NAME ____________________

Date __________ Period__________

SYLLABUS

GEOMETRY H

Unit 9 Syllabus: Circles

Day	Topic
1	Tangent Lines
2	Chords and Arcs and Inscribed Angles
3	Review/Graded Classwork
4	Review from before Break
5	Finding Angle Measures
6	Finding Segment Lengths
7	Review
8	Test

NAME ____________________

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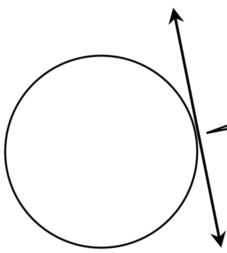
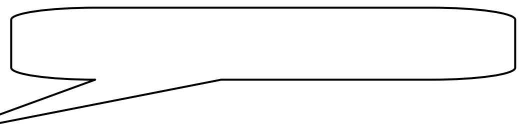
NOTES
GEOMETRY H

Tangent Lines - Unit 9 Day 1

1. A tangent line is a line that intersects a circle in exactly _____________ _____________.





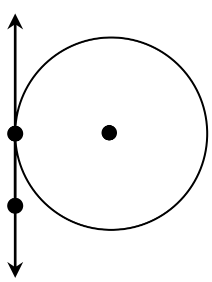
The word tangent may refer to a ____________, ____________, or ________________________.

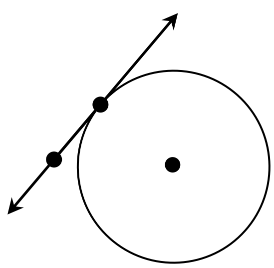
2. A line that intersects a circle in two points is called a _________________________ line.
   a. More on this to come…

3. <u>Today's goal</u>: Demonstrate an understanding of two important properties of tangents.

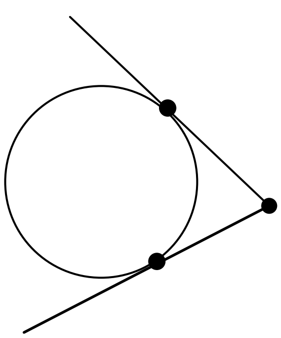
If a line is drawn tangent to a circle, and a radius is drawn to the point of tangency… *then* the tangent line and radius are _____________________________.

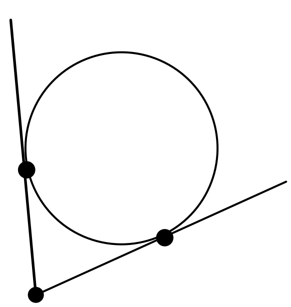
* The converse is also true!





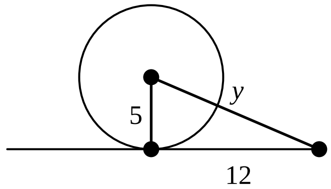
If two lines are tangent to the same circle…then the segments from their intersection to the point of tangency are ___________________.

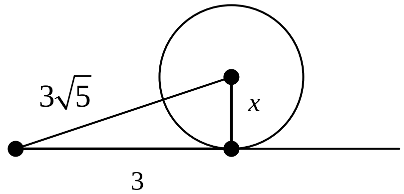




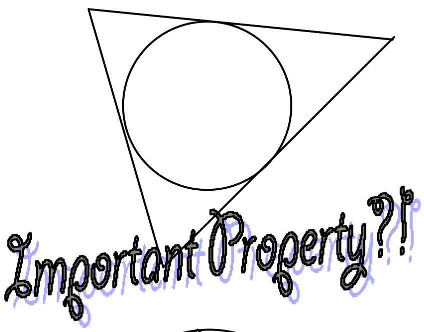
4. Wonderful applications of the two important properties…

   a. Tangent segments and radii create ______________ ________________



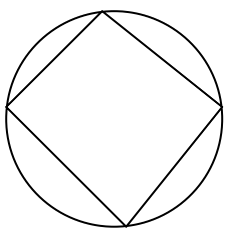


   b. Circumscribed polygons…



Triangle is ________________________ about the circle

Circle is _______________________ in the triangle

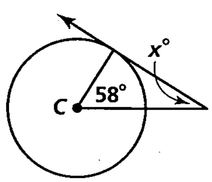


Quadrilateral is _____________________ in the circle

Circle is _____________________ about the quadrilateral

Assume that lines that appear to be tangent are tangent. *C* is the center of each circle. Find the value of *x*.

1.



