

## ***Objectives***

Draw and describe similarity transformations in the coordinate plane.

Use properties of similarity transformations to determine whether polygons are similar and to prove circles similar.

A transformation that produces similar figures is a **similarity transformation**.

A similarity transformation is a dilation or a composite of one or more dilations and one or more congruence transformations.

A **dilation** is a transformation that makes a figure bigger or smaller.

Two figures are similar if and only if there is a similarity transformation that maps one figure to the other figure.

### Example 1: Drawing and Describing Dilations

Apply the dilation  $D$  to the polygon with the given vertices. Describe the dilation.

$$D: (x, y) \rightarrow (3x, 3y)$$

$$A(1, 1), B(3, 1), C(3, 2)$$

Multiply all numbers  
coordinates by the 3.

**Example 2: Drawing and Describing Dilations**

Apply the dilation  $D$  to the polygon with the given vertices. Describe the dilation.

$$D: (x, y) \rightarrow \left( \frac{3}{4}x, \frac{3}{4}y \right)$$

$$P(-8, 4), Q(-4, 8), R(4, 4)$$

Multiply all numbers  
coordinates by the  $3/4$ .

**Example 3 : Determining Whether Polygons are Similar**

Determine whether the polygons with the given vertices are similar.

$$A(\underline{-6}, -6), B(-6, 3), C(3, 3), D(3, -6)$$

$$\text{and } H(\underline{-2}, -2), J(-2, 1), K(1, 1), L(1, -2)$$

Is second set of points a multiple of the first? If yes that is your scale factor and they are similar.

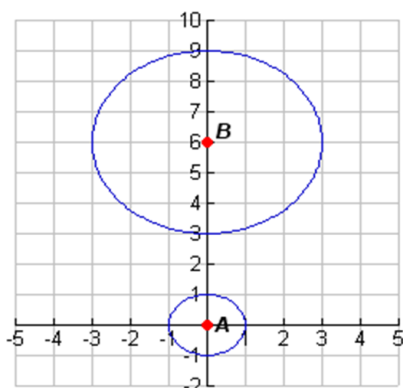
### Example 4: Determining Whether Polygons are Similar

$P(2, 0)$ ,  $Q(2, 4)$ ,  $R(4, 4)$ ,  $S(4, 0)$

and  $W(4, 0)$ ,  $X(4, 8)$ ,  $Y(8, 8)$ ,  $Z(10, 0)$ .

### Example 5: Proving Circles Similar

**Circle A with center  $(0, 0)$  and radius 1 is similar to circle B with center  $(0, 6)$  and radius 3.**



Circle A can be mapped to circle A' by a translation:  $(x, y) \rightarrow (x, y + 6)$ .

Circle A' and circle B both have center  $(0, 6)$ .

Then circle A' can be mapped to circle B by a dilation with center  $(0, 6)$  and scale factor 3.

So circle A and circle B are similar.