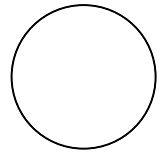
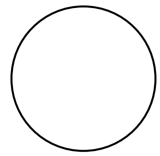
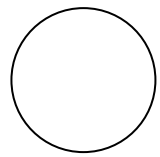
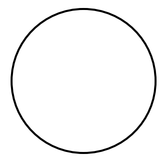
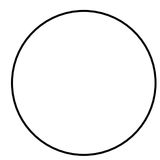
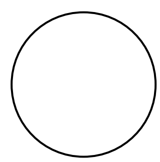
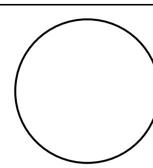
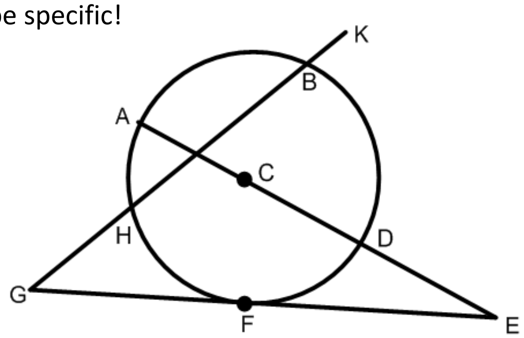
Unit 10: Properties of Circles

Circle Vocabulary and Tangents

Objective: Identify segments and lines related to circles.
Use properties of a tangent to a circle.

Word	Description	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		
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. $\overline{AD}$

b. $\overline{CD}$

c. $\overline{EG}$

d. $\overline{HB}$

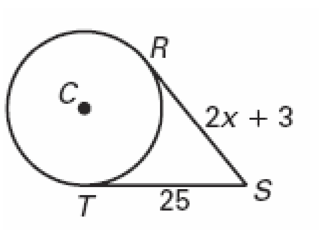
e. $\overline{FB}$

g. $\overline{FE}$

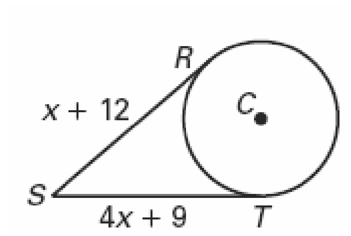
RULE: In a plane, a line is tangent to a circle if and only if the line is perpendicular to a radius of the circle at its endpoint on the circle		
RULE: Tangent segments from a common external point are congruent.		

EXAMPLE 2: Using Properties of Tangents $\overline{SR}$ and $\overline{ST}$ are tangent to $\odot C$. Find the value of x.

a.



b.

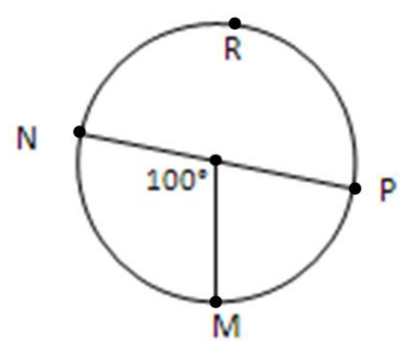


Arc Measurement/ Properties of Chords

Objective: Use properties of arcs of circles
Use properties of chords of circles

Central Angle: an angle whose vertex is the center of a circle		
Minor Arc: part of a circle that measures less than 180^o		
Major Arc: part of a circle that measures between 180^o and 360^o		
Semicircle: an arc with endpoints that are the endpoints of a diameter of a circle. The measure of a semicircle is 180^o		
Measure of a Minor arc: the measure of the arc's central angle		
Measure of a Major arc: the difference between 360^o and the measure of the related minor arc		