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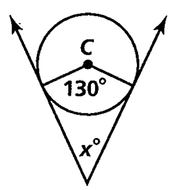

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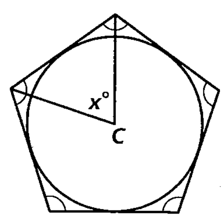

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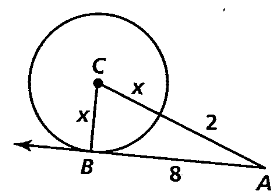
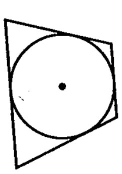


Tell whether each polygon is inscribed in or circumscribed about the circle.

5.



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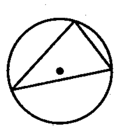

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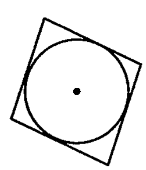
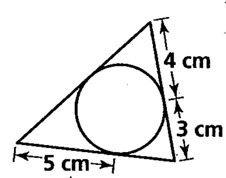
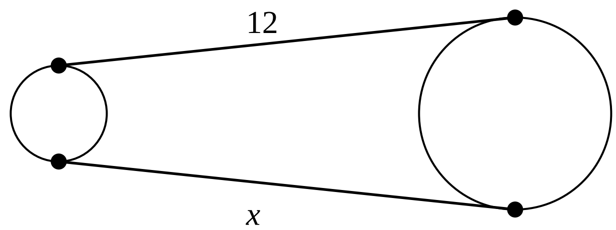


Find the Perimeter!

8.

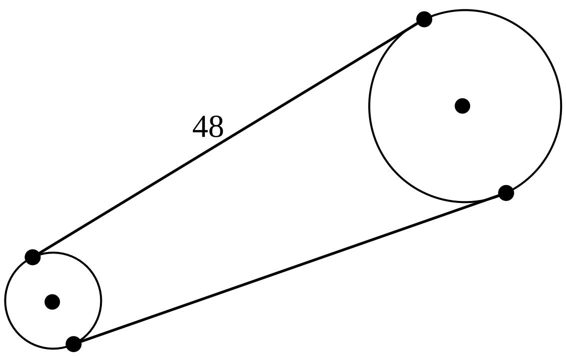


5. A pulley system (proof p. 664)…

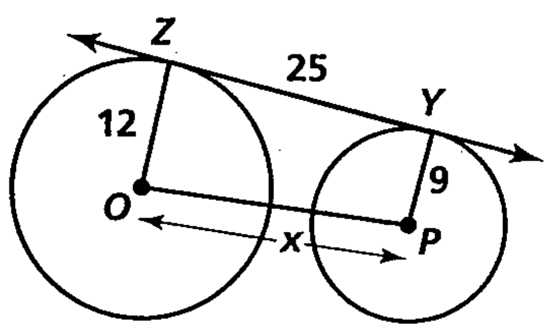


Smaller radius = 10 Larger radius = 24 What is the distance from center to center?

a.



b.



Closure: Describe the two properties of tangents that we learned today!

NAME ____________________

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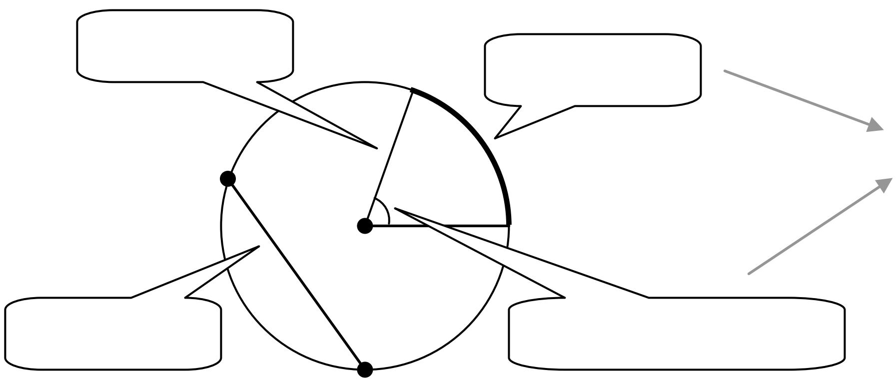
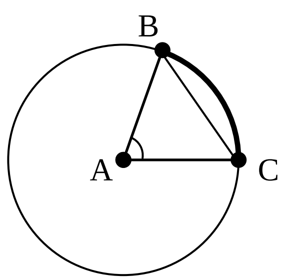
NOTES

