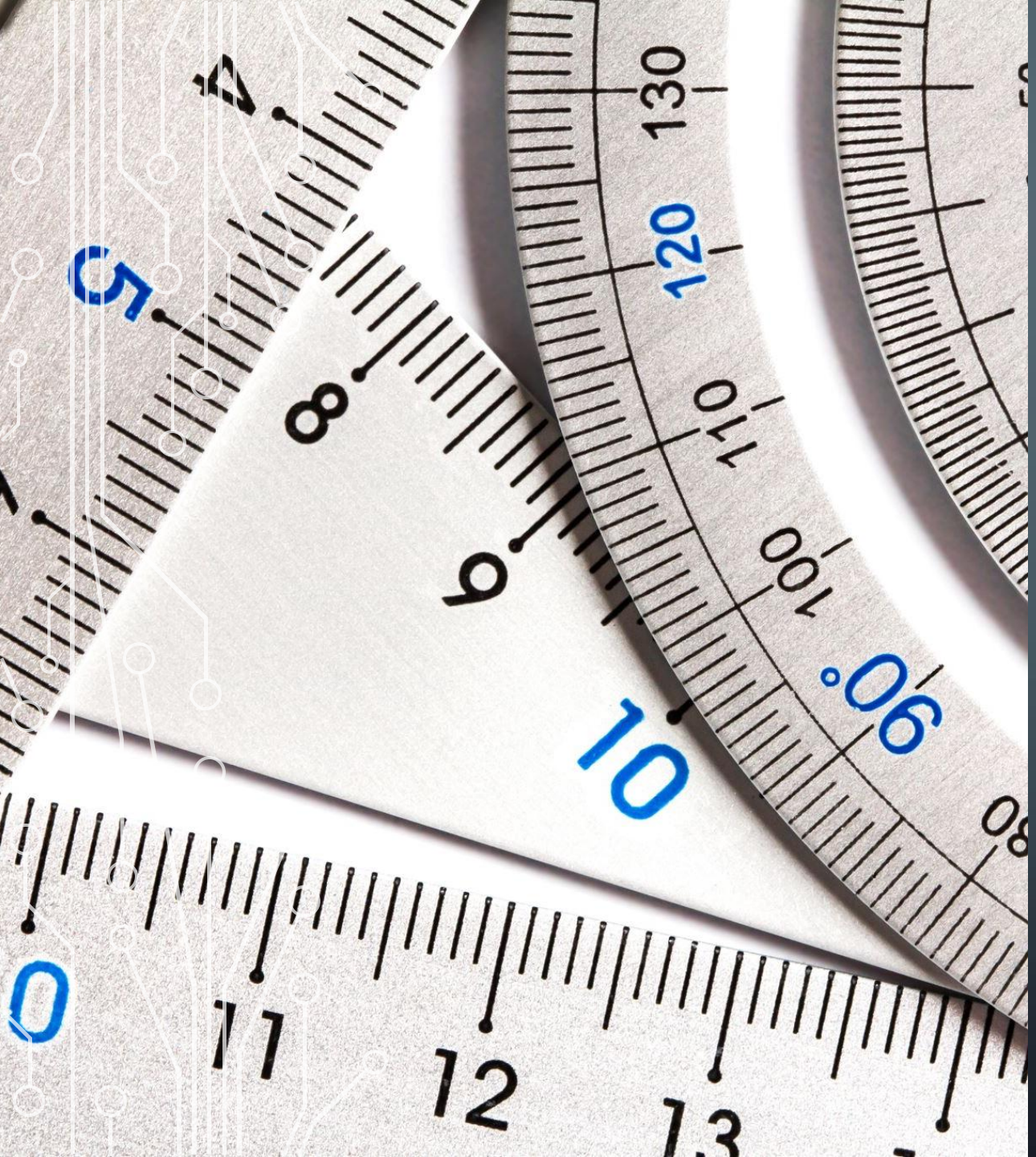
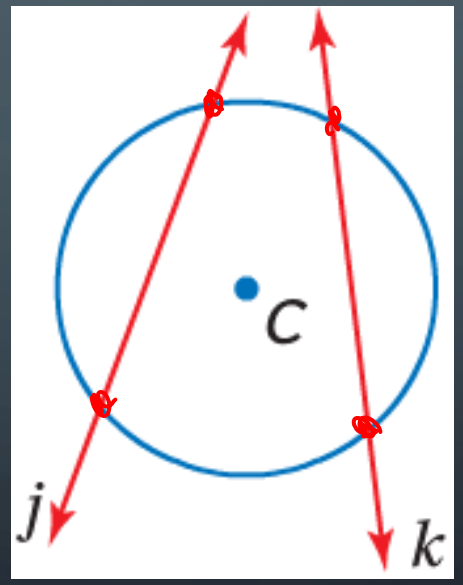


