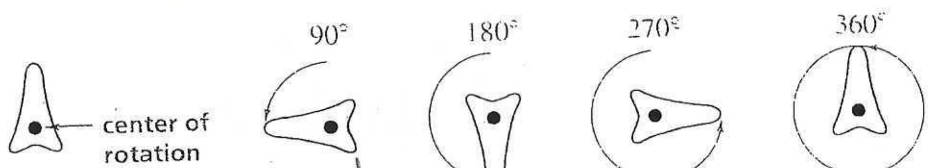
Name Key
Date ____________

Unit: Transformations

Part III - What Are Rotations?

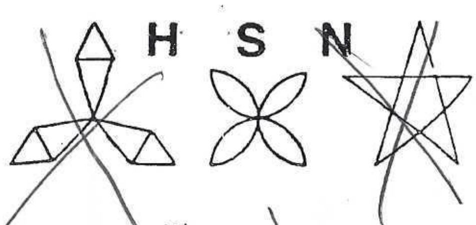
- A Rotation is a transformation that turns a figure about a fixed point called the center of rotation. same shape + size
- In general, a rotation preserves distance and angle measure. Under a rotation a figure is congruent to its image.
- Unless otherwise stated a rotation is in the **counterclockwise** direction. left



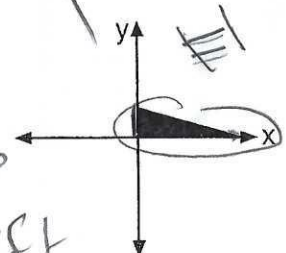
- on its side - 1 turn
- upside down - 2 turns
- 3 turns
- 4 turns

- When a figure can be rotated a certain number of degrees about a center point so that the image fits perfectly on top of the original figure, the figure has Point symmetry (Turn upside down).

Many letters, as well as designs in the shape of wheels, stars, and polygons have rotational symmetry. Each figure shown at the right has rotational symmetry.

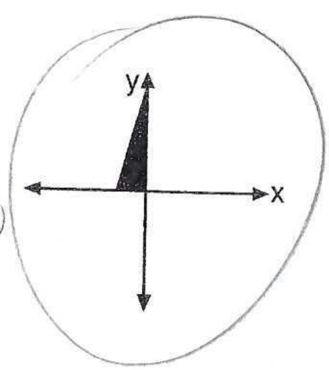


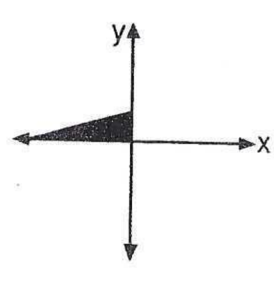
1) The accompanying diagram shows a right triangle.

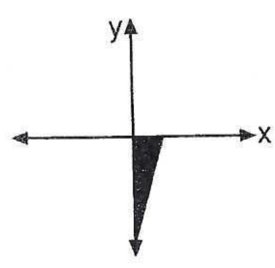


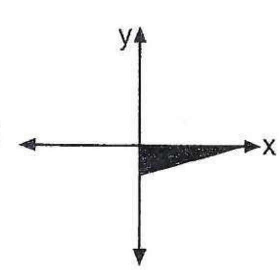
1 turn on its side
left

If the triangle is rotated 90° counterclockwise about the origin, what will the image be?

A) 

B) 

C) 

D) 

2) Brian drew a rectangle on the grid below. On the same grid, rotate the rectangle

(x, y) a) 90° counter-clockwise (−y, x) — 1 turn, on its side, left

b) 180° (−x, −y) — Same as reflection over the origin! — 2 turns, upside down — Same

