



Secants, Tangents, and Arcs

Student Activity

Name _____

Class _____

Open the TI-Nspire document *Secants_Tangents_and_Arcs.tns*.

In this activity you will first review major and minor arcs and then explore several cases in which two lines intersect at a point and also intersect a circle. You will investigate angle and arc relationships for these lines.



Move to page 1.2.

Press **ctrl** **▶** and **ctrl** **◀** to navigate through the lesson.

1. Two points, A and B , on a circle determine a minor arc AB . The measures of $\angle AOB$ and the minor arc AB are shown. Drag point A or B . The measure of a minor arc is defined to be equal to the measure of its central angle.
 - a. How do you find the measure of the major arc ADB if the measure of the minor arc AB is known?
 - b. When are the measures of arcs AB and ADB exactly the same?

Move to page 2.1.

Two lines are shown that intersect each other at point P .

If a line intersects a circle in two points, it is called a secant line to the circle.

If a line intersects a circle in only one point, it is called a tangent line to the circle.

2. The measures of $\angle APB$ and the arcs AB and CD intercepted by $\angle APB$ and its vertical angle are shown.
 - a. Drag point P around in the interior of the circle, but not at the center. With respect to the circle, what types of lines are \overline{PA} and \overline{PB} ?
 - b. Find a relationship between the measure of $\angle APB$ and the measures of intercepted arcs AB and CD .



Secants, Tangents, and Arcs

Student Activity

Name _____

Class _____

- c. Drag point P to coincide with the center of the circle. With respect to the circle, what types of lines are \overline{PA} and \overline{PB} ?
- d. Does the relationship you found in question 2b still hold?
3. Drag point P to several places outside of the circle, but make sure both \overline{PQ} and \overline{PR} intersect the circle in two points.
- a. With respect to the circle, what types of lines are \overline{PA} and \overline{PB} ?
- b. Find a relationship between the measure of $\angle APB$ and the measures of intercepted arcs AB and CD .
4. Leave P outside of the circle. Make sure both \overline{PQ} and \overline{PR} intersect the circle in two points. Drag point Q so that point C coincides with point A .
- a. With respect to the circle, what types of lines are \overline{PA} and \overline{PB} ?
- b. Does the relationship you found in question 3b still hold?
5. Leave P outside of the circle and leave C so that it still coincides with point A . Drag point R so that point B coincides with point D .
- a. With respect to the circle, what types of lines are \overline{PA} and \overline{PB} ?
- b. Is there a relationship between the measure of $\angle APB$ and the measure of the minor arc? Does the relationship you found in question 3b still hold?



6. Some students have made statements based on their experiences with this TI-Nspire file.
- Bryan says that if two secants intersect in the interior of a circle, then the measure of an angle between them is one-half the sum of the measures of the arcs intercepted by the angle and its vertical angle. Do you agree? Which of your answers lend support for or against Bryan's statement?

 - Dajah says that if two secants intersect in the exterior of a circle, then the measure of the angle formed is one-half the difference between the two intercepted arcs. Do you agree? Which of your answers lend support for or against Dajah's statement?

 - Michael agrees with Dajah, but he also thinks her statement is true for the case when there is a secant and a tangent, and also for the case when there are two tangents. Do you agree? Which of your answers lend support for or against Michael's statement?