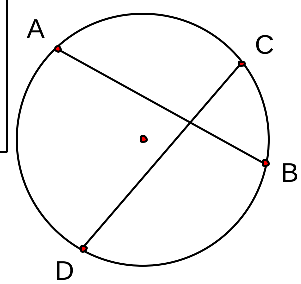
Chords, Tangents, and Secants
6.2, 6.3

Theorem 8
(6.2 – T 6.5)

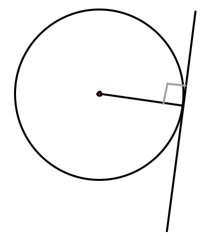
The measure of an angle formed by two chords that intersect within a circle is one-half the sum of the measures of the arcs intercepted by the angle and its vertical angle.

$$(2 \text{ chords } \angle = \frac{1}{2} \text{ sum } \frown 's).$$



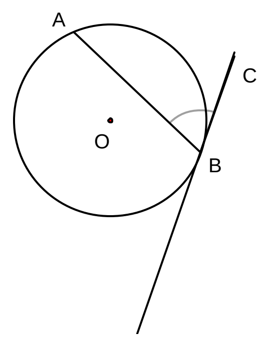
Postulate
(6.3 – P 6.3&4)

A line is tangent to a circle if and only if it is perpendicular to the radius drawn to the point of contact (tan $\perp$ rad to point contact).



Theorem 9
(6.3 – T 6.16)

The measure of an angle formed by a tangent to a circle and a chord drawn to the point of tangency is on-half the measure of its intercepted arc.

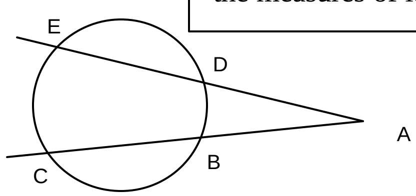


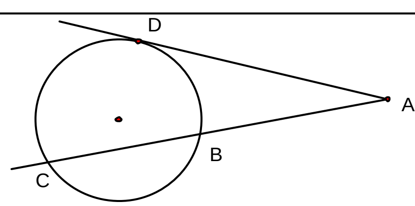
Theorem 10
(6.2 – T 6.14,
6.3 – T 6.17 &18)

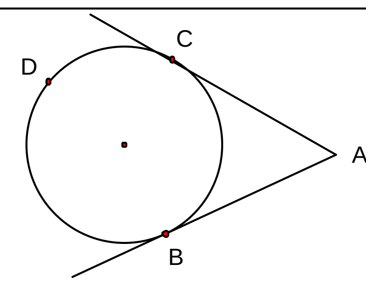
If an angle is formed by

- two secants
  or
- a tangent and a secant
  or
- two tangents

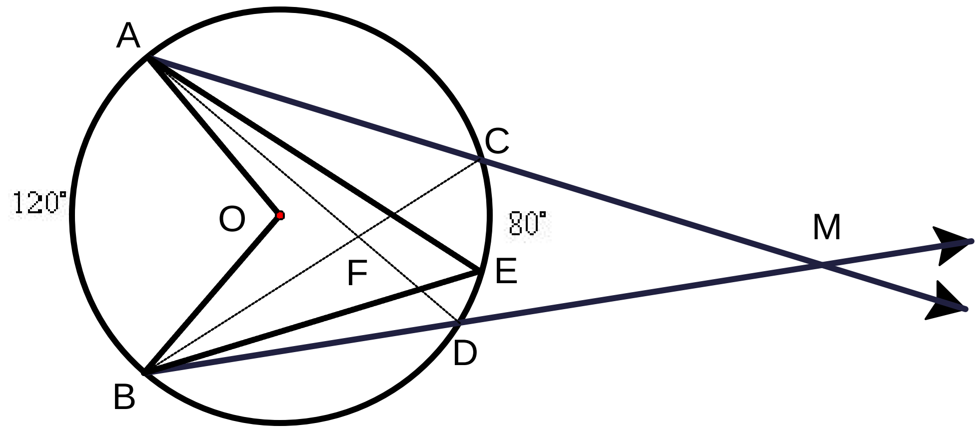
intersecting in the exterior of the circle, then the measure of the angle is one-half the difference of the measures of its intercepted arcs.







Problem #7 The next figure suggests a way to remember some of the properties of angles and arcs in circles. Note that the sizes of the angles decrease from left to right and that O is the circle's center. The following arcs and angles are shown in the figure:



Given arcs: $m\widehat{AB} = 120^\circ$ and $m\widehat{CD} = 80^\circ$

Central angle:

Angle formed by 2 chords:

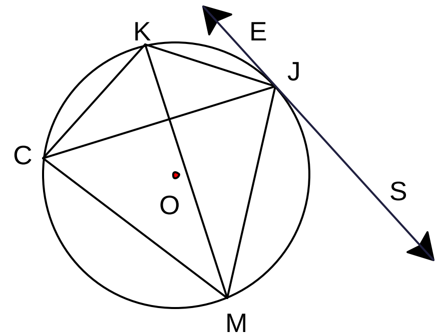
Inscribed angle:

Angle formed by two secants:

Problem #8 Use the figure to answer the questions.

Given $\odot O$

tan $\overleftrightarrow{ES}$



a) Name two angles congruent to $\angle KJE$.

b) Name two angles congruent to $\angle JCM$.

c) Name three angles supplementary to $\angle KJS$.

d) Name one angle supplementary to $\angle KCM$.

