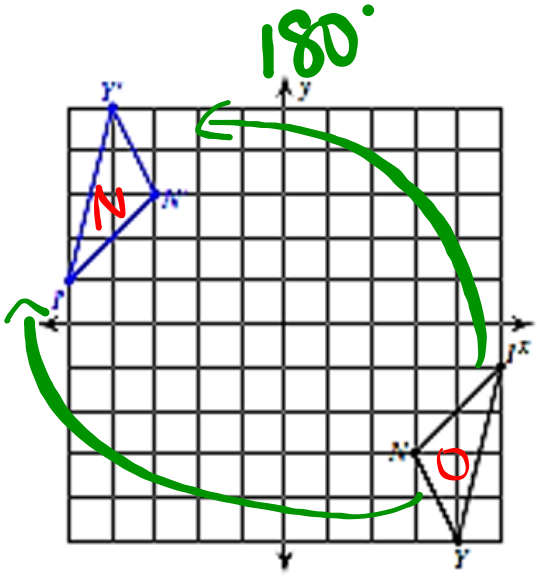
d. The line segment with endpoints (7, -8) and (-3, -5) are rotated ~~90° CW~~. What are its new endpoints?

(7, -8) → (-8, -7)

(-3, -5) → (-5, 3)

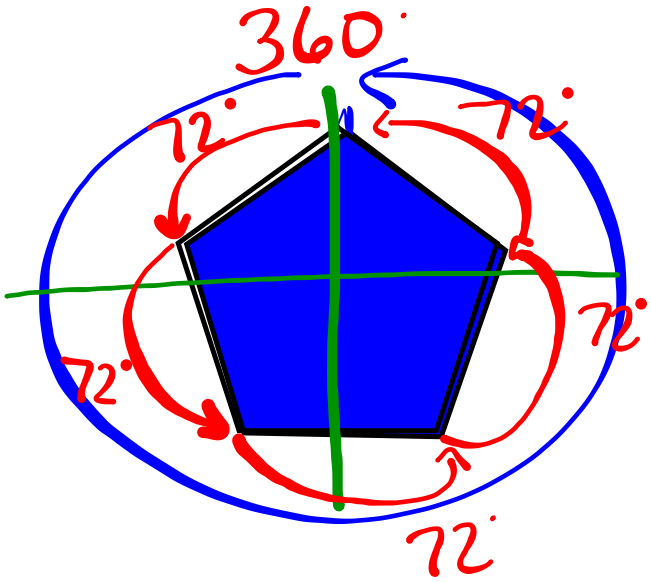
e. Describe the rotations:





order
$n = 5$

$\frac{360}{5} = 72°$



Rotational Symmetry

A figure has **rotational symmetry** if there is a center point around which the object is turned a certain number of degrees and the object looks the same. The degree of rotational symmetry that an object has is called its **order.** The order of rotational symmetry that an object has is the number of times that it fits onto itself during a full rotation of 360 degrees. To determine the **angle of rotation**, divide 360 degrees by its order.

Example: Determine the order and angle of rotation:

$n = 6$

Angle of rotation

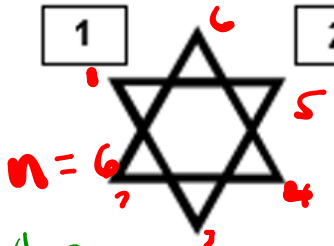
$\frac{360}{6} = 60$

$n = 5$

AOR = $\frac{360}{5} = 72$

Practice: For the following figures, name the order and degrees of rotation:

