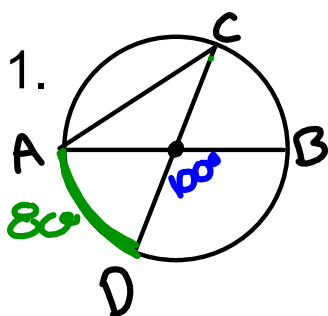
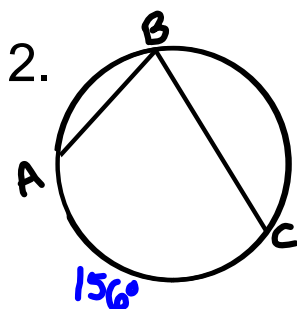


Warm-up

$$m\angle ACD = 40^\circ \quad m\widehat{CB} = 80^\circ$$

$$m\widehat{AC} = 100^\circ$$

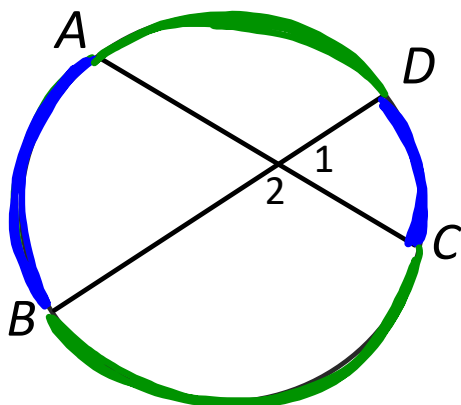


$$m\angle ABC = 78^\circ$$

Angles with vertices INSIDE a circle
(but not necessarily at the center)

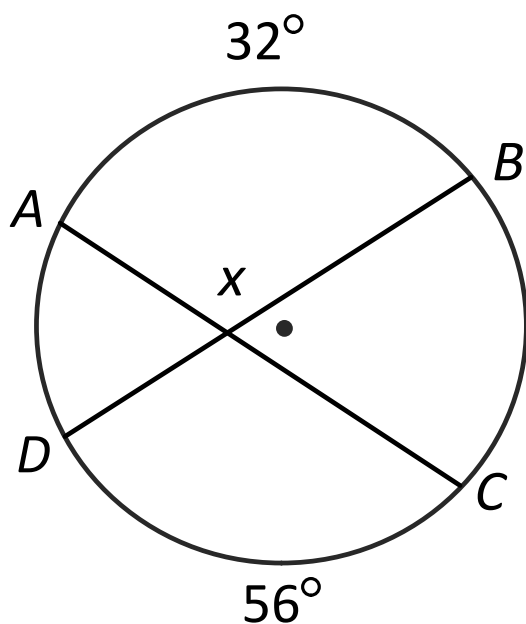
Theorem:

A chord-chord angle is half the SUM of the arcs intercepted by the angle and its vertical angle.



$$m\angle 1 = \frac{1}{2}(m\widehat{AB} + m\widehat{CD})$$

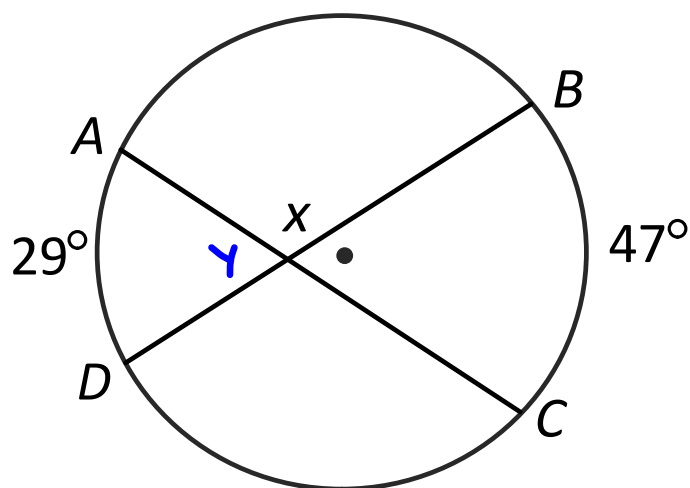
$$m\angle 2 = \frac{m\widehat{AD} + m\widehat{BC}}{2}$$



