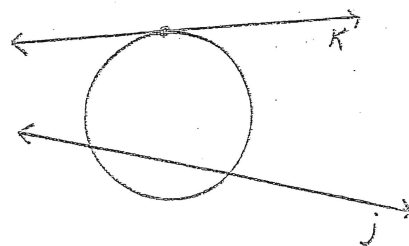
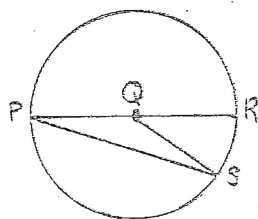
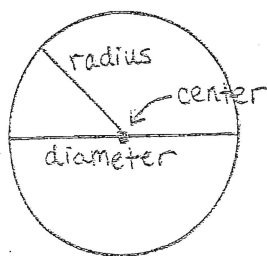


Chapter 10 – Circles

10.1 – Tangents to Circles

1. **Circle** – the set of all points in a plane that are equidistant from a given point, called the **center**.
2. A circle with center P is called “circle P”, or $\odot P$.
3. **Radius** – the distance from the center to a point on the circle.
 - a segment whose endpoints are the center of the circle and a point on the circle.
 - all radii of a circle are congruent.
4. Two circles are **congruent** if they have the same radius.
5. **Diameter** – the distance across the circle through its center. The diameter is twice the radius.
 - a chord that passes through the center of the circle. (\overline{PR})
6. **Chord** – a segment whose endpoints are points on the circle. (\overline{PS} and \overline{PR})
7. **Secant** – a line that intersects a circle in two points. (line j)
8. **Tangent** – a line in the plane of a circle that intersects the circle in exactly one point. (line k)



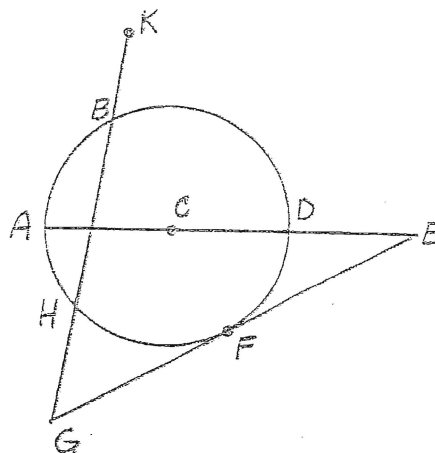
Example 1: Tell whether the line segment is best described as a *chord*, a *secant*, a *tangent*, a *diameter*, or a *radius* of $\odot C$.

a) \overline{AD}

b) \overline{CD}

c) \overrightarrow{EG}

d) \overline{HB}



In a plane, two circles can intersect in two points, one point, or no points.

9. **Tangent Circles** – coplanar circles that intersect in one point.

10. **Concentric Circles** – coplanar circles that have a common center.

11. **Common Tangent** – a line or segment that is tangent to two coplanar circles.

