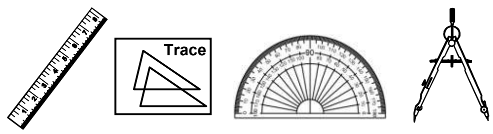
Name: ______________________________ Date: ____________________



ROTATIONS
N-GEN MATH® 8

Another fundamental type of transformation is a **rotation about a center point**. Whenever we perform a rotation we need to specify three things: (1) the **direction of rotation** (clockwise versus counterclockwise), (2) the **center of rotation**, and (3) the **angle of rotation**.

***Exercise* #1:** Rotate point A **counterclockwise about** point C by an angle of $60°$.

(a) Draw an arc of a circle that has its center at C and that passes through A in a counterclockwise direction.

(b) Draw ray $\overrightarrow{CA}$.

(c) Using ray $\overrightarrow{CA}$ and a protractor, draw ray $\overrightarrow{CA'}$ and plot point A'.

(d) Verify that A and A' are the same distance from the center point C. How far, in inches, are both points away from C?

We can rotate figures as well as just points. Let's use the same technique as above to rotate a line segment and see what results.

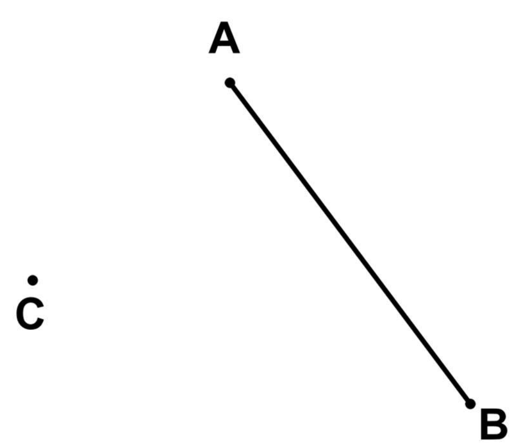
***Exercise* #2:** We would like to investigate rotating segment $\overline{AB}$ by $120°$ about point C in the counterclockwise direction to produce segment $\overline{A'B'}$.

(a) Rotate both endpoints A and B. You will need to draw two arcs centered at C.

(b) Measure the length, in inches, of the preimage, $\overline{AB}$, and its image after the rotation $\overline{A'B'}$.

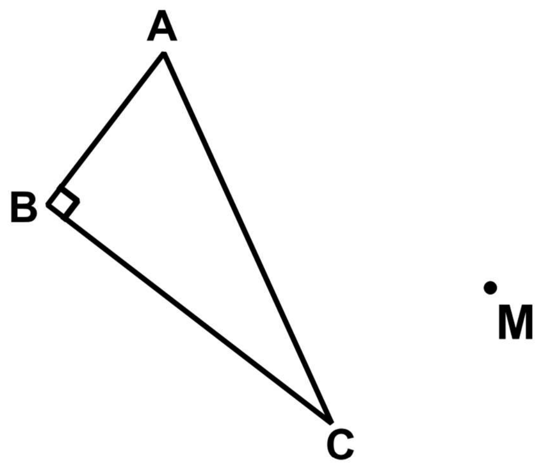
$AB =$ ___________ $A'B' =$ ___________

Did the rotation **preserve the length** of the segment?



When we rotate two points the distance between their images stays the same as the distance between the original two points. Let's now look at rotating an entire figure.

***Exercise* #3:** We want to rotate right triangle ABC below by $90°$ clockwise about point M.

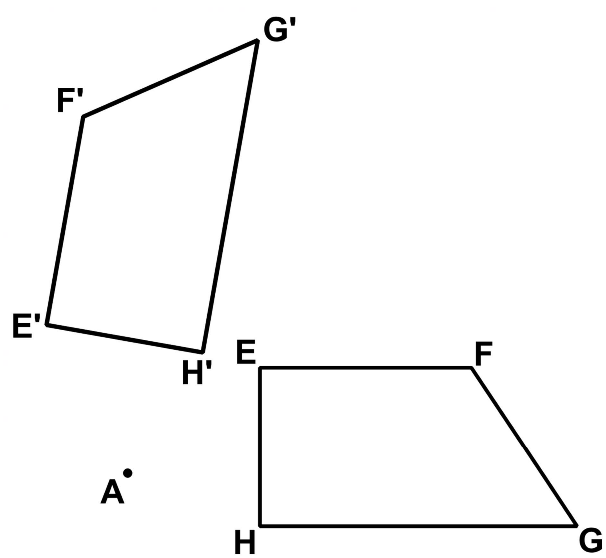


(a) Do the rotation by drawing three arcs centered at M to produce $\Delta A'B'C'$.

(b) Using tracing paper, determine if the two triangles are **congruent**.

We see from this example that a rotation is an example of a **rigid motion**. This means that when we rotate a figure it will always produce an image that is **congruent** with the original.

