SM 2

Date: **Section: 12.1**

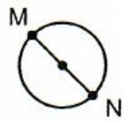
Objective: Circle Vocabulary, Arc, and Angle Measures

Circle: All points in a plane that are the same distance from a given point, called the ***center*** of the circle.

Chord: A segment with both endpoints on a circle.

$\overline{AB}$ is a chord.

Diameter: A chord that passes through the center of a circle.

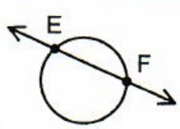


$\overline{MN}$ is a diameter.

Radius: A segment with one endpoint on the circle and one endpoint at the center of the circle.

$\overline{CD}$ is a radius.

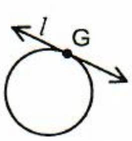
Secant: A line that intersects a circle at two points.



$\overleftrightarrow{EF}$ is a secant.

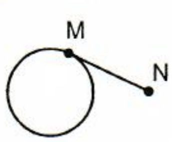
Tangent: A line in the plane of the circle that intersects a circle at exactly one point.

Point of Tangency: The point where a tangent intersects a circle.



Line l is a tangent. G is the point of tangency.

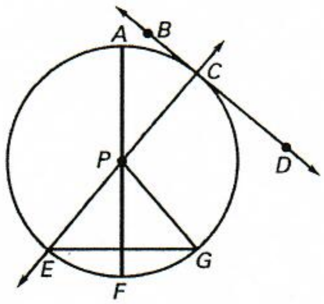
Tangent Segment: A segment that touches a circle at one of its endpoints and lies in the line that is tangent to the circle at that point.



$\overline{MN}$ is a tangent segment.

Example: In circle P, name the term that best describes the given line, segment, or point.

$\overline{AF}$	C
$\overline{EG}$	$\overleftrightarrow{CE}$
$\overline{PF}$	$\overrightarrow{BD}$
$\overline{PG}$	P

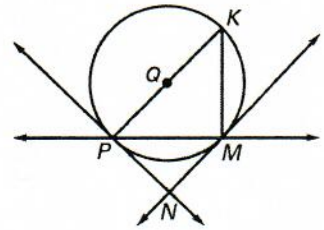


Example: In $\odot Q$, identify a chord, a diameter, two radii, a secant, two tangents, and two points of tangency.

Chord: Diameter:

Radii: Secant:

Tangents: Points of tangency:

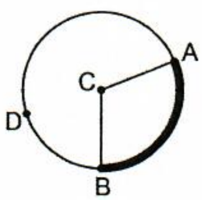


Central Angle: An angle in a circle whose vertex is the center of the circle and whose sides are radii of the circle

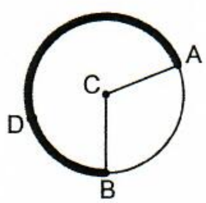
Minor Arc: All the points on a circle that lie in the interior of a central angle whose measure is less than 180°.

Major Arc: All the points on a circle that do not lie on the corresponding minor arc.

$\overset{\frown}{AB}$ is a minor arc.



$\overset{\frown}{ADB}$ is a major arc.

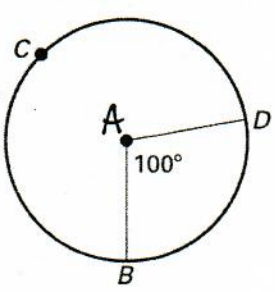


Measure of a Central Angle: is the measure of the angle with its vertex at the center of a circle.

Measure of a Minor Arc: is the measure of its central angle.

Measure of a Major Arc: 360° minus the measure of the minor arc.

Example:

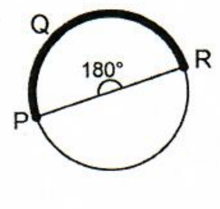


Measure of central angle:__________ Name the central angle:____________

Measure of the minor arc:__________ Name the minor arc:____________

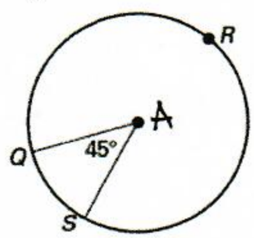
Measure of the major arc:__________ Name the major arc:____________

Semicircle: An arc whose central angle measures 180°.

