

Module 10c: Rotations

Math Practice(s):

- Model with mathematics.
- Use appropriate tools strategically.

Learning Target(s):

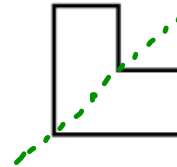
- Develop a definition of a rotation through investigation.
- Perform a rotation about a specified point using various tools; given a pre-image, draw an image.

Homework:

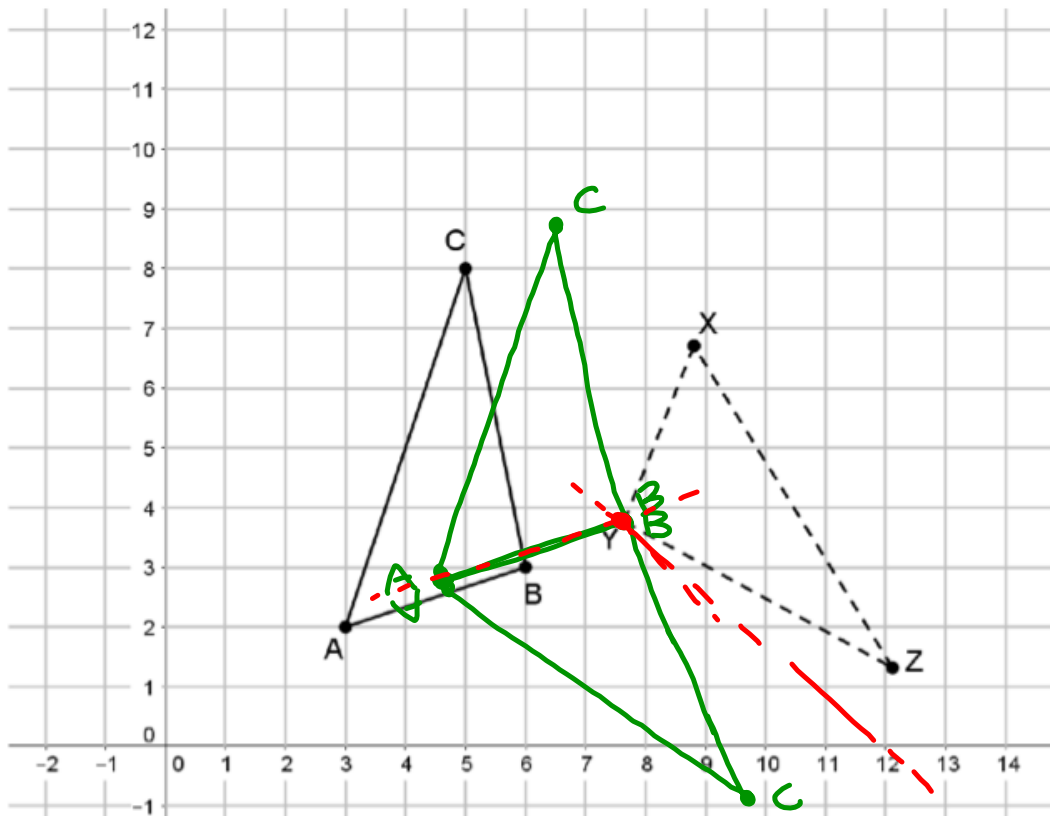
HW#6: 10c #1-5

Warm-up

- Does the figure to the right have reflective symmetry? If so, draw a line of symmetry on the figure.