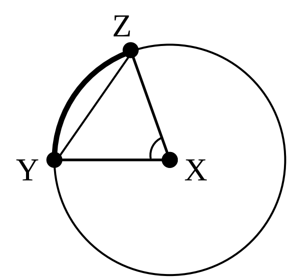
GEOMETRY H

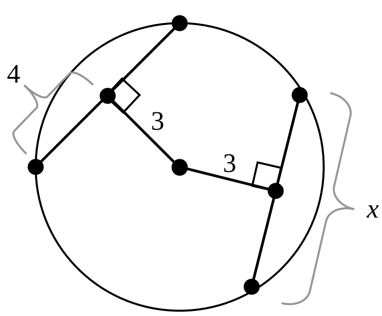
Chords, Arcs, and Inscribed Angles - Unit 9 Day 2

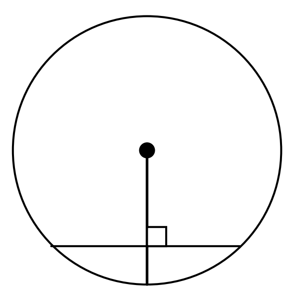
Important properties that hold within one circle, or in two (or more) congruent circles…











In Summary…

a) Congruent central angles have congruent chords

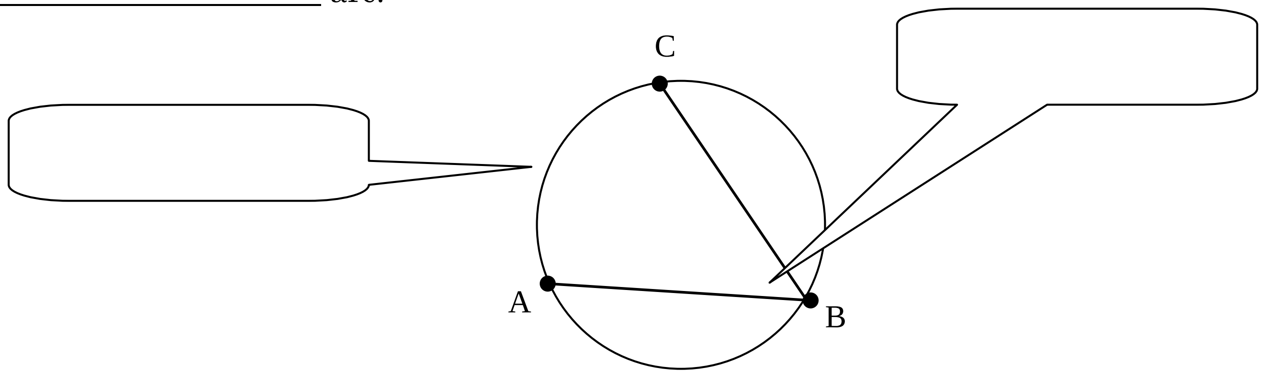
b) Congruent chords have congruent arcs

c) Congruent arcs have congruent central angles

d) Chords equidistant from the center are congruent/bisected by the radius

Two chords create an ______________________ angle. The arc that is formed is called an

___________________________ arc.



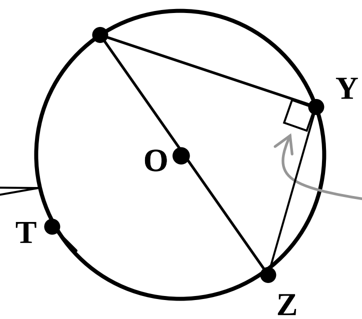
1. **<u>The Inscribed Angle Theorem</u>:** The measure of the inscribed angle is

   ___________________ the measure of its intercepted arc

---

a) Right-Angle Corollary: If an inscribed angle intercepts a semicircle, then the angle is right

$\overset{\frown}{XTZ}$ is a semicircle
So $\overset{\frown}{XTZ} = 180^{\circ}$



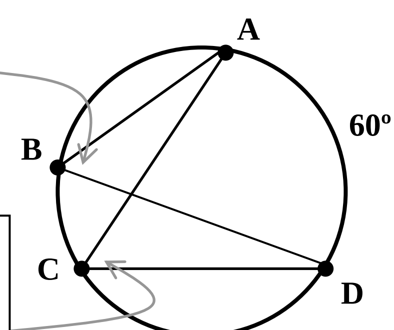
$\angle XYZ$ intercepts $\overset{\frown}{XTZ}$, so it is half the measure
Therefore half of 180° is 90°

---

b) Arc-Intercept Corollary: If two inscribed angles intercept the same arc, then they have the same measure.

