Rotation - turning a figure about a fixed point

How can we turn objects?

1. clock wise

2. Canter clock wise

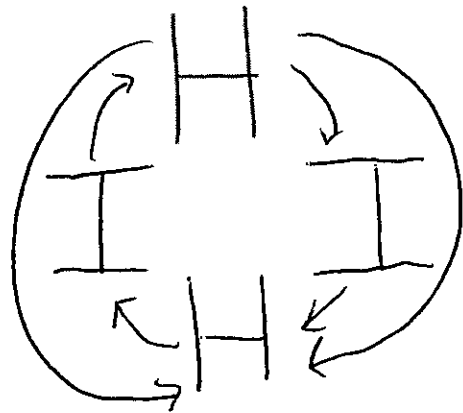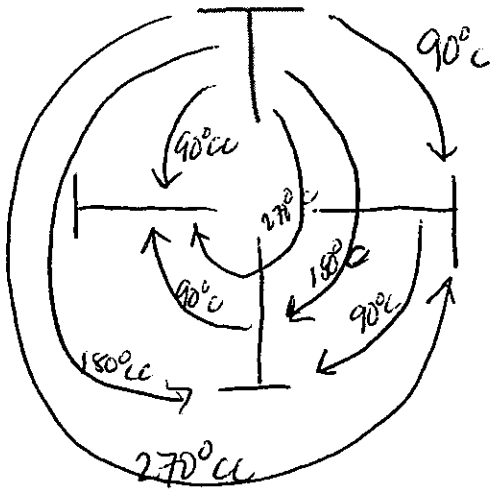We need to know the two "D's" of rotations:

1. Degree — how far

2. Direction — which way

After a rotation has been performed, is the image going to be similar or congruent? Explain.

Same size & shape.

Example:

1. Triangle *ABC* is labeled on your graph below.

a) Rotate Triangle *ABC*, 90° counterclockwise. Label the triangle $A'B'C'$.

$A'\ (-4,1)$ $B'\ (-2,5)$ $C'\ (0,2)$

b) Rotate Triangle *ABC*, 180° counterclockwise. Label the triangle $A''B''C''$.

$A''\ (-1,-4)$ $B''\ (-5,-2)$ $C''\ (-2,0)$

c) Rotate Triangle *ABC*, 270° counterclockwise. Label the triangle $A'''B'''C'''$.

$A'''\ (4,-1)$ $B'''\ (2,-5)$ $C'''\ (0,-2)$

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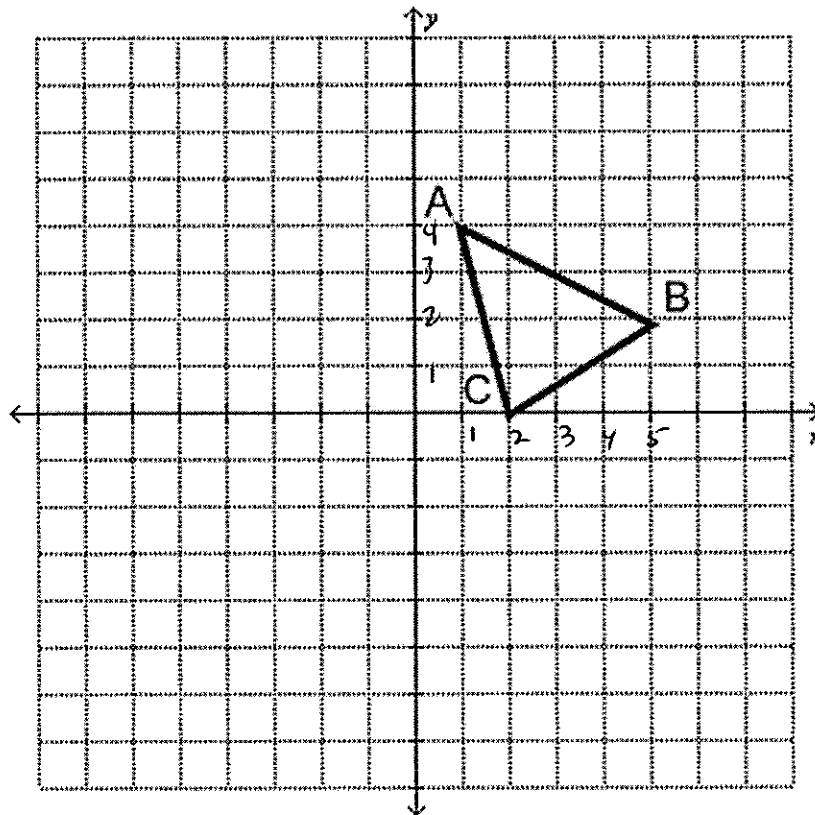
2. Organize your results from Part A in the table.

