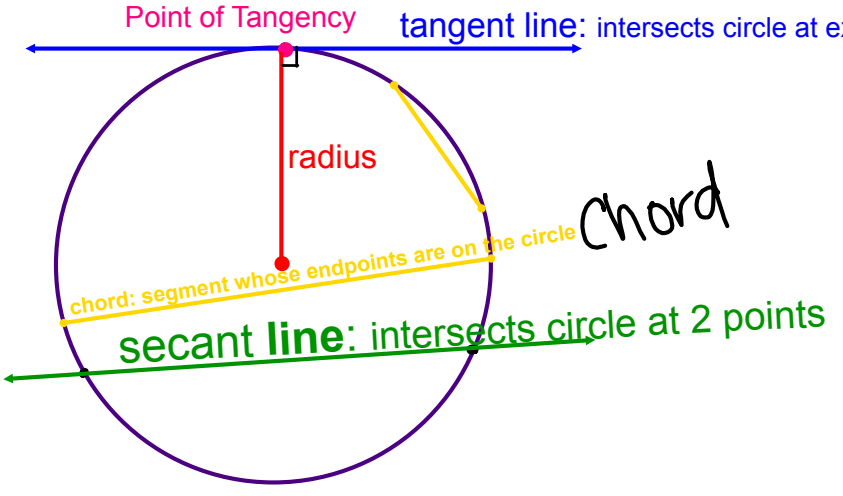
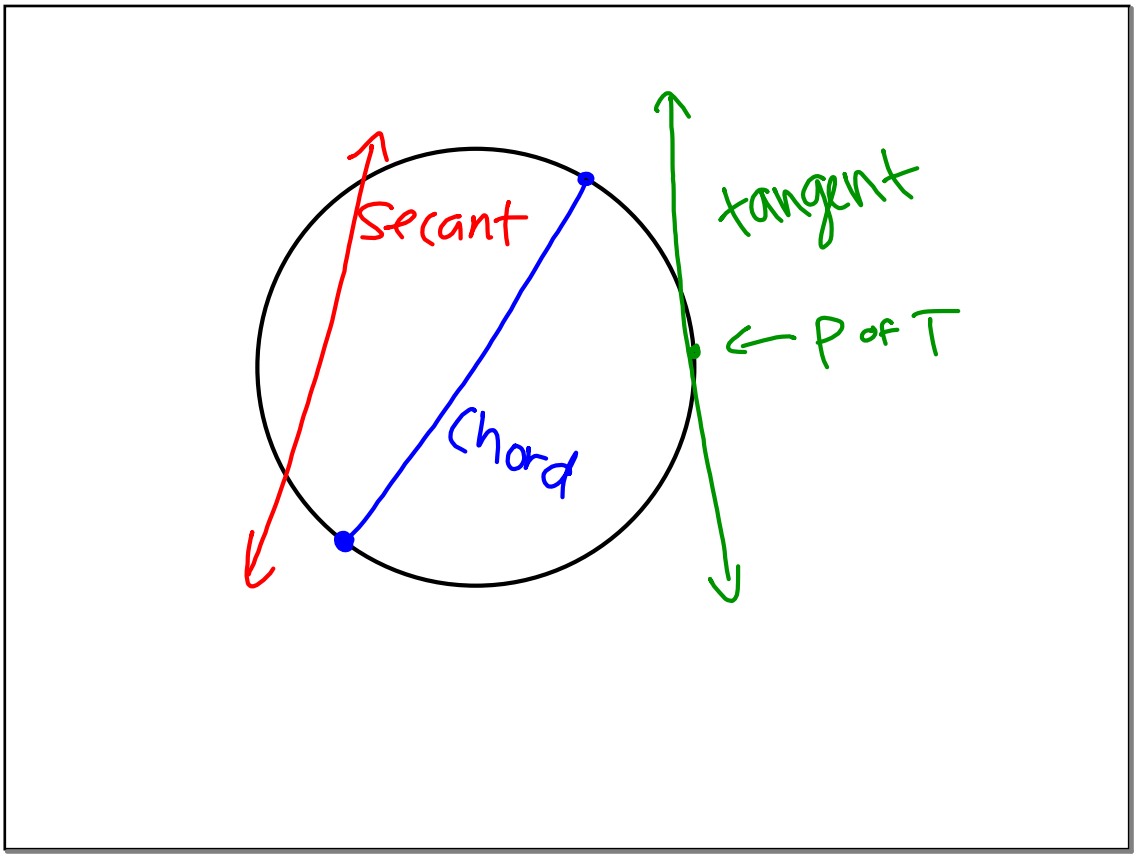
12-4 Chords, Secants, and Tangents

