Name: _____Key_____   Date: _____

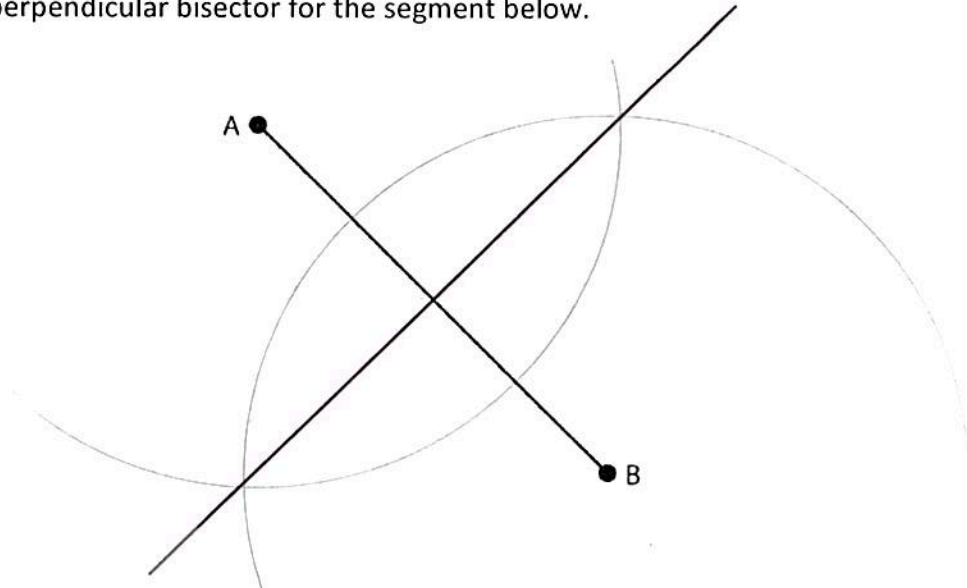UNIT 2   LESSON 6

AIM: HOW DO WE IDENTIFY/CONSTRUCT THE CENTER OF ROTATION OFF THE COORDINATE PLANE?

*Do Now:* Construct the perpendicular bisector for the segment below.

HOW DO WE FIND THE CENTER OF ROTATION OFF THE COORDINATE PLANE?

(1) Pick any point and its mapping point.
(2) Construct the perpendicular bisector.
(3) Repeat steps 1 & 2.
(4) The center of rotation is the point of intersection of the perpendicular bisectors. Label this point P.
(5) Identify the angle of rotation and determine if the rotation is either clockwise or counterclockwise.

