

# GEOM §10-2 NOTES

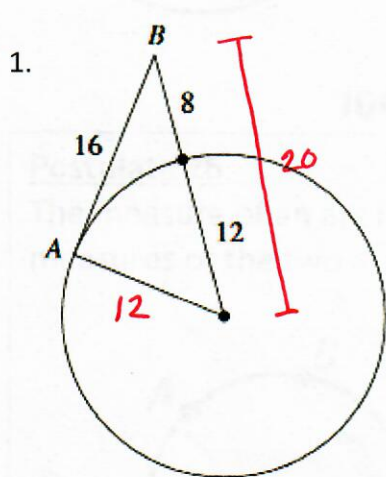
## GEOMETRY NOTES

### 10.2 Arcs and Chords

**Objectives:** Use properties of arcs of circles.  
Use properties of chords of circles.

#### Warm-Up

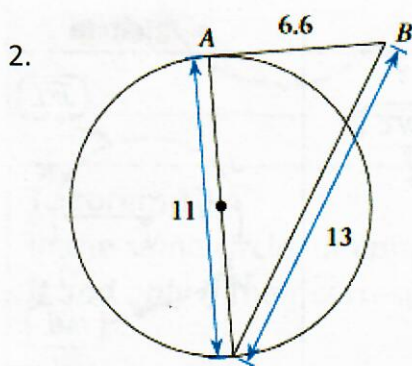
Determine if line AB is tangent to the circle.



$$12^2 + 16^2 \stackrel{?}{=} 20^2$$

$$144 + 256 \stackrel{?}{=} 400$$

$$400 = 400 \quad \therefore \text{Tangent}$$

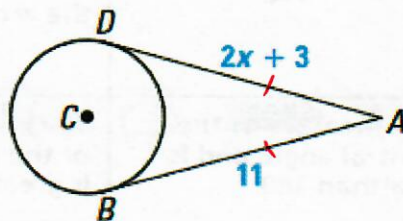


$$6.6^2 + 11^2 \stackrel{?}{=} 13^2$$

$$43.56 + 121 \stackrel{?}{=} 169$$

$$164.56 \neq 169 \quad \therefore \text{Not tangent}$$

3.  $\overline{AB}$  is tangent to  $\odot C$  at  $B$ .  
 $\overline{AD}$  is tangent to  $\odot C$  at  $D$ .  
Find the value of  $x$ .



$$2x + 3 = 11$$

$$2x = 8$$

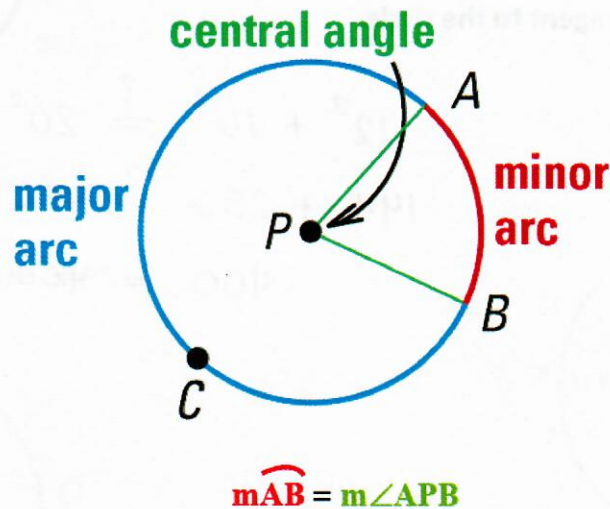
$$x = 4$$

## Definitions

**Central Angle** – an angle whose vertex is the center of a circle

**Minor Arc** – formed by a central angle which is less than  $180^\circ$

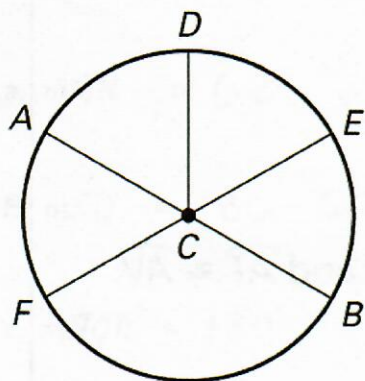
**Major Arc** – formed by a central angle which is between  $180^\circ$  and  $360^\circ$



