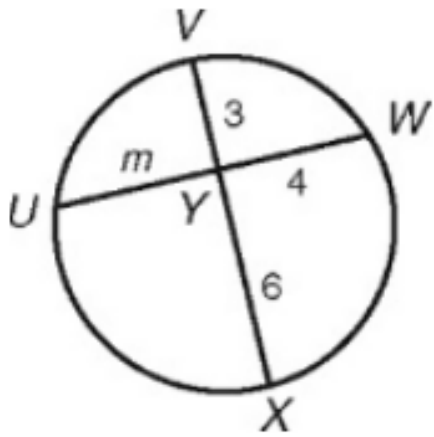


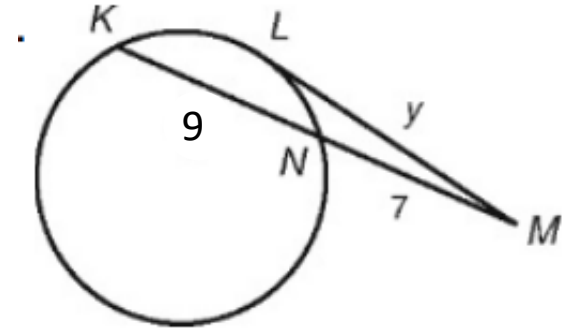
Warm Up



$m =$ _____

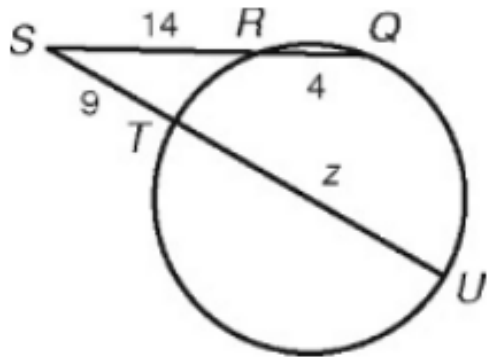
$UW =$ _____

$VX =$ _____



$y =$ _____

$KM =$ _____



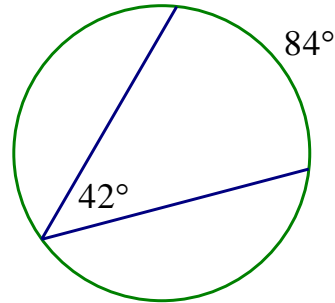
$z =$ _____

$SQ =$ _____

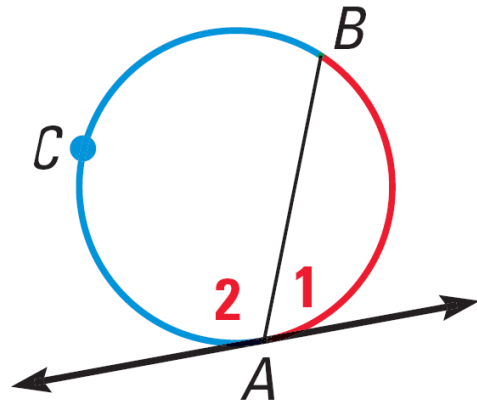
$SU =$ _____

15.5 Angle Relationships in Circles

Remember: When the angle is on the circle: $\text{Angle} = \frac{1}{2} (\text{Arc})$



- This works even when one of the lines is a tangent:

