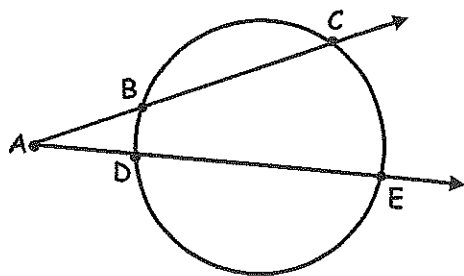
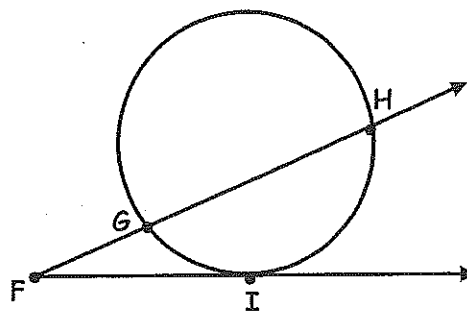


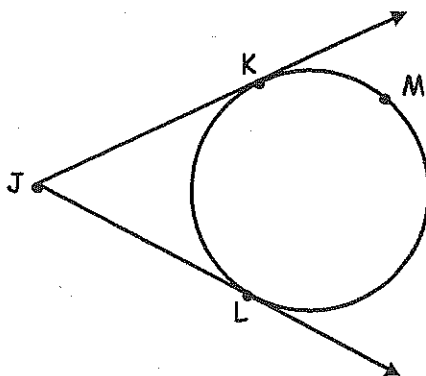
12-4 Secants, Tangents, and Angle Measures



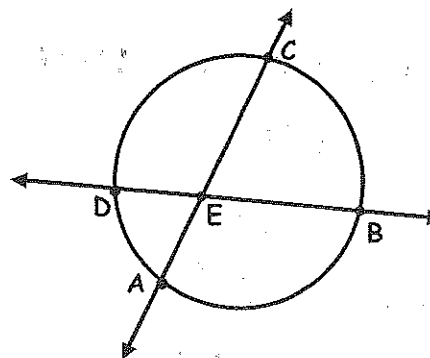
$$m\angle A = \frac{1}{2}(m\widehat{CE} - m\widehat{BD})$$



$$m\angle F = \frac{1}{2}(m\widehat{IH} - m\widehat{GI})$$

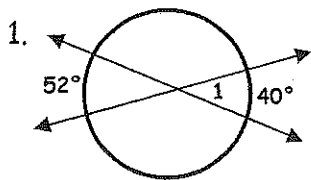


$$m\angle J = \frac{1}{2}(m\widehat{KML} - m\widehat{KL}) \quad \text{or} \quad m\angle J + m\widehat{KL} = 180^\circ$$

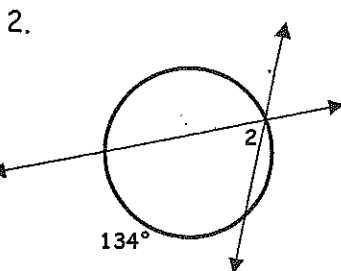


$$m\angle CEB = \frac{1}{2}(m\widehat{BC} + m\widehat{AD})$$

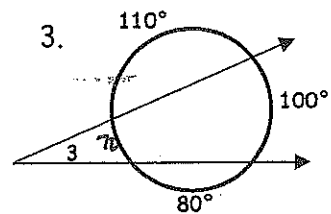
Find the measure of each numbered angle.



$$\begin{aligned} \angle 1 &= \frac{1}{2}(40 + 52) \\ &= 46^\circ \end{aligned}$$



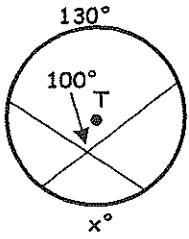
$$\frac{134}{2} = 67^\circ$$



$$\begin{aligned} \angle 3 &= \frac{1}{2}(100 - 70) \\ &= 15^\circ \end{aligned}$$

Given $\odot T$, find the value of x .

4.

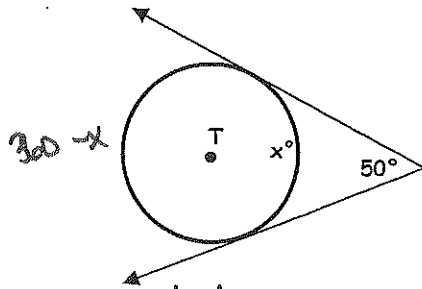


$$100 = \frac{1}{2}(130 + x)$$

$$100 = 65 + \frac{1}{2}x$$

$$\underline{70 = x}$$

5.