# SECANTS, TANGENTS, AND ANGLE MEASURES

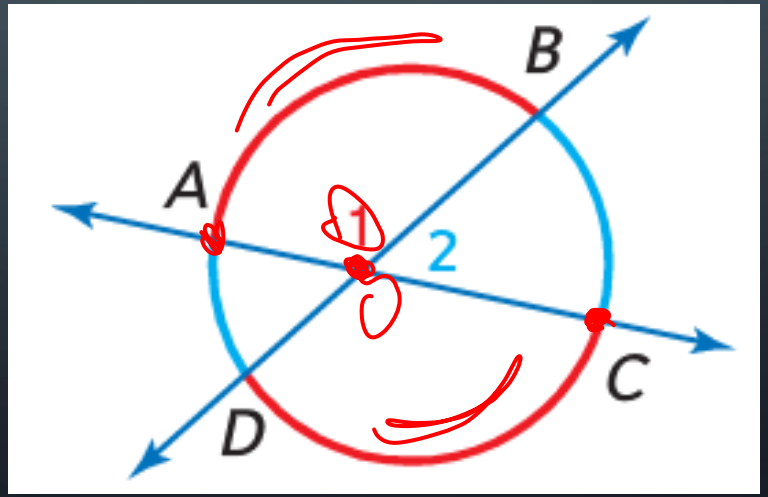
# SECANT

- A secant is a line that intersects a circle in exactly two points.



# SECANT THEOREM

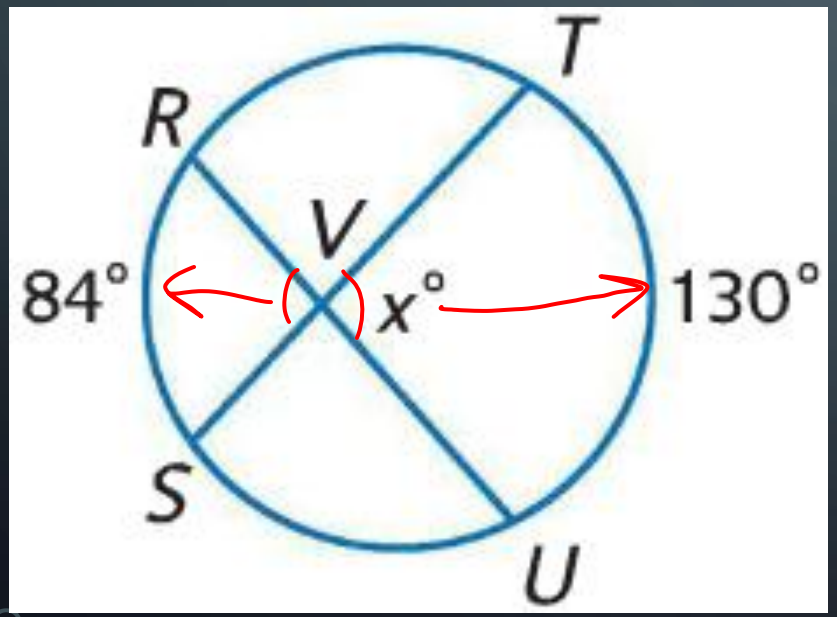
- If two secants or chords intersect in the interior of a circle, then the measure of an angle formed is one half the sum of the measure of the arcs intercepted by the angle and its vertical angle.