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



a. $\widehat{MN}$

b. $\widehat{MPN}$

c. $\widehat{PMN}$

d. $\widehat{PM}$

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

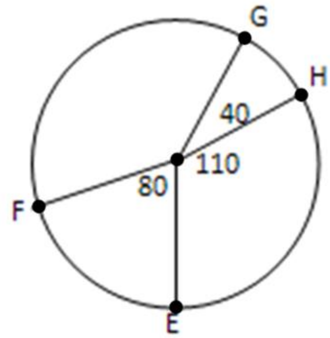
EXAMPLE 2: Finding the measures of Arcs

a. $\widehat{GE}$

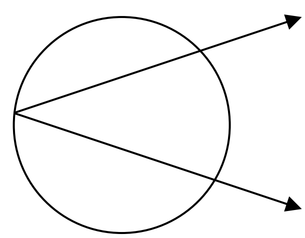
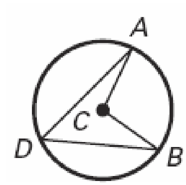
b. $\widehat{GEF}$

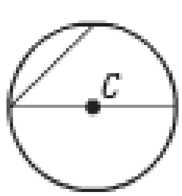
c. $\widehat{GF}$

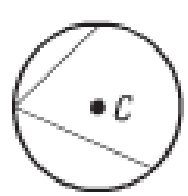
d. $\widehat{FHE}$

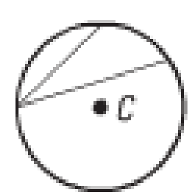


Inscribed Angles and Polygons

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	

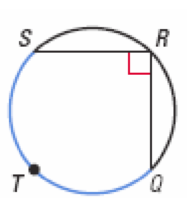






EXAMPLE 1: Finding the measure of each arc and inscribed angle.

A)



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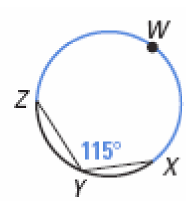

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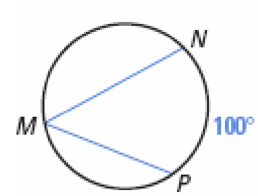

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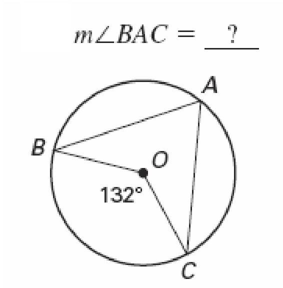

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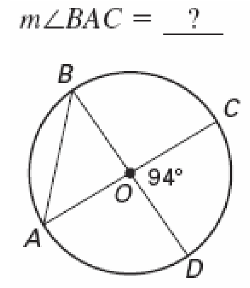
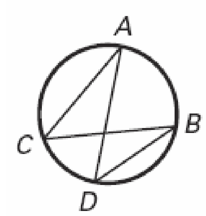
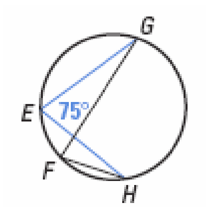


RULE: If two inscribed angles of a circle intercept the same arc, then the angles are congruent.	

EXAMPLE 2: $m\angle E = 75°$. What is $m\angle F$?



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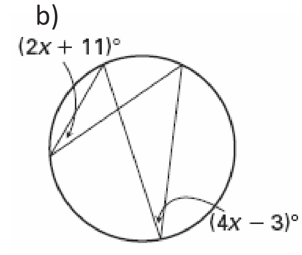
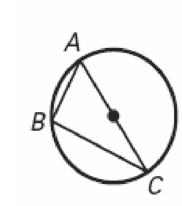
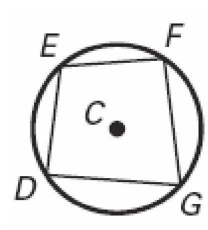
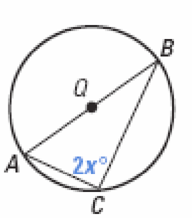


Inscribed Polygons.