***Exercise* #4:** Trapezoid E'F'G'H' is the image of trapezoid EFGH after a counterclockwise rotation about point A.



(a) Using your protractor, determine the angle of rotation. Show or explain how you found your answer.

(b) Circle each pair of line segments if the two **must have the same length:**

(1) $\overline{EH}$ and $\overline{E'H'}$

(2) $\overline{AE}$ and $\overline{AH}$

(3) $\overline{AF}$ and $\overline{AF'}$

(4) $\overline{EF}$ and $\overline{HG}$

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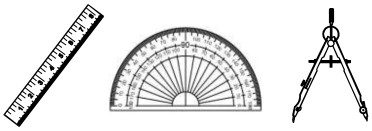
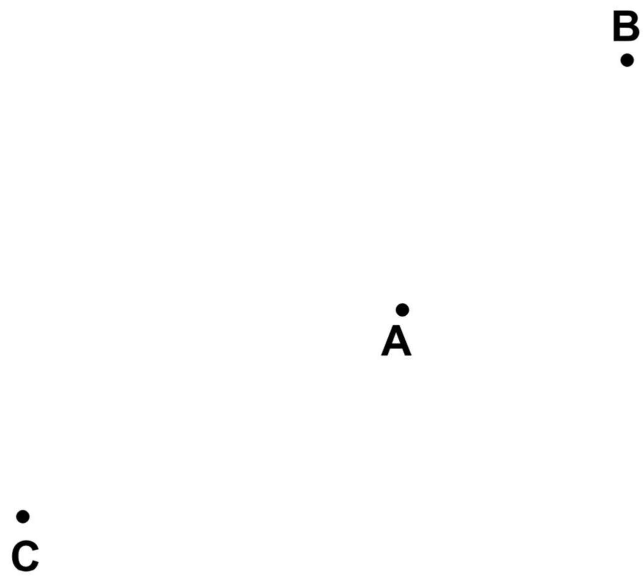


ROTATIONS
N-GEN MATH® 8 HOMEWORK

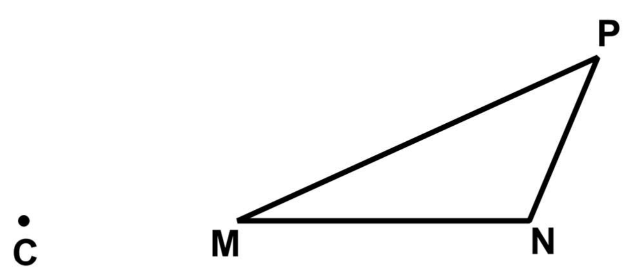
FLUENCY

1. Draw the image of point A after a counterclockwise rotation of $120°$ about point C. Label its image point A'. Leave all marks on your paper.

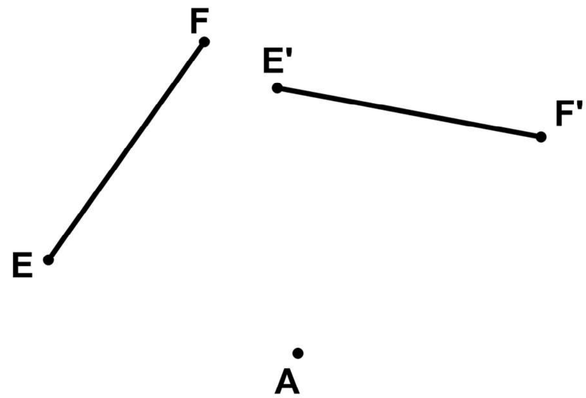


2. Using the same diagram above, draw the image of point B after a $90°$ clockwise rotation about point A. Leave all marks on your paper.

3. Rotate triangle MNP by $90°$ counter-clockwise about point C to produce triangle $M'N'P'$. Leave all marks on your paper.



4. Segment $\overline{E'F'}$ is the image of $\overline{EF}$ after a clockwise rotation about point A. Determine the angle of rotation. Show or explain how you found your answer.

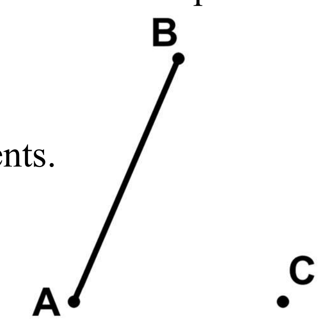


5. Rotations by $180°$ about a point hold a special place in geometry. In the diagram below we want to rotate segment $\overline{AB}$ by $180°$ (a half-turn) clockwise around point C.

(a) Draw the image $\overline{A'B'}$. Leave all marks.

(b) Draw **lines** $\overleftrightarrow{AB}$ and $\overleftrightarrow{A'B'}$ by extending both segments.

(c) What appears to be true about the two lines?



Reasoning

6. When the angle of rotation about a center point is $180°$ why does the direction not matter?

7. Shown below, point A is rotated by $180°$ around point C to produce A'. A rotation by an angle of $180°$ is the only one where the pre-image point, A, the center, C, and the image point, A', all do what? Illustrate on the diagram.