Example #1: Given the diagram below:
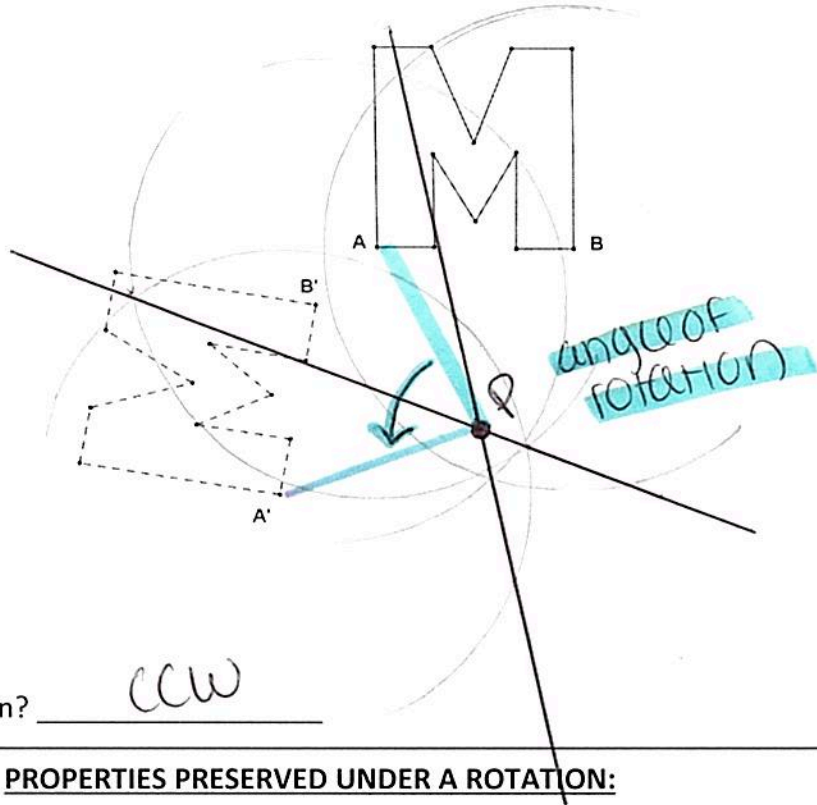(a) Construct the center of rotation and label the point P.
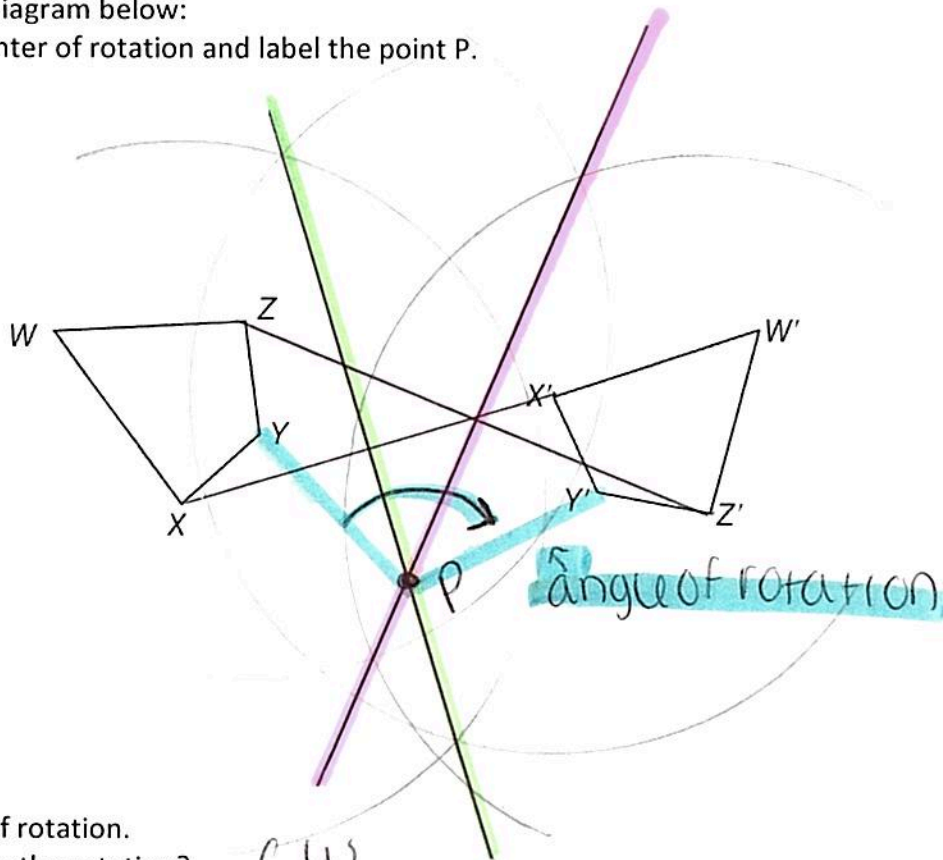
(a) Draw the angle of rotation.
(b) Which direction is the rotation?_____CW_____

Example #2: Construct the center of rotation that maps *M* onto *M'*
(a) Construct the center of rotation and label the point P.

angle of rotation

(b) Draw the angle of rotation.
(c) Which direction is the rotation? _____CCW_____


PROPERTIES PRESERVED UNDER A ROTATION:

1. **DISTANCE** (lengths of segments are the same)
2. **ANGLE MEASURE** (angles stay the same)
3. **ORIENTATION** (lettering order remains the same)
4. **PARALLELISM** (things that were parallel are still parallel)
5. **COLINEARITY** (points on a line, remain on the line)

To describe a ROTATION, three facts are needed:
1. _____center of rotation_____
2. _____angle of rotation (# of degrees)_____
3. _____Direction (cw or ccw)_____

Example #1: Given the diagram below:

