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**Geometry Notes 10.1 Exploring Circles**

Circle – The set of ___________________ in a ______________ that are ___________________
from a given ______________, called the ______________ of the circle.

If the center is $P$, then the circle can be denoted by ______________

The __________________________ the circle form the circles _____________________

The __________________________ the circle form its ___________________________

A chord of a circle is a ______________ whose ______________ are _______ the circle.

A diameter of a circle is a __________________ that passes through the ______________

A radius of a circle is a ______________ that has the ______________ as ___________________ and a point ______________ as the __________________________

All radii of a circle are __________________________

The ______________ of a circle is __________________________

Then __________________________

Secant – a ______________ that ___________________ a circle at __________________________

Tangent – a ______________ that __________________ a circle at __________________________

__________________________ – the point at which a line is tangent to a circle.

Common tangent – a line that is tangent to __________________________

Common external tangent – a __________________________ that __________________________

the segment that joins the ______________ of the circle.

Common internal tangent – a __________________________ that __________________________

the segment that joins the ______________ of two circles.
Ways that circles intersect:

- No points of intersection
- Exactly one point of intersection – circles are tangent to each other
- Two points of intersection
- All points of intersection

Concentric – circles that have the ________________

Congruent circles – that have ____________________________ or congruent diameters

**Geometry Notes 10.2 Properties of Tangents**

Theorem 10.1: If a line is tangent to a circle, then it is perpendicular to the radius drawn to the point of tangency.

![Diagram of Theorem 10.1](image)

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.

![Diagram of Theorem 10.2](image)

Theorem 10.3: If two segments from the same exterior point are tangent to a circle, then they are congruent.

![Diagram of Theorem 10.3](image)

A circle is __________________________ in a polygon if __________________ of the polygon is __________________________ to the circle.

A circle is __________________________ about a polygon if __________________ of the polygon __________________________
Geometry Notes 10.3 Central Angles and Arcs

Central Angle – an angle whose ___________________ is the ___________________ of a circle <APB or <BPA.
________________________ - if the m<APB (or <BPA) is less than 180°, then the shortest arc linking the points A and B is the minor arc.

(1) Denoted by two letters: ____________

(2) The __________________ of a minor arc is defined to be the measure of its __________________

Ex. If m<APB = 20° then m arc AB = 20°

Semicircle – when the __________________ of an __________ are the endpoints of a ______________

(1) A semicircle measures __________
________________________ - if the m<APB is greater than 180°, then the longer arc linking points A and B is the major arc.

(1) Denoted by three letters: ____________

(2) The measure of a major arc is defined to be the __________________ between ________°
and the measure of its ____________________________

Ex. If m<APB = 120° then m arc ABC = 360° - 120° = 240°

Postulate 21 – Arc Addition Postulate: The measure of an arc formed by two adjacent arcs in the sum of the measures of the two arcs.

Arc Addition:

arc AB =
arc AC - arc CB
= 160°

Theorem 10.4: In the same circle, or in congruent circles, two arcs are congruent if and only if their central angles are congruent.
Theorem 10.5: In the same circle or in congruent circles, two minor arcs are congruent if and only if their corresponding chords are congruent.

Theorem 10.6: If a diameter of a circle is perpendicular to a chord, then the diameter bisects the chord and its arc.

Theorem 10.7: If chord $AB$ is a perpendicular bisector of another chord, then $AB$ is a diameter.

Theorem 10.8: In the same circle or in congruent circles, two chords are congruent if and only if they are equidistant from the center.
**Geometry Notes 10.5 Inscribed Angles**

An angle, \(<\text{ABC} is \underline{\text{__________________________}} \) of a circle if \(AB\) and \(BC\) are \underline{\text{__________________________}} \) of the circle. The \underline{\text{__________________________}} that lies in the \underline{\text{__________________________}} of an \underline{\text{__________________________}} \) is the \underline{\text{__________________________}} of the angle.

Theorem 10.9: If an angle is inscribed in a circle, then its measure is half the measure of its intercepted arc.

Theorem 10.10: If two inscribed angles of a circle intercept the same arc, then the angles are congruent.

Theorem 10.11: An angle that is inscribed in a circle is a right angle if and only if its corresponding arc is a semicircle.

Theorem 10.12: A quadrilateral can be inscribed in a circle if and only if its opposite angles are supplementary.
**Geometry Notes 10.6 Other Angle Relationships**

Theorem 10.13: If a tangent and chord intersect at a point on a circle, then the measure of each angle formed is half the measure of its intercepted arc.

Theorem 10.14: If two chords intersect on the interior of a circle, then the measure of each angle is half the sum of the measures of the arcs intercepted by the angle and its vertical angle.

Theorem 10.15: If a tangent and a secant, two tangents, or two secants intersect in the exterior of a circle, then the measure of the angle formed is half the difference of the measures of the intercepted arcs.
The standard equation of a circle with radius \( r \) and center \((h, k)\) is:

\[ (x - h)^2 + (y - k)^2 = r^2 \]

E1. Write the standard form of the equation of a circle whose center is \((3, -1)\) and whose radius is 4.

P1. Write the standard form of the equation of a circle whose center is \((-3, 5)\) and whose radius is 9.

E2. The point \((1, 2)\) is on a circle whose center is \((0,0)\). Write its standard equation.

P2. The point \((-6, 5)\) is on a circle whose center is \((5, 0)\). Write its standard equation.

E3. Determine the center of the circle and the radius of: \[ (x - 3)^2 + (y + 4)^2 = 16 \]

P3. Determine the center of the circle and the radius of: \[ (x + 10)^2 + (y - 7)^2 = 36 \]
**Geometry Notes Special Segments of Circles**

**Part Part=Part Part (PP=PP)**

Theorem - If two chords intersect in a circle, then the product of the lengths of the segments of one chord equals the product of the lengths of the segments of the second chord.

E1. \[ \text{Whole Outside} = \text{Outside} \times \text{Whole} (WO=WO) \]

Theorem - If two secant segments are drawn to a circle from an exterior point, then the product of the lengths of one secant segment and its external segment equals the product of the lengths of the other secant segment and its external segment.

E2. \[ \text{Whole Outside}=\text{Tangent}^2 (WO=T^2) \]

Theorem - If a tangent segment and a secant segment are drawn to a circle from an exterior point, then the square of the length of the tangent segment equals the product of the lengths of the secant segment and is an external segment.

E3.