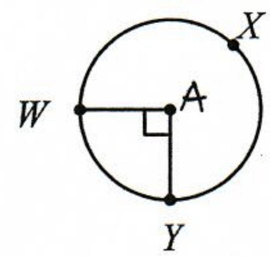


Examples: Name the major and minor arcs and the central angle. Find the measure of each.

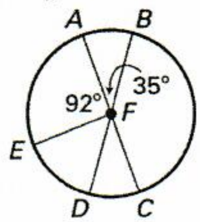
a)



b)



Examples: $\overline{AC}$ and $\overline{BD}$ are diameters. Find the indicated measures.



a) $m\overset{\frown}{DC}$

d) $m\overset{\frown}{DE}$

b) $m\overset{\frown}{BC}$

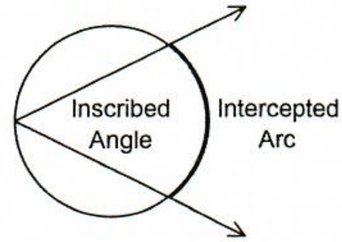
e) $m\overset{\frown}{ABE}$

c) $m\overset{\frown}{CDE}$

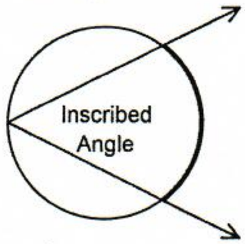
f) $m\overset{\frown}{ABD}$

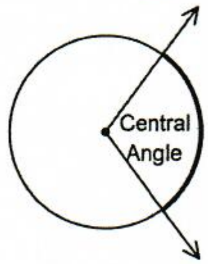
Inscribed Angle: An angle whose vertex is on a circle and whose sides contain chords of the circle.

Intercepted Arc: An arc that lies in the interior of an inscribed angle and has endpoints on the sides of the angle.

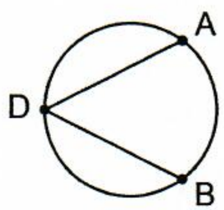


WARNING: Don't get ***inscribed*** angles and ***central*** angles mixed up!





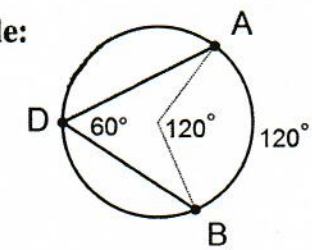
Theorem: If an angle is inscribed in a circle, then its measure is half the measure of its intercepted arc.



$$m\angle ADB = \frac{1}{2} m\overset{\frown}{AB}$$

$$m\overset{\frown}{AB} = 2m\angle ADB$$

Example:

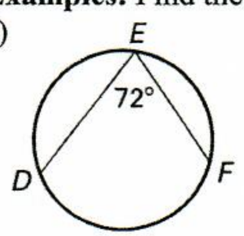


$$m\angle ADB = 60°$$

$$m\overset{\frown}{AB} = 120°$$

Examples: Find the measure of the inscribed angle or the intercepted arc.

a)



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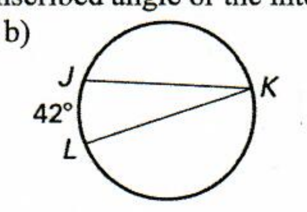
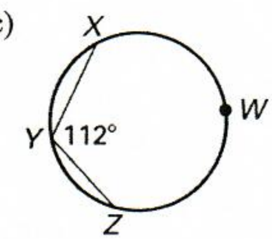


c)



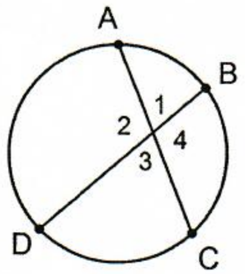
SM 2

Date: **Section: 12.2**

Objective: Tangent and Chord Theorems

Theorem:

- If two chords intersect inside a circle, then the measure of each angle formed is the average of the measures of the arcs intercepted by the angle and its vertical angle.