## ARCS OF A CIRCLE

Type of Arc:	minor arc	major arc	semicircle
Example:			
Named:	usually by the letters of the two endpoints $\widehat{AC}$	by the letters of the two endpoints and another point on the arc $\widehat{DFE}$	by the letters of the two endpoints and another point on the arc $\widehat{JML}$ and $\widehat{JKL}$
Arc Degree Measure Equals:	the measure of the central angle and is less than 180 $m\angle ABC = 110$ , so $m\widehat{AC} = 110$	360 minus the measure of the minor arc and is greater than 180 $m\widehat{DFE} = 360 - m\widehat{DE}$ $m\widehat{DFE} = 360 - 60$ or 300	$360 \div 2$ or 180 $m\widehat{JML} = 180$ $m\widehat{JKL} = 180$

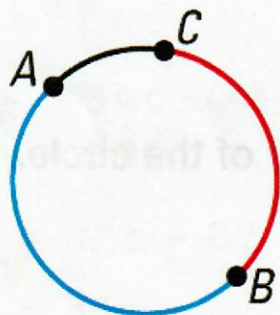
**Example 1** Determine whether the arc is a minor arc, a major arc, or a semicircle.



- a.  $\widehat{FA}$     minor arc
- b.  $\widehat{BE}$     minor arc
- c.  $\widehat{BDA}$     semicircle
- d.  $\widehat{FB}$     minor arc
- e.  $\widehat{BAE}$     major arc

**Postulate 26**

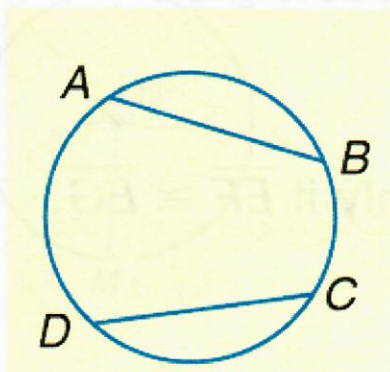
The measure of an arc formed by two adjacent arcs is the sum of the measures of the two arcs.



$$m\widehat{ABC} = m\widehat{AB} + m\widehat{BC}$$

**Theorem 10.4**

In the same circle, or congruent circles, two minor arcs are congruent **if and only if** their corresponding chords are congruent.

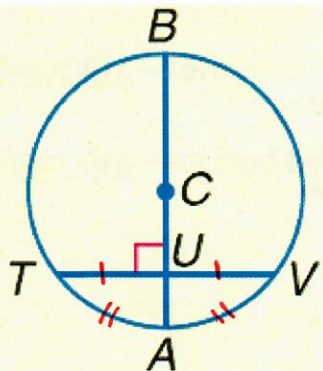


$$\overline{AB} \cong \overline{CD}, \Rightarrow \widehat{AB} \cong \widehat{CD}$$

$$\widehat{AB} \cong \widehat{CD}, \Rightarrow \overline{AB} \cong \overline{CD}$$

**Theorem 10.5**

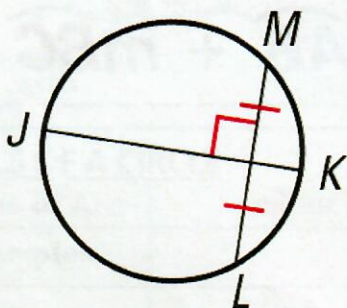
IF the diameter of a circle is perpendicular to a chord,  
THEN the diameter bisects the chord and its arc.



If  $\overline{BA} \perp \overline{TV}$ , then  $\overline{UT} \cong \overline{UV}$  and  $\widehat{AT} \cong \widehat{AV}$ .

**Theorem 10.6**

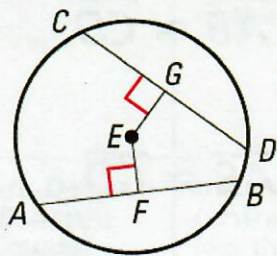
IF one chord is a perpendicular bisector of another chord,  
THEN the first chord is a diameter.



$\overline{JK}$  is a diameter of the circle.