Find x

$$x = \frac{32 + 56}{2}$$

$$x = 44^\circ$$



Find x

$$y = \frac{1}{2}(29 + 47)$$

$$y = 38^\circ$$

$$x + y = 180$$

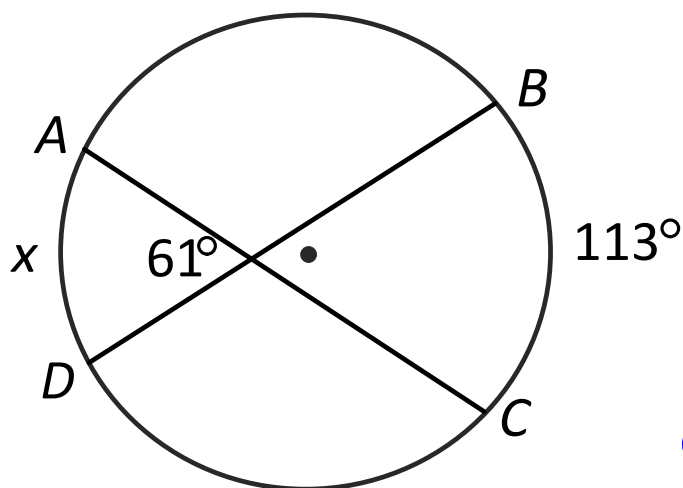
$$x + 38 = 180$$

$$x = 142^\circ$$

$$360 - 29 - 47 = m\widehat{AB} + m\widehat{CD}$$

$$284 = m\widehat{AB} + m\widehat{CD}$$

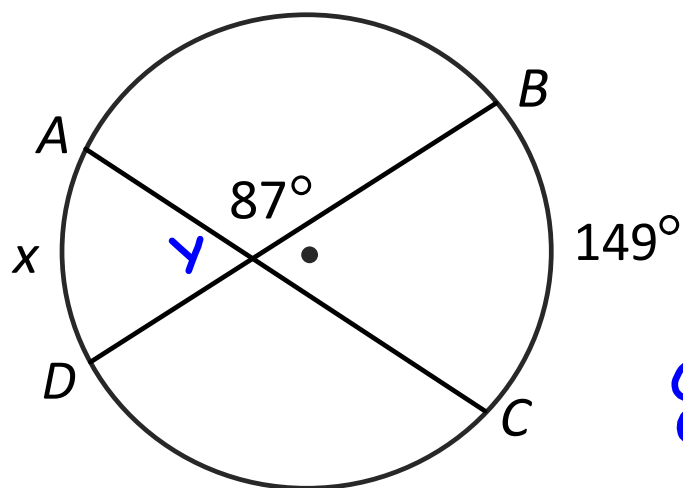
$$x = \frac{1}{2}(284) = 142^\circ$$

Find x

$$61 = \frac{1}{2}(x + 113)$$

$$122 = x + 113$$

$$x = 9^\circ$$

Find x

$$93 = \frac{x + 149}{2}$$

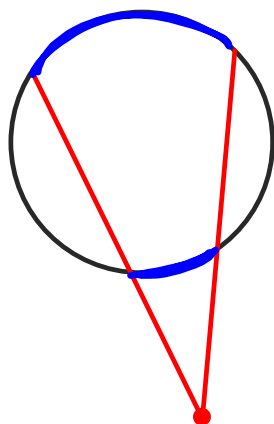
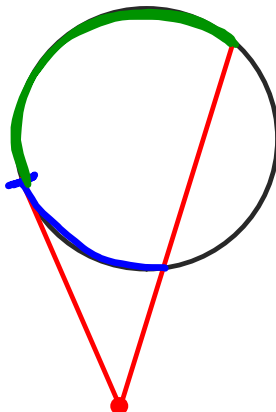
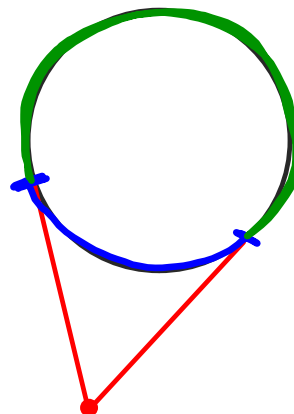
$$186 = x + 149$$