$\angle ABD$ intercepts $\overset{\frown}{AD}$ so it is half the measure,

Thus $\angle ABD = \frac{1}{2} 60° = 30°$



$\angle ACD$ intercepts $\overset{\frown}{AD}$ so it is half the measure,

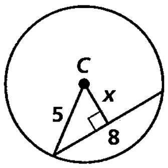
Thus $\angle ACD = \frac{1}{2} 60° = 30°$

Because both angles have to be half of 60º - that means that they must both be equal. Thus, $m\angle ABC = m\angle ACD$ because they both equal 30º.

c) The opposite angles of a quadrilateral inscribed in a circle are ____________________.

Find the value of *x* to the nearest tenth.

1.



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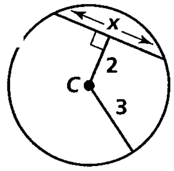

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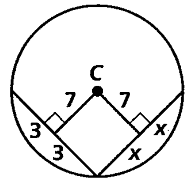

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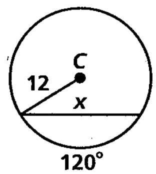

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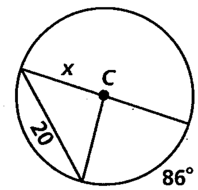

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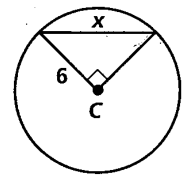

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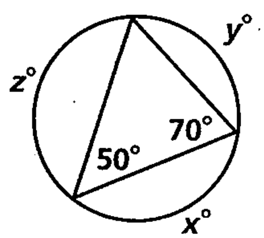

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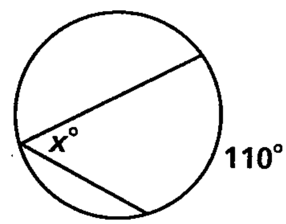

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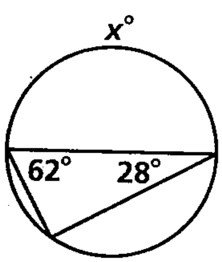

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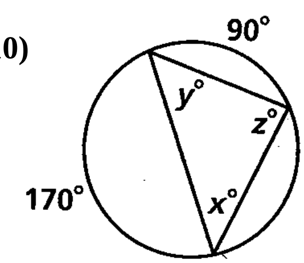

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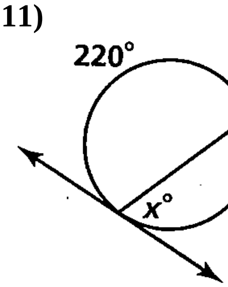

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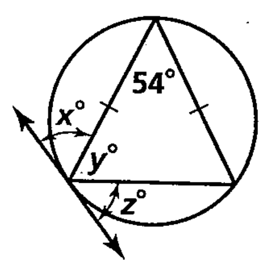
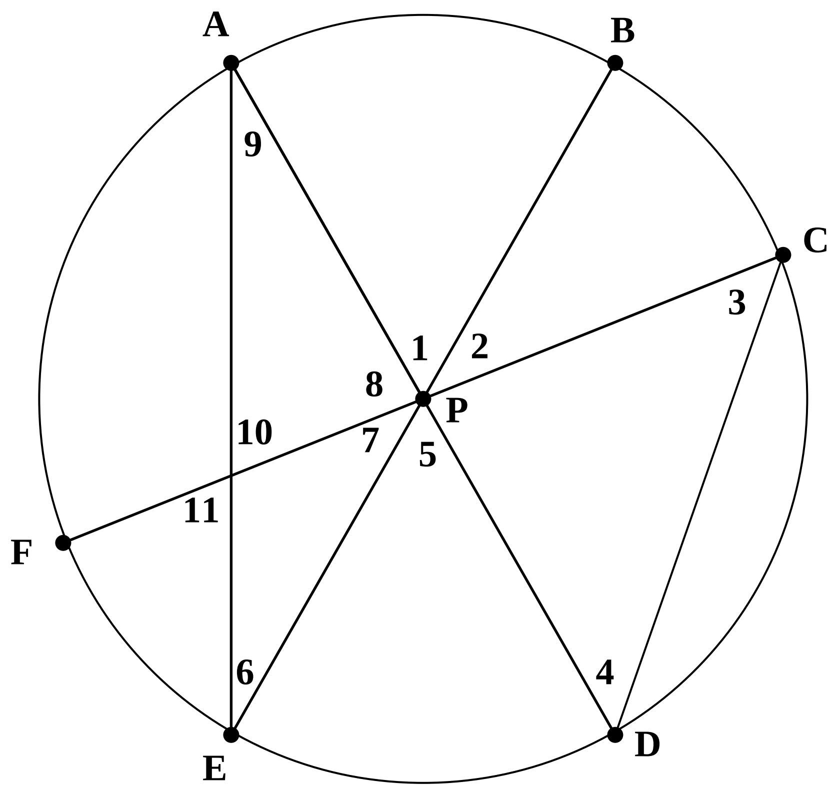