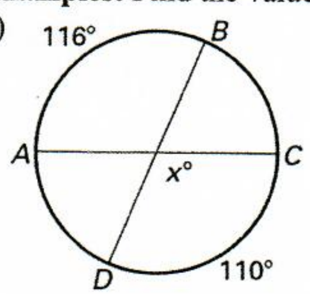


$$m\angle 1 = m\angle 3 = \frac{1}{2}\left(m\overset{\frown}{AB} + m\overset{\frown}{CD}\right)$$

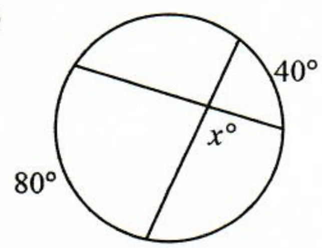
$$m\angle 2 = m\angle 4 = \frac{1}{2}\left(m\overset{\frown}{BC} + m\overset{\frown}{AD}\right)$$

Examples: Find the value of *x*.

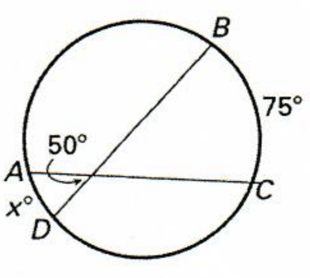
a)



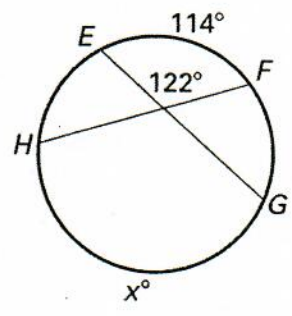
b)



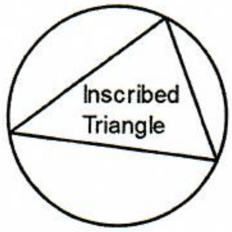
c)



d)

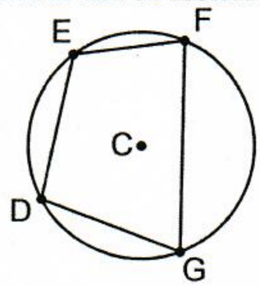


Inscribed Polygon: A polygon whose vertices all lie on a circle.



Theorem:

- If a quadrilateral can be inscribed in a circle, then its opposite angles are supplementary.

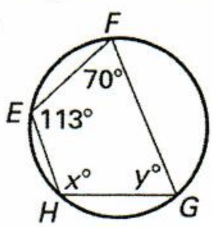


$m\angle D + m\angle F = 180°$

$m\angle E + m\angle G = 180°$

Examples: Find the values of x and y.

a)



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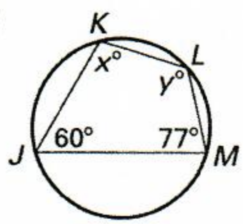

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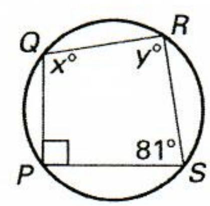
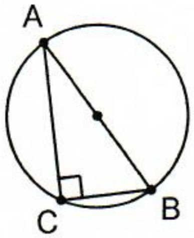


Theorems:

- If a triangle inscribed in a circle is a right triangle, then the hypotenuse is a diameter of the circle.



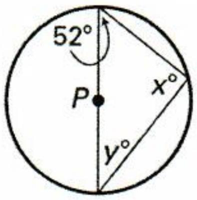
If $\triangle ABC$ is a right triangle with hypotenuse $\overline{AB}$, then $\overline{AB}$ is a diameter of the circle.

- If a side of a triangle inscribed in a circle is a diameter of the circle, then the triangle is a right triangle.

