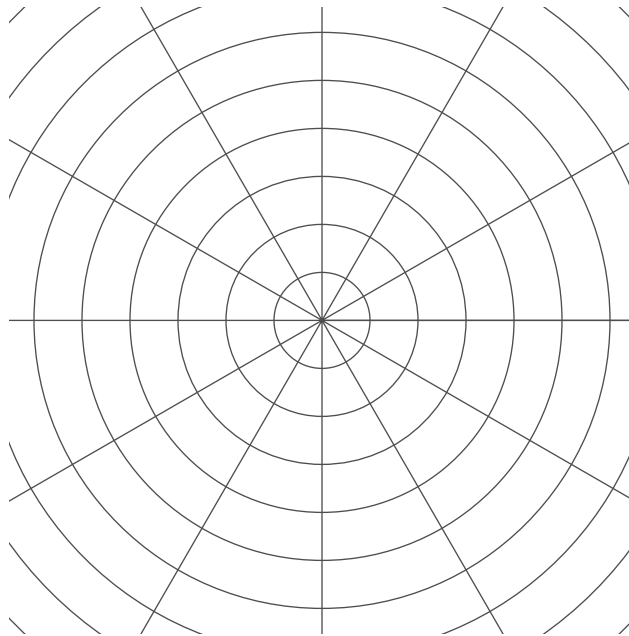


# Circular Grid

Let's dilate figures on circular grids.

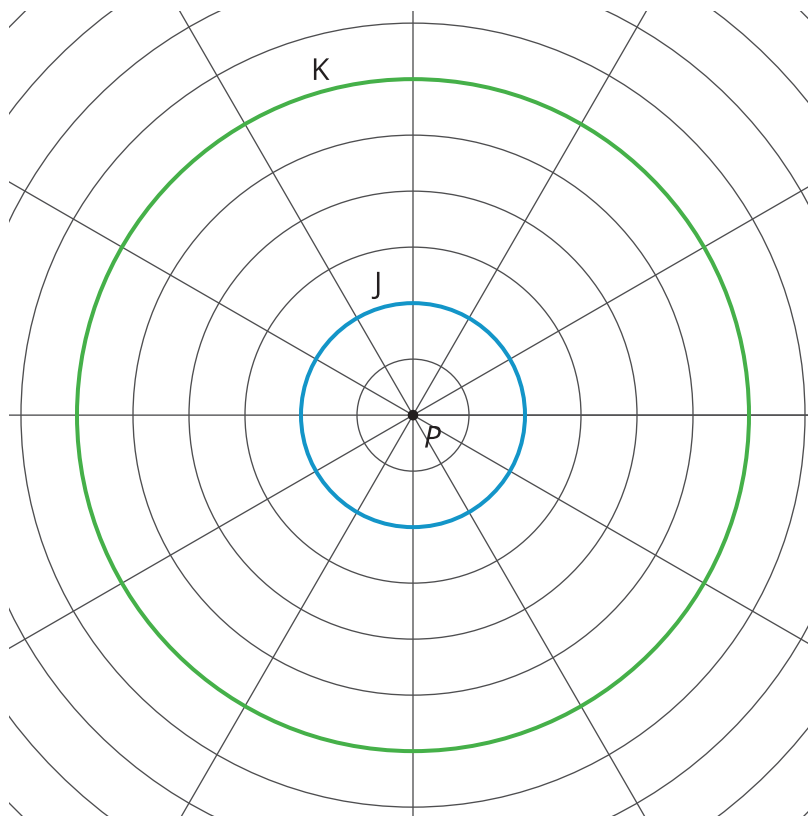
## 2.1 Notice and Wonder: Concentric Circles

What do you notice? What do you wonder?



## 2.2 A Droplet on the Surface

Here are two circles drawn on a circular grid with point  $P$  at the center.



1. Draw four points on Circle J (not inside the circle), and label them  $A$ ,  $B$ ,  $C$ , and  $D$ .
2. Draw a ray from  $P$  through each of your four points.
3. Mark the points where the rays intersect Circle K, and label them as  $E$ ,  $F$ ,  $G$ , and  $H$ .
4. In the first table, write the distance between point  $P$  and each point on the smaller circle. In the second table, write the distance between point  $P$  and each point on the larger circle.