Starting Point	90° Rotation CC	180° Rotation CC	270° Rotation CC	360° Rotation CC
A (1, 4)	A'(-4,1)	A''(-1,-4)	A'''(4,-1)	A(1,4)
B (5, 2)	B'(-2,5)	B''(-5,-2)	B'''(2,-5)	B(5,2)
C (2, 0)	C'(0,2)	C''(-2,0)	C'''(0,-2)	C(2,0)

270° clockwise   90° clockwise

3. Complete each rule for finding the image of any point (*x, y*) under the given rotation.   • rotate the x & y values change 1st sign

a) 90° rotation about the origin: Canter clockwise $(x, y) \rightarrow (-y, x)$

b) 180° rotation about the origin: $(x, y) \rightarrow (-x, -y)$ • rotate the signs

c) 270° rotation about the origin: Canter clockwise $(x, y) \rightarrow (y, -x)$ • rotate the x & y values change 2nd sign.

d) 360° rotation about the origin: $(x, y) \rightarrow (x, y)$ • don't change

4. What are the coordinates of (3, - 2) under a 90° counterclockwise rotation about the origin?

$(2, 3)$

5. What are the coordinates of (- 5, 4) under a 180° counterclockwise rotation about the origin?
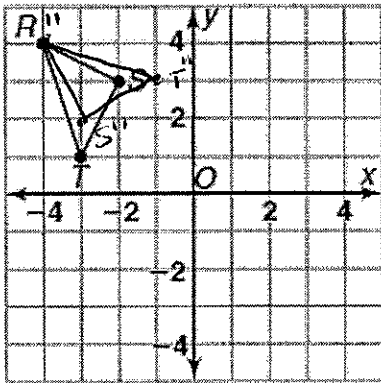
$(5, -4)$

6. What are the coordinates of (3, 2) under a 90° **clockwise** rotation about the origin?

$(2, -3)$

3

.7.

   a. Draw the final image created by rotating triangle *RST* 90° counterclockwise about the origin and then reflecting the image in the *x*-axis.
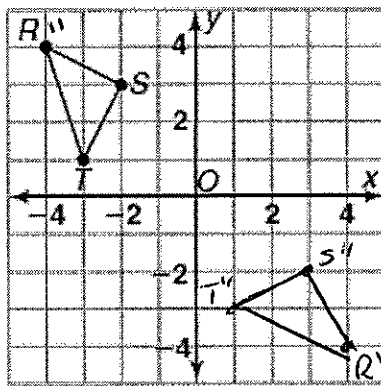

$$(x,y) \rightarrow R_{90}(-y,x) \rightarrow (x,-y)$$

$$R(-4,4) \rightarrow R'(-4,-4) \rightarrow R''(-4,4)$$

$$S(-2,3) \rightarrow S'(-3,-2) \rightarrow S''(-3,2)$$

$$T(-3,1) \rightarrow T'(-1,-3) \rightarrow T''(-1,3)$$

   b. Draw the final image created by reflecting triangle *RST* in the *x*-axis and then rotating the image 90° counterclockwise about the origin.