In circle P shown below, $m\angle 1 = 50°$ and $m\widehat{FA} = 75°$. Find each angle and arc below.



$m\angle 2 =$ __________

$m\angle 3 =$ __________

$m\angle 4 =$ __________

$m\angle 5 =$ __________

$m\angle 6 =$ __________

$m\angle 7 =$ __________

$m\angle 8 =$ __________

$m\angle 9 =$ __________

$m\angle 10 =$ __________

$m\angle 11 =$ __________

$m\widehat{AB} =$ __________

$m\widehat{BC} =$ __________

$m\widehat{CD} =$ __________

$m\widehat{DE} =$ __________

$m\widehat{EF} =$ __________

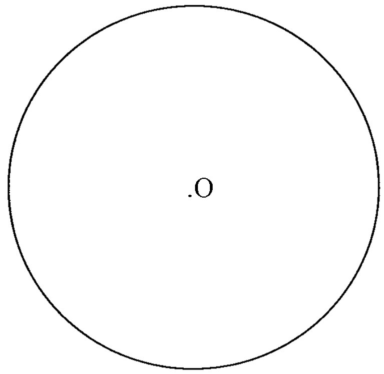
NAME ____________________ **CLASSWORK**

Date __________ Period__________ **GEOMETRY H**

Unit 9 Day 4: Post Holiday Break Review!

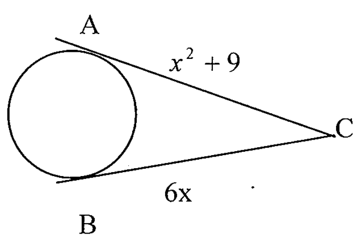
1. Label each line or segment on circle O.

   a. radius $\overline{OP}$
   b. diameter $\overline{NR}$
   c. tangent $\overleftrightarrow{RL}$
   d. chord $\overline{NP}$
   e. secant $\overleftrightarrow{XY}$
   f. $\angle NOP$ is called a ___________ angle, since it's vertex is at point O.



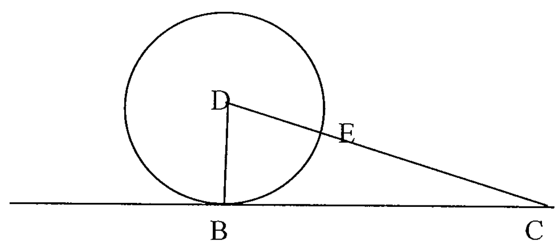
Solve for the indicated sides. Points A and B are points of tangency for the given circles.

2.



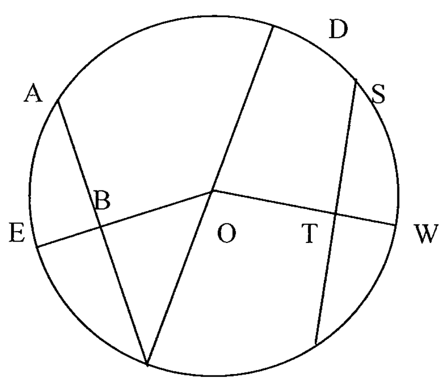
AC = ___________

3. Given Circle D; DB = 5; BC = 12



EC = _____________

4. Find all indicated segment lengths and arc measures for circle O. (Picture is not drawn to scale.)
$\overline{OB} \perp \overline{AC}$; $\overline{OT} \perp \overline{RS}$; $m\angle EOC = 60$; OD = 10; $\overline{AC} \cong \overline{RS}$