	$A$	$B$	$C$	$D$
$P$				

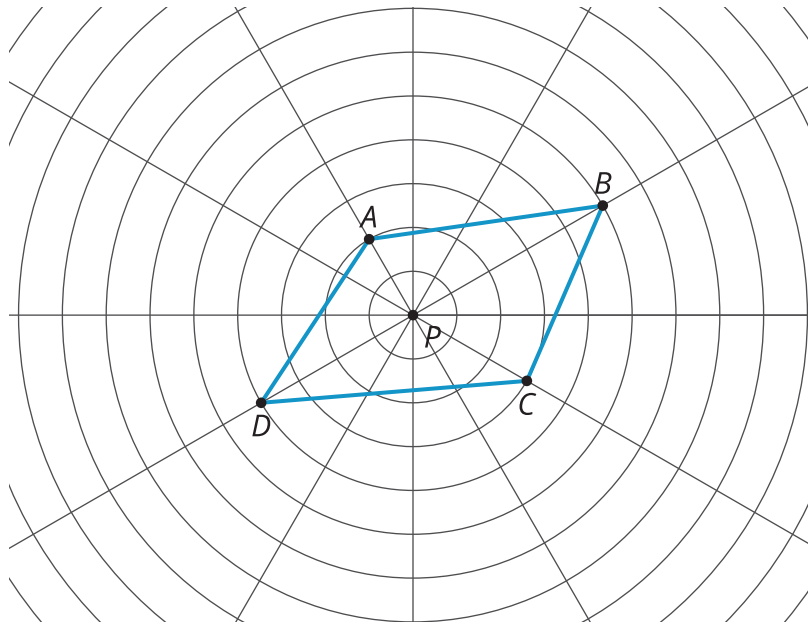
	$E$	$F$	$G$	$H$
$P$				

5. What is the scale factor that takes smaller Circle J to larger Circle K? Explain your reasoning.

## 2.3

## Quadrilateral on a Circular Grid

Here is a polygon  $ABCD$ .



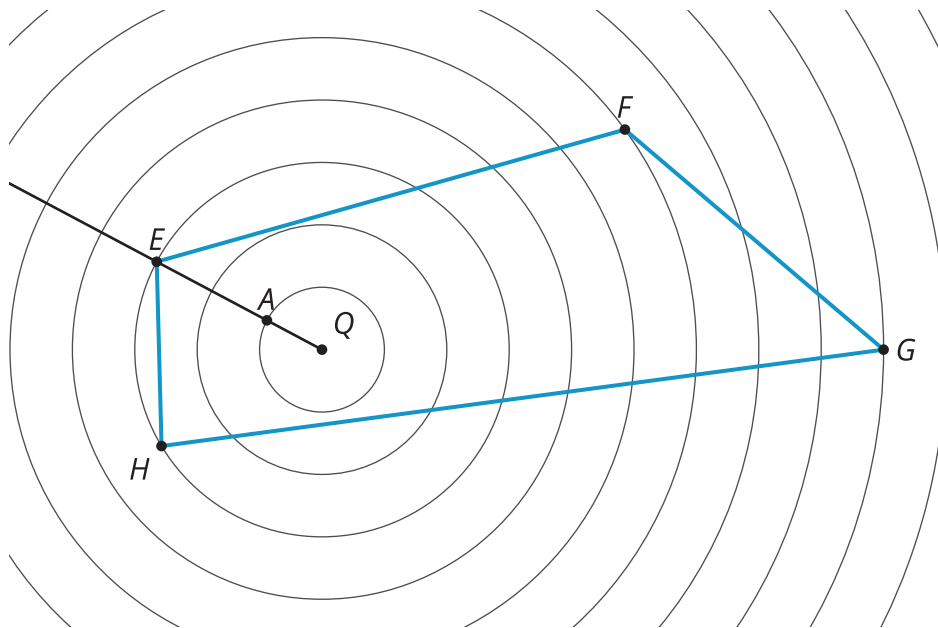
1. **Dilate** each vertex of polygon  $ABCD$  using  $P$  as the center of dilation and a scale factor of 2. Label the image of  $A$  as  $E$ , the image of  $B$  as  $F$ , the image of  $C$  as  $G$ , and the image of  $D$  as  $H$ . Draw segments between the dilated points to create polygon  $EFGH$ .
2. What are some things you notice about the new polygon?
3. Choose a few more points on the sides of the original polygon and transform them using the same dilation. What do you notice?
4. Dilate each vertex of polygon  $ABCD$  using  $P$  as the center of dilation and a scale factor of  $\frac{1}{2}$ . Label the image of  $A$  as  $I$ , the image of  $B$  as  $J$ , the image of  $C$  as  $K$ , and the image of  $D$  as  $L$ . Draw segments between the dilated points to create polygon  $IJKL$ .
5. What do you notice about polygon  $IJKL$ ?

### Are you ready for more?

Suppose  $P$  is a point that is not on line segment  $WX$ . Let line segment  $YZ$  be the dilation of line segment  $WX$  using  $P$  as the center with a scale factor of 2. Experiment using a circular grid to make predictions about whether each of the following statements is always true, sometimes true, or never true.

1. Line segment  $YZ$  is twice as long as line segment  $WX$ .
2. Line segment  $YZ$  is 5 units longer than line segment  $WX$ .
3. The point  $P$  is on line segment  $YZ$ .
4. Line segments  $YZ$  and  $WX$  intersect.

## 2.4 A Quadrilateral and Concentric Circles



Dilate polygon  $EFGH$  using  $Q$  as the center of dilation and a scale factor of  $\frac{1}{3}$ .  $A$ , the image of  $E$ , is already shown on the diagram. (You may need to use a straightedge to draw more rays from  $Q$  in order to find the images of other points.)

## Lesson 2 Summary

A **dilation** is a transformation in which each point on a figure moves along a line and changes its distance from a fixed point, called the center of dilation.

All of the original distances are multiplied by the same scale factor.

In this diagram,  $P$  is the center of dilation and the scale factor is 2.

Each point of triangle  $ABC$  stays on the same ray from  $P$ , but its distance from  $P$  doubles.

Since the circles on a circular grid are the same distance apart, we can simply count units from the center to a given point and use the scale factor to determine where the new point should be located, making the circular grid useful for performing dilations.