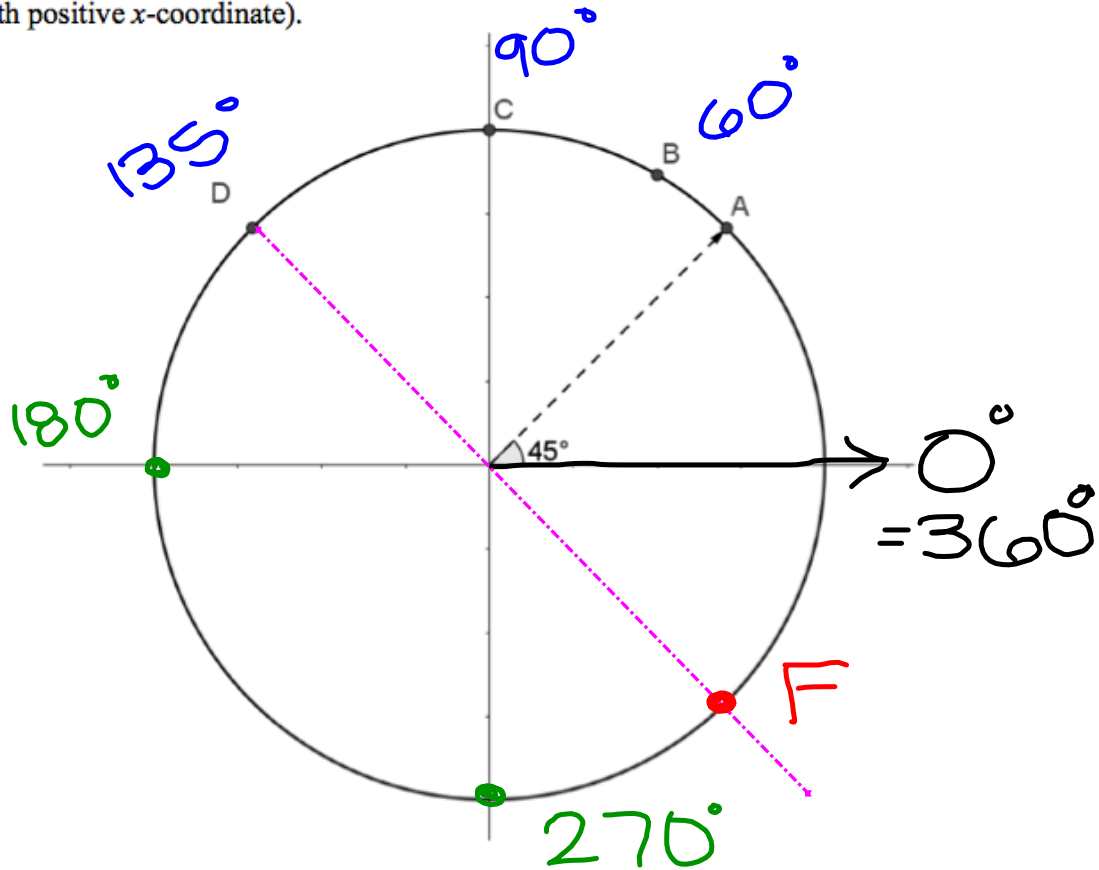
- In the diagram below, $\triangle ABC \cong \triangle XYZ$. Use patty paper to trace the pre-image $\triangle ABC$ below. Try to move your copy of $\triangle ABC$ around using only translations (sliding while retaining the orientation) and reflections (flipping your copy over a line) to arrive at the image $\triangle XYZ$. List the transformations you used below.



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Work with a partner to analyze the diagram below.

Below is a circle with points A, B, C, and D. Recall that a circle has 360 degrees. Points A, B, C, and D are located on the circle at 45° , 60° , 90° , and 135° , respectively, as measured in a counterclockwise direction from the right-hand portion of the x -axis (i.e. the ray with endpoint the origin and containing all points with positive x -coordinate).



- i. Which point on the circle is located 90° from point A in a counterclockwise direction?

D ($45^\circ + 90^\circ = 135^\circ$)

- ii. Which point on the circle is located 30° from C in a clockwise direction?

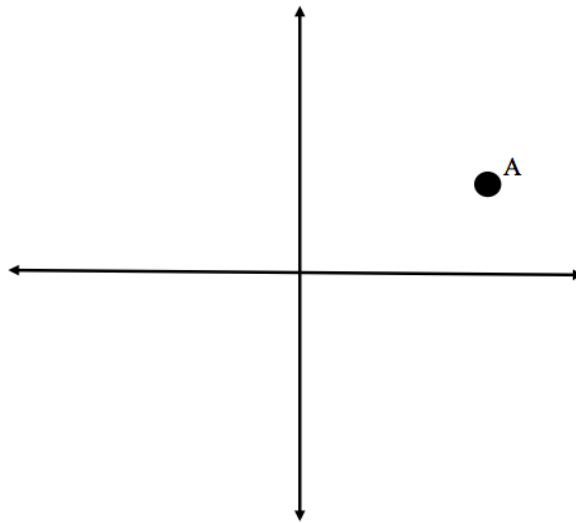
B ($90^\circ - 30^\circ = 60^\circ$)

- iii. Which point on the circle is located 90° in a clockwise direction from D?

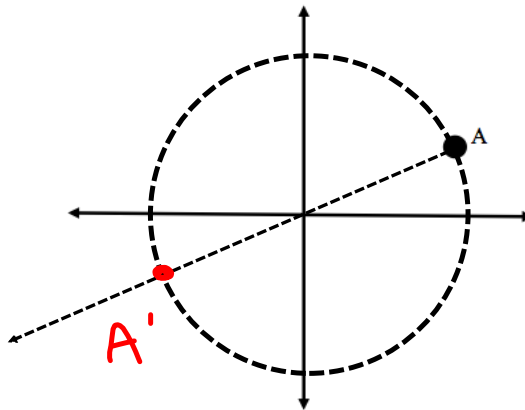
A ($135^\circ - 90^\circ = 45^\circ$)

- iv. Label the point F on the circle that is located 180° in a counterclockwise or clockwise direction from D.