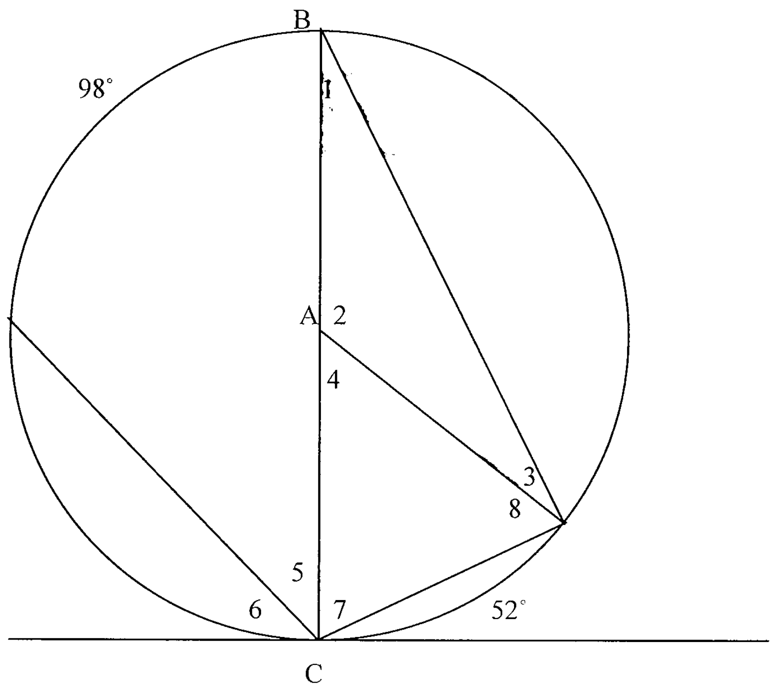


a. OC = _______
b. OB = _______
c. BE = _______
d. BC = _______
e. AB = _______
f. OT = _______
g. SR = _______
h. $m\widehat{EC}$ = _____
i. $m\widehat{AC}$ = _____
j. $m\widehat{SR}$ = _____

C R

5. Find the measures of all of the angles below for Circle A.

$\overline{BC}$ is a diameter and point C is a point of tangency. (Picture is not drawn to scale.)



a. $m\angle 1 =$ ______ b. $m\angle 2 =$ ______ c. $m\angle 3 =$ ______ d. $m\angle 4 =$ ______

e. $m\angle 5 =$ ______ f. $m\angle 6 =$ ______ g. $m\angle 7 =$ ______ h. $m\angle 8 =$ ______

NAME ____________________

Date __________ Period__________

NOTES

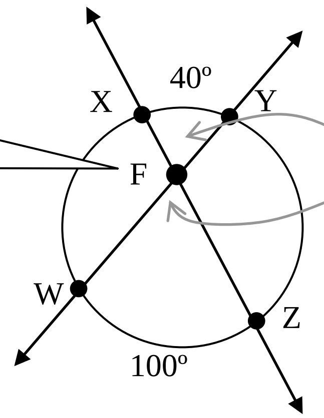
GEOMETRY H

Finding Angle Measures - Unit 9 Day 5

1. The measure of an angle formed by two secants or chords that intersect in the **interior of a circle** is _____________ the _____________ of the measures of the arcs intercepted by the angle and its vertical angle.

Intersects **INSIDE** the circle.

Note: F is **NOT** the center



Angles are congruent because they are vertical angles

$\angle XFW = 110°$ because it is supplementary

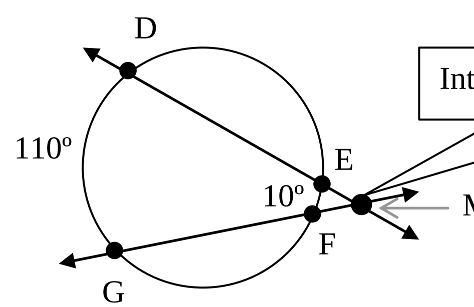
$\angle WFZ = \frac{1}{2}(100° + 40°) = 70°$

INSIDE the circle is +

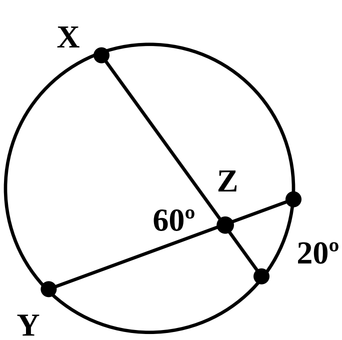
2. The measure of an angle formed in the **exterior of a circle** is ____________________the ____________________ of the measures of the intercepted arcs.

