## Exercises

1. **a.** What is the equation of a circle with center $(6, 0)$ and radius 5?
   **b.** Is the point $Q(2, 3)$ on the circle?
   **c.** Plot $P(12, 8)$. Is $\overline{PQ}$ tangent to the circle?

**In Exercises 2–4, (a) verify that points $A$ and $B$ lie on circle $O$, (b) make a sketch and find $M$, the midpoint of $\overline{AB}$, and (c) use slopes to verify that $\overline{OM} \perp \overline{AB}$.**

2. Circle $O$ has radius 5. The points are $A(0, 5)$ and $B(4, 3)$.

3. Circle $O$ has radius 10. The points are $A(6, 8)$ and $B(-8, 6)$.

4. Circle $O$ has radius $5\sqrt{2}$. The points are $A(5, 5)$ and $B(-7, 1)$.

5. Sketch the circles $x^2 + y^2 = 225$ and $(x - 6)^2 + (y - 8)^2 = 25$ and explain why the circles must be internally tangent. (*Hint:* Find the two radii and the distance between the centers of the circles.)

6. **a.** Sketch the circle $x^2 + y^2 = 25$ and the line $y = 2x - 5$.
   **b.** Solve the two equations simultaneously by substituting $2x - 5$ for $y$ in the equation $x^2 + y^2 = 25$. Solve the resulting quadratic equation by factoring. For each value of $x$, find the corresponding value of $y$ by substituting into the equation $y = 2x - 5$.
   **c.** Your two solutions in part (b) correspond to two points on the circle. Show them on your sketch.
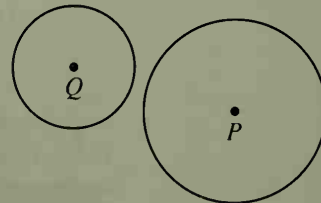
7. $\overleftrightarrow{PA}$ is tangent to circle $O$ at $A$.
   **a.** If the figure shown is reflected in $\overleftrightarrow{PO}$, what is the image of circle $O$? of $\overline{PA}$?
   **b.** Since a reflection is an isometry, what do you know about $\overline{PA}$ and its image?
   **c.** State the corollary that part (b) proves.
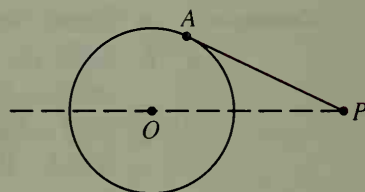


8. Circles $P$ and $Q$ intersect at $A$ and $B$.
   **a.** What is the image of $A$ when reflected in $\overleftrightarrow{PQ}$?
   **b.** What does part (a) tell you about $\overline{AB}$ and $\overleftrightarrow{PQ}$?
   **c.** Sketch the image of $\overline{XY}$ when reflected in $\overleftrightarrow{PQ}$.
   **d.** What can you deduce from part (c) about the common external tangents of two circles?
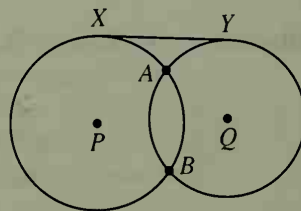


★ 9. Find an equilateral triangle $ABC$ with vertex $B$ on $\odot P$ and vertex $C$ on $\odot Q$. (*Hint:* Rotate $\odot P$ 60° about $A$. Its image will intersect $\odot Q$ in two points. Either of these points can be the desired vertex $C$. How do you find $B$?)