- I can name a chord, secant, and tangent line and their relationship with circles.
- I can describe the relationship between angles and chords when the angles are created inside, outside and on the circle.
- I can describe the relationship between opposite angles of inscribed quadrilaterals.

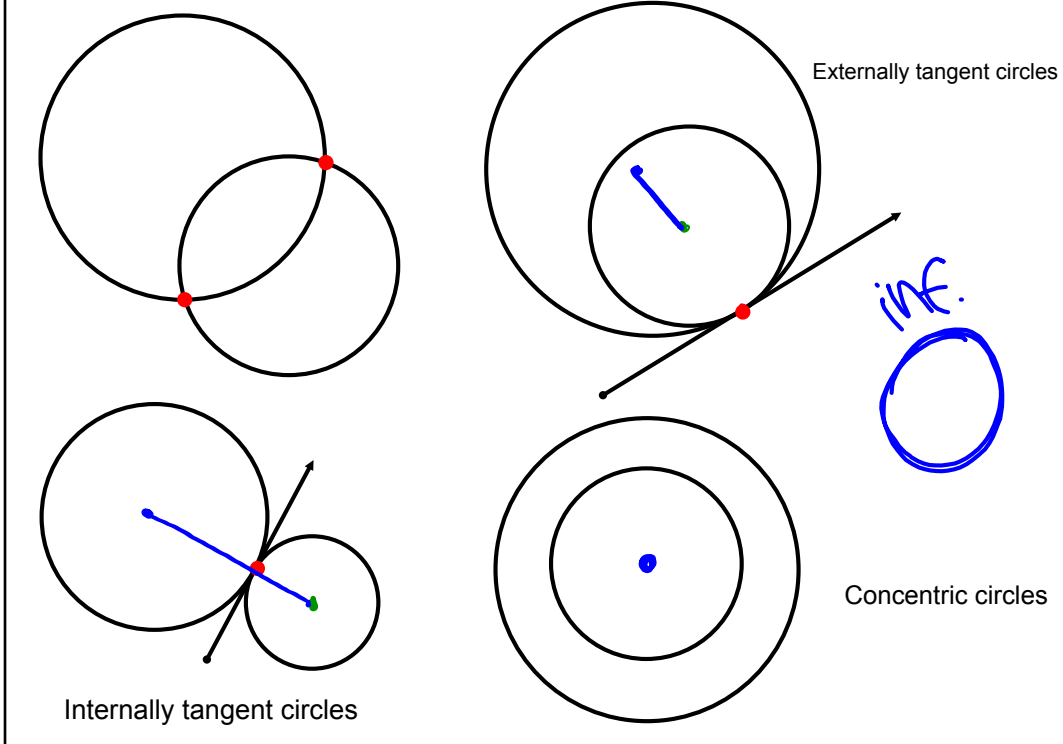
Tangent, Secant Lines and Chords



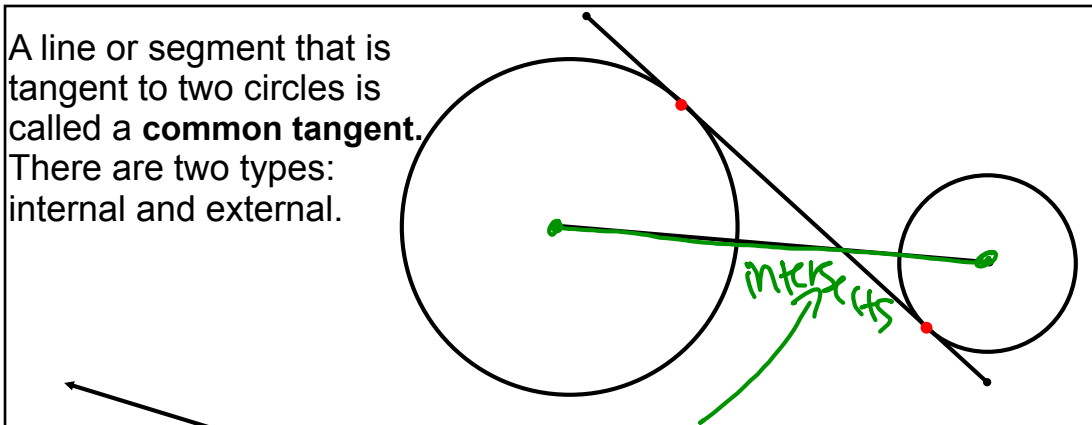
If a line is tangent to a circle, then it is perpendicular to the radius drawn to the point of tangency.



Circles can intersect each other 0, 1, or 2 times