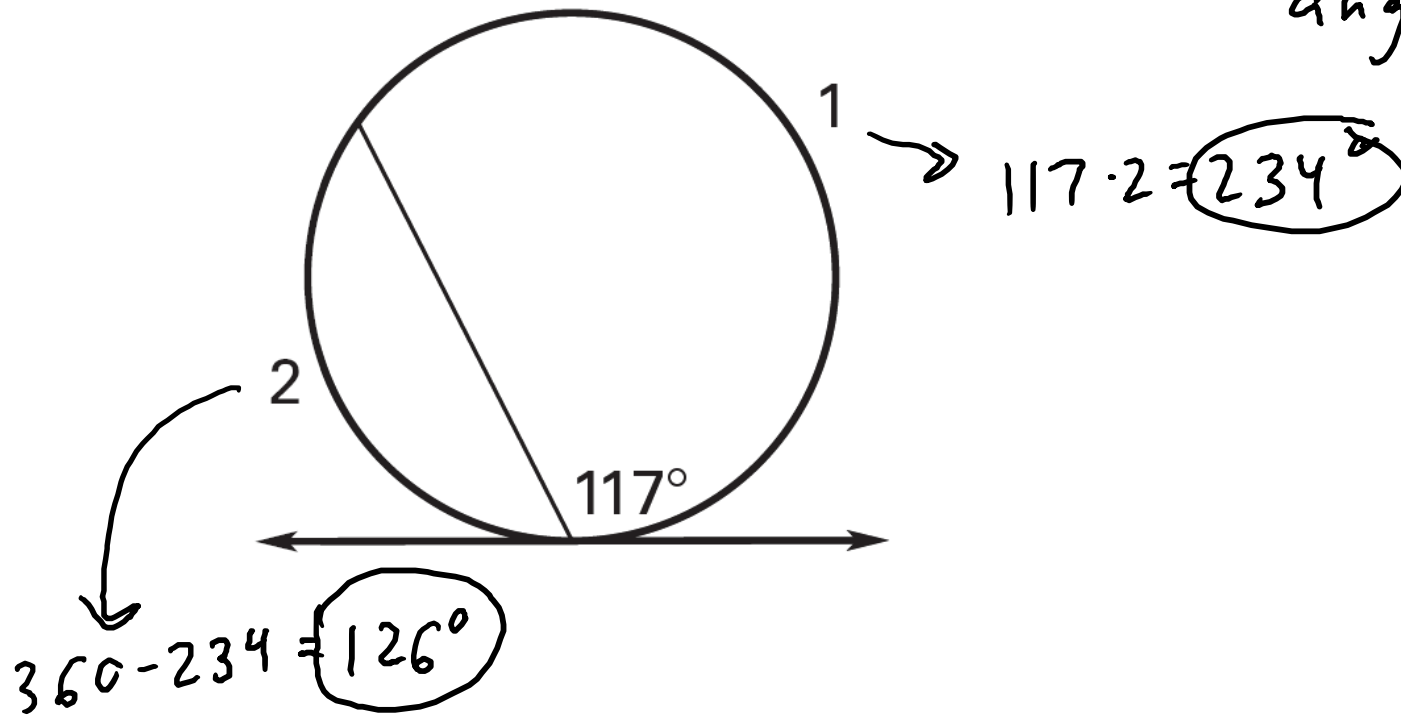


$$m\angle 1 = \frac{1}{2} m\widehat{AB}$$

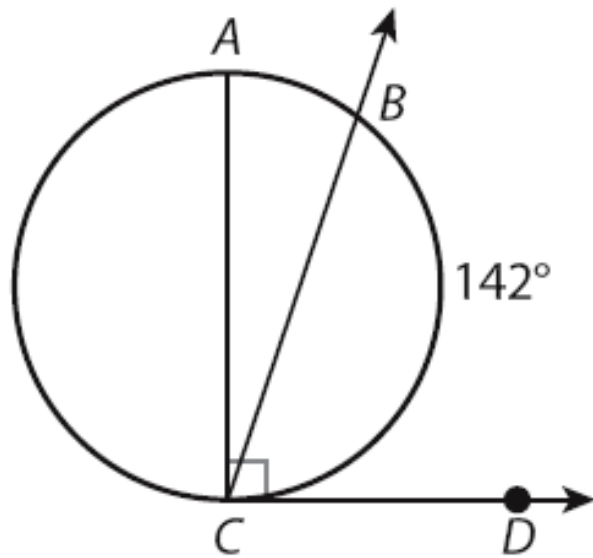
$$m\angle 2 = \frac{1}{2} m\widehat{BCA}$$

Ex. Find the measures of the two arcs.