Right Triangle RULE: If a right triangle is inscribed in a circle, then they 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)



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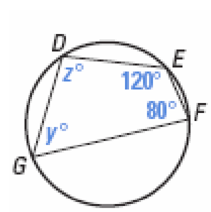

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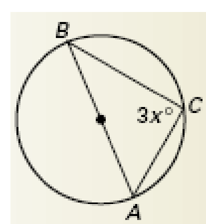

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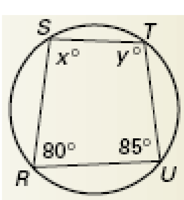

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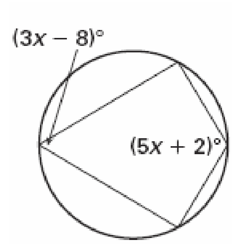
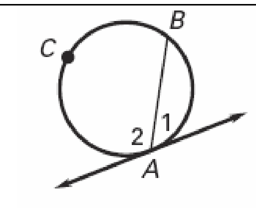


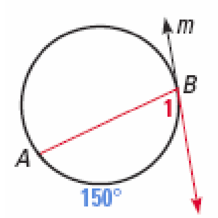
Other Angle Relationships in Circles

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)



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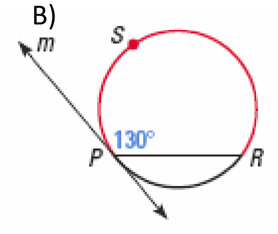

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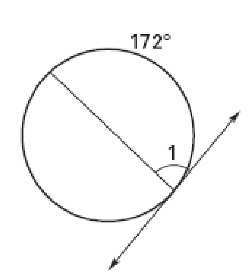

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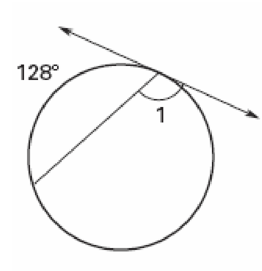
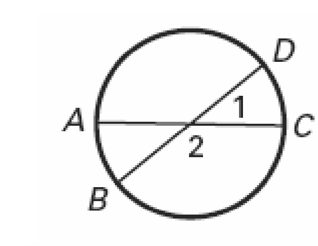
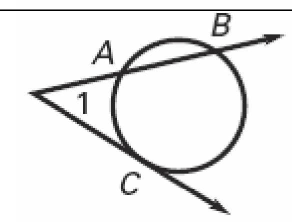


LINES INTERSECTING INSIDE OR OUTSIDE A CIRCLE.

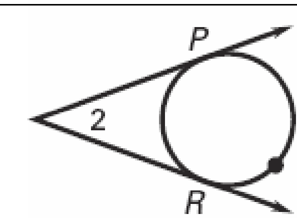
Chords Intersect Inside the Circle/Angles Inside the Circle
If two chords intersect *inside* a circle, then the measure of each angle is one half the *sum* of the measures of the arcs intercepted by the angle and its vertical angle.



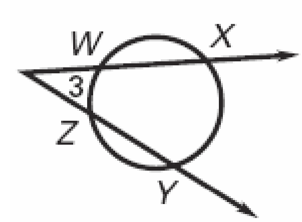
One Secant & One Tangent/Angles Outside the Circle
If a tangent and a secant, two tangents, or two secants intersect *outside* a circle, then the measure of the angle formed is one half the *difference* of the measures of the intercepted arcs.



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.

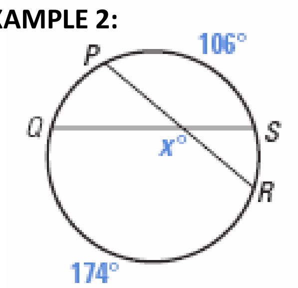


Two Secants/Angles Outside the Circle
If a tangent and a secant, two tangents, or two secants intersect *outside* a circle, then the measure of the angle formed is one half the *difference* of the measures of the intercepted arcs.



EXAMPLE 2:

A)



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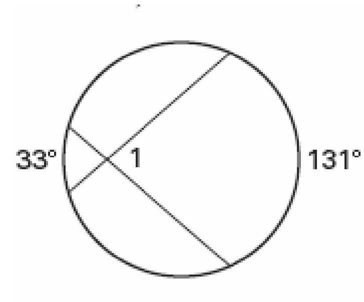
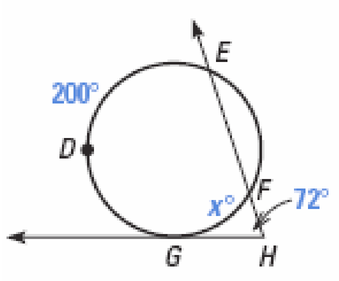


C)