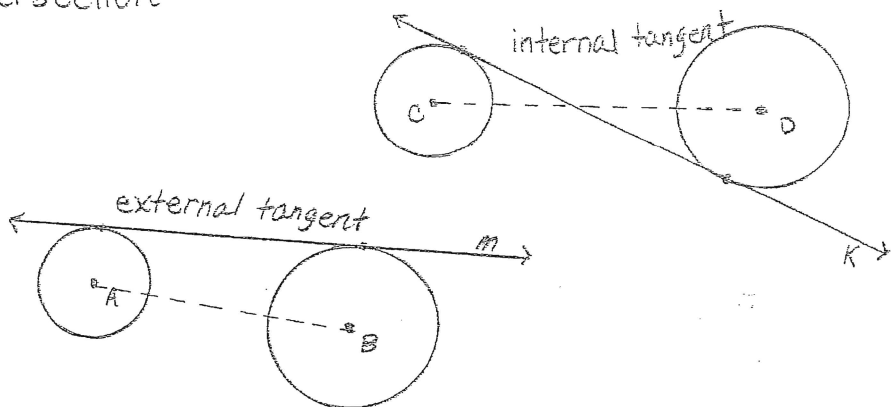
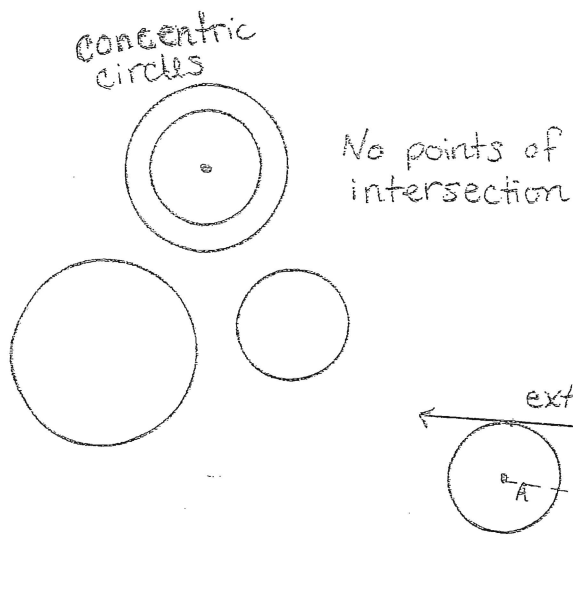
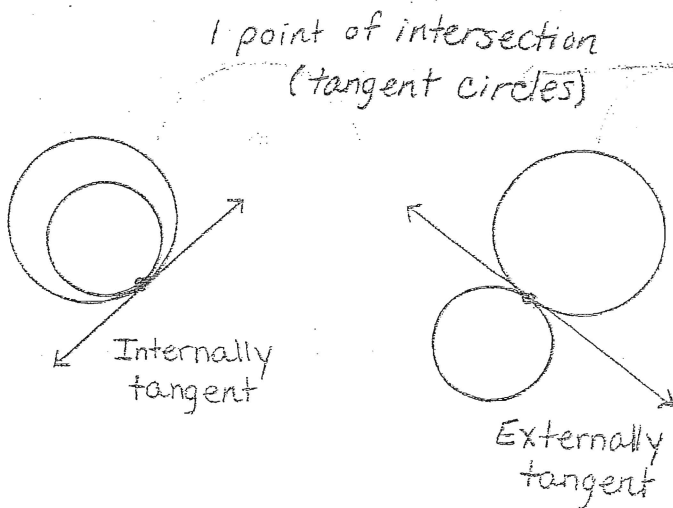
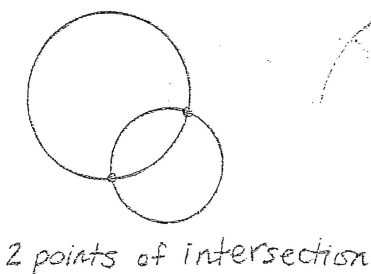
12. **Common Internal Tangent** – intersects the segment that joins the centers of the two circles.

13. **Common External Tangent** – does not intersect the segment that joins the centers of the two circles.

14. **Point of Tangency** – the point at which a tangent line intersects the circle to which it is tangent.

15. **Interior of a Circle** – consists of the points that are inside the circle.

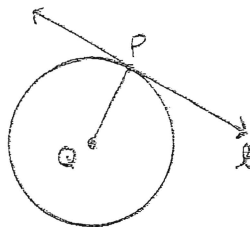
16. **Exterior of a Circle** – consists of the points that are outside the circle.



Theorem 10.1

If a line is tangent to a circle, then it is perpendicular to the radius drawn to the point of tangency.

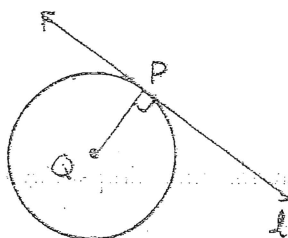
If ℓ is tangent to $\odot Q$ at P , then $\ell \perp \overline{QP}$.