A. What point represents the center of rotation? _____O_____

B. What is the angle of rotation? _____90_____

C. Which direction is the rotation? _____CW_____
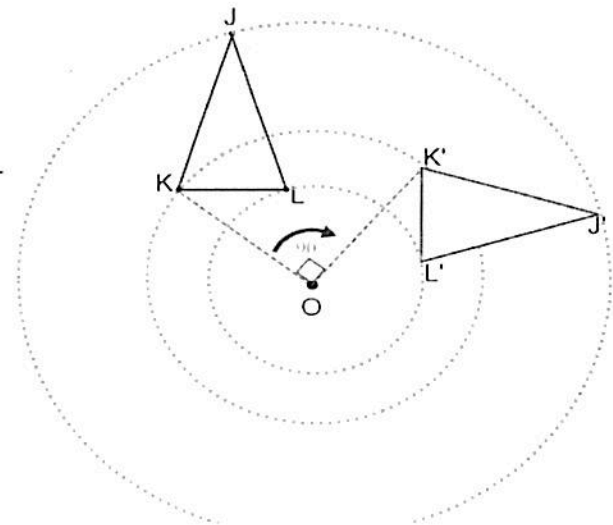
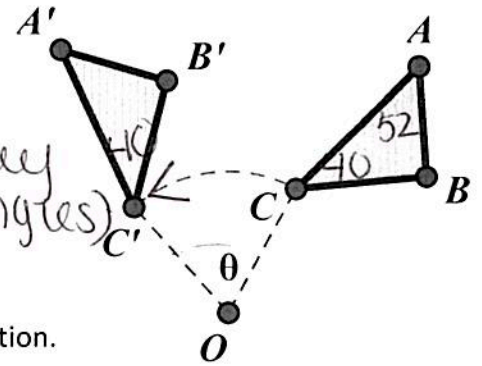**Example #2:** The diagram below shows a rotation of θ degrees was performed on $\triangle ABC$ to create $A'B'C'$.

a) Pre-image is: $\triangle ABC$. Image is: $\triangle A'B'C'$.

b) What is the center of rotation? O

c) What is the angle of rotation? θ (fancy way to say "x" for angles)

d) Which direction is the rotation? CCW

e) If $m\angle A = 52°$ and $m\angle C' = 40°$ find the measure of $\angle B'$. **Explain** your solution.

$$\angle A \cong \angle A'$$
$$\angle B \cong \angle B'$$
$$\angle C \cong \angle C'$$

$$\begin{array}{r} 40 \\ + 52 \\ \hline 92 \end{array}$$

$$\begin{array}{r} 180 \\ - 92 \\ \hline \boxed{88 = \angle B} \end{array}$$

A rotation is a rigid motion which preserves distance and angle measure.

Example #3: Triangle *MNP* is the image of triangle *JKL* after a 120° counterclockwise rotation about point *Q*.
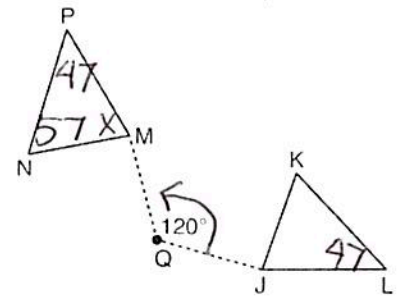
a) Pre-image is: $\triangle JKL$. Image is: $\triangle MNP$.

b) What is the center of rotation? Q

c) What is the angle of rotation? $120°$

d) Which direction is the rotation? CCW

e) If the measure of angle *L* is 47° and the measure of angle *N* is 57°, determine the measure of angle *M*. **Explain** how you arrived at your answer.

$$\angle J \cong \angle M$$
$$\angle K \cong \angle N$$
$$\angle L \cong \angle P$$

$$\begin{array}{r} 47 \\ + 57 \\ \hline 104 \end{array}$$

$$\begin{array}{r} 180 \\ - 104 \\ \hline \boxed{76 = \angle M} \end{array}$$

A rotation is a rigid motion which preserves distance & $\angle$ measure

**If the angle of rotation is *not* indicated, connect two mapping points to the <u>center</u>
<u>of rotation</u> **and draw the angle****

**Example # 1:** Given the diagram below, draw the angle of rotation.

a) What is the pre-image? <u>Quad ABCD</u>

b) What is the image? <u>Quad A'B'C'D'</u>

c) What is the center of rotation? <u>E</u>

d) Which direction is the rotation? <u>CCW</u>

e) Are these figures congruent? <u>Explain</u>.
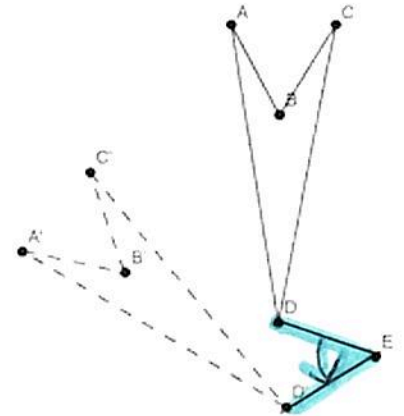
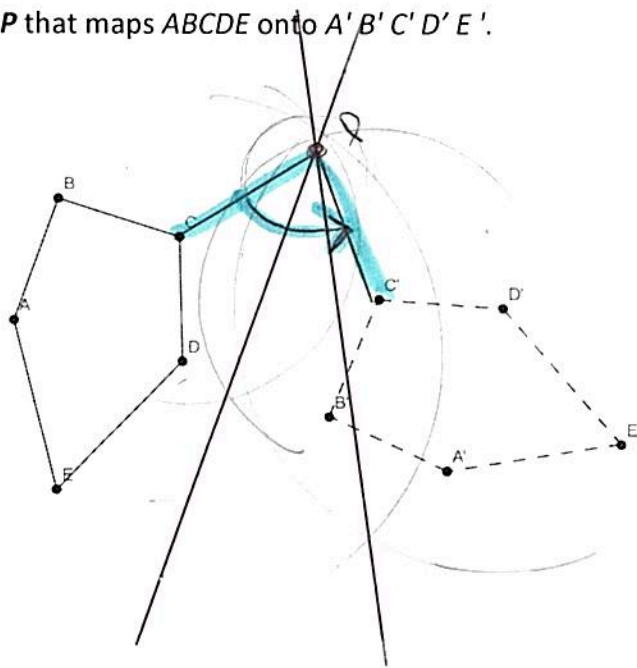<u>yes, a rotation is a rigid motion which</u>
<u>preserves distance, + measure</u>