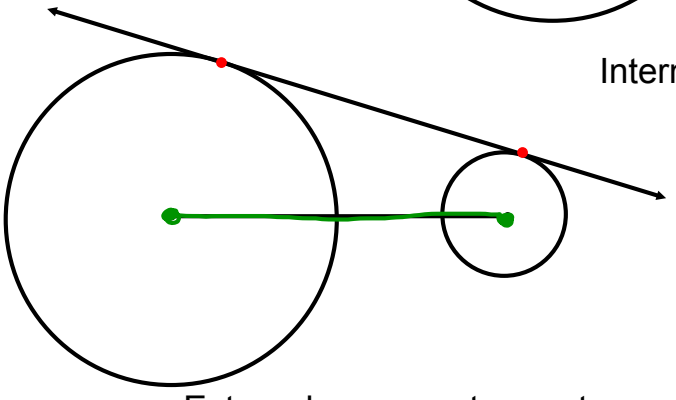


A line or segment that is tangent to two circles is called a **common tangent.** There are two types: internal and external.



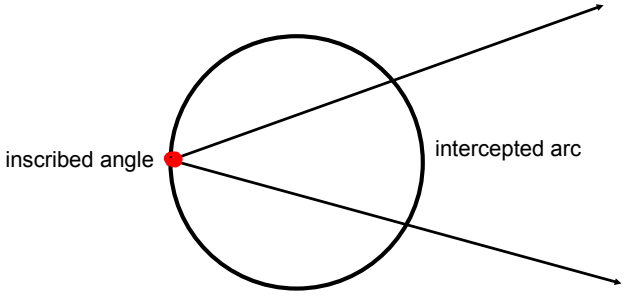
Internal common tangent

Shared



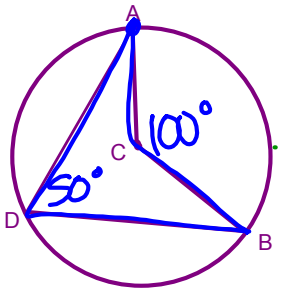
External common tangent

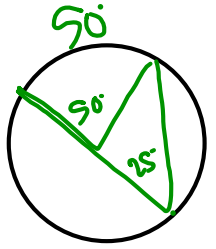
An **inscribed angle** is: an angle whose vertex is on a circle and whose sides contain chords of the circle. The arc that lies in the interior of an inscribed angle and has endpoints on the angle is called the intercepted arc of the angle.