$$\text{angle} = \frac{1}{2}(\text{arc})$$

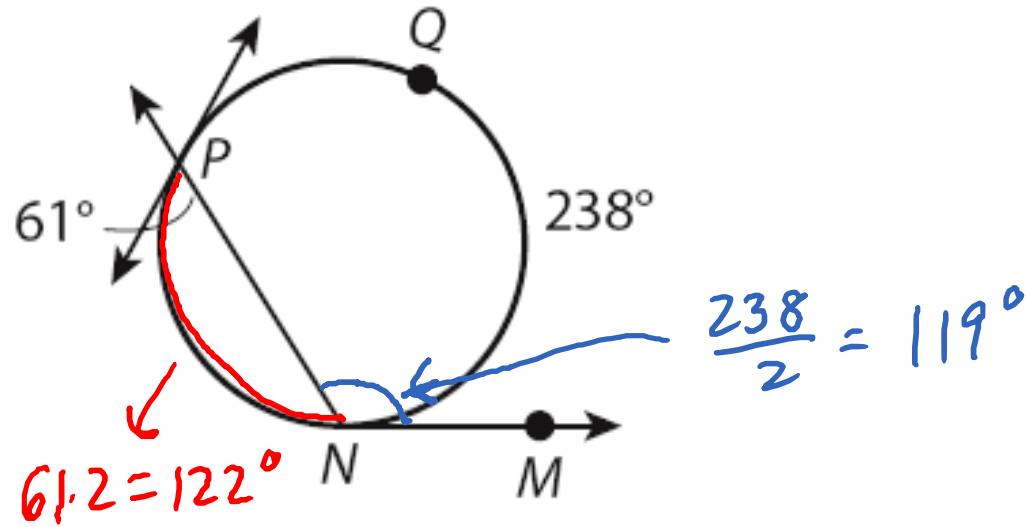


Ex. Find $m\angle BCD$.

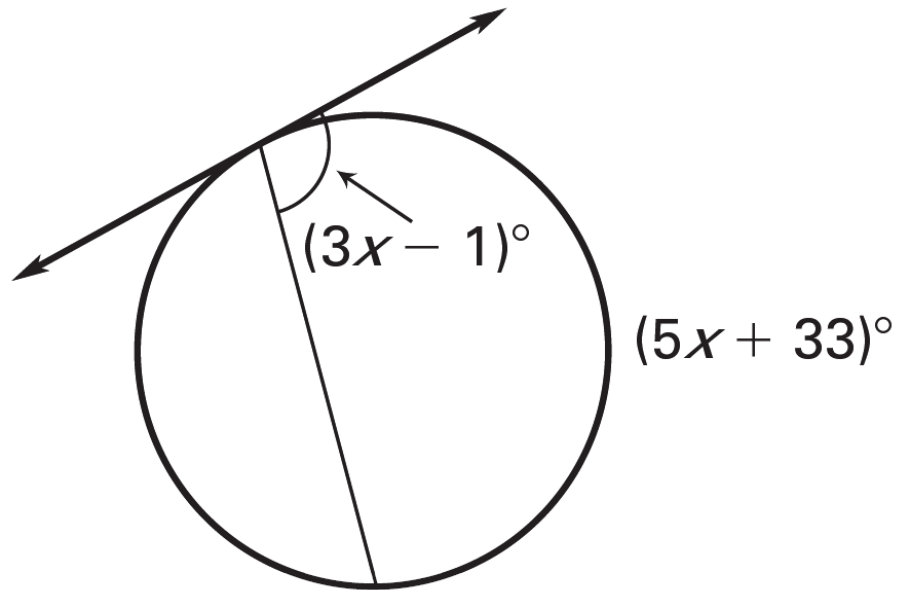


$$\frac{142}{2} = \boxed{71}$$

Pract. Find $m\widehat{PN}$ and $m\angle MNP$.



Ex. Find x .