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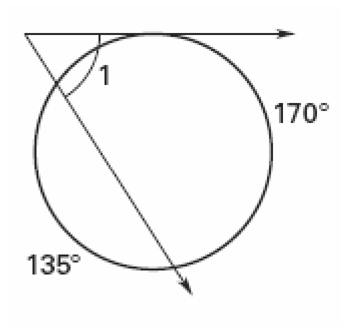

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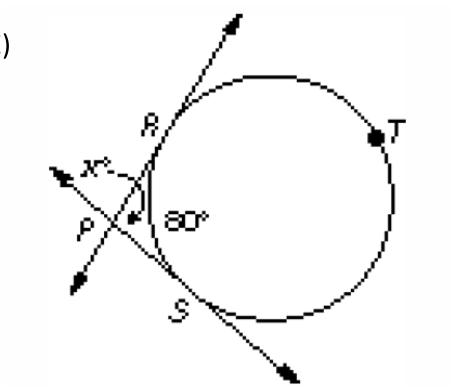
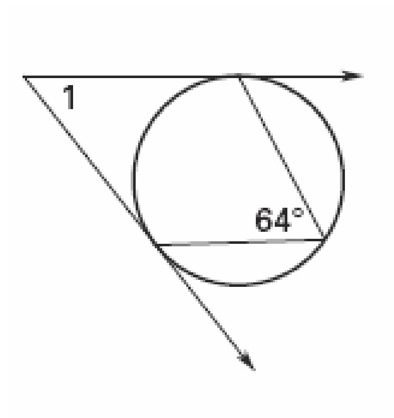
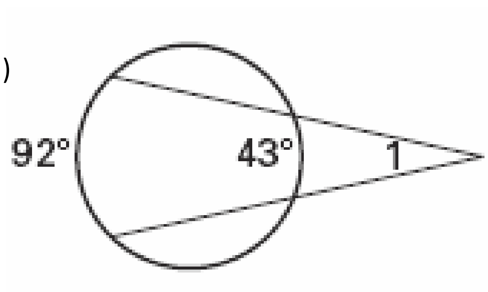


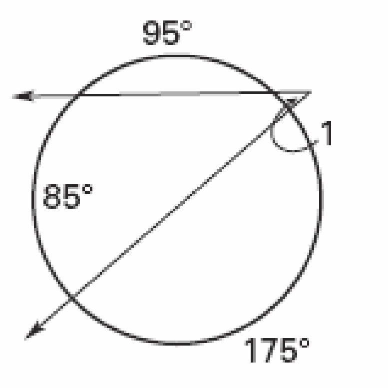
F)



G)



H)



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. $(x-6)^2+(y-24)^2=25$

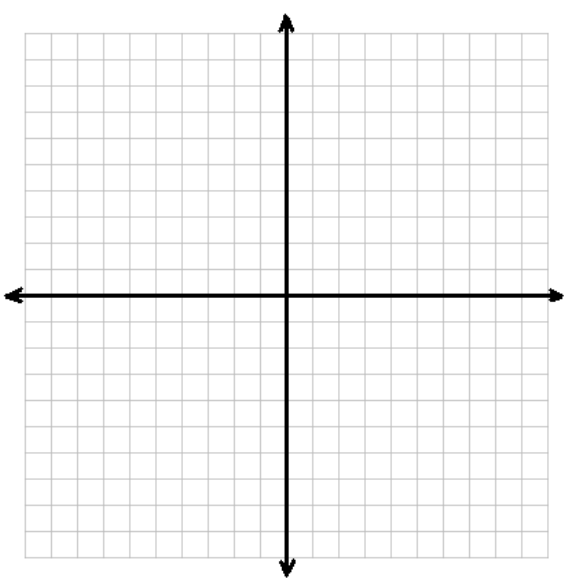
b. $(x-9)^2+(y-42)^2=49$

c. $(x+8)^2+(y-17)^2=1$

d. $(x-10)^2+(y+9)^2=64$

EXAMPLE 3: Graphing an Equation of a Circle

a. $(x+3)^2+(y-2)^2=4$



b. $(x-3)^2+(y-1)^2=16$