$$37^\circ = x$$

$$y = 180 - 87$$

$$y = 93^\circ$$

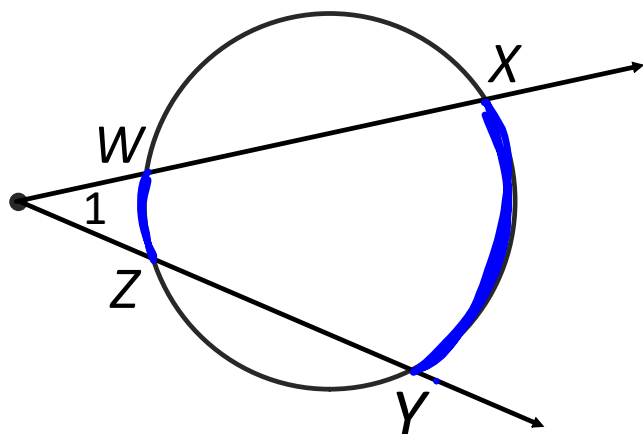
Angles with vertices OUTSIDE a circle

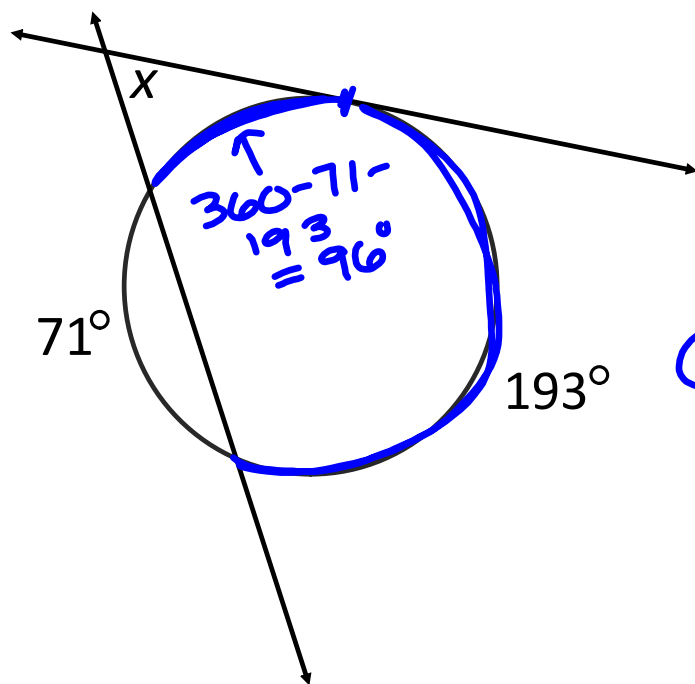
Secant-Secant
AngleSecant-Tangent
AngleTangent-Tangent
Angle

Theorem:

The measure of an angle whose vertex is outside of the circle is equal to half the DIFFERENCE of the intercepted arcs.

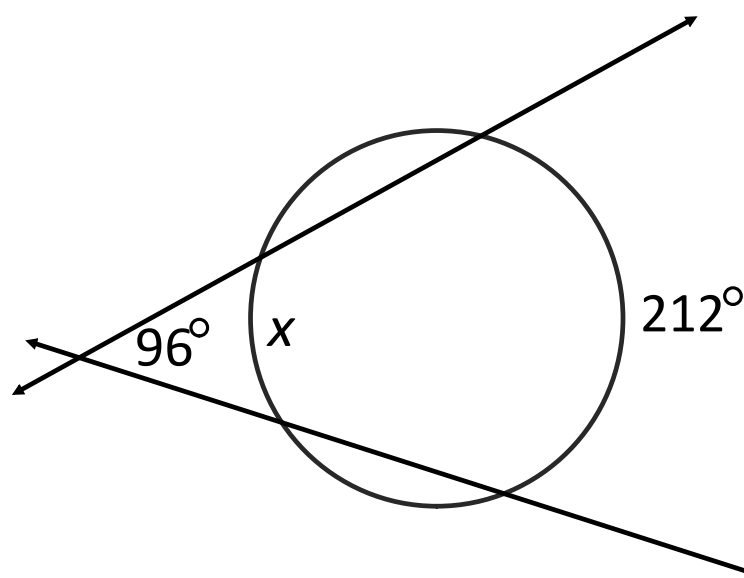
$$m\angle 1 = \frac{1}{2}(\widehat{XY} - \widehat{WZ})$$