If an angle is inscribed in a circle, then its measure is half the measure of its intercepted arc.

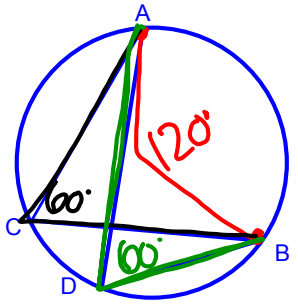
$$m\angle ADB = \frac{1}{2} m\overset{\frown}{AB}$$





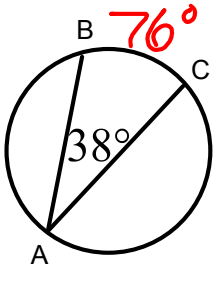
If two inscribed angles of a circle intercept the same arc, then the angles are congruent.

$$\angle C \cong \angle D$$

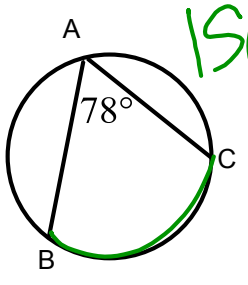


Find the measure of the indicated arc or angle.

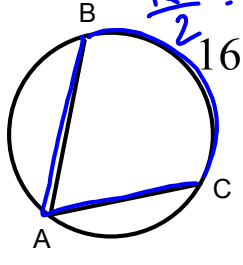
1. $m\overset{\frown}{BC} = 38 \cdot 2$ 76° 76°



2. $m\overset{\frown}{BC}$ $78 \cdot 2$ 156°

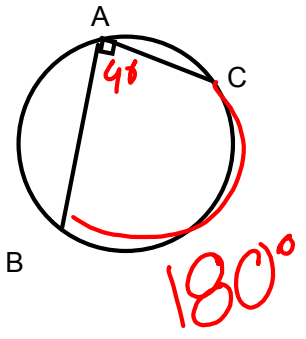


3. $m\angle BAC$ $\frac{160}{2} = 80°$

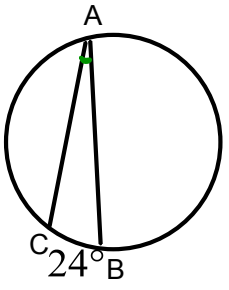


you try

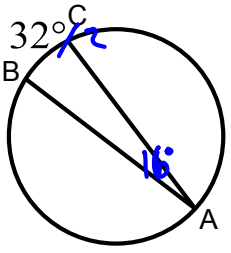
$4.\ m\overset{\frown}{BC}$



$5.\ m\angle BAC$

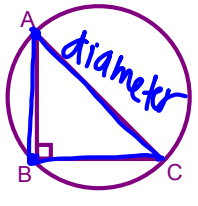


$6.\ m\angle BAC$



If a right triangle is inscribed in a circle, then the hypotenuse is a diameter of the circle. Conversely, if one side of an inscribed triangle is a diameter of a circle, then the triangle is a right triangle and the angle opposite the diameter is the right angle.

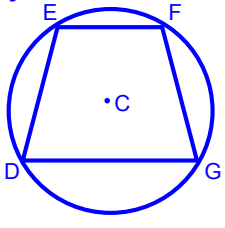
Angle B is a right angle if and only if segment AC is a diameter of the circle.



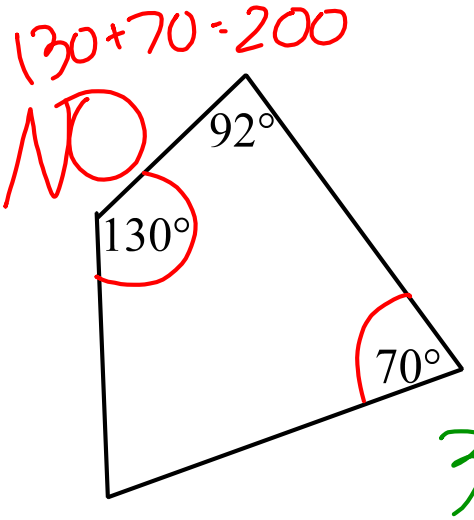
A quadrilateral can be inscribed in a circle if and only if its opposite angles are supplementary.