c) 90° clockwise (y, −x) — Counter as clockwise 1 turn → Right on its side

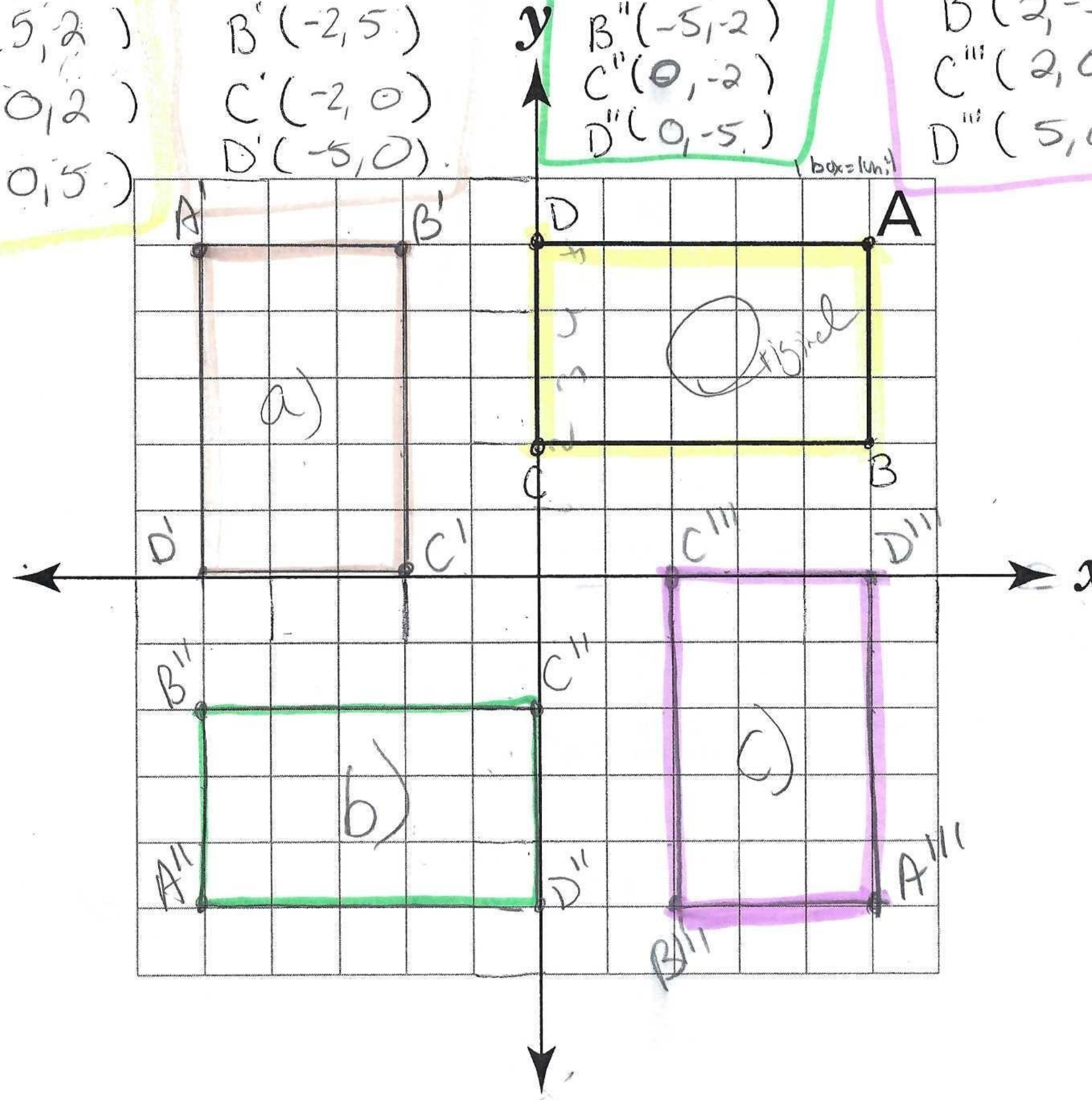
Original
A(5, 5)
B(5, 2)
C(0, 2)
D(0, 5)

a)
A'(−5, 5)
B'(−2, 5)
C'(−2, 0)
D'(−5, 0)

b)
A''(−5, −5)
B''(−5, −2)
C''(0, −2)
D''(0, −5)

c)
A'''(5, −5)
B'''(2, −5)
C'''(2, 0)
D'''(5, 0)