**Theorem 10.7**

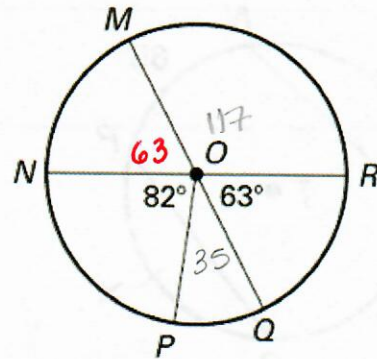
In the same circle, or in congruent circles, two chords are congruent  
if and only if they are equidistant from the center.



$\overline{AB} \cong \overline{CD}$  if and only if  $\overline{EF} \cong \overline{EG}$ .

**Example 2**  $\overline{MQ}$  and  $\overline{NR}$  are diameters. Find the indicated measure.

- a.  $m\widehat{MN} = 63^\circ$   
 b.  $m\widehat{NQ} = 180 - 63 = 117$   
 c.  $m\widehat{NQR} = 180^\circ$



d.  $m\widehat{MRP} = 117 + 63 + 35 = 215$  or  $360 - 63 - 82 = 215$

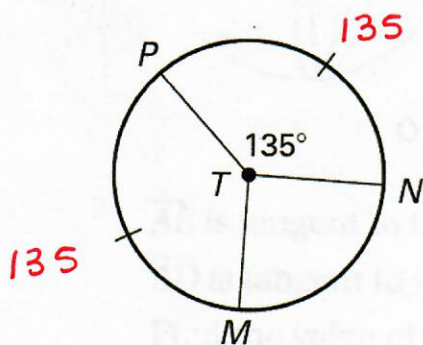
e.  $m\widehat{QR} = 63$

f.  $m\widehat{MR} = 117$

g.  $m\widehat{QMR} = 360 - 63 = 297$

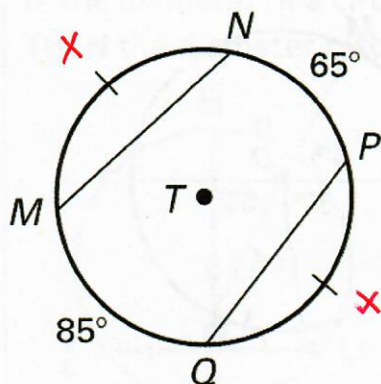
h.  $m\widehat{PQ} = 180 - 82 - 63 = 35$

**Example 3** Find the measure of  $\widehat{MN}$ .



$$\widehat{MN} = 360 - 135 - 135 = 90$$

**Example 4** Find the measure of  $\widehat{MN}$ .



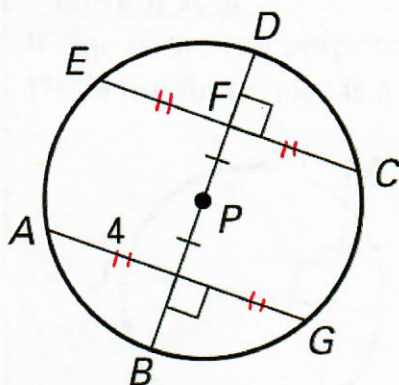
$$x + x + 85 + 65 = 360$$

$$2x + 150 = 360$$

$$2x = 210$$

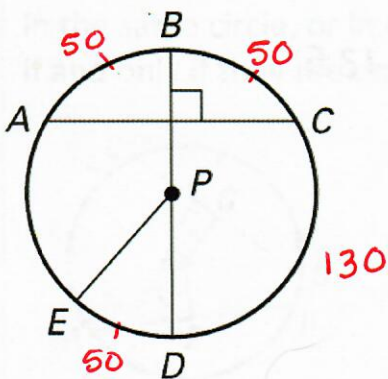
$$x = 105$$

**Example 5** Find the length of FC.



$$FC = 4 \quad (\text{Thm 10.7})$$

**Example 6** If  $m\widehat{BC} = 50^\circ$ , and  $\widehat{AB} \cong \widehat{ED}$ , find  $m\widehat{AE}$ .



$$m\widehat{AE} = 130 - 50$$

$$= 80^\circ$$