

Tangent Lines, Secants, and Chords – Part 1

Let's examine the following figures.



chord diameter secant tangent

What differences do you see among these figures?

Different locations & intersect at different points

Which of these figure(s) have you not seen yet?

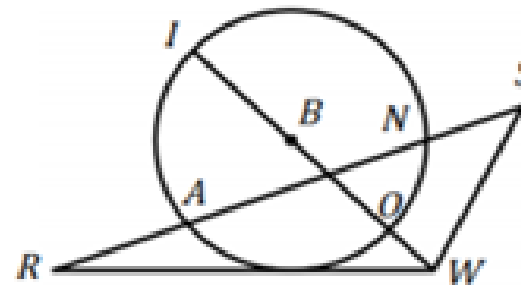
Last 2

A **secant** is a line that intersects a circle at 2 points.

A **tangent** is a line in the plane of a circle that intersects the circle at exactly 1 point.

1. Classify each of the following segments as a radius, chord, secant, tangent, or diameter.

\overline{TB} is a radius
 \overline{AN} is a chord
 \overline{WR} is a tangent
 \overline{RS} is a secant
 \overline{IO} is a diameter



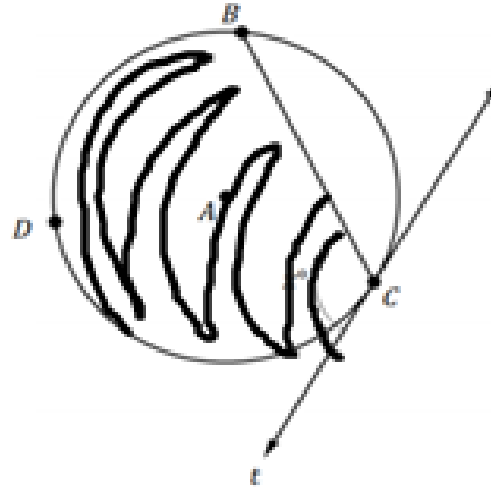
2. Mark the most appropriate answer for each statement in the table below.

Statements	Always	Sometimes	Never
A chord is part of a secant.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
A diameter is a tangent.	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
A tangent is a ray.	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
A tangent has exactly one point in common with a circle.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
A secant to a circle contains the diameter.	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
A chord in a circle contains a radius.	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>

Consider the diagram below.



$$x = \frac{1}{2} m \widehat{AC}$$



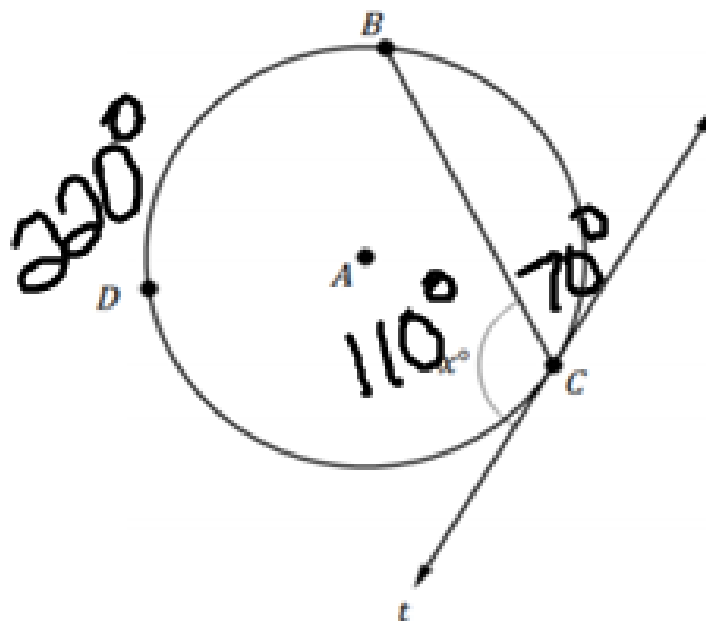
Circle A has chord \overline{BC} and tangent line t through C . The chord and the tangent line form an angle measuring x° . What do you think is the value of x in the above figure?

$$x = \frac{1}{2} (m \widehat{BDC})$$

Tangent chord Angle Theorem

The measure of an angle formed by a chord and a tangent line is $\frac{1}{2}$ the measure of the intercepted arc.