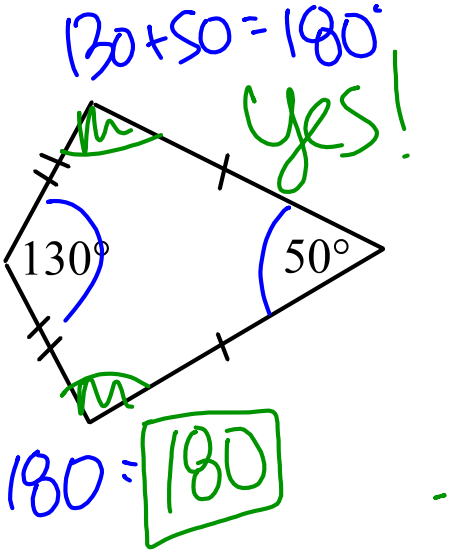
D, E, F, and G lie on some circle, C, if and only if

$m\angle D + m\angle F = 180°\ and\ m\angle E + m\angle G = 180°$

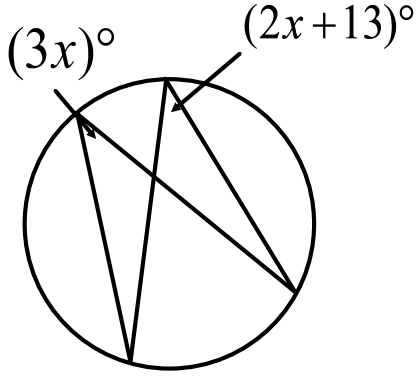


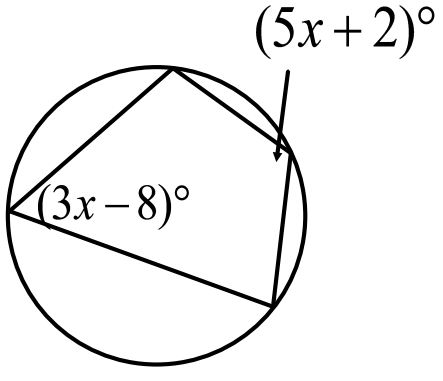
Can a circle be circumscribed about the quad?





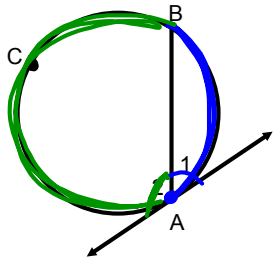
Find x.





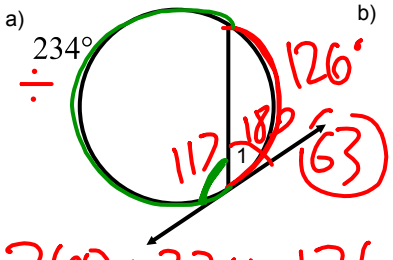
If a tangent and a chord intersect at a point on a circle, then the measure of each angle formed is one half the measure of its intersected arc.

$$m\angle 1 = \frac{1}{2} m\overset{\frown}{AB} \qquad m\angle 2 = \frac{1}{2} m\overset{\frown}{BCA}$$

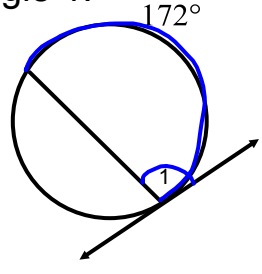


Find the measure of angle 1.

a)