Example 1: Point A is given in the sketch below. Explain to your partner what you think it means to "rotate point A 90° counterclockwise about the origin." (A')



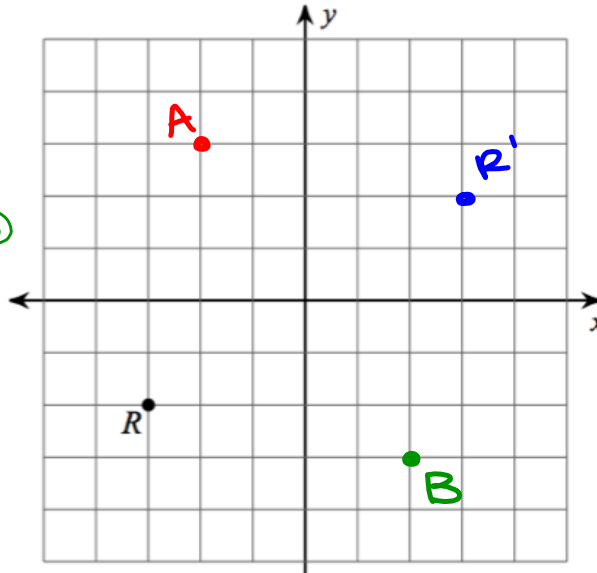
Example 2: Point A is given in the sketch below. Explain to your partner what you think it means to "rotate point A 180° clockwise about the origin." (A')



Example 3: Point R is given to the right.

- a) Rotate point R 90° clockwise about the origin. Label the image A. $(-2, 3)$
- b) Rotate point R 90° counterclockwise about the origin. Label the image B. $(2, -3)$
- c) Rotate point R 180° clockwise about the origin. Label the image R'. $(3, 2)$
- d) Point B could have been obtained by doing a different rotation about the origin. What rotation would that be?

270° clockwise about the origin



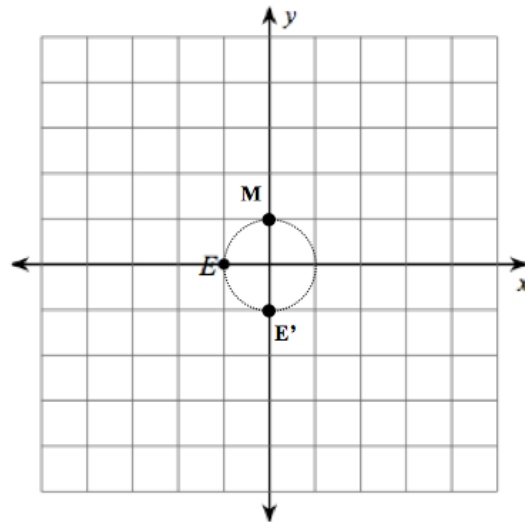
Rotation About a Point

A clockwise/counterclockwise **rotation**, x° about the point C, is a function that moves each point P to a point Q located x° in a clockwise/counterclockwise direction along the circle centered at C with radius PC.

Point E is given to the right.

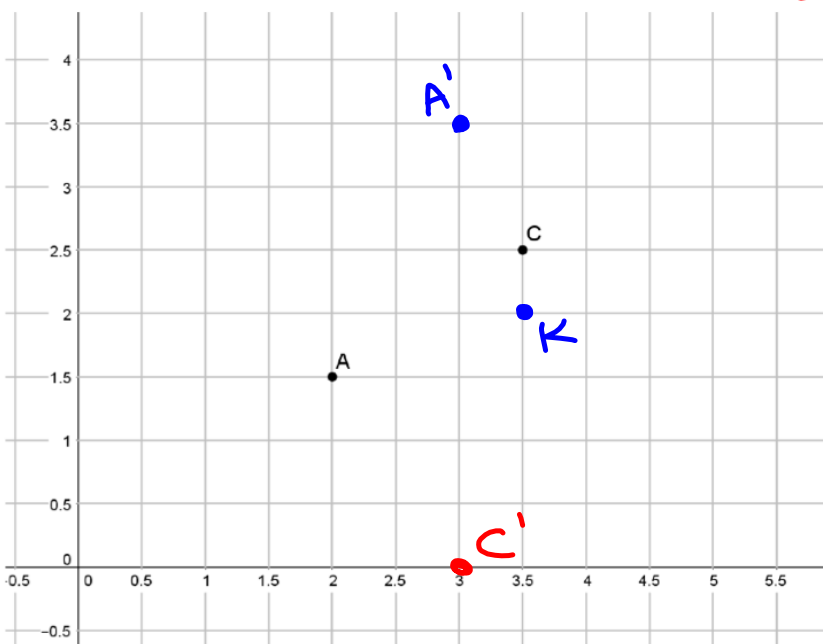
Point E' is a 90° counterclockwise rotation of point E about the origin.

Point M is a 90° clockwise rotation of point E about the origin.



