

# Angles & Circles

23

$$4x + 116 = 180$$

$$-116 \quad -116$$

$$\hline 4x = 64$$

$$\frac{4x}{4} = \frac{64}{4}$$

$$x = 16$$

$$7y = 98$$

$$y = 14$$

$$\begin{array}{r} 152 \\ + 80 \\ \hline 232 \\ \div 2 \\ \hline 116 \end{array}$$

$$\begin{array}{r} 152 \\ + 44 \\ \hline 196 \\ \div 2 \\ \hline 98 \end{array}$$

title

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

on the circle      inside the circle      outside the circle

angles relationships

**ON the circle**  
 a tangent intersecting a chord:

angle =  $\frac{1}{2}$  intercepted arc

$$\begin{array}{r} 360 \\ - 120 \\ \hline 240 \end{array}$$

on circle

Find the value of x.

$$\frac{804}{156} - \frac{360}{204} = \frac{204}{2} = 102^\circ$$

$$\boxed{x = 102^\circ}$$

$$\frac{90}{180} \cdot x = 180^\circ$$

examples

**INSIDE the circle**  
two intersecting chords:

angle =  $\frac{1}{2}$  (sum of arcs)  
of the vertical angles

$$\frac{36+50}{2} = \frac{86}{2} = 43^\circ$$

inside circle

Find the value of x.

$$2 \cdot 100 = \frac{x+65}{2} \cdot 2$$

$$\frac{200}{-65} = \frac{x+65}{-65}$$

$$\boxed{135 = x}$$

$$\frac{110+30}{2} = \frac{140}{2} = 70^\circ$$

$$\boxed{x = 70^\circ}$$

examples

**OUTSIDE the circle**  
a tangent intersecting a secant, two intersecting tangents,  
or two intersecting secants:

angle =  $\frac{1}{2}$  (difference of arcs)  
big arc - little arc

$$\angle 1 = \frac{200-60}{2}$$

$$\angle 1 = \frac{140}{2} \quad \boxed{\angle 1 = 70^\circ}$$

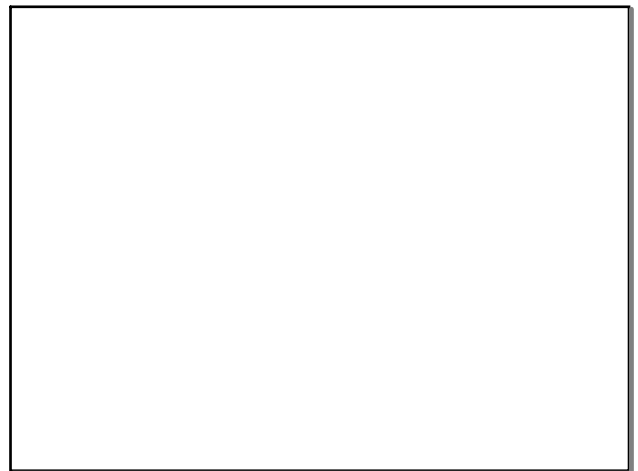
outside circle

Find the value of x.

$360$   
 $- 232$   
 $128$

$\angle X = \frac{232 - 128}{2}$   
 $\angle X = \frac{104}{2}$   
 $\angle X = 52^\circ$

$2 \cdot 44 = \frac{(18x + 9) - (6x + 5)}{2} \cdot 2$   
 $88 = 18x + 9 - 6x - 5$   
 $88 = 12x + 4$   
 $\frac{84}{12} = \frac{12x}{12}$   
 $7 = x$



examples

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