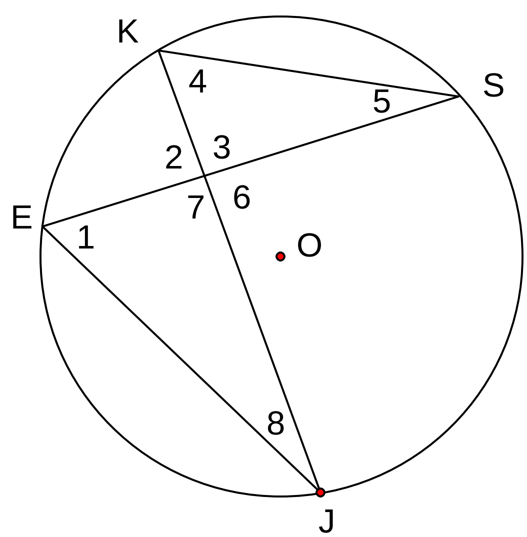
Problem #9 Given $\odot O$

$m\overset{\frown}{EJ} = 88^\circ$

$m\overset{\frown}{KS} = 74^\circ$

$m\angle 8 = \frac{1}{3} m\angle 2$

Find $m\angle 1 - 8$

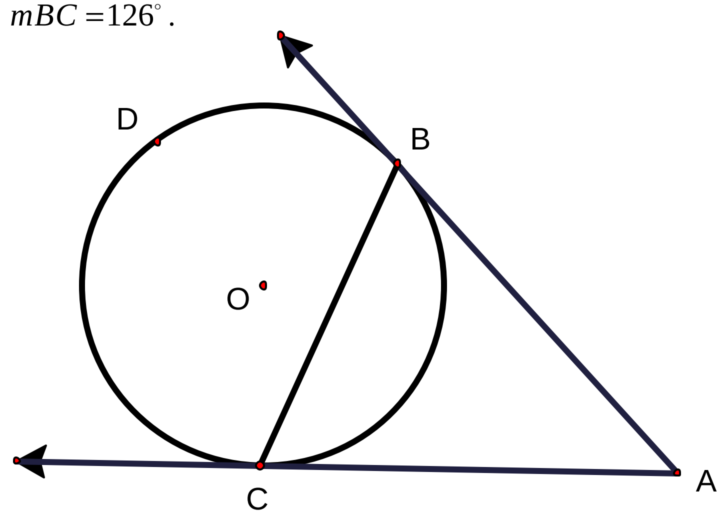


Problem #10 Given: $\overrightarrow{AB}$ and $\overrightarrow{AC}$ are tangents to $\odot O$, $m\widehat{BC} = 126^\circ$.

Find: a) $m\angle A$

b) $m\angle ABC$

c) $m\angle ACB$



Problem #11 Given: $\overrightarrow{AB}$ and $\overrightarrow{AC}$ are tangents to $\odot O$, with B and C on the circle and $m\angle ACB = 68^\circ$.

Find: a) $m\widehat{BC}$

b) $m\widehat{BDC}$

c) $m\angle ABC$

d) $m\angle A$

Line and Segment Relationships in the Circle
Lengths of Segments in a Circle
6.2, 6.3

Theorem 11
(6.2 – T 6.8)

A line drawn from the center of a circle perpendicular to a chord bisects the chord and the arc formed by the chord (sec thru center $\perp$ chord bisects chord & arc).

Theorem 12 (Converse of Theorem 8)
(6.2 – T 6.9)

Theorem 13
(6.2 – T6.12)

The perpendicular bisector of a chord passes through the center of the circle.

Theorem 14
(6.3 – T 6.19)

The tangent segments to a circle from an external point are congruent (tans to $\odot \cong$).

Theorem 15
(6.2 – T 6.13)

If two chords intersect inside a circle, the product of the lengths of the segments of one chord is equal to the product of the lengths of the segments of the other.

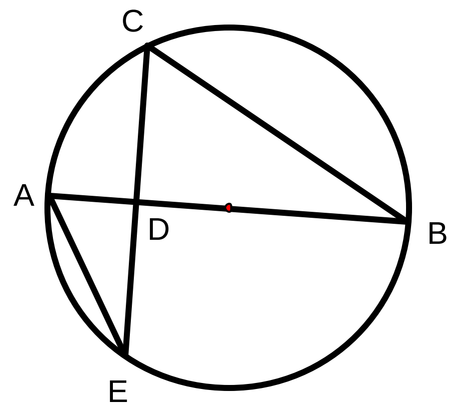
Theorem 16
(6.2 – T 6.15)

If two secants are drawn to a circle from an external point, then the product of the lengths of one secant segment to its external segment is equal to the product of the lengths of the other secant segment and its external segment.

Theorem 17
(6.3 – T 6.20)

If a secant and a tangent are drawn to a circle from an external point, then the length of the tangent segment is the geometric mean between the length of the secant segment and its external segment.

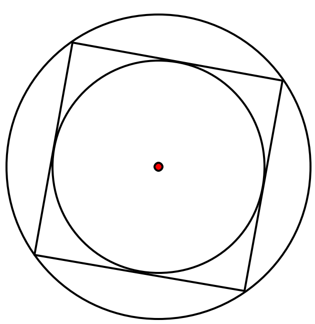
Problem #12 Given: Diameter $\overline{AB} \perp \overline{CE}$ at D
Prove: CD is the geometric mean of AD and DB.



Polygons inscribed in a circle
6.4

Definition Any **polygon is inscribed in a circle** if and only if all its vertices are points of the circle; the **circle is** said to be **circumscribed about the polygon**.

Also, a **circle is inscribed in a polygon** if and only if it is tangent to each of the polygon's sides.



Example:

- the square is inscribed in the ________________________________
- the larger circle is ____________________________ about the square.
- the __________________________________ is inscribed in the square.

Theorem 18
(6.4 – T 6.23)

If a quadrilateral is inscribed in a circle, then its opposite angles are ___________________________ (if quad inscr in ⊙, opp ∠s supp).