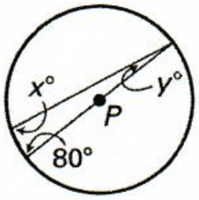
If $\overline{AB}$ is a diameter of the circle, then $\triangle ABC$ is a right triangle with $\overline{AB}$ as hypotenuse.

Examples: Find the values of x and y in $\odot$P.

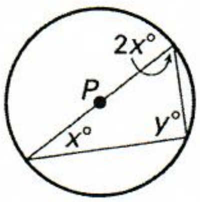
a)



b)



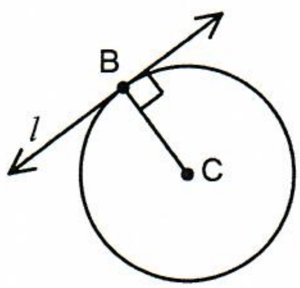
c)



Theorems About Tangents:

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

If line l is tangent to $\odot C$ at B, then $l \perp \overline{CB}$.

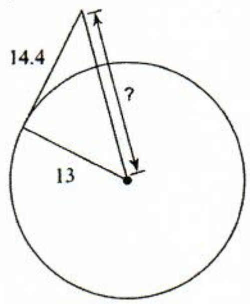


- In a plane, if a line is perpendicular to a radius of a circle at its endpoint on the circle, then the line is tangent to the circle.

If $l \perp \overline{CB}$, then line l is tangent to $\odot C$ at B.

Examples: Find the length of the missing segment. Assume that segments which appear to be tangent to the circle are tangent to the circle.

a)



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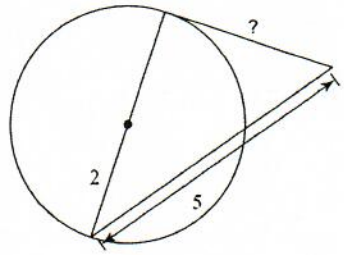

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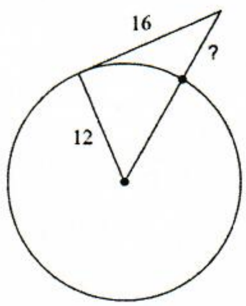

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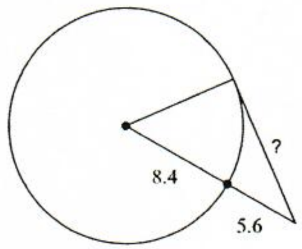
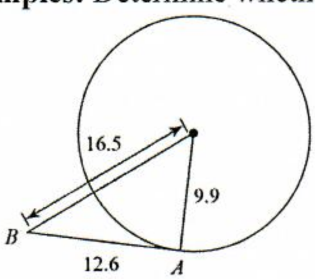
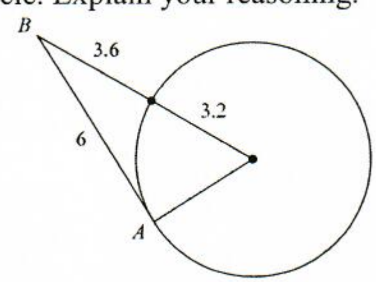


Examples: Determine whether $\overline{AB}$ is tangent to the circle. Explain your reasoning.

a)



b)



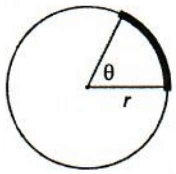
SM 2

Date:

Section: 12.3

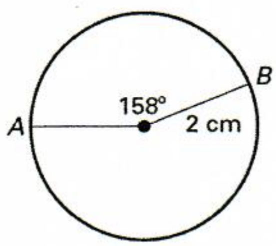
Objective: Arc Length and Sector Area

Arc Length: $Arc\text{ Length} = \dfrac{\theta}{360°} \cdot \text{circumference of circle} = \dfrac{\theta}{360°} \cdot 2\pi r$