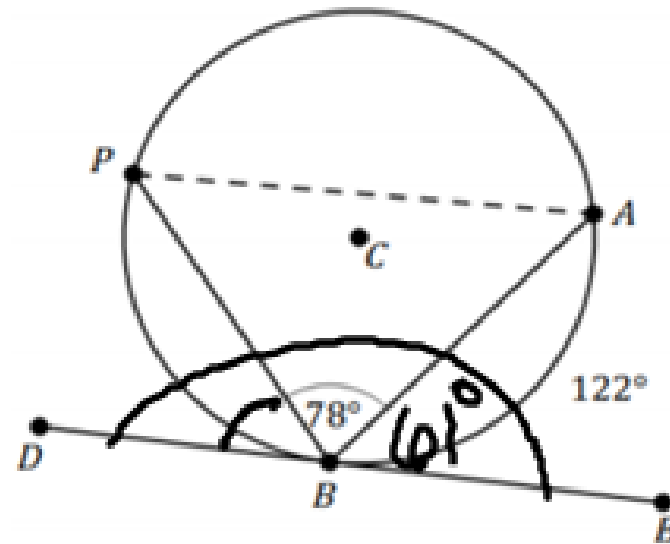
1. Consider the diagram below.



If $m\widehat{CDB}$ is 220° , then what is the supplement of the angle measuring x° ? Justify your answer.

$$\frac{220}{2} = 110^\circ$$
$$\begin{array}{r} 180 \\ - 110 \\ \hline 70^\circ \end{array}$$

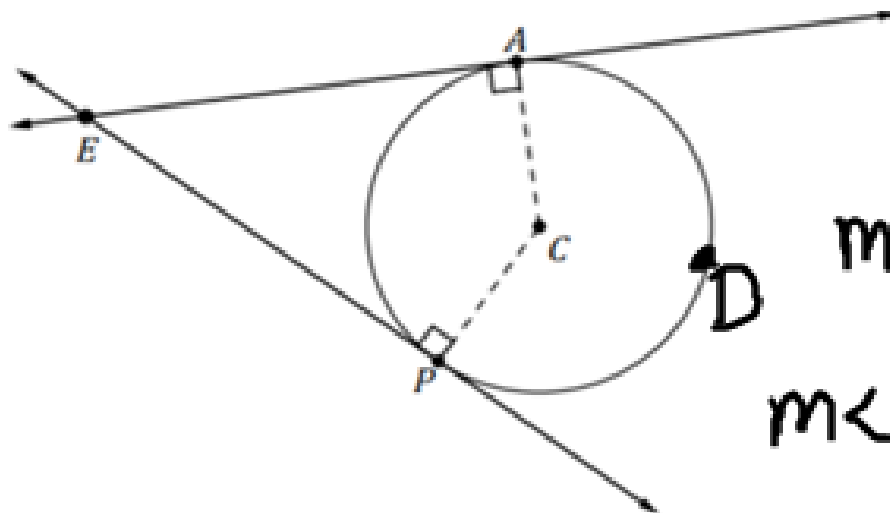
Consider the diagram below.



a. Determine the $m\angle PBD$.

$$\frac{122}{2} = 61$$

$$\begin{array}{r} + 61 \\ + 78 \\ \hline 139 \end{array} \quad \begin{array}{r} 180 \\ - 139 \\ \hline 41 \end{array}$$



$$m\angle E = \frac{1}{2} (m\widehat{AD} - m\widehat{AP})$$

$$m\angle E + m\angle C = 180$$

$\angle AEP$ is a Circumscribed angle.

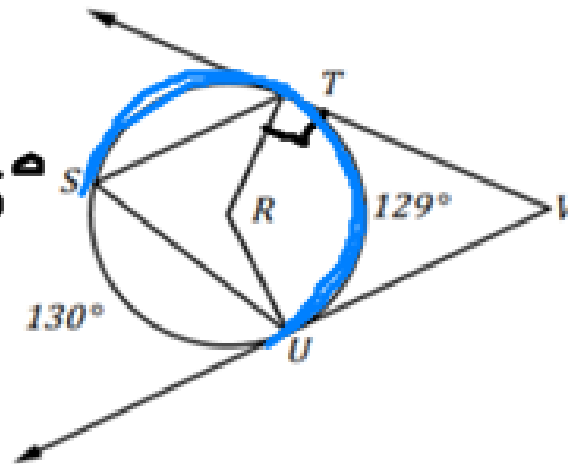
A Circumscribed angle is an angle with rays tangent to the circle. It is equal to $\frac{1}{2}$ of the difference between the intercepted arcs.

The Circumscribed angle and the central angle formed by the same arcs are supplementary angles.