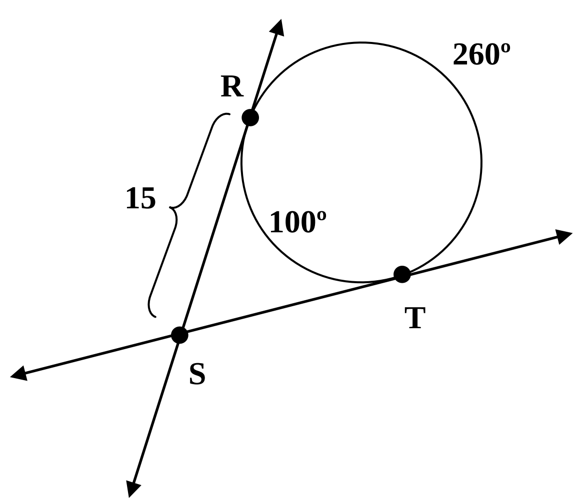
$\angle DMG = \frac{1}{2}(110° - 10°) = 50°$

OUTSIDE the circle is -



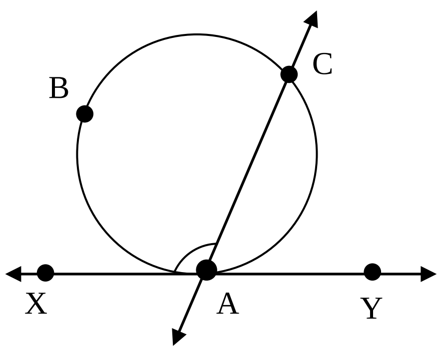
Intersection **OUTSIDE** the circle





Summary of Angles…

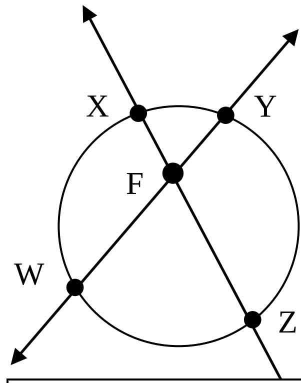
Vertex is <u>on</u> the circle



$\angle XAB = \frac{1}{2}\left(\widehat{ABC}\right)$

$\angle YAC = \frac{1}{2}\left(\widehat{AC}\right)$

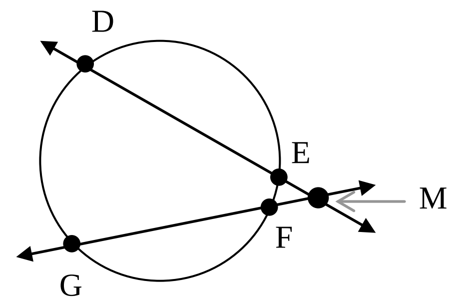
Vertex is <u>inside</u> the circle



$\angle WFZ = \frac{1}{2}\left(\widehat{WZ} + \widehat{XY}\right)$

$\angle WFX = \frac{1}{2}\left(\widehat{WX} + \widehat{YZ}\right)$

Vertex is <u>outside</u> the circle

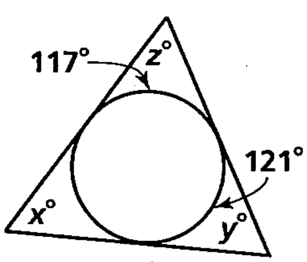


$\angle DMG = \frac{1}{2}\left(\widehat{DG} - \widehat{EF}\right)$

In the space below, compare and contrast the three properties shown above, as well as the central angle theorem (how does the measure of a central angle compare to the measure of its arc)? Draw pictures if you want…

Directions: Find each missing variable below

1)



