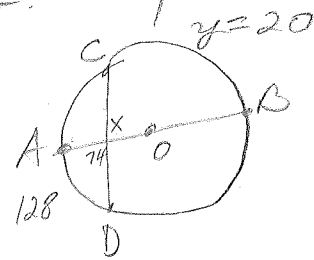


A diameter \overline{AB} and a chord \overline{CD} intersect inside $\odot O$ at X .
If $m\widehat{AD} = 128$ and $m\angle AXD = 74$, find each measure.



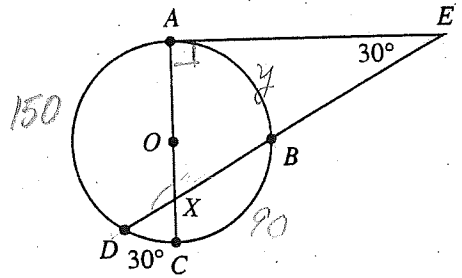
1. $m\widehat{AC} = 180 - 20 = \underline{160}$

step 1 2. $m\widehat{CB} = y$ $74 = \frac{1}{2}(128 + y)$
 $148 = 128 + y$
 $20 = y$

$m\widehat{CB} = 20$

3. $m\widehat{BD} = 180 - 128 = \underline{52}$

In $\odot O$, \overline{AC} is a diameter and \overline{AE} is a tangent. $m\widehat{DC} = 30$,
 $m\angle AED = 30$ Find each measure.

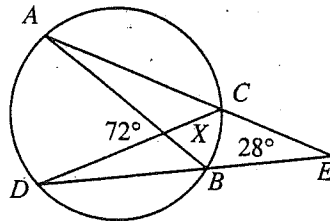


4. $m\widehat{AB} = 90 \rightarrow 30 = \frac{1}{2}(150 - y)$
 $60 = 150 - y$
 $y = 90$

5. $m\widehat{BC} = 90$

6. $m\angle AXD = \frac{1}{2}(150 + 90) = 120$

7. Given $m\angle AXD = 72$, $m\angle AED = 28$
Find $m\widehat{AD}$ and $m\widehat{CB}$.



sys. of eqs:

$72 = \frac{1}{2}(m + n) \rightarrow 144 = m + n$

$28 = \frac{1}{2}(m - n) \rightarrow 56 = m - n$

$200 = 2m$

$100 = m$

$m\widehat{AD} = 100$
 $m\widehat{CB} = 44$

$72 = \frac{1}{2}(100 + n)$

$144 = 100 + n$

$44 = n$

ck
 $28 = \frac{1}{2}(100 - 44)$
 $= \frac{1}{2}(56)$
 $28 = 28$

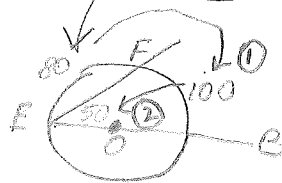
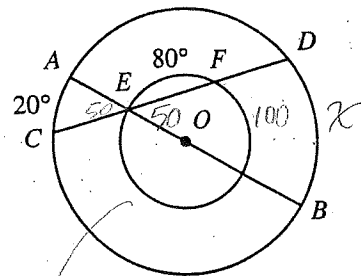
8. Given concentric circles centered at O . \overline{AB} and \overline{CD} are chords of the large circle that intersect at point E on the small circle.
 $m\widehat{EF} = 80$, $m\widehat{AC} = 20$ Find $m\widehat{BD}$.

$$50 = \frac{1}{2}(20 + x)$$

$$100 = 20 + x$$

$$80 = x$$

$$m\widehat{BD} = 80$$



$\odot O$ is tangent to $\odot B$ at point A . \overline{GA} is tangent to both circles at A and \overline{CD} is tangent to $\odot O$ at B . $\overline{GA} \parallel \overline{CD}$,
 $m\angle AGB = 42$

$$\widehat{AD} \cong \widehat{AC} \quad (1)$$

$$AD = AC = 90$$

$$m\widehat{FAC} = 138$$

$$360 - 84 - x$$

9. Find $m\widehat{AH} = 132$

$$(90 + 42)$$

$$42 = \frac{1}{2}(276 - x - x)$$

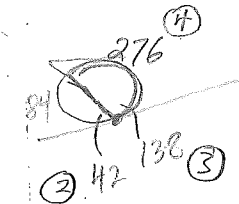
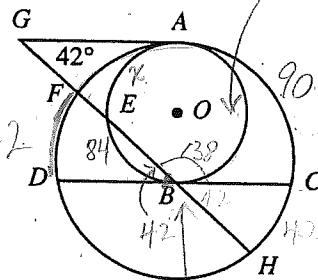
$$84 = 276 - 2x$$

$$2x = 192$$

$$x = 96$$

10. Find $m\widehat{AF} = 48$

$$138 - 90 = 48$$



11. Find $m\widehat{AE} = x = 96$

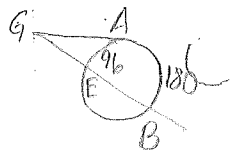
$$42 = \frac{1}{2}((360 - 84 - x) - x)$$

$$84 = 276 - 2x$$

$$2x = 192$$

$$x = 96$$

circle method



$\odot O$ is tangent to the larger circle at A . Chords \overline{AE} and \overline{CD} intersect at F on $\odot O$ and \overline{CD} is tangent to $\odot O$.

12. If $m\angle EAB = 25$, find $m\angle AHF = 40$

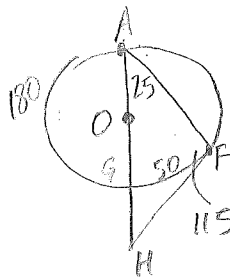
$$m\angle APH = \frac{1}{2}(m\widehat{AGF}) \quad (180 - 115 - 25)$$

$$= \frac{1}{2}(230) = 115$$

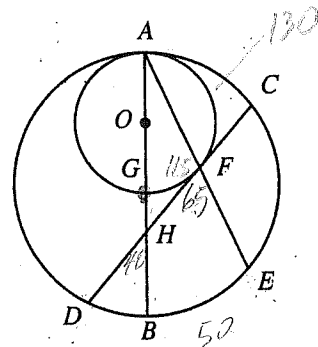
13. If $m\angle DFE = 65$, find $m\angle BAE = 25$

$$\hookrightarrow m\angle APH = 115 \rightarrow m\widehat{AGF} = 230$$

$$230 - 180 = 50 \leftarrow m\widehat{GF}$$



$$m\widehat{GF} = 50$$



14. If $m\angle DFE = 65$, find $m\widehat{BE} = 50$