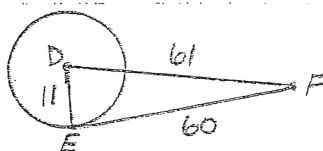
Theorem 10.2

In a plane, if a line is perpendicular to a radius of a circle at its endpoint on the circle, then the line is tangent to the circle.

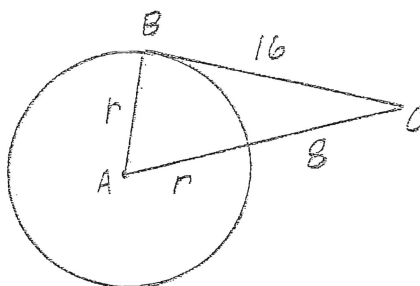
If $\ell \perp \overline{QP}$ at P , then ℓ is tangent to $\odot Q$.



Example 2: Is \overline{EF} tangent to $\odot D$?



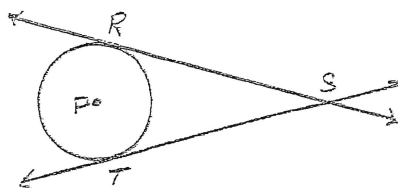
Example 3: Find the radius of $\odot A$. \overline{BC} is tangent to the circle.



Theorem 10.3

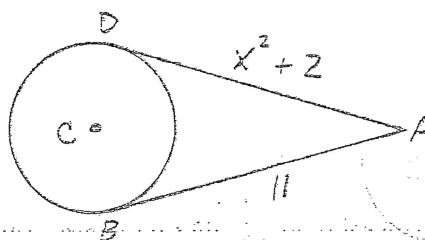
If two segments from the same exterior point are tangent to a circle, then they are congruent.

If \overline{SR} and \overline{ST} are tangent to $\odot P$, then $\overline{SR} \cong \overline{ST}$.



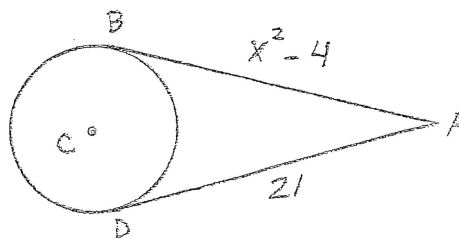
Example 4: \overline{AB} is tangent to $\odot C$ at B.
 \overline{AD} is tangent to $\odot C$ at D.

Find the value of x.



Example 5: \overline{AB} is tangent to $\odot C$ at B.
 \overline{AD} is tangent to $\odot C$ at D.

Find the value of x.



The diameter of a circle is given. Find the radius.

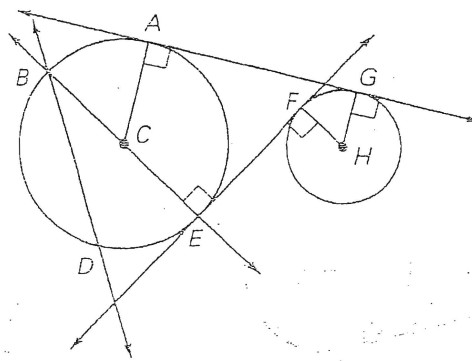
1. $d = 13$ in.
2. $d = 8$ cm
3. $d = 12.6$ ft
4. $d = 2$ ft 5 in.

The radius of a circle is given. Find the diameter.

5. $r = 17$ cm
6. $r = 6.3$ ft
7. $r = 0.75$ in.
8. $r = 4.25$ ft

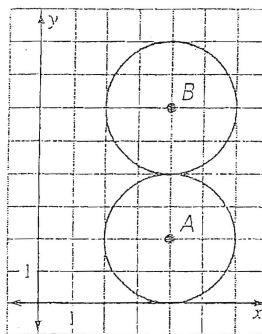
Match the notation with the term that best describes it.

