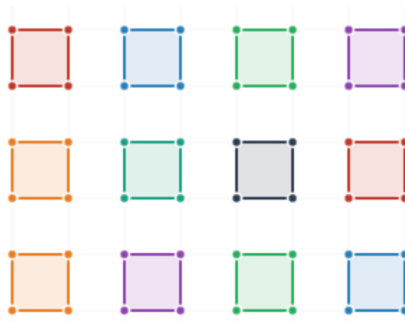


Inversion Activities

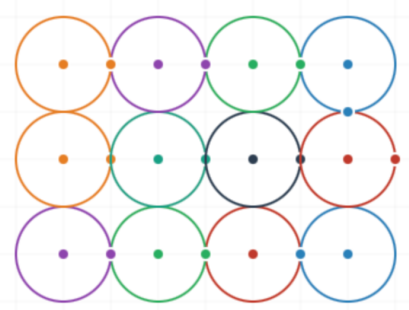
These activities are designed for the [Inversion app](#). Before proceeding, tap Help and watch a video demonstration of the app's features.

1. Construct a point. Turn on Trace Points. Drag the point and observe the location and movement of its inverse. What do you notice?
2. Can a point and its inverse both be inside the circle of inversion? Can they both be outside the circle of inversion? Are there locations where the two points meet?
3. Construct a circle. Drag the circle. What do you notice about its inverse?
4. Construct a circle so that the point on its circumference snaps to the center of inversion. Drag the center of the circle to change its size. What do you notice? To continue, construct a point and turn on Trace Points. Drag the point around the circle. What do you notice about the point and its inverse?
5. Find a circle whose inverse lands exactly on top of itself. Construct a point and turn on Trace Points. Drag the point around the circle. What do you notice about the point and its inverse?
6. Construct two circles and adjust them so that they are tangent to each other. Drag one circle keeping it tangent to the other as best you can. What do you notice about the inverse circles?
7. Construct several concentric circles. What do you notice about their inverses? Explore what happens when the common center of the circles is located at the center of inversion.
8. Construct a line. Drag the line by either of the two points that define it or drag the line itself. What do you notice about its inverse? Slowly drag the line so that it passes through the center of inversion. What do you notice? Construct more lines that pass through the center of inversion.
9. Turn off Show Inverses and turn on Trace Points. Construct a line and a point. Drag the point slowly along the line and observe the path of its inverse. Repeat with different lines, including a line that passes through the center of inversion.

10. With Snap to Grid on, draw some parallel lines. What do you notice about their inverses?
Observe what happens when you drag the center of inversion and change the size of the circle of inversion.
11. With Snap to Grid on, draw a grid of lines. What do you notice about its inverse?
Observe what happens when you drag the center of inversion and change the size of the circle of inversion.
12. With Snap to Grid on, draw a collection of squares, as shown below. What do you notice about the inverse squares?



13. With Snap to Grid on, draw a collection of tangent circles, as shown below. What do you notice about the inverse circles?



14. Turn off Show Inverses. Pick an image from the Gallery and predict what its inverse will look like. Then turn Show Inverses on. Drag the image, resize it by dragging a corner, and experiment with dragging it into the circle of inversion. What do you notice? Which images produce the biggest surprise?
15. Use the Upload Image feature to import your own images into the app and investigate their inverses.
16. Turn on Trace Points. Construct a point and drag it at a steady speed across the screen.
Compare the motion of the point and its inverse. Does the inverse point move at steady

speed? When does it move fastest? When does it move slowest? What role does the distance from the center of inversion seem to play?

17. The mathematician Eli Maor has said that “we may think of the interior of the [circle of inversion] as a condensed image, a microcosmos, of the exterior.” Other descriptions of inversion say that “the interior [of the circle of inversion] is a miniature map of the world outside the circle” and inversion “maps points that are close to the center [of inversion] onto points far away from it.” How do you interpret these statements based on your own experiments and observations?