Find x

$$x = \frac{1}{2}(193 - 96)$$

$$x = \frac{97}{2}$$

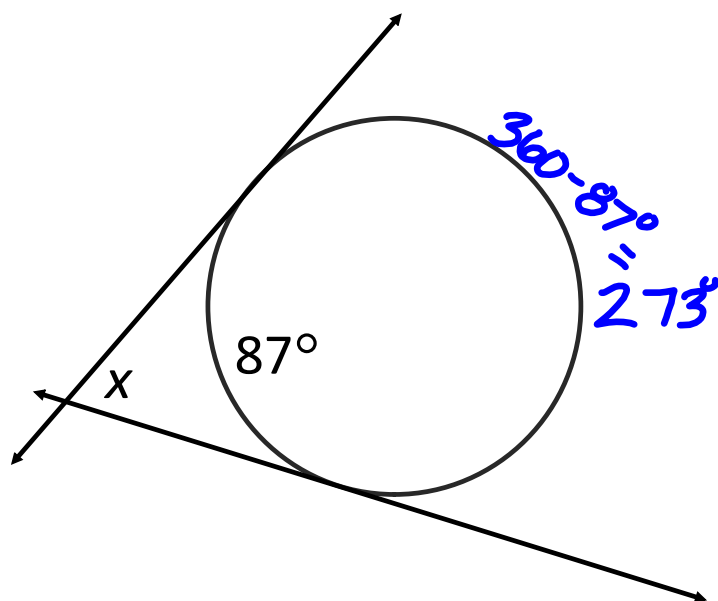
Find x

$$96 = \frac{1}{2}(212 - x)$$

$$192 = 212 - x$$

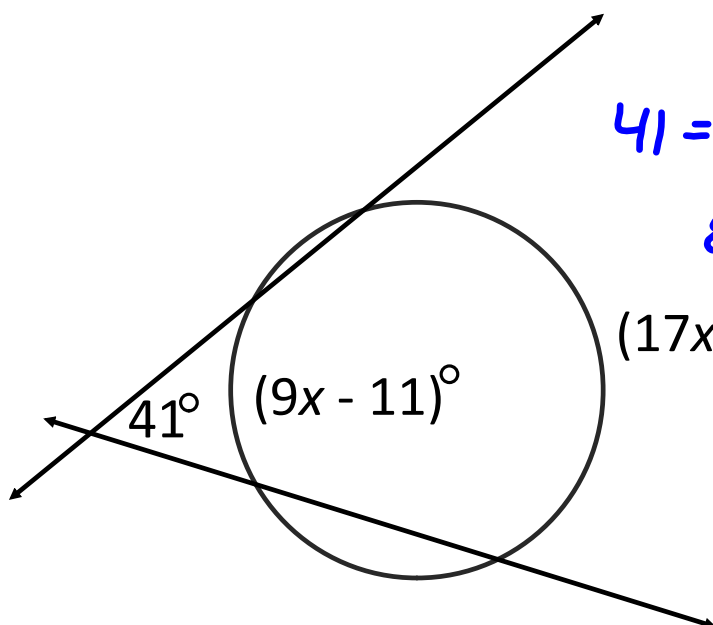
$$\frac{-20 = -x}{-1}$$

$$x = 20^\circ$$

Find x

$$x = \frac{1}{2}(273 - 87)$$

$$x = 93^\circ$$

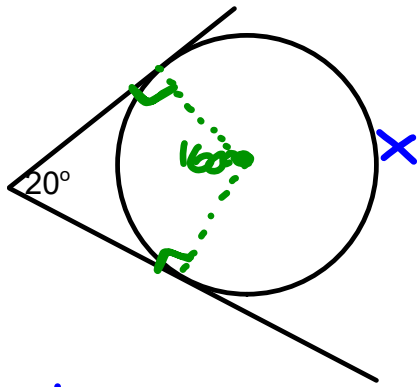
Find x

$$41 = \frac{1}{2}((17x + 3) - (9x - 11))$$

$$82 = 8x + 14$$

$$68 = 8x$$

$$x = \frac{17}{2}$$



$$y + x = 360$$

$$y = 360 - x$$

$$20 = \frac{1}{2}(x - (360 - x))$$

$$40 = 2x - 360$$

$$400 = 2x$$

$$x = 200^\circ$$