PROBLEM 1 Keep Both Hands on the Wheel

Recall that the degree measure of a circle is 360°.

Each minor arc of a circle is associated with and determined by a specific central angle. The **degree measure** of a minor arc is the same as the degree measure of its central angle. For example, if the measure of central angle *PRQ* is 30°, then the degree measure of its minor arc *PQ* is equal to 30°. Using symbols, this can be expressed as follows: If $\angle PRQ$ is a central angle and $m\angle PRQ = 30°$, then $m\overset{\frown}{PQ} = 30°$.

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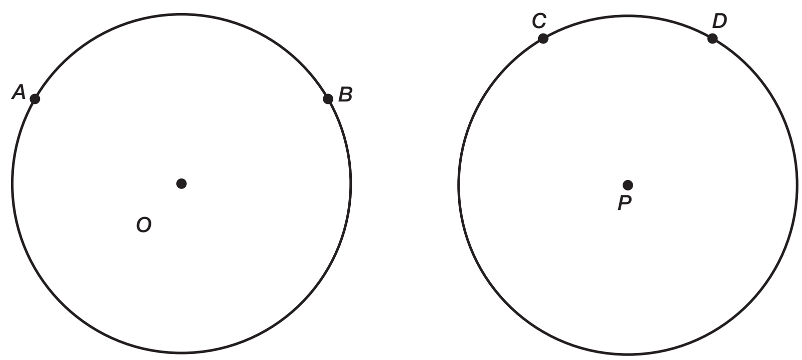
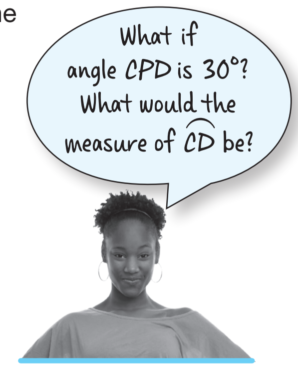
1. The circles shown represent steering wheels, and the points on the circles represent the positions of a person's hands.





For each circle, use the given points to draw a central angle. The hand position on the left is 10–2 and the hand position on the right is 11–1.

a. What are the names of the central angles?

b. Without using a protractor, determine the central angle measures. Explain your reasoning.

c. How do the measures of these angles compare?

d. Why do you think the hand position represented by the circle on the left is recommended and the hand position represented on the right is not recommended?

e. Describe the measures of the minor arcs.

f. Plot and label point Z on each circle so that it does not lie between the endpoints of the minor arcs. Determine the measures of the major arcs that have the same endpoints as the minor arcs.

2. If the measures of two central angles of the same circle (or congruent circles) are equal, are their corresponding minor arcs congruent? Explain your reasoning.

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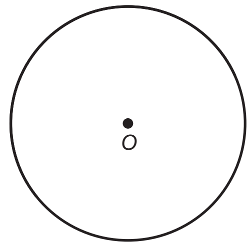
4. Draw and label two adjacent arcs on circle O shown.

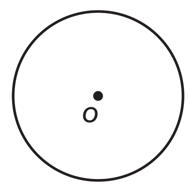


The **Arc Addition Postulate** states: "The measure of an arc formed by two adjacent arcs is the sum of the measures of the two arcs."

5. Apply the Arc Addition Postulate to the adjacent arcs you created.

An *intercepted arc* is an arc associated with and determined by angles of the circle. An **intercepted arc** is a portion of the circumference of the circle located on the interior of the angle whose endpoints lie on the sides of an angle.

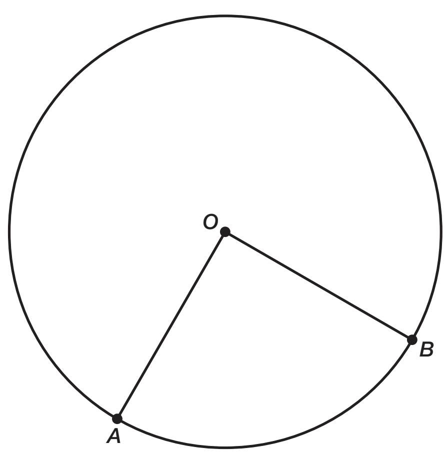
6. Consider circle O.



   a. Draw inscribed $\angle PSR$ on circle O.

   b. Name the intercepted arc associated with $\angle PSR$.

7. Consider the central angle shown.



   a. Use a straightedge to draw an inscribed angle that contains points A and B on its sides. Name the vertex of your angle point P. What do the angles have in common?

b. Use your protractor to measure the central angle and the inscribed angle. How is the measure of the inscribed angle related to the measure of the central angle and the measure of $\overset{\frown}{AB}$?

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c. Use a straightedge to draw a different inscribed angle that contains points *A* and *B* on its sides. Name its vertex point *Q*. Measure the inscribed angle. How is the measure of the inscribed angle related to the measure of the central angle and the measure of $\overset{\frown}{AB}$?

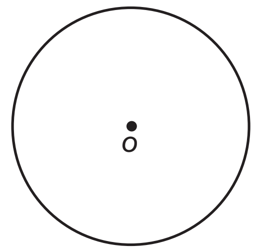
d. Use a straightedge to draw one more inscribed angle that contains points *A* and *B* on its sides. Name its vertex point *R*. Measure the inscribed angle. How is the measure of the inscribed angle related to the measure of the central angle and the measure of $\overset{\frown}{AB}$?

8. What can you conclude about inscribed angles that have the same intercepted arc?

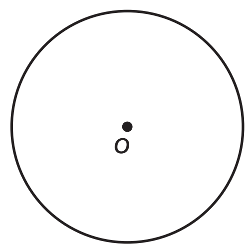
9. Dalia says that the measure of an inscribed angle is half the measure of the central angle that intercepts the same arc. Nate says that it is twice the measure. Sandy says that the inscribed angle is the same measure. Who is correct? Explain your reasoning.

10. Inscribed angles formed by two chords can be drawn three different ways with respect to the center of the circle.

Case 1: Use circle O shown to draw and label inscribed $\angle MPT$ such that the center point lies on one side of the inscribed angle.



Case 2: Use circle O shown to draw and label inscribed $\angle MPT$ such that the center point lies on the interior of the inscribed angle.



Case 3: Use circle O shown to draw and label inscribed $\angle MPT$ such that the center point lies on the exterior of the inscribed angle.