Example #2: Given the diagram below, draw the angle of rotation.

a. What is the pre-image? <u>△ABC</u>

b. What is the image? <u>△A'B'C'</u>

c. What is the center of rotation? <u>P</u>

d. Which direction is the rotation? <u>CW</u>

e. Are these figures congruent? <u>Explain.</u>
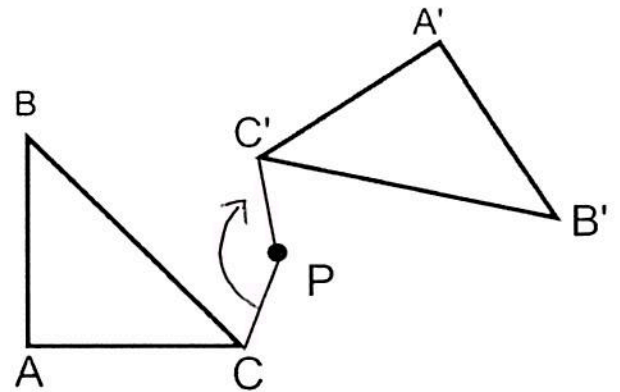
<u>yes, a rotation is a rigid motion which</u>
<u>preserves distance and ∡ measure</u>

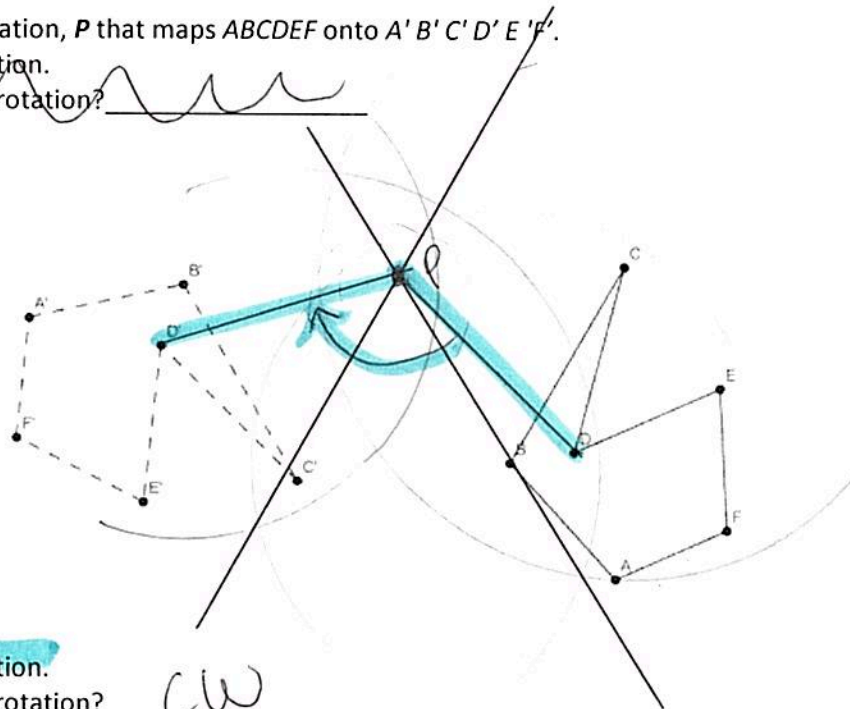1. Construct the center of rotation, *P* that maps *ABCDE* onto *A'B'C'D'E'*.