1 box = 1 unit

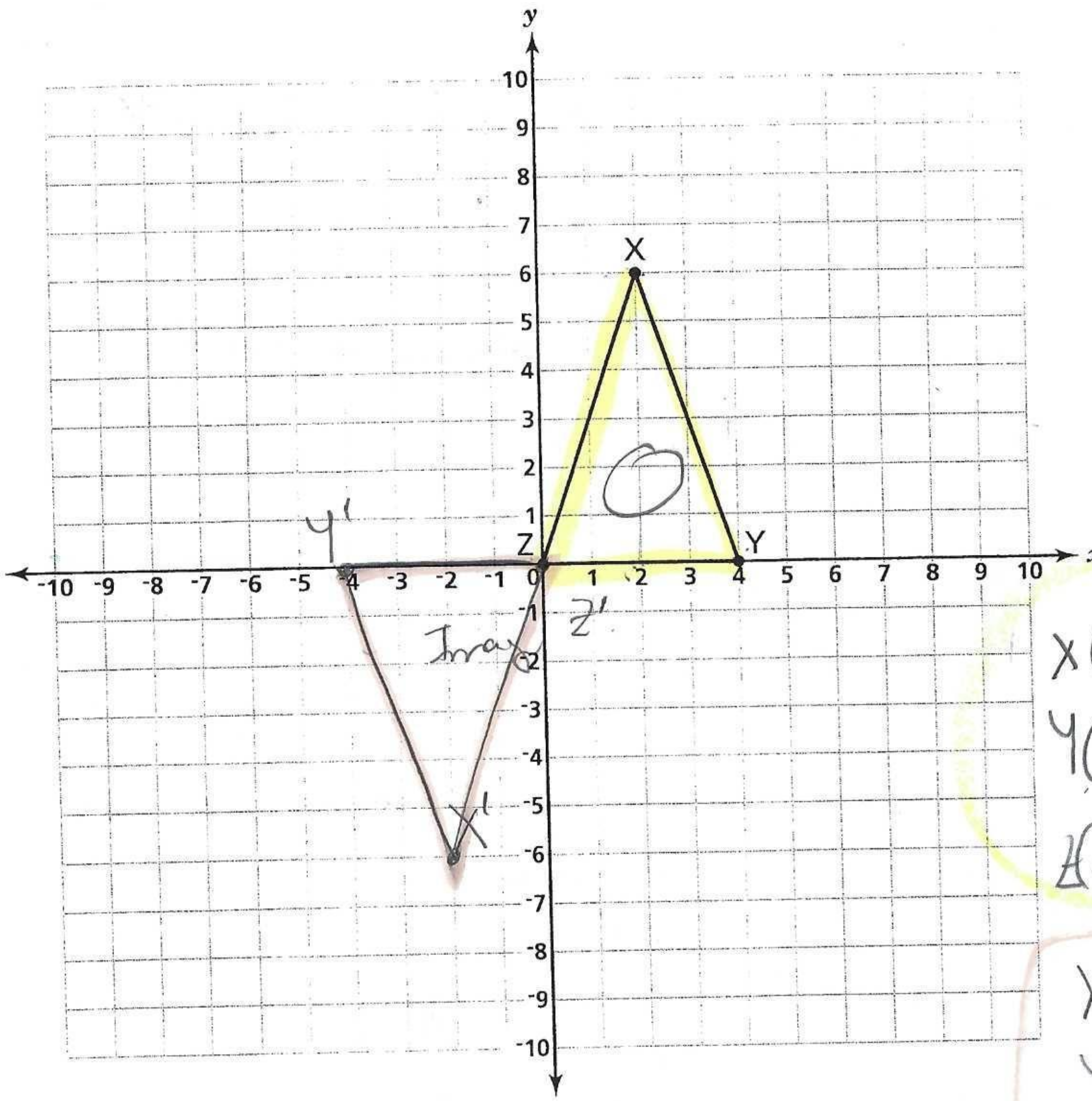


* Rule for: 90° counter-clockwise rotation: $(x, y) \rightarrow (-y, x)$

* Rule for: 180° counter- or clockwise rotation: $(x, y) \rightarrow (-x, -y)$

* Rule for: 90° clockwise rotation: $(x, y) \rightarrow (y, -x)$

③ Triangle XYZ is plotted on the grid below.



X(2,6)
Y(4,0)
Z(0,0)

X'(-2,-6)
Y'(-4,0)
Z'(0,0)

Part A

On the grid, draw the image of triangle XYZ after a clockwise rotation of 180° about the origin. Label the new triangle X'Y'Z'.

★ Same as reflection over the origin! ↓ Right ↓ upside down - 2 turns

Part B

On the lines below, explain how you determined the location of point Y'.

I used the rule (x,y) → (-x,-y) so Y(4,0) became Y'(-4,0) OR I turned the paper upside down to get the new coordinates for Y' so Y(4,0) became Y'(-4,0)

4

Triangle ABC has the coordinates A(1,1), B(4, 1), and C(4,7).

On the following graph:

(a) Graph and label ΔABC

-1 turn
on its side

(b) Graph and label $\Delta A'B'C'$ the image of ΔABC after a rotation of 90°. Rule: (-y, x)

A' (-1 , 1) B' (-1 , 4) C' (-7 , 4)

Counter-clockwise → (left)
(if they don't say which way)

(c) Graph and label $\Delta A''B''C''$ the image of ΔABC after a rotation of 180°. Rule: (-x, -y)

Same as reflection over the origin

A'' (-1 , -1) B'' (-4 , -1) C'' (-4 , -7)

-2 turns
upside down
counter or clockwise

(d) Graph and label $\Delta A'''B'''C'''$ the image of ΔABC after a rotation of 270°. Rule: (y, -x)

A''' (1 , -1) B''' (1 , -4) C''' (7 , -4)

-3 turns
counterclockwise

Same as 90° clockwise
right
on its side