Example 4: Points A and C are given below. Rotate point C 90° clockwise about point A.

$C'(3, 0)$

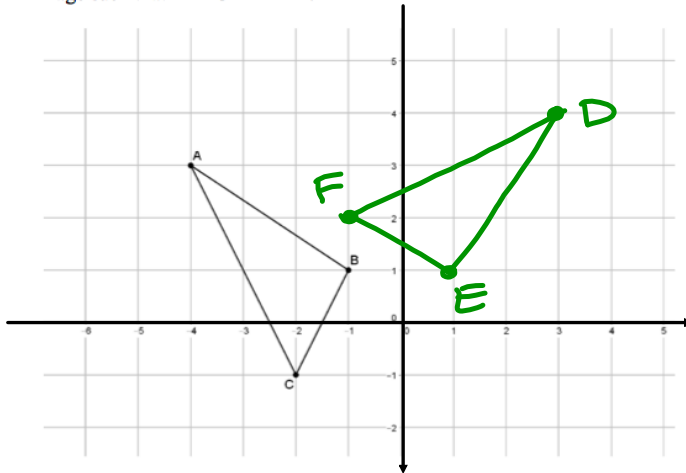


Example 5: In the coordinate plane above, mark the point (3.5, 2) and label it point K. Then, rotate point A 270° counterclockwise about point K.

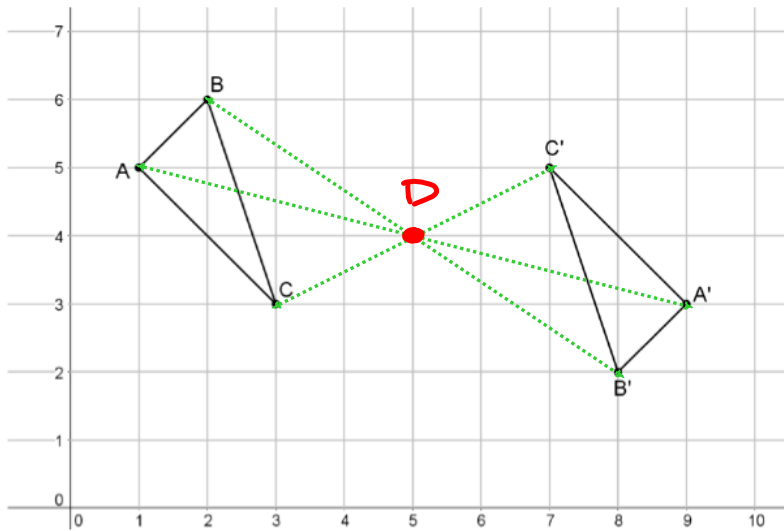
(90° clockwise about point K)

$A'(3, 3.5)$

Example 6: Rotate $\triangle ABC$ 90° in a clockwise direction about the origin to form $\triangle DEF$. Label the image such that $\triangle ABC \cong \triangle DEF$.



Example 7: $\triangle ABC$ below was rotated 180° about point D to create $\triangle A'B'C'$ ($\triangle ABC \cong \triangle A'B'C'$). Determine the location of point D . (Hint: when a single point P is rotated about point D , the distance from its image P' to D remains the same as from P to D .)



*Remember, the point of rotation is the center of a circle that both the pre-image and image are on.

Rotational Symmetry

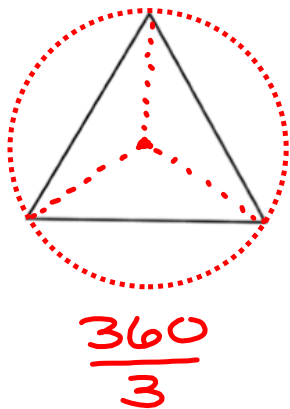
A figure is said to possess **rotational symmetry** if there exists a point C, called the center of rotation, and a number X, so that when the figure is rotated X° in the counterclockwise direction about C the image is the same figure.

Patty Paper Exercise

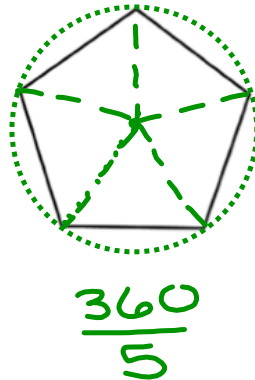
Below are three regular polygons. Perform the following steps for each figure.

- Use patty paper to trace the figure.
- Locate and mark the center of rotation that can be used to show the figure possesses rotational symmetry.
- Lay your copy directly over the figure below so that it matches perfectly.
- Rotate/spin your traced figure about the center of rotation until your copy matches the figure perfectly.
- Determine the value for x that represents the number of degrees you needed to rotate your copy before to perfectly match the given polygon.

A. $x = \underline{120^\circ}$



B. $x = \underline{72^\circ}$



C. $x = \underline{60^\circ}$