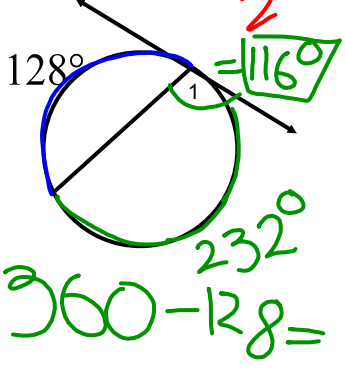
b)



$\frac{172^\circ}{2} = 86^\circ$

$360 - 234 = \frac{126}{2} = 63^\circ$

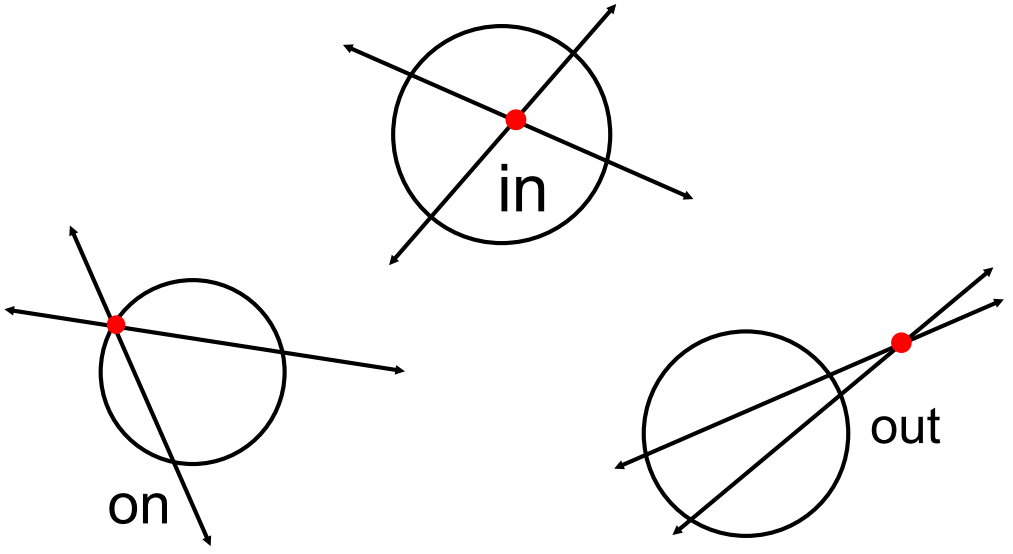
c)



$232 \div 2 = 116$

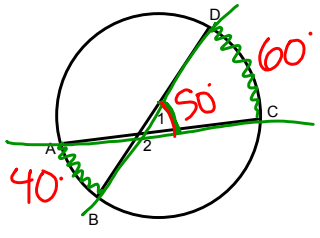
$360 - 128 =$

If two lines intersect a circle, there are three places where the lines can intersect.



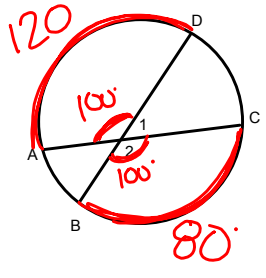
If two chords intersect in the interior of a circle, then the measure of each angle is one half the sum of the measures of the arcs intercepted by the angle and its vertical angle.

$$m\angle 1 = \frac{1}{2}(m\overset{\frown}{CD} + m\overset{\frown}{AB}), m\angle 2 = \frac{1}{2}(m\overset{\frown}{BC} + m\overset{\frown}{AD})$$



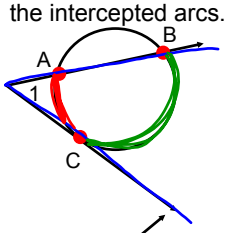
$\frac{60+40}{2} = \frac{100}{2}$

$50°$



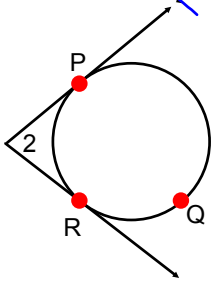
$120+80 = \frac{200}{2} = 100°$

If a tangent and a secant, two tangents, or two secants intersect in the exterior of a circle, then the measure of the angle formed is one half the difference of the measures of the intercepted arcs.