1



$n = 6$

AOR = $\frac{360}{6} = 60$

2

$n = 2$

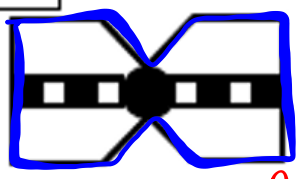
AOR = $\frac{360}{2} = 180$

3

$n = 3$

AOR = $\frac{360}{3} = 120$

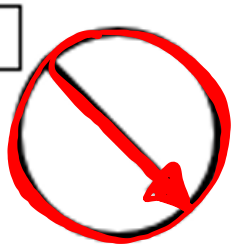
4



$n = 2$

AOR = 180

5

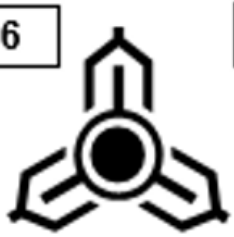


$n = 1$

AOR = $\frac{360}{1}$

360

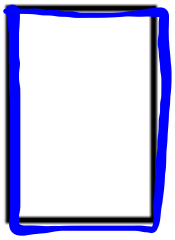
6



$n = 3$

AOR = 120

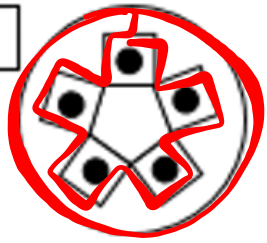
7



$n = 2$

AOR = 180

8

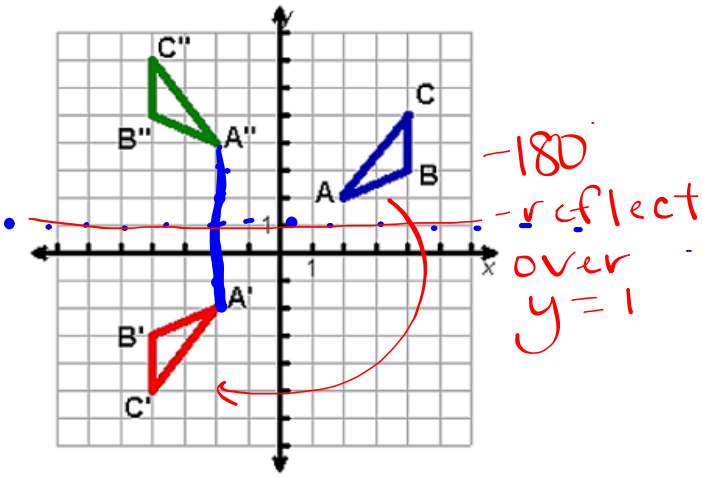


$n = 5$

AOR = 72

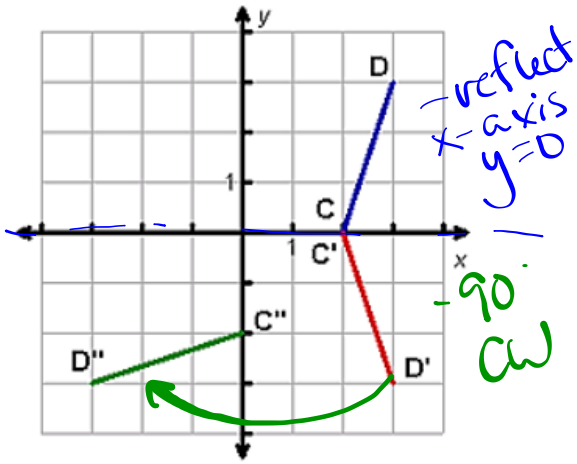
Practice: Describe that transformations that occurred from the pre-image to each image (in order).

A.



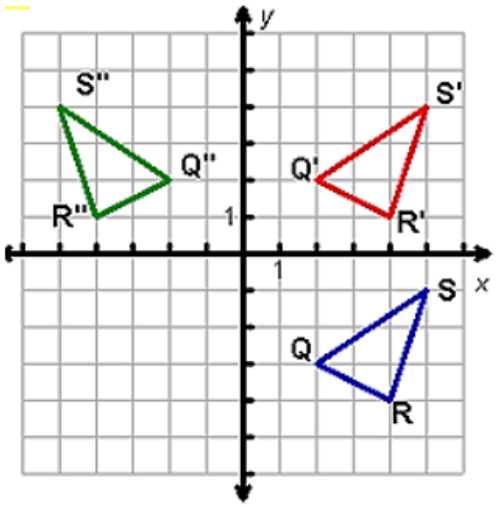
-180°
-reflect over y=1

B.

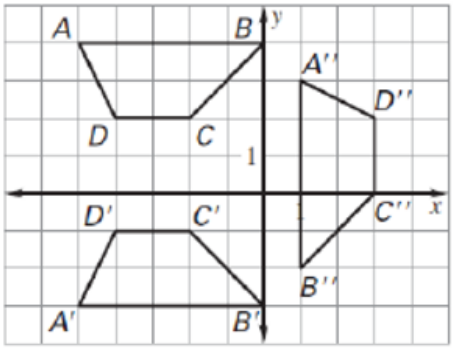


-reflect x-axis y=0
-90° CW

C.