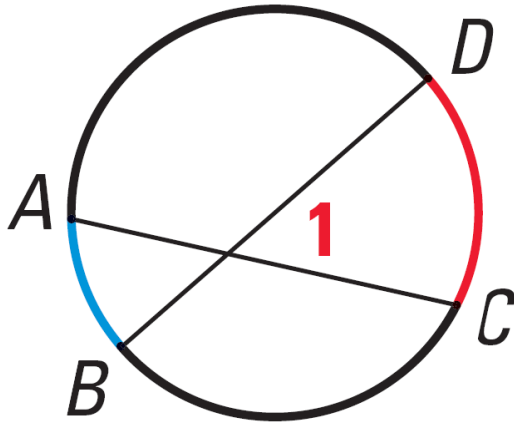
$$2(3x - 1) = 5x + 33$$

$$\begin{array}{r} 6x - 2 = 5x + 33 \\ -5x \quad -5x \end{array}$$

$$\begin{array}{r} x - 2 = 33 \\ +2 \quad +2 \end{array}$$

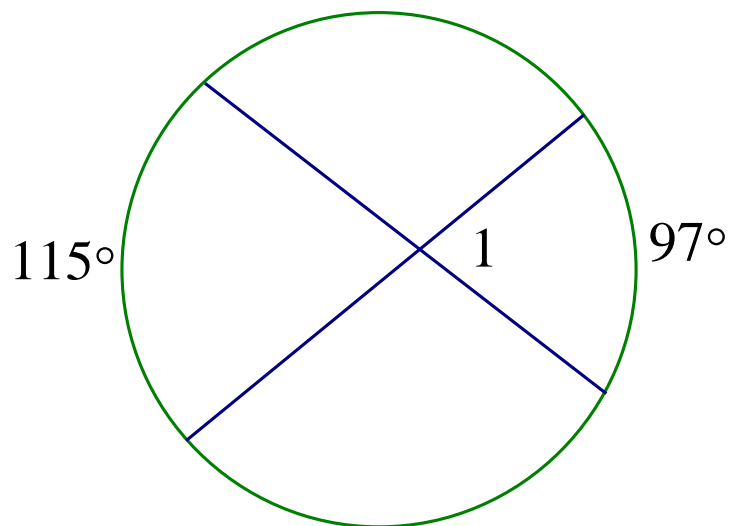
$$x = 35$$

- When chords intersect inside a circle: Angle = $\frac{1}{2}$ (Arc + Arc)



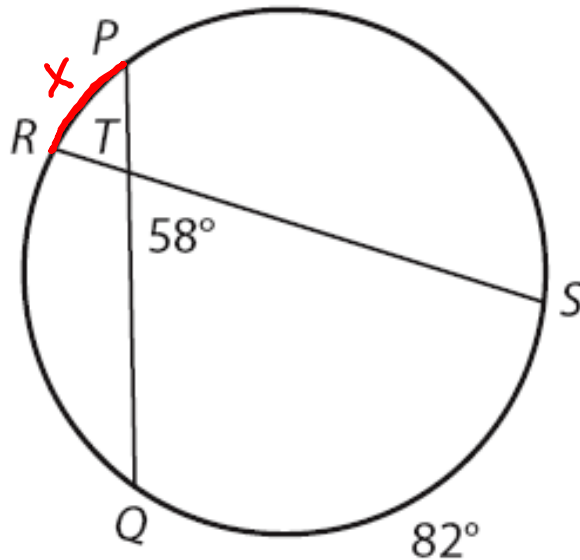
$$m\angle 1 = \frac{1}{2}(m\widehat{DC} + m\widehat{AB})$$

Ex. Find $m\angle 1$.



$$\frac{1}{2}(115 + 97)$$
$$\frac{1}{2}(212)$$
$$\boxed{106^\circ}$$

Ex. Find $m\widehat{PR}$.