(A) Draw the angle of rotation.
(B) Which direction is the rotation? CCW
(C) Are these figures congruent? Explain.

yes, a rotation is a rigid motion which preserves distance + ∠ measure

2. Construct the center of rotation, *P* that maps *ABCDEF* onto *A'B'C'D'E'F'*.
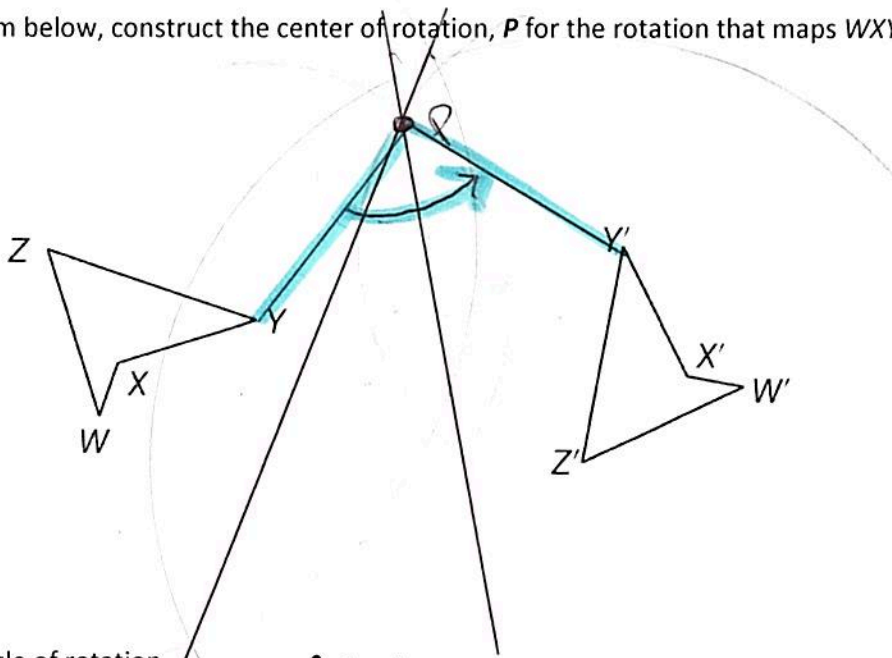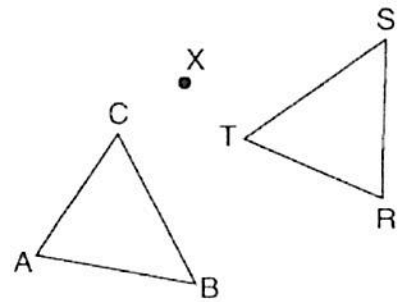(a) Draw the angle of rotation.
(b) Which direction is the rotation?

(D) Draw the angle of rotation.
(E) Which direction is the rotation? CW
(F) Are these figures congruent? Explain.

yes, a rotation is a rigid motion which preserves distance and ∠ measure

3. Given the diagram below, construct the center of rotation, **P** for the rotation that maps WXYZ onto W' X' Y' Z'.

(A) Draw the angle of rotation.
(B) Which direction is the rotation? _____ CW _____
(C) Are these figures congruent? **Explain.**

   yes, a rotation is a rigid motion which preserves distance and ∡ measure

4. After a counterclockwise rotation about point X, scalene triangle ABC maps onto $\triangle RST$, as shown in the diagram below. Which statement must be true?

(1) $\angle A \cong \angle R$ ∡A ≅ ∡R $\overline{AB} \cong \overline{RS}$
(2) $\angle A \cong \angle S$ ∡B ≅ ∡S $\overline{BC} \cong \overline{ST}$
(3) $\overline{CB} \cong \overline{TR}$ ∡C ≅ ∡T $\overline{AC} \cong \overline{RT}$
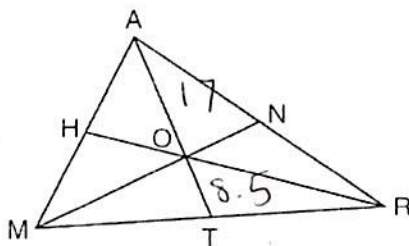(4) $\overline{CA} \cong \overline{TS}$

5. In the diagram below of $\triangle MAR$, medians $\overline{MN}$, $\overline{AT}$, and $\overline{RH}$ intersect at O. If AO = 17 , what is the length of $\overline{TA}$?

   $17 \div 2 = 8.5$

   $\overline{TA} = 17 + 8.5$

   $\boxed{\overline{TA} = 25.5}$

6. In the accompanying diagram, $\overleftrightarrow{ABC} \parallel \overleftrightarrow{DEF}$ and $\overline{BE} \cong \overline{BF}$. If $m\angle CBF = 40$, find $m\angle BED$.

   Linear pair

   Base ∡'s of isosceles △

   alt. int. ∡'s