$$(x,y) \rightarrow (x,-y) \rightarrow R_{90}\left(\frac{-y}{x}\right)$$

$$R(-4,4) \rightarrow R'(-4,-4) \rightarrow R''(4,-4)$$

$$S(-2,3) \rightarrow S'(-2,-3) \rightarrow S''\left(\frac{3,-2}{}\right)$$

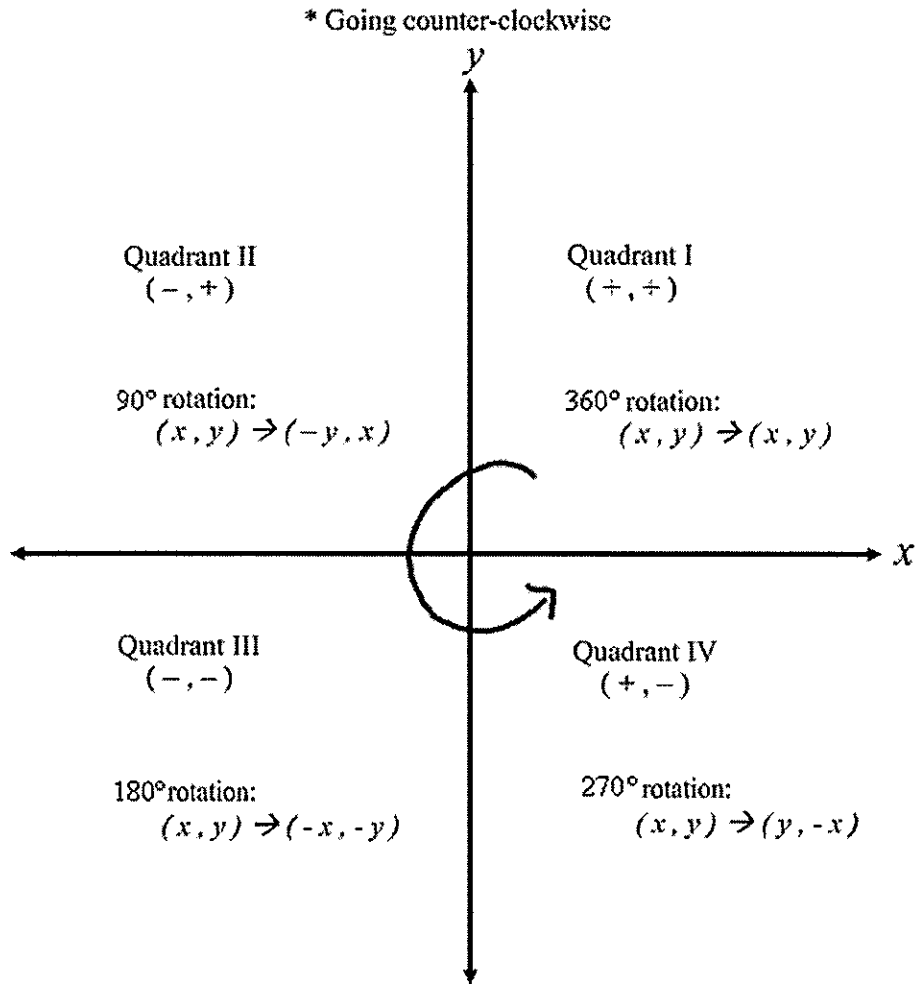$$T(-3,1) \rightarrow T'(-3,-1) \rightarrow T''\left(\frac{1,-3}{}\right)$$

   c. Are the final images in parts (a) and (b) the same? Why or why not?

They are similar & congruent.
They are exactly the same figure just not
in the same place.

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Rotation Summary

y

Quadrant II
$(-,+)$

Quadrant I
$(+,+)$

90° rotation:
$(x,y) \rightarrow (-y,x)$

360° rotation:
$(x,y) \rightarrow (x,y)$

x

Quadrant III
$(-,-)$

Quadrant IV
$(+,-)$

180° rotation:
$(x,y) \rightarrow (-x,-y)$

270° rotation:
$(x,y) \rightarrow (y,-x)$

** Note: Negative sign in this case means opposite. **