**Chapter 9: Properties of Circles**

|  |  |  |
| --- | --- | --- |
| **Topic/Assignment** |  | **Turned in?** |
| **Ch 9 Vocabulary Puzzle** |  | Yes No |
| **Vocabulary and Properties of Tangents**  HW: Worksheet | I can use properties of a tangent to a circle to solve for missing values. | Yes No |
| **Arc Measurements/ Properties of Chords**  HW: Worksheet | I can use angle measures to find arc measures.  I can find the length of a chord and measure of an arc using relationships. | Yes No |
| **Inscribed Angles and Polygons**  HW: Worksheet | I can find measures of angles and length of arcs for inscribed angles on circles. | Yes No |
| **Ch 9 Quiz** |  |  |
| **Angles in Circles**  HW: Worksheet | I can find the measures of angles inside or outside a circle. | Yes No |
| **Segment Lengths in Circles**  HW: Worksheet | I can find the segment lengths in circles. | Yes No |
| **Equations of Circles**  HW: Worksheet | I can write equations of circles in the coordinate plane. | Yes No |
| **Ch 9 Review** |  | Yes No |

**The Ch 9 Test is on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

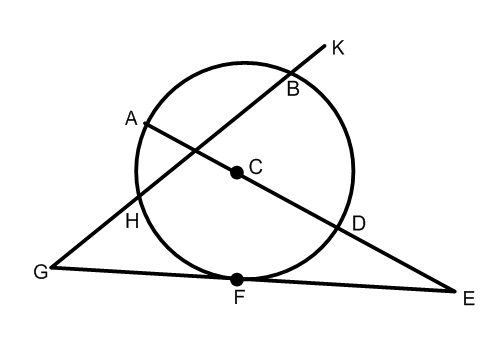
\*\*If *all* assignments are completed *by the day the Unit 10 test is given* you will receive 5 extra points on the test. \*\*

**Circle Vocabulary and Concepts**

Objective: Identify segments and lines related to circles.

Use properties of a tangent to a circle.

|  |  |  |
| --- | --- | --- |
| Term | Notes | Drawing |
| **Circle:**  the set of all points in a plane that are equidistant from a given point called the **center** of the circle |  |  |
| **Radius:**  a segment whose endpoints are the center and any point on the circle.  All radii of a circle are congruent. |  |  |
| **Chord:**  a segment whose endpoints are on a circle |  |  |
| **Diameter:**  a chord that contains the center of the circle |  |  |
| **Secant:**  a line that intersects a circle in two points |  |  |
| **Tangent:**  a line in the plane of a circle that intersects the circle in exactly one point (the *point of tangency*) |  |  |
| **Point of Tangency:**  the point where a tangent line intersects the circle |  |  |

**EXAMPLE 1:** Tell whether the line or segment is best described as a chord, a secant, a tangent, a diameter, or a radius—be specific!

a. b.

c. d.

e. g.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Term | | Notes | Drawing | |
| **RULE:**  In a plane, a line is tangent to a circle if and only if the line is perpendicular to a radius of the circle at its endpoint on the circle |  | | |  | |
| **RULE:**  Tangent segments from a common external point are congruent. |  | | |  | |

**EXAMPLE 2:** Verifying a Tangent to a Circle. (Use the Pythagorean Theorem Converse!)

a. b. c.

C

9

15

12

C

6

6

4

8

C

6

6

4

8

**EXAMPLE 3:** Using Properties of Tangents. Given:  and  are tangent to Circle C. Find the value of x.



a. b.

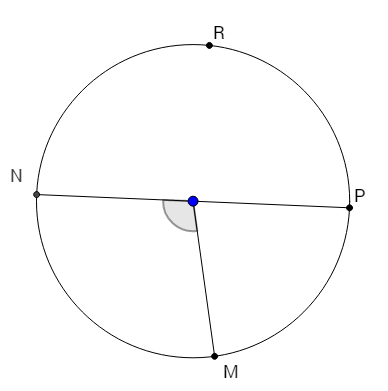
**Arc Measurement/ Properties of Chords**

Objective: Use properties of arcs of circles

Use properties of chords of circles

|  |  |  |
| --- | --- | --- |
| Term | Notes | Drawing |
| **Central Angle:**  an angle whose vertex is the center of a circle |  |  | |
| **Minor Arc:**  part of a circle that measures less than 180⁰ |  |  | |
| **Major Arc:**  part of a circle that measures between 180⁰ and 360⁰ |  |  | |
| **Semicircle:**  an arc with endpoints that are the endpoints of a diameter of a circle. The measure of a semicircle is 180⁰ |  |  | |
| **Measure of a Minor arc:**  the measure of the arc’s central angle |  |  | |
| **Measure of a Major arc:**  the difference between 360⁰ and the measure of the related minor arc |  |  | |