# EXAMPLES

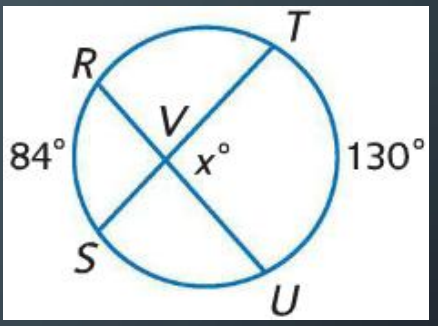
- Find x.

$$\begin{array}{r} 130 \\ +84 \\ \hline 214 \end{array} \qquad \frac{214}{2} = 107$$



# EXAMPLES

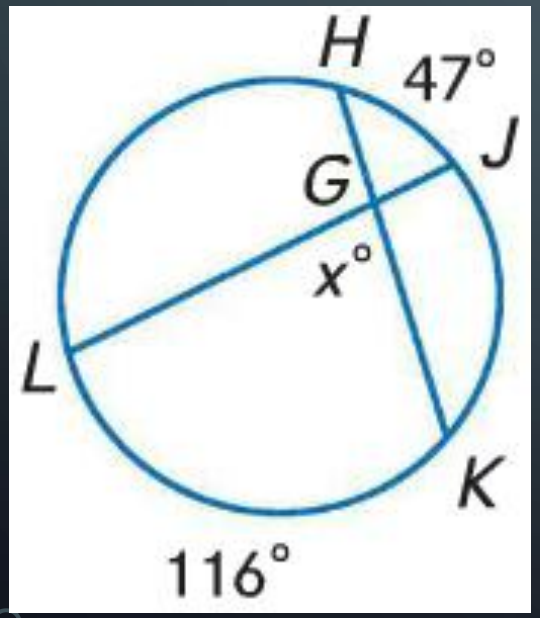
- Find x.




- $84 + 130 = 214$ Sum of the intercepting arcs
- $\frac{1}{2} * 214 = 107$ Half of the sum

# EXAMPLES

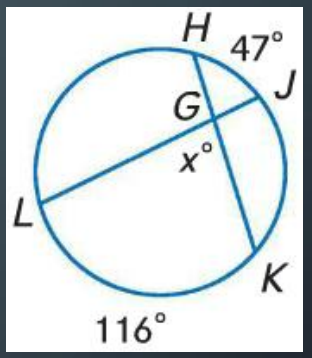
- Find x.




$$\begin{array}{r} 116 \\ +47 \\ \hline 163 \end{array} \qquad \frac{163}{2} = 81.5$$

# EXAMPLES

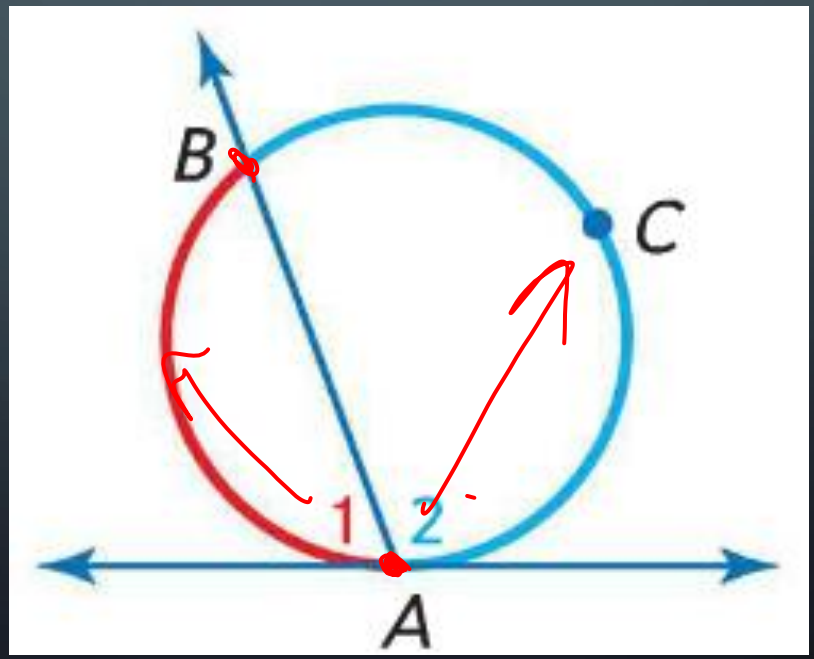
- Find x.