Let's Practice!

3. Find each of the following angles and arcs formed in circle R .

- a. $m\angle RTV = 90^\circ$
 b. $m\angle TRU = 129^\circ$
 c. $m\angle TVU = 51^\circ$
 d. $m\angle TSU = 64.5^\circ$
 e. $m\widehat{ST} = 101^\circ$
 f. $m\widehat{STU} = 230^\circ$



$$\begin{array}{r} 180 \\ -129 \\ \hline 51 \end{array}$$

$$\frac{129}{2} = 64.5$$

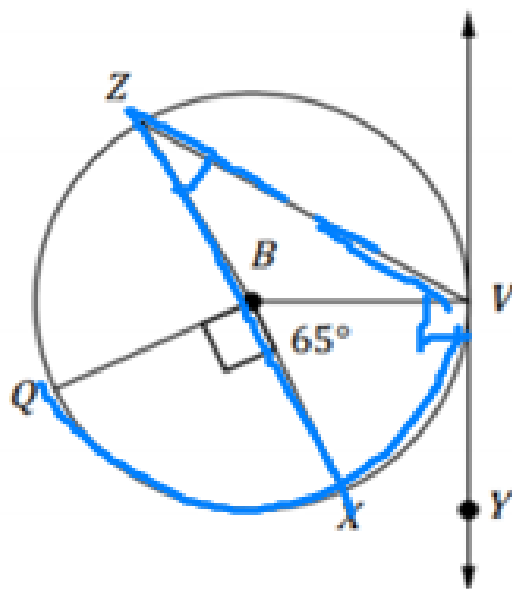
$$\begin{array}{r} 101 \\ +129 \\ \hline 230 \end{array}$$

$$\begin{array}{r} 129 \\ +130 \\ \hline 259 \end{array} \quad \begin{array}{r} 360 \\ -259 \\ \hline 101 \end{array}$$

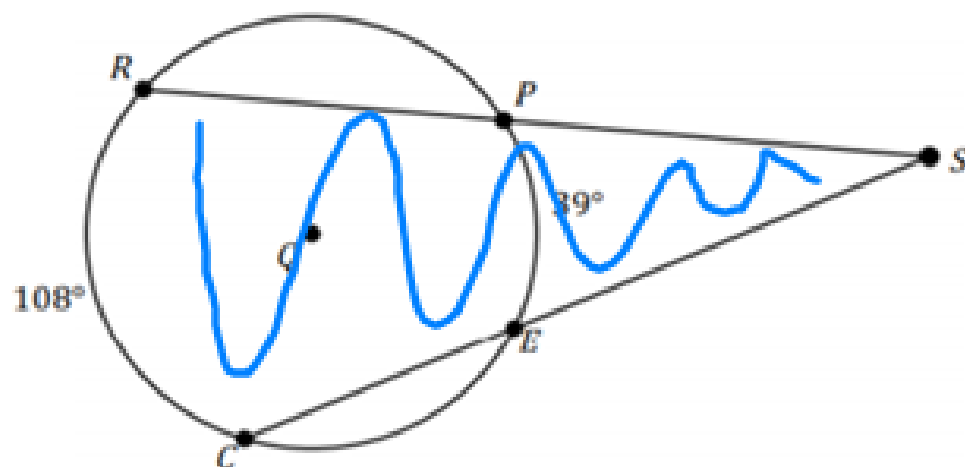
4. Find each of the following angles and arcs formed in circle B .

- a. $m\angle YVB = 90$
 b. $m\widehat{VX} = 65$
 c. $m\angle VZX = 32.5^\circ$
 d. $m\widehat{VQ} = 155$

$$\begin{array}{r} 90 \\ + 65 \\ \hline 155 \end{array}$$



Consider the diagram below where $\angle RSC$ is formed by two secants intersecting outside of circle Q .