**EXAMPLE 1:** Finding measures of each arc of circle R. (NP is a diameter)



100°

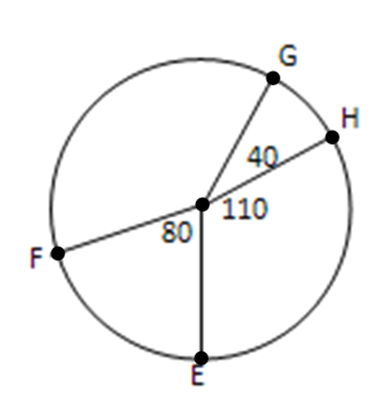
a.

b.

c.

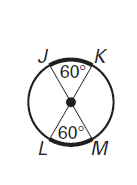
d.

|  |  |
| --- | --- |
| **Arc Addition Postulate**  The measure of an arc formed by two adjacent arcs is the sum of the measures of the two arcs. |  |

**EXAMPLE 2:** Finding the measures of Arcs

a. b.

c. d.

****

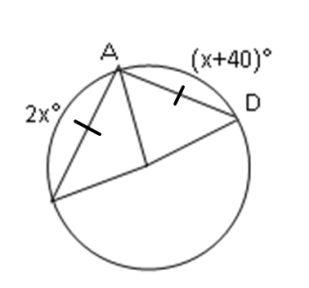
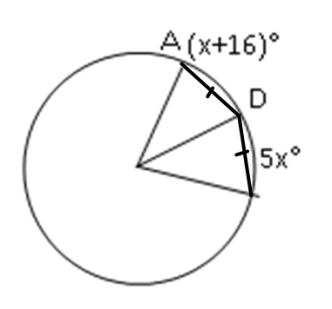
|  |  |  |
| --- | --- | --- |
| **Congruent Circles:**  Two circles that have the same radius. |  |  |
| **Congruent Arcs:**  Two arcs that have the same measure. They are part of the same circle or congruent circles |  |  |

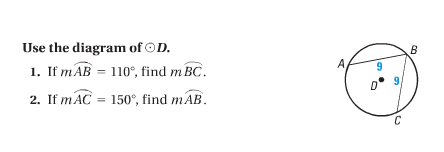
**EXAMPLE 3:** Tell whether the highlighted arcs are congruent. Explain why or why not.

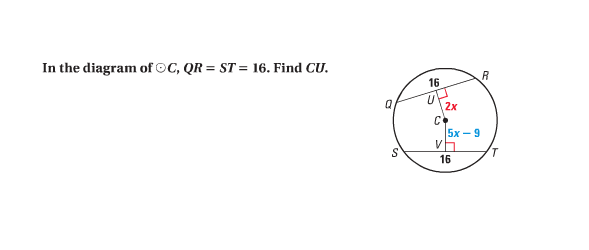
a. b.

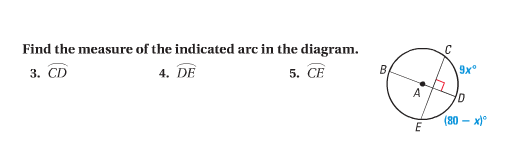
|  |  |
| --- | --- |
| **RULE:**  In the same circle, or in congruent circles, two minor arcs are congruent IF AND ONLY IF their corresponding chords are congruent. |  |
| **RULE:**  If one chord is a perpendicular bisector of another chord, then the first chord is a diameter. |  |
| **RULE:**  If a diameter of a circle is perpendicular to a chord, then the diameter bisects the chord and its arc. |  |

**EXAMPLE 4:**

a. Find b. Find

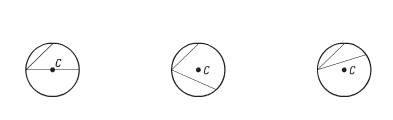


****

****

**Inscribed Angles and Polygons**

|  |  |
| --- | --- |
| **Inscribed angle:**  an angle whose vertex is on a circle and whose sides contain chords of the circle  **Intercepted arc:**  the arc that lies in the interior of an inscribed angle and has endpoints on the angle |  |
| **Measure of an Inscribed Angle:**  the measure of an inscribed angle is one half the measure of its intercepted arc |  |