Examples: Find the length of $\overparen{AB}$. Write your answers in terms of π and as decimals rounded to the nearest hundredth.

a)



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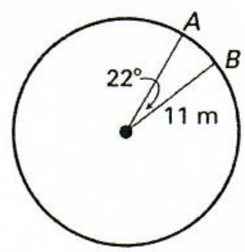

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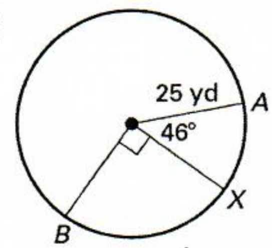
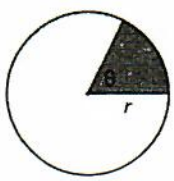
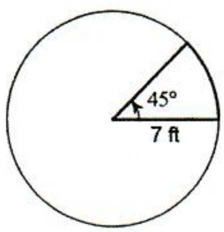


Sector Area: $\text{Sector Area} = \dfrac{\theta}{360°} \cdot \text{area of circle} = \dfrac{\theta}{360°} \cdot \pi r^2$

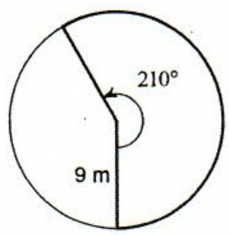


Examples: Find the area of each sector. Write your answers in terms of π and as decimals rounded to the nearest tenth.

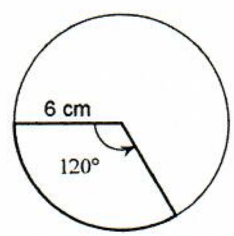
a)



b)



c)



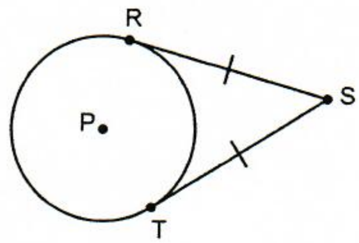
SM 2

Date: **Section: 12.4**

Objective: More Tangent and Chord Theorems

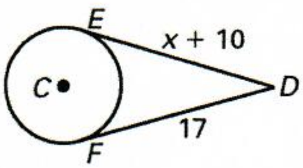
Theorem: If two segments from the same point outside a circle are both tangent to the circle, then they are congruent.

If $\overline{SR}$ and $\overline{ST}$ are tangent to circle P at points R and T then $\overline{SR} \cong \overline{ST}$.

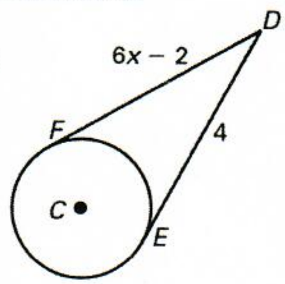


Examples: $\overline{DE}$ and $\overline{DF}$ are both tangent to ⊙C. Find the value of x.

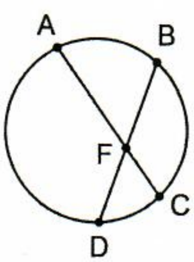
a)



b)



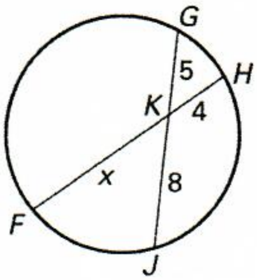
Theorem: If two chords intersect inside a circle, then the product of the lengths of the segments of one chord is equal to the product of the lengths of the segments of the other chord.



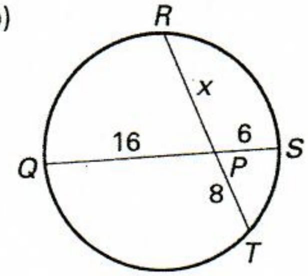
$\overline{AF} \cdot \overline{FC} = \overline{BF} \cdot \overline{FD}$

Examples: Find the value of x.