- $47 + 116 = 163$ Sum of the intercepting arcs
- $\frac{1}{2} * 163 = 81.5$ Half of the sum

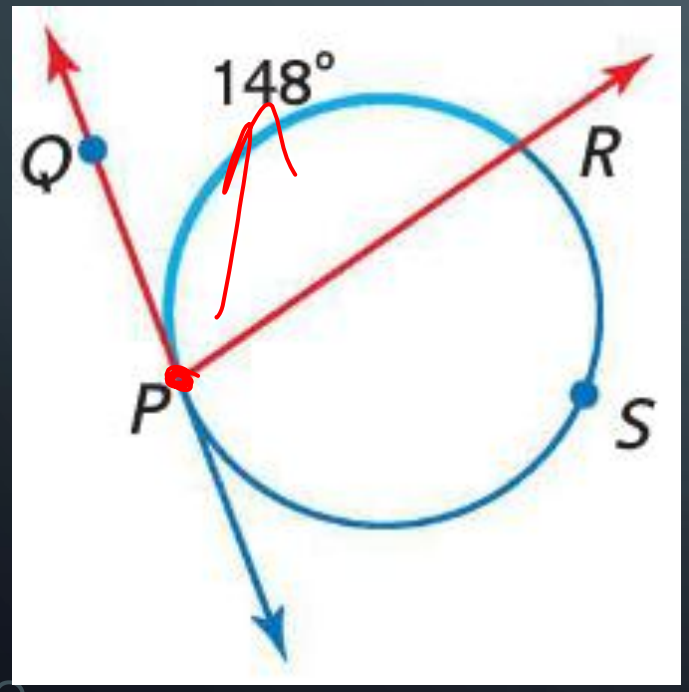
# SECANT-TANGENT THEOREM

- If a secant and a tangent intersect at the point of tangency, then the measure of each angle formed is one half the measure of its intercepted arc.



# EXAMPLES

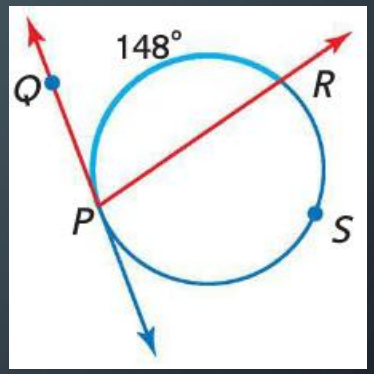
- Find each measure.