****

**EXAMPLE 1:** Finding the measure of each arc and inscribed angle.



A) B)  C)

D) E)



|  |  |
| --- | --- |
| **RULE:**  If two inscribed angles of a circle intercept the same arc, then the angles are congruent. |  |

**EXAMPLE 2:** *mE* = 75°. What is *mF*? b)



**Inscribed Polygons.**

|  |  |
| --- | --- |
| **Right Triangle RULE:**  If a right triangle is inscribed in a circle, then the hypotenuse is a diameter of the circle. Conversely, if one side of an inscribed triangle is a diameter of the circle, then the triangle is a right triangle and the angle opposite the diameter is the right angle. |  |
| **Quadrilateral RULE:**  A quadrilateral can be inscribed in a circle if and only if its opposite angles are supplementary. |  |

**EXAMPLE 3: Find the value of each variable.**



A) B) C)



D) E)

**Other Angle Relationships in Circles**

|  |  |
| --- | --- |
| **Tangent and Chord RULE:**  If a tangent and a chord intersect at a point on a circle, then the measure of each angle formed is one half the measure of its intercepted arc. |  |

**EXAMPLE 1:** Finding Angle and Arc Measures.

A) B)  C) D)

**LINES INTERSECTING INSIDE OR OUTSIDE A CIRCLE.**

|  |  |
| --- | --- |
| **Chords Intersect Inside the Circle/Angles Inside the Circle**  If two chords intersect *inside* a circle, then the measure of each angle is one half the *sum* of the measures of the arcs intercepted by the angle and its vertical angle. |  |
| **One Secant & One Tangent/Angles Outside the Circle**  If a tangent and a secant, two tangents, or two secants intersect *outside* a circle, then the measure of the angle formed is one half the *difference* of the measures of the intercepted arcs. |  |
| **Two Tangents/Angles Outside the Circle**  If a tangent and a secant, two tangents, or two secants intersect *outside* a circle, then the measure of the angle formed is one half the *difference* of the measures of the intercepted arcs. |  |
| **Two Secants/Angles Outside the Circle**  If a tangent and a secant, two tangents, or two secants intersect *outside* a circle, then the measure of the angle formed is one half the *difference* of the measures of the intercepted arcs. |  |

**EXAMPLE 2:**

A) B)



C) D)



E) F)



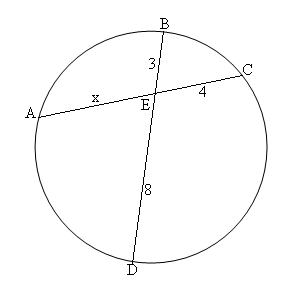
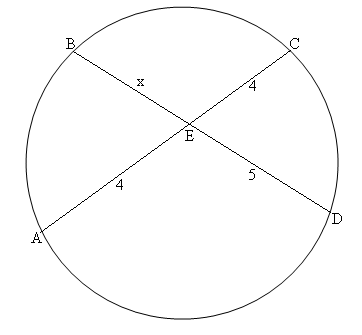


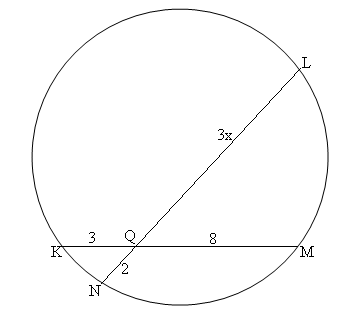
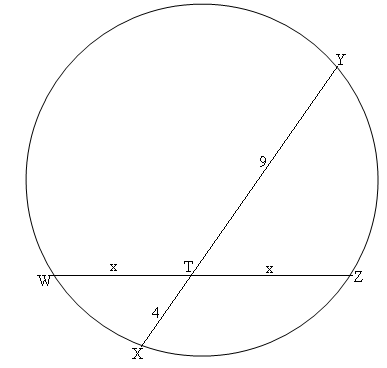
G) H)

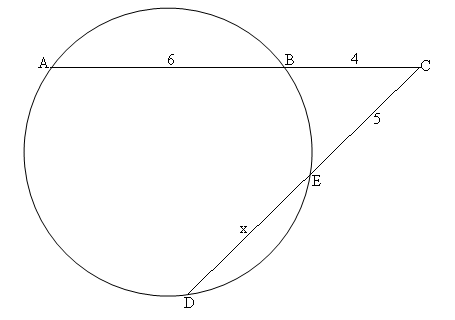
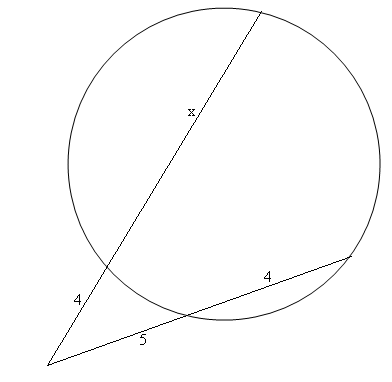
**Segments in Circles**