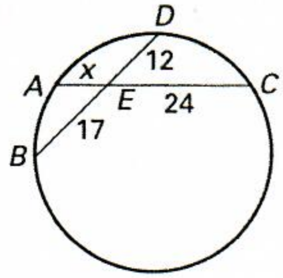
a)



b)



c)



SM 2

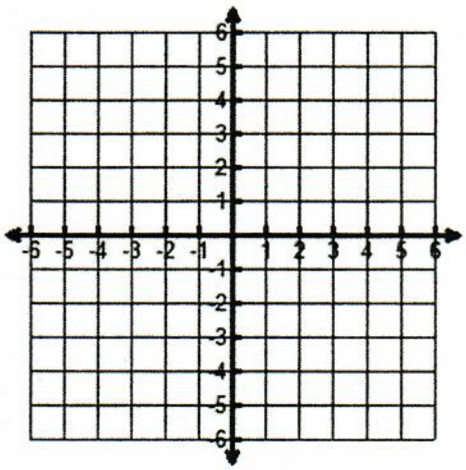
Date: **Section: 12.5**

Objective: Graphing Circles

Equation of a Circle with Center at the Origin and Radius *r*: $x^2 + y^2 = r^2$

Examples: Determine the center and radius of each circle, then graph the circle.

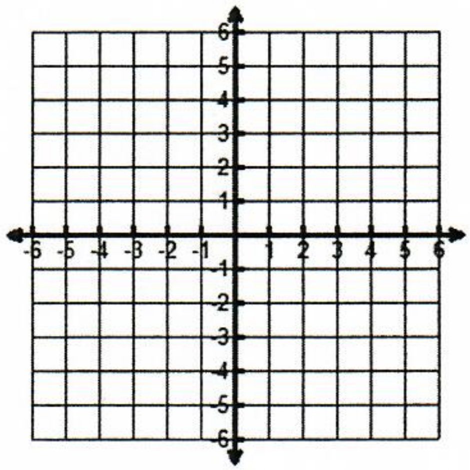
a) $x^2 + y^2 = 36$



Radius: ____________________

Center: ____________________

b) $x^2 + y^2 = 13$



Radius: ____________________

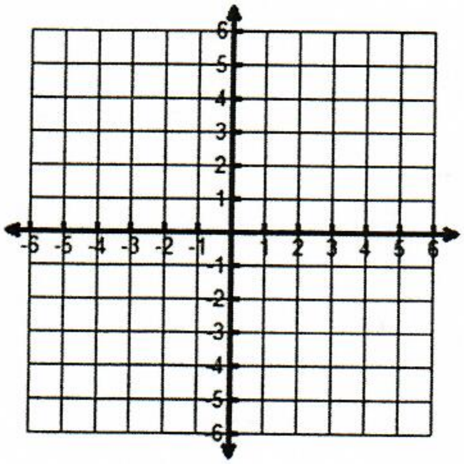
Center: ____________________

Example: Write the equation of a circle with center at $(0,0)$ and radius 11.

Equation of a Circle with Center at (h,k) and Radius *r*: $(x-h)^2 + (y-k)^2 = r^2$

Examples: Determine the center and radius of each circle, then graph the circle.

