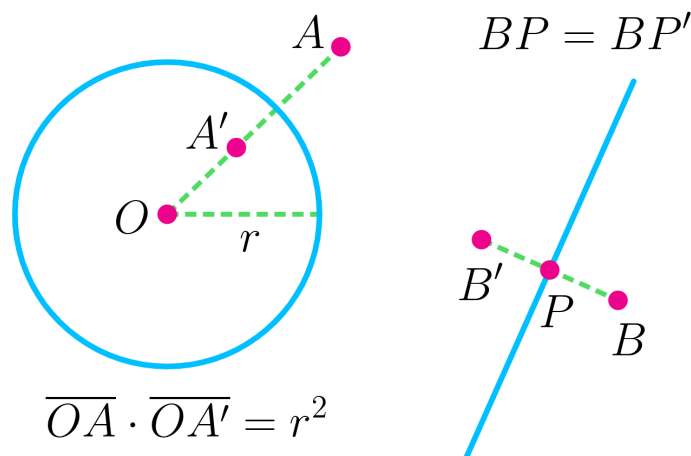# Celestial Shifting

Circle inversions swap the inside and outside of circles by flipping points across them: a point A and its image A' lie on a ray at reciprocal lengths (scaled with the circle's size) from the center. In this context, lines are considered infinitely large circles, and inversions across lines are just reflections.

$$\overline{OA} \cdot \overline{OA'} = r^2$$

$$BP = BP'$$

Look up "inversive geometry" for more information on inversions.

Problem. Show that for any two pairs of points, there is a sequence of inversions which transforms the first pair of points into the second pair of points.

Hint. What happens if we compose inversions across two concentric circles, or across two lines (whether parallel or intersecting)?

Submit your solution online by scanning QR code and filling out the form, or submit at

    `sites.google.com/unomaha.edu/unopow`

A photo of handwritten work is fine. You can also turn in solutions physically at the UNO math department's mail room (located on the second floor of the Durham Science Center).