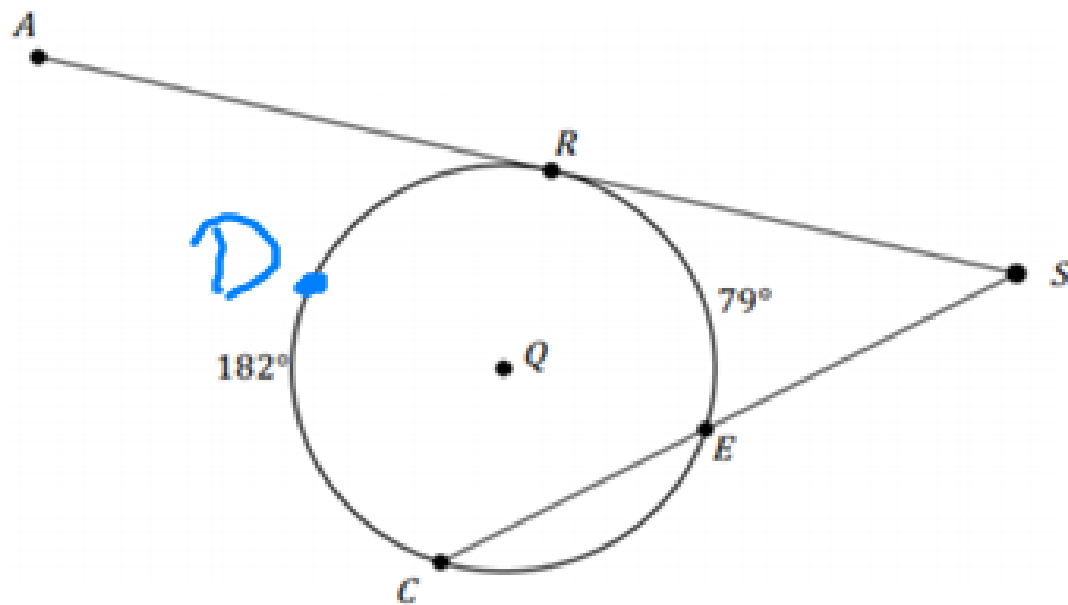
Identify the intercepted arcs

$$m\widehat{RC} \text{ \& } m\widehat{PE}$$

Determine $m\angle RSC$.

$$\frac{1}{2}(108 - 39) = 34.5^\circ$$

1. Consider the diagram below, where $\angle ASC$ is formed by a tangent line and a secant line intersecting outside of circle Q .



- a. What are the intercepted arcs in the above diagram?

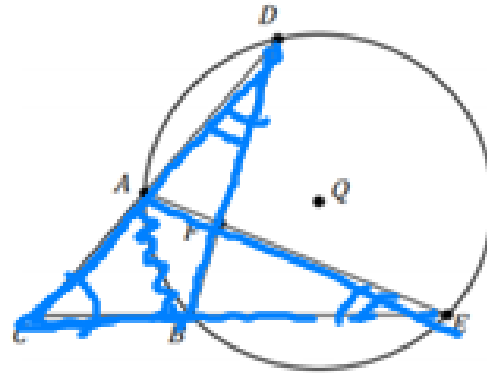
$m\widehat{RDC}$ & $m\widehat{RE}$

- b. Determine $m\angle ASC$.

$$\frac{1}{2}(182 - 79) = 51.5^\circ$$

Informal Assessment:

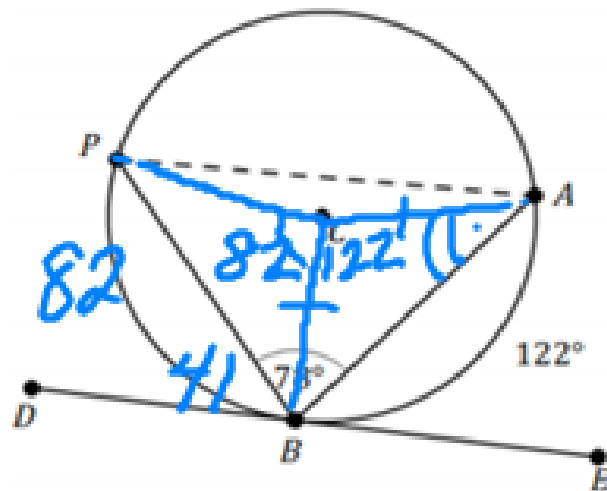
1. Consider the diagram below.



Which of the following statements is correct?

- $\triangle DCB \sim \triangle ECA$ by Angle-Angle Similarity
- $\angle ACB \cong \angle BFA$ by definition of an angle formed by two secants intersecting outside of a circle
- $\angle DAF \cong \angle CBF$ by Alternate Interior Angles Theorem
- $m\angle BFE = m\widehat{BE}$ by definitions of central angles and inscribed angles

2. Consider the diagram below.



If triangles PCB and ACB are constructed, what are the measures of $\angle PCB$ and $\angle CAB$?

$$\begin{array}{r} 180 \\ - 122 \\ \hline 58 \div 2 \end{array}$$

$m\angle PCB =$

$m\angle CAB =$