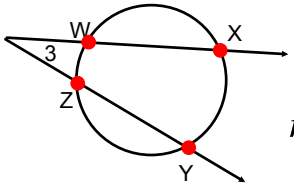


$$m\angle 1 = \frac{1}{2}(m\overset{\frown}{BC} - m\overset{\frown}{AC})$$

big arc − small arc / 2



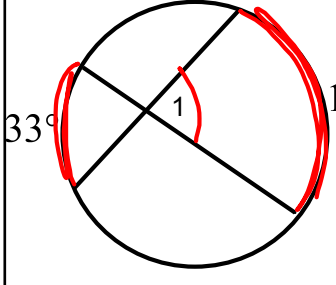
$$m\angle 2 = \frac{1}{2}(m\overset{\frown}{PQR} - m\overset{\frown}{PR})$$



$$m\angle 3 = \frac{1}{2}(m\overset{\frown}{XY} - m\overset{\frown}{WZ})$$

Find the measure of angle 1.

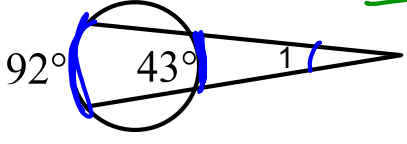
a)



131 + 33 = 164

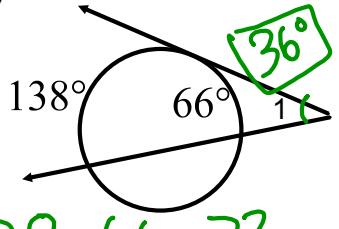
164 / 2 = 82

b)



92 − 43 / 2 = 49 / 2 = 24.5°

c)



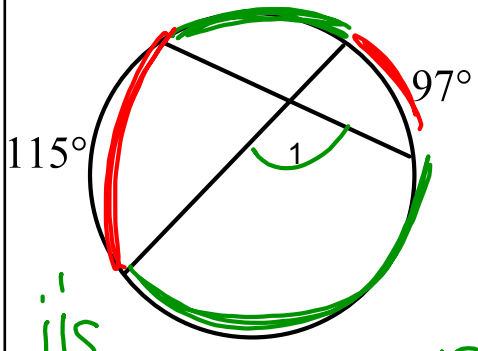
138 − 66 = 72

72 / 2 = 36°

Find the measure of angle 1.

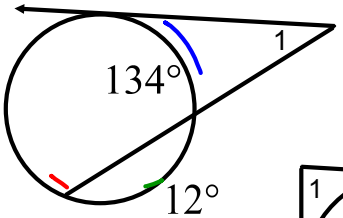
you try

d)



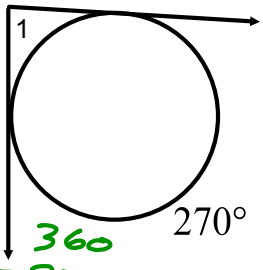
115
+97
212

e)



360 − 212 = 148
148 / 2
= 74°

f)

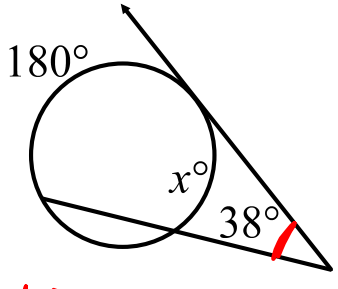


360
−270
90

270 − 90 = 180
180 / 2 = 90°

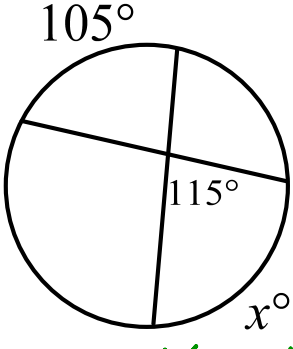
Find the value of x.