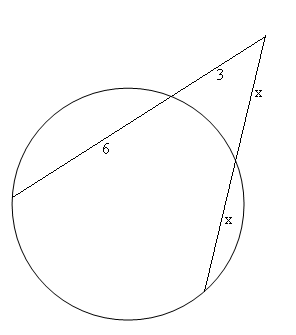
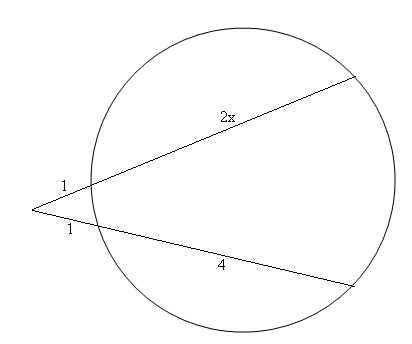
|  |  |  |
| --- | --- | --- |
| **Chord Segments**  The two segments of each chord that are formed when two chords intersect in the interior of a circle. |  |  |
| **Segments of Chords**  If two chords intersect in the interior of a circle, then the product of the lengths of the segments of one chord is equal to the product of the lengths of the segments of the other chord. |  |  |
| **Secant/External Secant Segments**  A *secant segment* is a segment that contains a chord of a circle, and has exactly one endpoint outside the circle. The part of a secant segment that is outside the circle is called an *external segment.* |  |  |
| **Segments of Secants**  If two secant segments share the same endpoint outside a circle, 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. |  |  |
| **Segments of Secants and Tangents**  If a secant segment and a tangent segment share an endpoint outside a circle, then the product of the lengths of the secant segment and its external segment equals the square of the length of the tangent segment. |  |  |

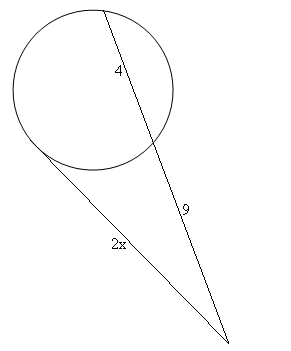
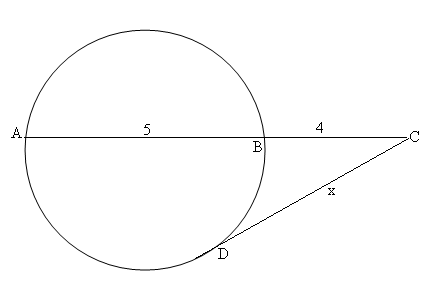
**EXAMPLES:** Solve for x

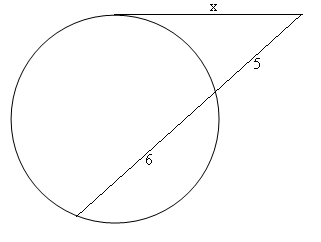
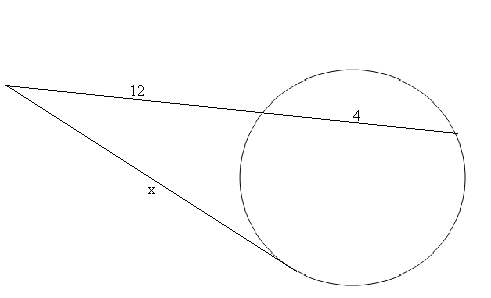
a) b)

c) d)

e) f)

g) h)

i) j)

k) l)

**Equation of the Circle**

Objective: Write the equation of a circle. Use the equation of a circle and its graph to solve problems.

|  |  |
| --- | --- |
| Equation of a Circle |  |

**EXAMPLE 1:** Write an equation of a circle with the given radius and center.

a. r = 5 ( 12 , 80 ) b. r = 9 ( 6 , 12 )

c. r = 12 ( -1 , 15 ) d. r = 4 ( 8 , -7 )

**EXAMPLE 2:** Identify the center and radius of the following

a.  b. 

c.  d. 

**EXAMPLE 3:** Graphing an Equation of a Circle

a.  b. 