$\frac{148}{2} = 74$

# EXAMPLES

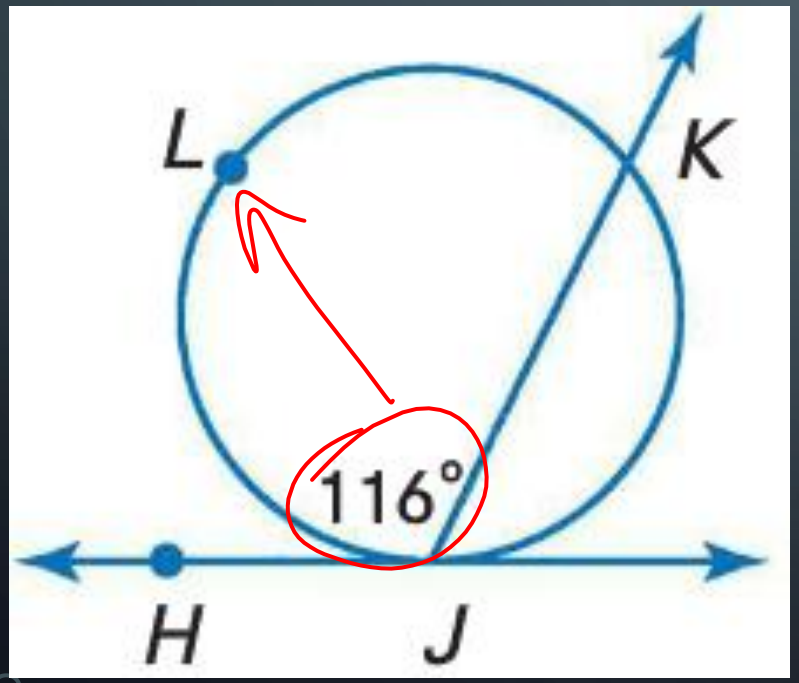
- Find each measure.




- $\frac{1}{2} * 148 = 74$ Half of the arc

# EXAMPLES

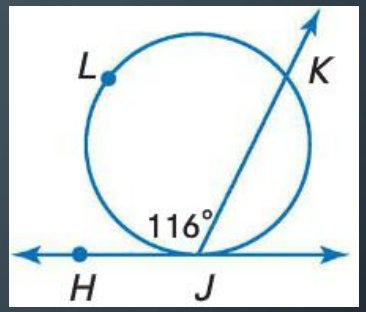
- Find $m\widehat{JLK}$.




$$\begin{array}{r} 116 \\ \times\ \ 2 \\ \hline 232 \end{array}$$

# EXAMPLES

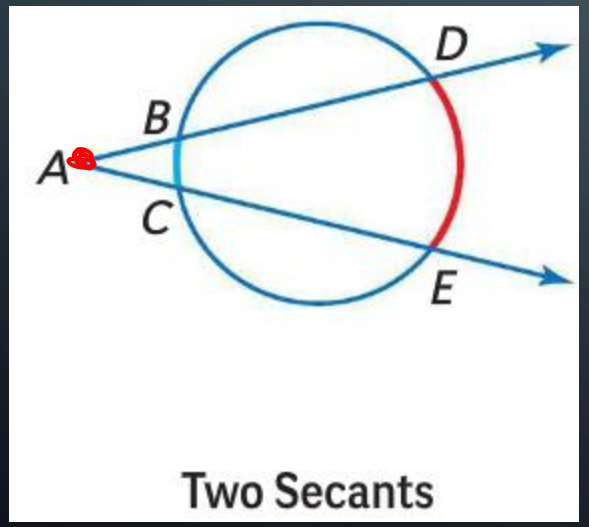
- Find m$\widehat{JLK}$.