$$\text{angle} = \frac{1}{2}(\text{arc} + \text{arc})$$

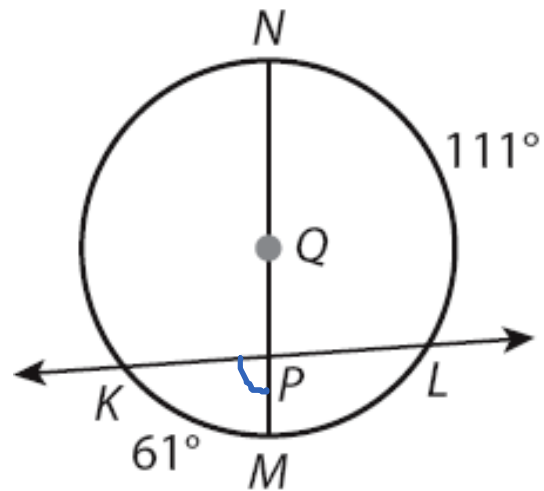
$$58 = \frac{1}{2}(82 + x)$$

$$58 = 41 + \frac{1}{2}x$$

$$2 \cdot 17 = \frac{1}{2}x \cdot 2$$

$$34 = x$$

Pract. Find $m\angle MPK$.

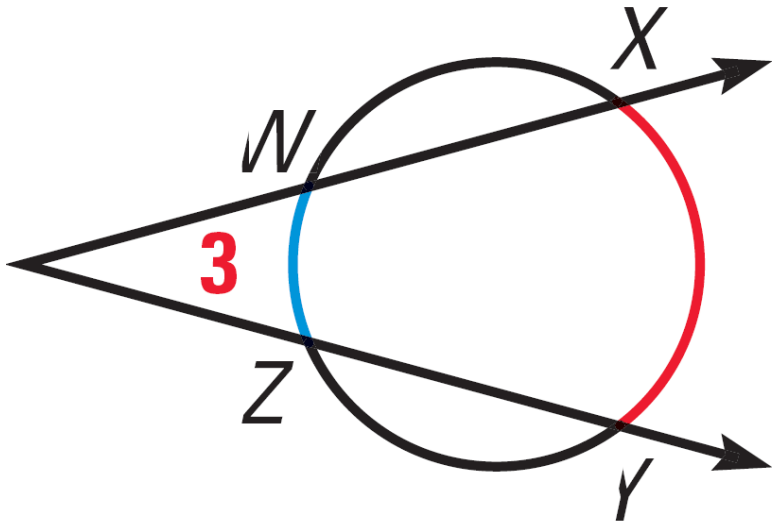


$$\frac{1}{2}(111 + 61)$$

$$\frac{1}{2}(172)$$

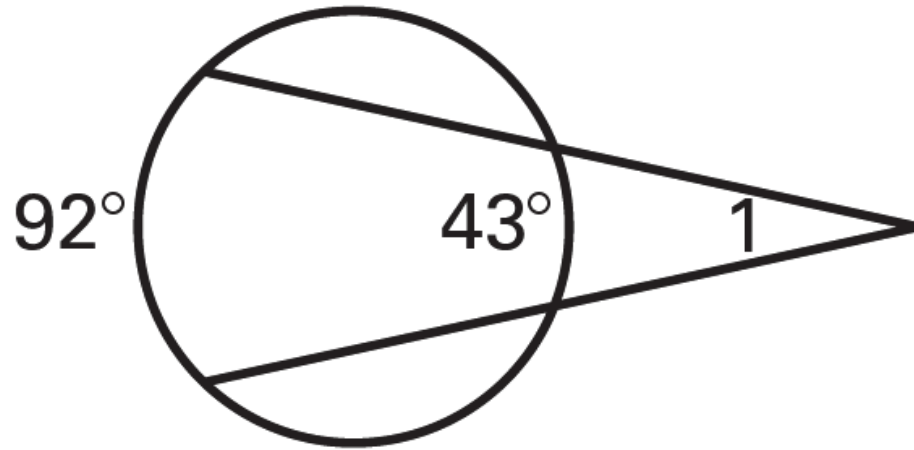
$$\boxed{86}$$

- When chords intersect outside a circle: Angle = $\frac{1}{2}(\text{Arc} - \text{Arc})$



