Investigating Segment Lengths

You can use geometry software to explore the lengths of segments in a circle.

▶ **CONSTRUCT** **Follow the steps to construct a circle and two intersecting lines.**

1 Draw a circle.

2 On the circle, draw and label points A, B, C, and D.

3 Draw lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$.

4 Draw the point of intersection of $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$. Label it point E.
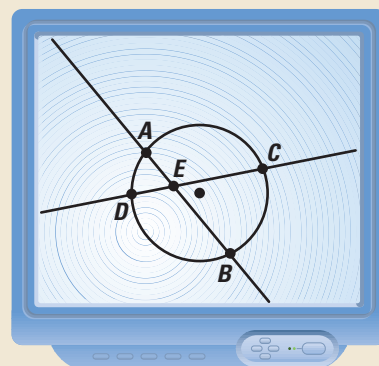
▶ **INVESTIGATE**

1. Drag points A, B, C, and D. Can you rearrange the points so that point E is outside the circle? on the circle? inside the circle?

2. Draw $\overline{EA}$, $\overline{EC}$, $\overline{EB}$, and $\overline{ED}$. Hide $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$.

3. Rearrange the points A, B, C, and D so that point E is inside the circle. Measure $\overline{EA}$, $\overline{EC}$, $\overline{EB}$, and $\overline{ED}$. Calculate $EA \cdot EB$ and $EC \cdot ED$. What do you notice?

4. Drag points A, B, C, and D, keeping point E inside the circle. What do you notice about $EA \cdot EB$ and $EC \cdot ED$?
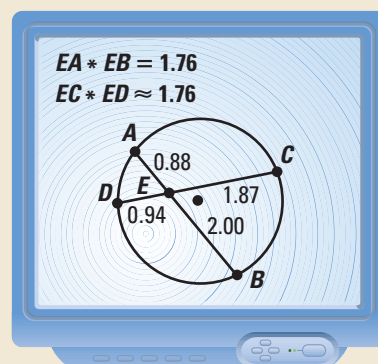
▶ **CONJECTURE**

5. Make a conjecture about the lengths of the segments of intersecting chords.

▶ **INVESTIGATE**

6. Drag points A, B, C, and D so that point E is outside the circle. What do you notice about $EA \cdot EB$ and $EC \cdot ED$?

▶ **CONJECTURE**

7. Make a conjecture about the lengths of the segments of secants from a point outside a circle to the circle.

EXTENSION

CRITICAL THINKING Move point A until it is in the same place as point B. What kind of line is $\overleftrightarrow{EA}$? What is the relationship between EA, EC, and ED? Make and test a conjecture.