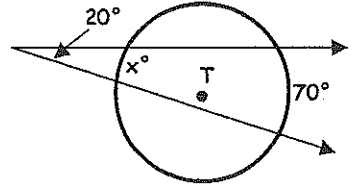


$$50 = \frac{1}{2}(360 - x - x)$$

$$50 = 180 - x$$

$$\underline{x = 130}$$

6.



$$20 = \frac{1}{2}(70 - x)$$

$$20 = 35 - \frac{1}{2}x$$

$$\frac{1}{2}x = 15$$

$$\underline{x = 30}$$

In $\odot K$, $m\widehat{OB} = 98^\circ$, $m\widehat{OY} = 28^\circ$, $m\widehat{YD} = 62^\circ$, and $m\widehat{DA} = 38^\circ$. Find:

7. $m\widehat{AB} = 134^\circ = 360 - 98 - 28 - 62 - 38$

8. $m\angle 1 = 86^\circ = \frac{134 + 38}{2}$

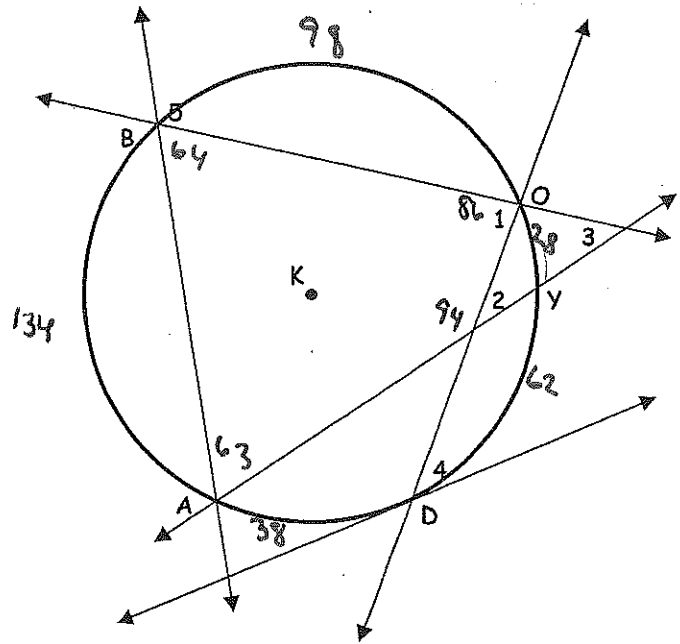
9. $m\angle 2 = 33^\circ = \frac{38 + 28}{2}$

10. $m\angle 3 = 53^\circ = \frac{134 - 28}{2}$

11. $m\angle 4 = 45^\circ = \frac{62 + 28}{2}$

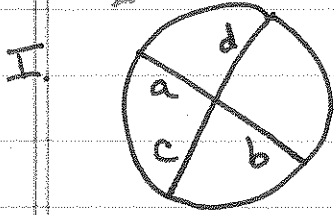
12. $m\angle 5 = 180 - 64 = 116$

$$\frac{38 + 62 + 28}{2} = 64$$



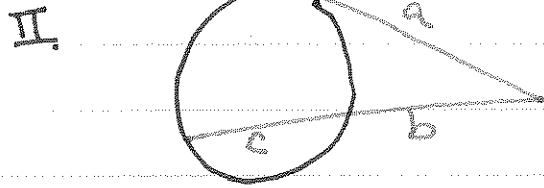
12.4 Segment Lengths

2 chords



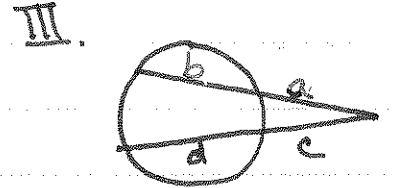
$$a \cdot b = c \cdot d$$

Tangent and secant



$$a^2 = b(b+c)$$

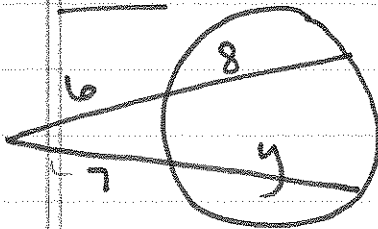
2 secants



$$a(a+b) = c(c+d)$$

Intersects
circle at two points
↓

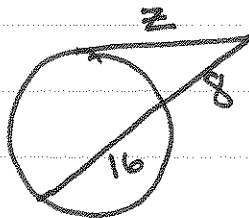
Ex. 1



$$6(6+8) = 7(7+y)$$

$$y = 5$$

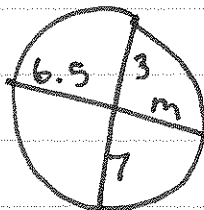
Ex. 2



$$z^2 = (8)(8+16)$$

$$z = 13.9$$

Ex. 3



$$3 \cdot 7 = 6.5m$$

$$m = 3.2$$

Handwritten notes and diagrams at the top of the page, including a small diagram with arrows and labels.

Handwritten notes and diagrams in the middle section, featuring a larger diagram with arrows and labels.

Handwritten notes and diagrams in the lower middle section, including a diagram with arrows and labels.

Handwritten notes and diagrams at the bottom of the page, with a diagram showing arrows and labels.