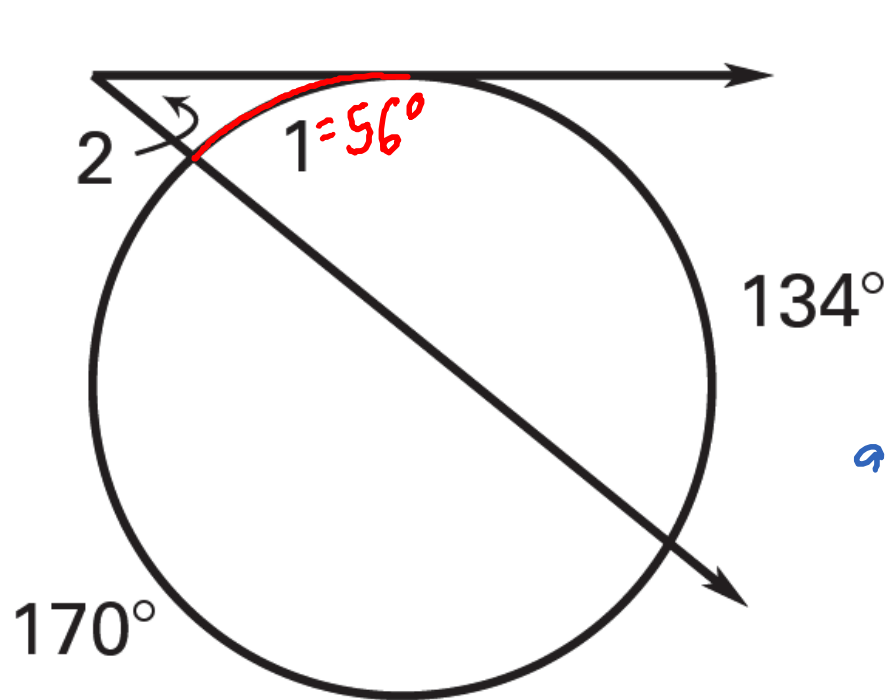
$$m\angle 3 = \frac{1}{2}(m\widehat{XY} - m\widehat{WZ})$$

Ex. Find the measure of $\angle 1$.



$$\begin{aligned} \text{angle} &= \frac{1}{2}(\text{arc} - \text{arc}) \\ &= \frac{1}{2}(92 - 43) \\ &= \frac{1}{2}(49) \\ &= 24.5 \end{aligned}$$

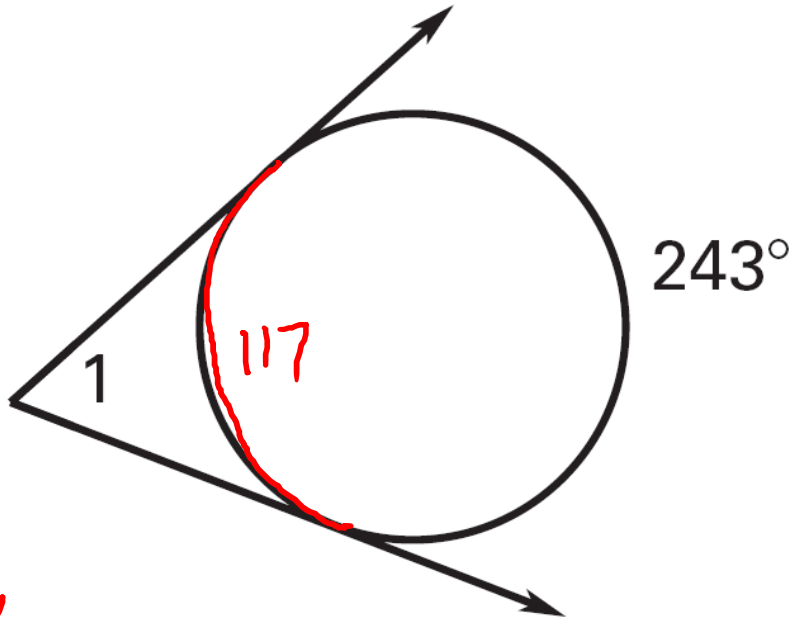
Ex. Find the measures of the angle and the arc.