- | | |
|-------------------------------|----------------------------|
| 9. F | A. Center |
| 10. \overleftrightarrow{FE} | B. Chord |
| 11. \overline{HG} | C. Diameter |
| 12. \overline{DB} | D. Radius |
| 13. C | E. Point of tangency |
| 14. \overline{BE} | F. Common external tangent |
| 15. \overleftrightarrow{DB} | G. Common internal tangent |
| 16. \overleftrightarrow{AG} | H. Secant |



Use the diagram at the right.

17. What are the center and radius of $\odot A$?
18. What are the center and radius of $\odot B$?
19. Describe the intersection of the two circles.
20. Describe all the common tangents of the two circles.



Tell whether \overleftrightarrow{AB} is tangent to $\odot C$. Explain your reasoning.

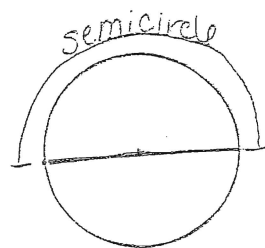
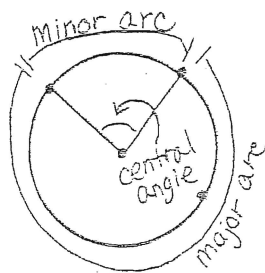
- 21.
- 22.

\overleftrightarrow{AB} and \overleftrightarrow{AD} are tangent to $\odot C$. Find the value of x .

- 23.
- 24.
- 25.

10.2 – Arcs and Chords

1. **Central Angle** – an angle whose vertex is the center of a circle.
2. If the measure of a central angle, $\angle APB$, is less than 180° , then A and B and the points of circle P in the interior of $\angle APB$ form a minor arc of the circle.
3. The points A and B and the points of circle P in the exterior of $\angle APB$ form a major arc.
4. If the endpoints of an arc are the endpoints of a diameter, then the arc is a semicircle.



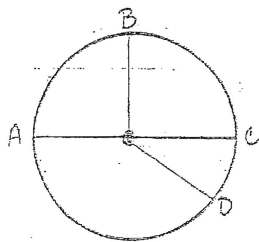
5. Naming Arcs

Arcs are named by their endpoints. Major arcs and semicircles are named by their endpoints and by a point on the arc.

\widehat{ABC} – semicircle

\widehat{ACB} – major arc

\widehat{BAD} – major arc



\widehat{AB} – minor arc

\widehat{BD} – minor arc

\widehat{CD} – minor arc

6. **Measure of a Minor Arc** – the measure of its central angle.
7. **Measure of a Semicircle** – 180°
8. **Measure of a Major Arc** – the difference between 360° and the measure of its associated minor arc.

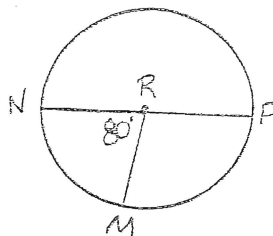
Example 1: Find the measure of each arc.

a) \widehat{MN}

b) \widehat{MPN}

c) \widehat{PMN}

d) \widehat{PM}

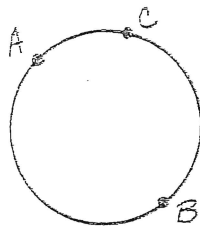


- Two arcs of the same circle are **adjacent** if they intersect at exactly one point
- You can add the measures of adjacent arcs.

Postulate 26 – Arc Addition Postulate

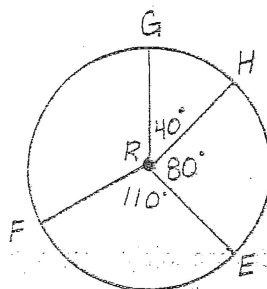
The measure of an arc formed by two adjacent arcs is the sum of the measures of the two arcs.

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



Example 2: Find the measure of each arc.

- \widehat{GE}
- \widehat{GEF}
- \widehat{GF}



9. **Congruent Arcs** – arcs of the same circle or of congruent circles that have the same measure.

Example 3: Are the arcs congruent? Explain.

