Exploring Secants
with Geometer’s Sketchpad

In this activity, we will investigate properties of secants within a circle.

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***Def. Secant–*** *a line that intersects a circle at \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

$\overleftrightarrow{AB}$is a secant of circle *O.*

***Construction note:*** *When making the following constructions, do not use the initial construction point on the circle as one of your endpoints for chords or arcs. Save this point as a handle to modify the size of the circle.*

**Part 1: Arc Measures**

1. Construct circle *O* (label the center *O*).
2.  Construct secants $\overleftrightarrow{AB}$ and $\overleftrightarrow{AC}$ with points *B* and *C* outside the circle
(as in the drawing to the right.)
3. Now select the circle and $\overleftrightarrow{AB}$. Construct the points of intersection using the construct menu and label these points *D* and *E*.
4. Now select the circle and $\overleftrightarrow{AC}$. Construct the points of intersection using the construct menu and label these points F and *G*.
5. Measure the arc angles $\hat{DF}$ and $\hat{EG}.$
6. Measure angle $∠BAC$.
7. Calculate $m\hat{DF}+m\hat{EG}$ and $m\hat{DF}-m\hat{EG}$

**Case 1: Intersection inside circle**

1. Move point *A* inside the circle.
2. How does $m∠BAC$ relate to one of the calculations from #7?

Write a conjecture based on your observations:

Move point *A* around the inside of the circle to test your conjecture.

**Case 2: Intersection of two secants outside the circle**

1. Move point *A* outside the circle.
2. How does $m∠BAC$ relate to one of the calculations from #7? Move points *B* and *C*

Write a conjecture based on your observations:

Move point *A* around the inside of the circle to test your conjecture.

**Part 2: Exploring Secant Lengths**

1. Continue with the same construction in Part 1.
Measure the distances *AE*, *AD*, *AF*, and *AG.*
2. Move point *A* inside the circle.
3. Make a conjecture about the relationship between the segment lengths.
Use the *Calculate* feature to test your conjecture.

*a*

*c*

*d*

*b*

1. Now move point *A* outside the circle.
2. Make a conjecture about the relationship between the segment lengths.
Use the *Calculate* feature to test your conjecture.

*z*

*y*

*x*

*w*