$$\begin{array}{r} 360 \\ -134 \\ -170 \\ \hline 56 \end{array}$$

$$\begin{aligned} \text{angle} &= \frac{1}{2}(\text{arc} - \text{arc}) \\ &= \frac{1}{2}(134 - 56) \\ &= \frac{1}{2}(78) \\ &= 39^\circ \end{aligned}$$

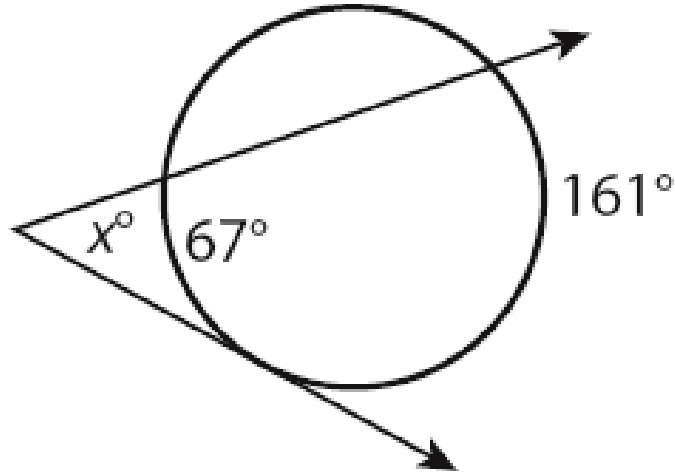
Ex. Find the measure of $\angle 1$.



$$\begin{array}{r} 360 \\ - 243 \\ \hline 117 \end{array}$$

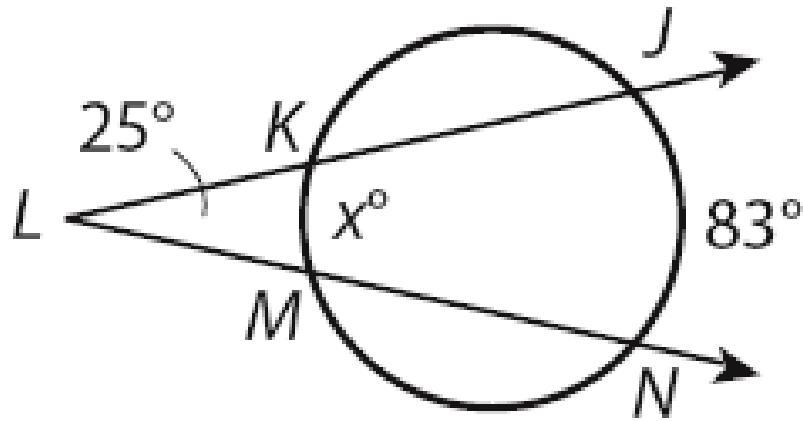
$$\begin{aligned} \text{angle} &= \frac{1}{2} (\text{arc} - \text{arc}) \\ &= \frac{1}{2} (243 - 117) \\ &= \frac{1}{2} (126) \\ &= 63^\circ \end{aligned}$$

Pract. Find x .



$$\begin{aligned} \text{angle} &= \frac{1}{2}(\text{arc} - \text{arc}) \\ &= \frac{1}{2}(161 - 67) \\ &= \frac{1}{2}(94) \\ &= 47 \end{aligned}$$

Ex. Find x .



$$\text{angle} = \frac{1}{2}(\text{arc} - \text{arc})$$

$$25 = \frac{1}{2}(83 - x)$$

$$25 = 41.5 - \frac{1}{2}x$$
$$\underline{-41.5} \quad \underline{-41.5}$$

$$(-2) \cdot -16.5 = -\frac{1}{2}x \cdot (-2)$$

$$33 = x$$