

## Rotations

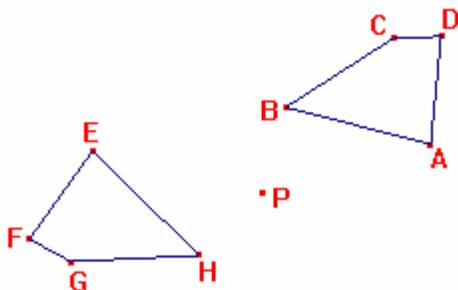
1.
  - a. On a piece of patty paper, draw a small polygon. Label vertices X, Y, etc. Make sure the figure is drawn toward the side of the patty paper.
  - b. Mark a point P on the paper. Draw an acute angle APB with vertex at P. Determine the measure of  $\angle APB$ .
  - c. On a second piece of patty paper, trace the polygon and point P. Also trace  $\overline{PA}$ .
  - d. Stack the papers and align the polygon and point P. Holding point P aligned, turn the bottom paper until its  $\overline{PA}$  is aligned with  $\overline{PB}$  on the top paper. Trace the image onto the first piece of patty paper.
  - e. Locate the vertex X of the original polygon and label its corresponding vertex on the image polygon as X'. Draw  $\overline{XP}$  and  $\overline{X'P}$ . Measure the angle formed. Measure the length of each segment.
  - f. Locate the vertex Y of the original polygon and label its corresponding vertex on the image polygon as Y'. Draw  $\overline{YP}$  and  $\overline{Y'P}$ . Measure the angle formed. Measure the length of each segment.
  - g. Measure XX' and YY'. Are the distances between points on the original polygon and their corresponding image points always the same?
  - h. Correctly complete the following statement concerning rotations by circling the correct word in each pair of italicized words that makes a true statement about rotation.

**Rotation:**

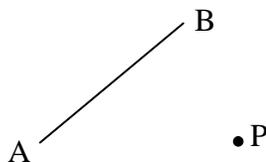
When a figure is rotated around a point, the shape is *changed/not changed*, the orientation of the image in *changed/not changed* and the distance between points and their images are *the same/different* but the angle formed by a point and its image with the center of rotation is always *the same/different*.

## Rotations (Continued)

2. The polygon EFGH is the image of polygon ADCB under a counterclockwise rotation of  $150^\circ$  around point P.



- Name the image of point A.
  - Name the pre-image of G.
  - What is the image of  $\overline{CD}$ ?
3. To construct the image of the segment AB after a rotation of  $90^\circ$  clockwise around point P follow the steps below.



Draw  $\overline{AP}$ .

Draw an  $90^\circ$  angle with vertex at P, side  $\overline{AP}$ , and the other side above and to the right of  $\overline{AP}$ .

Copy the length of  $\overline{AP}$  on to the other side of the  $90^\circ$  angle you drew. Mark point A'.

*Use a different color pencil for the next steps.*

Draw  $\overline{BP}$ .

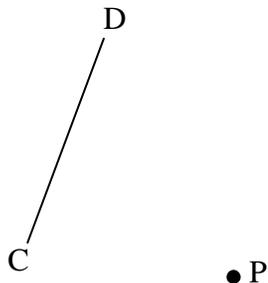
Draw an  $90^\circ$  angle with vertex at P, side  $\overline{BP}$ , and the other side above and to the right of  $\overline{BP}$ .

Copy the length of  $\overline{BP}$  on to the other side of the  $90^\circ$  angle you drew. Mark point B'.

Finally draw segment A'B'.

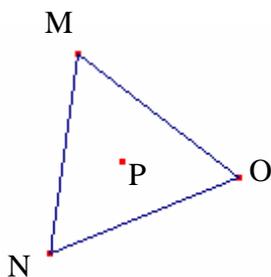
## Rotations (Continued)

4. Construct the image of the segment  $\overline{CD}$  after a rotation of  $120^\circ$  clockwise around point P.



5. How should the angle be drawn if the instruction was to rotate the line segment counterclockwise?
6. Sometimes the center of rotation is inside the figure. Using  $\triangle MNO$  below, draw a segment from the center of rotation, point P, to a vertex. Copy the triangle and the segment to patty paper. Draw the angle of rotation,  $120^\circ$  counterclockwise, on the triangle below. Then place the patty paper on the figure, aligning point P. Rotate the patty paper until the segment on the copy aligns with the other side of the angle of rotation.

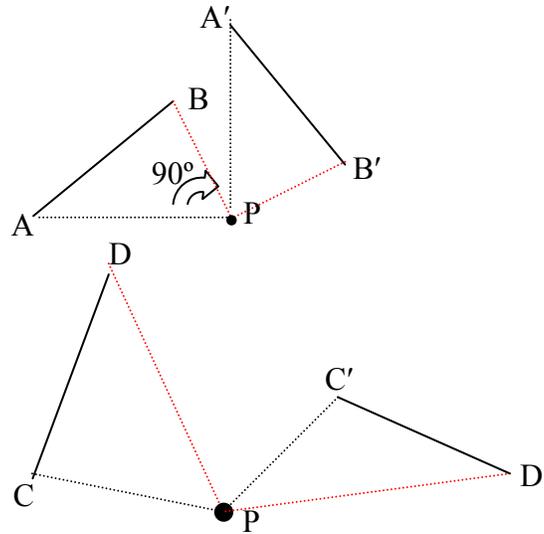
- a. Where does point M end up if you rotate the figure  $120^\circ$  counterclockwise about point P?



- b. Where does point M end up if you rotate the figure  $120^\circ$  clockwise about point P?

Answers:

1. h. When a figure is rotated around a point, the shape is *not changed*, the orientation of the image is *changed* and the distance between points and their images are *the same* but the angle formed by a point and its image with the center of rotation is always *the same*.
2. a. The image of point A is the point E.  
b. The pre-image of the point G is the point C.  
c. The image of  $\overline{CD}$  is  $\overline{GF}$ .
- 3.



- 4.
5. The line segment should be rotated in the other direction and the angle should be constructed in the other direction.
6. a. The point M rotated  $120^\circ$  counter clockwise is the point N.  
b. The point M rotated  $120^\circ$  clockwise is the point O.