a)



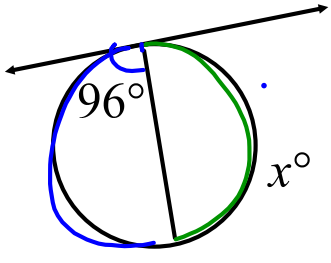
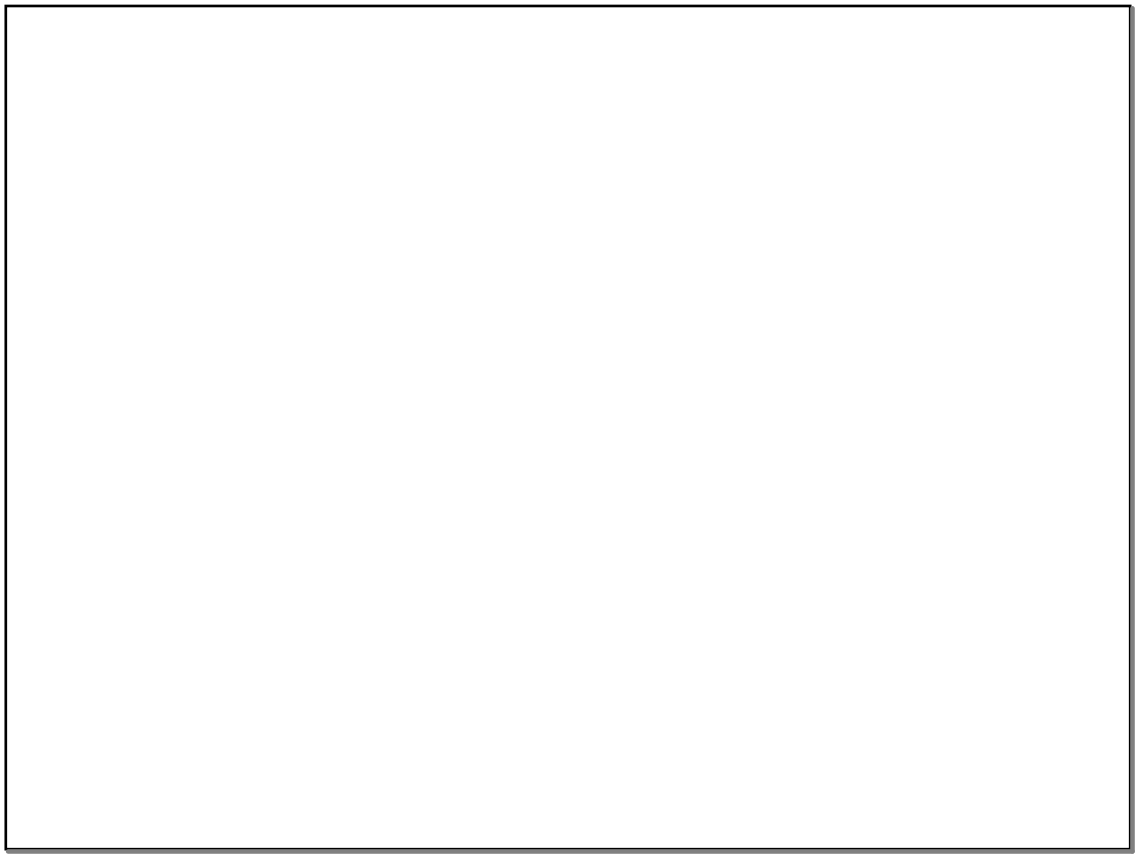
180 − X = 38
2
X = 104

b)



105 + X = 115
2
X = 125

c)



360 − X = 96
2
X = 168