Figures are similar if they have the same shape. Similar figures don't necessarily have the same size. A dilation is a transformation that preserves shape. In this activity you'll use a dilation to discover principles of similarity. You'll use your discoveries to come up with a definition of similar polygons.

## SKETCH AND INVESTIGATE

1. Construct any polygon.

Double-click the point to mark it as a center.

Select the segments, then, in the Transform menu, choose
Mark Segment
Ratio. The selection order determines the numerator and denominator of the ratio.

Select the polygon; then, in the Transform menu, choose Dilate.

Select the two segments; then, in the Measure menu, choose Ratio.
2. Construct a point outside the polygon and mark it as a center for dilation.
3. Construct two segments of different lengths and mark them as a ratio.

4. Dilate your entire polygon by the marked ratio.
5. Drag the center of dilation. Also change the lengths of your two segments that define the ratio. Observe how these changes affect the similar polygons.

Q1 How can you make the dilated image coincide with the original figure?
6. If necessary, drag the ratio segments so that the polygons don't coincide.
7. Measure the ratio of these segments' lengths.
8. Measure the ratios of some corresponding sides of your polygons.
9. Experiment with dragging different points on the polygon, the ratio segments, and the dilation center. Observe the ratios of corresponding side lengths in the polygon.
10. To compare angles in the two polygons, drag the center of dilation onto each vertex.

Q2 Use your observations to write a definition of similar polygons.

## EXPLORE MORE

1. To learn more about what a dilation does, construct rays from the point marked as the center through each vertex of your original polygon.
a. What other point does each ray pass through?
b. How does the distance between the center and the first polygon compare to the distance between the
$\qquad$
$0-0$

$0 \longrightarrow$ center and the second polygon?
2. Construct a pair of similar triangles without a dilation. Explain your method.
3. Construct two nonsimilar polygons whose corresponding angles are congruent. Explain your method.
4. Construct two nonsimilar polygons whose corresponding sides are proportional but whose corresponding angles are not congruent. Explain your method.