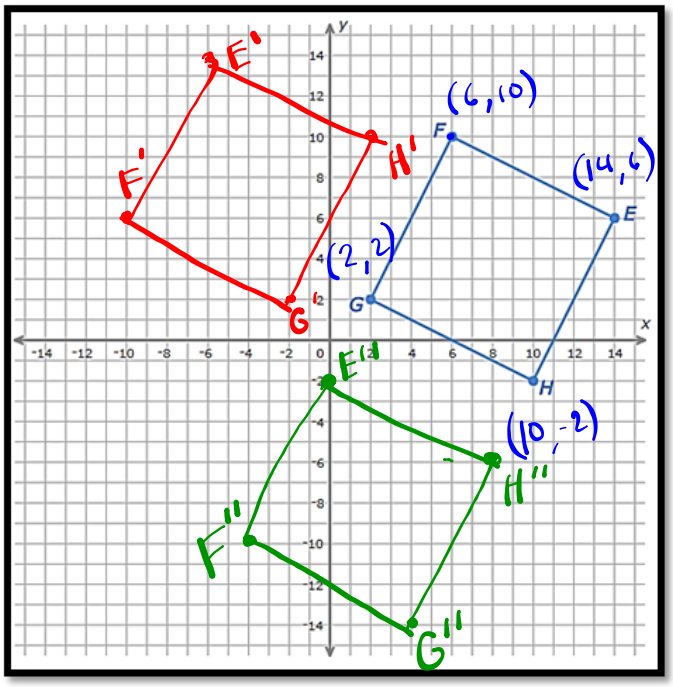
D.



Perform the following transformations:

a. Rotation 90° CCW around the origin:

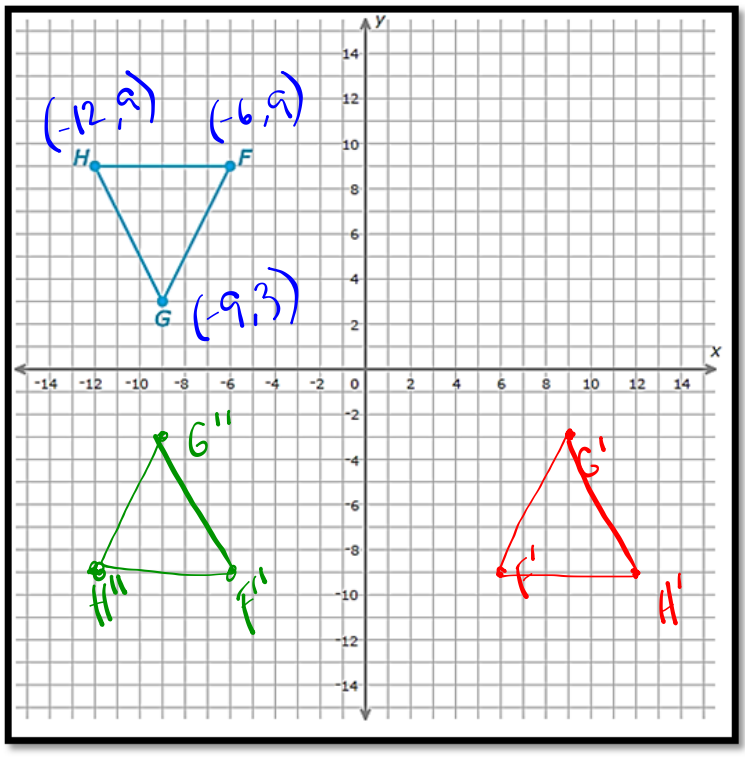
b. Translation (x, y) → (x + 6, y – 16)

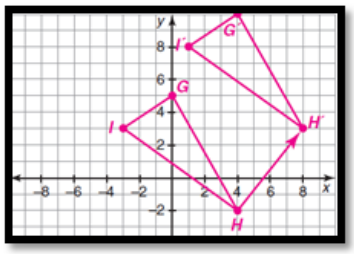
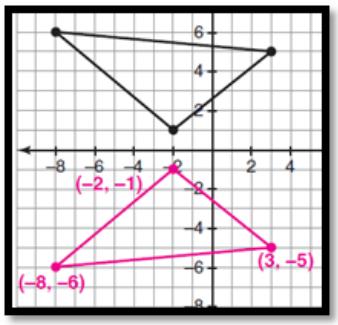


Perform the following transformations:

a. Rotation 180° CW around the origin:

b. Reflection across the y-axis:



Transformation	Rules	Examples
Translations *"slide"*	(x, y) → (x + a, y + b) a: horizontal slide (+ right, - left) b: vertical slide (+ up, - down)	
Reflections *"flip"*	x-axis: (x, y) → (x, -y) y-axis: (x, y)→(-x, y) y = x: (x, y) → (y, x) y = -x: (x, y) → (-y, -x)	
Rotations *"turn"*	90° CW = 270° CCW: (x, y)→ (y, -x) 180° CW = 180° CCW : (x, y) → (-x, -y) 90° CCW = 270° CW: (x, y) → (-y, x)