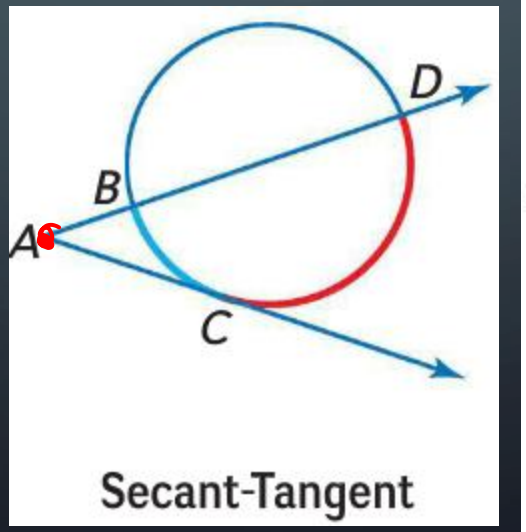

- $\frac{1}{2} * 116 = 58$ Half of the arc

# THEOREM

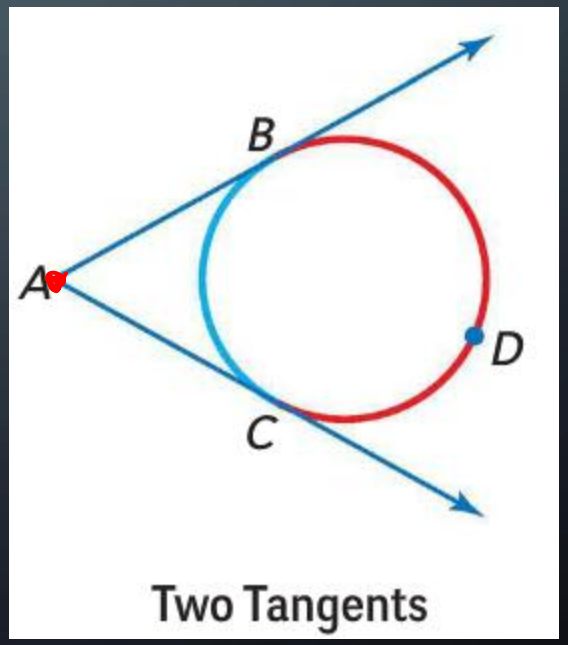
- If two secants, a secant and a tangent, or two tangents intersect outside of a circle, then the measure of the angle formed is one half of the difference of the intercepted arcs.



Two Secants



Secant-Tangent



Two Tangents

# EXAMPLES

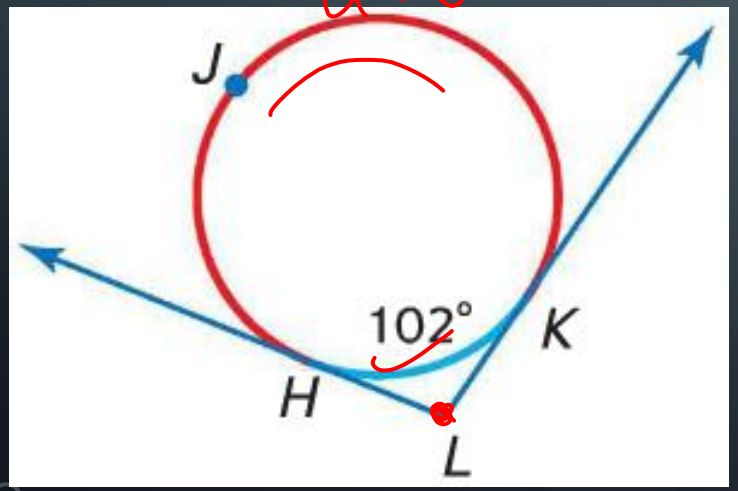
- Find m∠L.