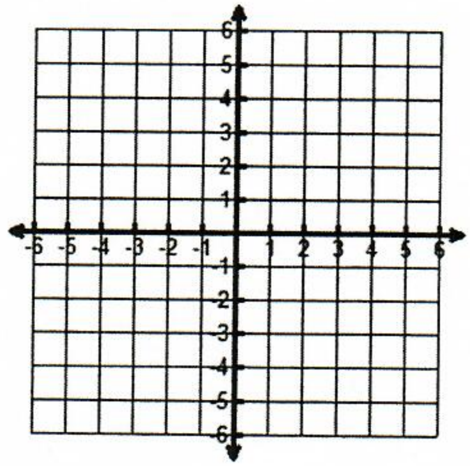
a) $(x-2)^2+(y-1)^2=9$



Radius: ______________________

Center: ______________________

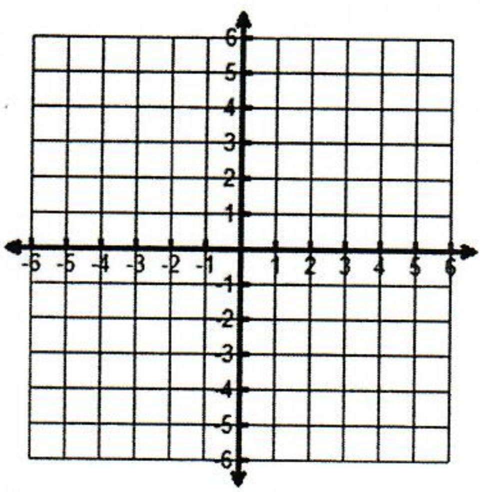
b) $(x+3)^2+(y-5)^2=1$



Radius: ______________________

Center: ______________________

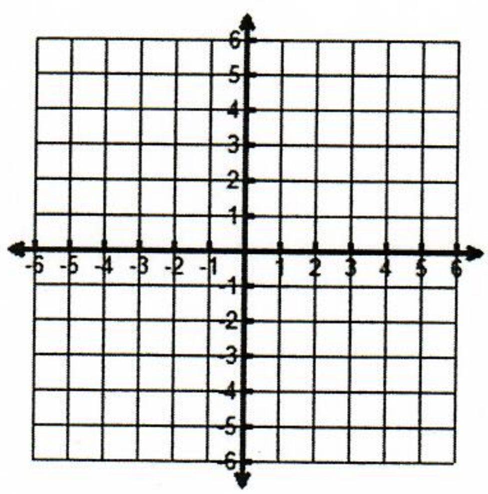
c) $(x+3)^2+(y+1)^2=12$



Radius: ______________________

Center: ______________________

d) $x^2+(y-2)^2=36$



Radius: ______________________

Center: ______________________

Examples: Write the equation of the circle with the given center and radius.

a) $(2,5)$; $r=7$

Equation: ________________

b) $(3,-1)$; $r=\sqrt{13}$

Equation: ________________

c) $(-2,12)$; $r=15$

Equation: ________________

d) $(-5,0)$; $r=2\sqrt{3}$

Equation: ________________

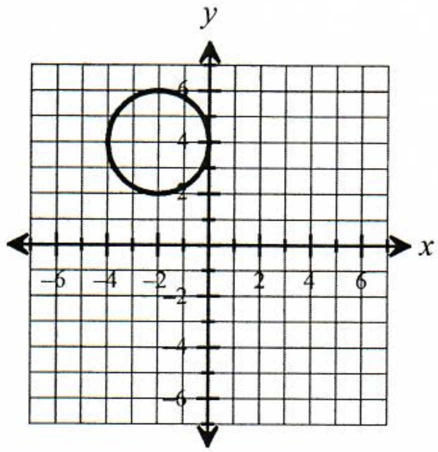
e) $(-6,-9)$; $r=1$

Equation: ________________

f) $(0,4)$; $r=\frac{1}{2}$

Equation: ________________

g)

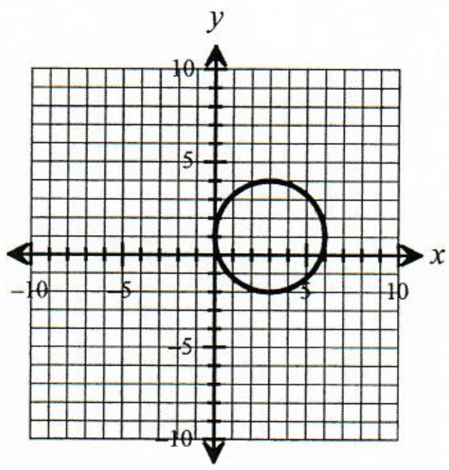


Radius: ________________

Center: ________________

Equation: ________________

h)



Radius: ________________

Center: ________________

Equation: ________________