$$\begin{array}{r} 360 \\ -\ 102 \\ \hline 258 \end{array}$$

$$\begin{array}{r} 258 \\ -102 \\ \hline 156 \end{array}$$

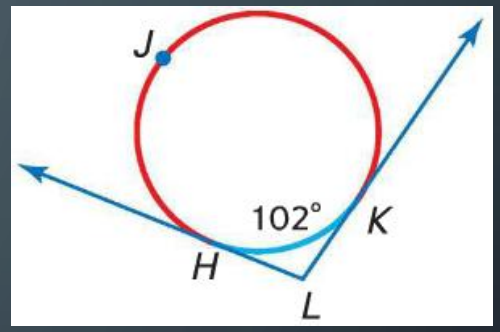
$$\frac{156}{2} = 78$$

258



# EXAMPLES

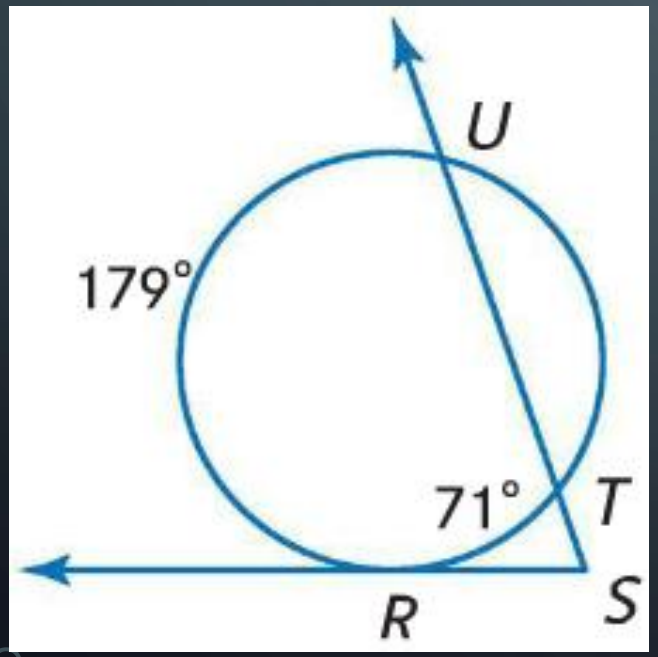
- Find m∠L.




- (360 – 102) – 102 = arcs — Difference of the intercepting arcs
- 258 – 102 = 156
- $\frac{1}{2} * 156 = 78$ — Half of the difference

# EXAMPLES

- Find m∠S.



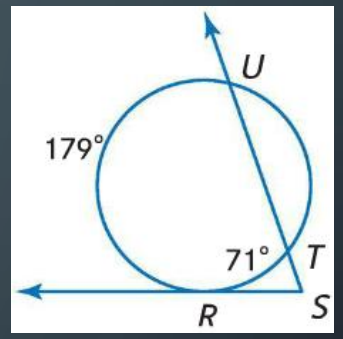

179
-71
108

108/2 = 54

54

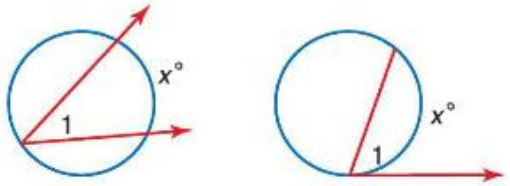
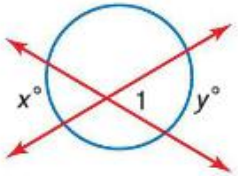
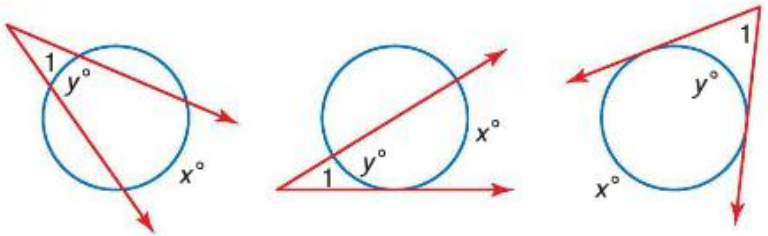
# EXAMPLES

- Find m∠S.




- $179 - 71 = 108$ Difference of the intercepting arcs
- $\frac{1}{2} * 108 = 54$ Half of the difference

# CIRCLE AND ANGLE RELATIONSHIPS

| Vertex of Angle | Model(s) | Angle Measure |
|---|---|---|
| on the circle |   | one half the measure of the intercepted arc $m\angle 1 = \frac{1}{2}x$ |
| inside the circle |   | one half the measure of the sum of the intercepted arc $m\angle 1 = \frac{1}{2}(x + y)$ |
| outside the circle |   | one half the measure of the difference of the intercepted arcs $m\angle 1 = \frac{1}{2}(x - y)$ |