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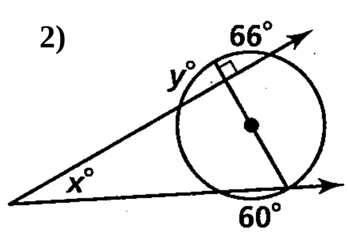
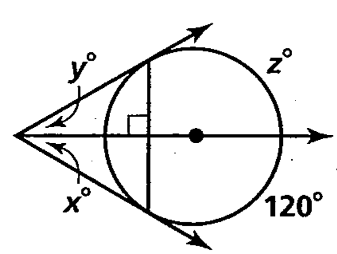
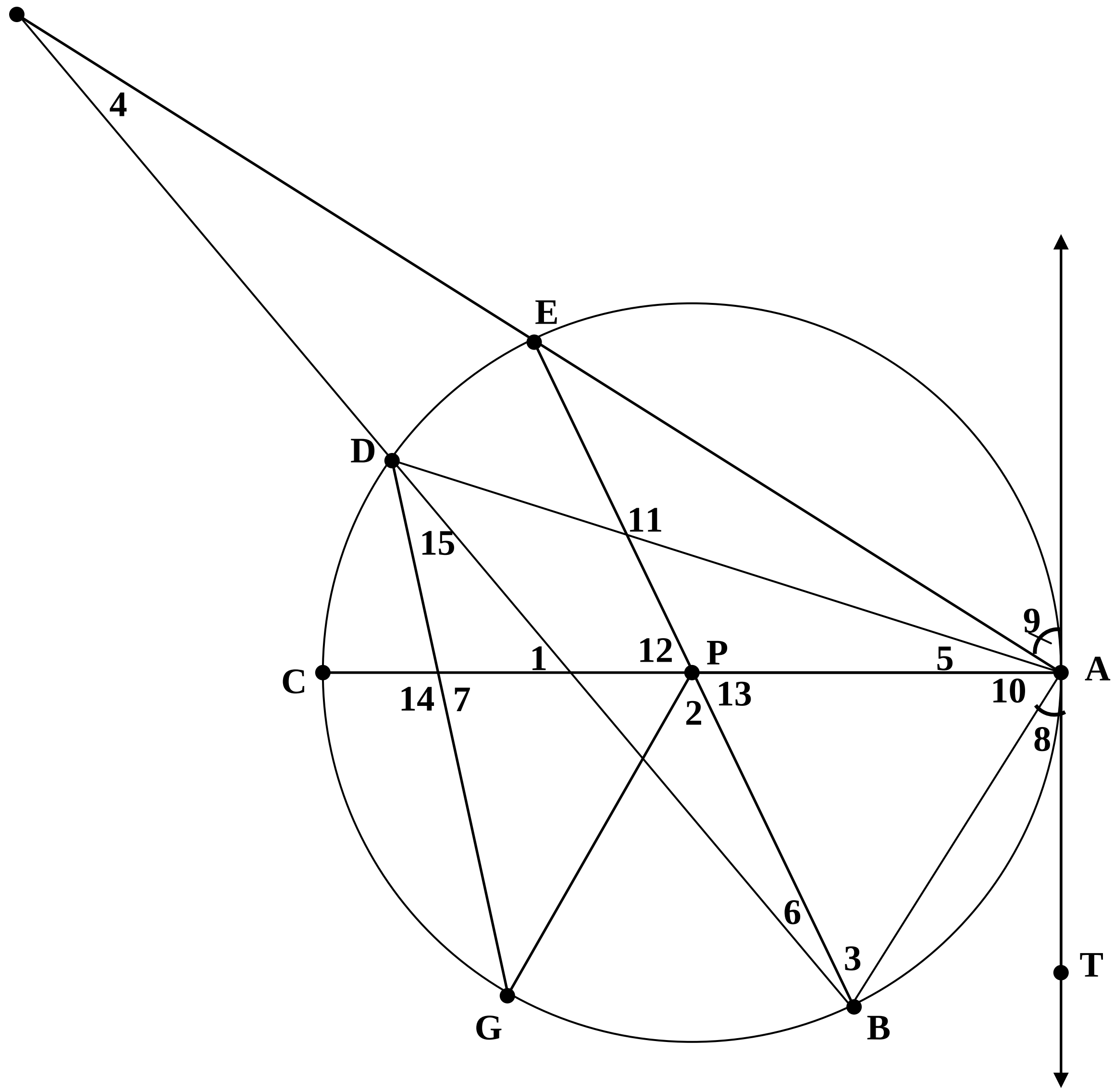


3)



In circle P shown below, $\overleftrightarrow{AT}$ is tangent, $\overline{EB}$ and $\overline{AC}$ are diameters, plus $m\widehat{DE} = 50°$, $m\widehat{AB} = 80°$, and $m\widehat{AB} = m\widehat{CG}$.



$m\angle 1 =$ __________

$m\angle 2 =$ __________

$m\angle 3 =$ __________

$m\angle 4 =$ __________

$m\angle 5 =$ __________

$m\angle 6 =$ __________

$m\angle 7 =$ __________

$m\angle 8 =$ __________

$m\angle 9 =$ __________

$m\angle 10 =$ __________

$m\angle 11 =$ __________

$m\angle 12 =$ __________

$m\angle 13 =$ __________

$m\angle 14 =$ __________

$m\angle 15 =$ __________

NAME ____________________

Date __________ Period__________

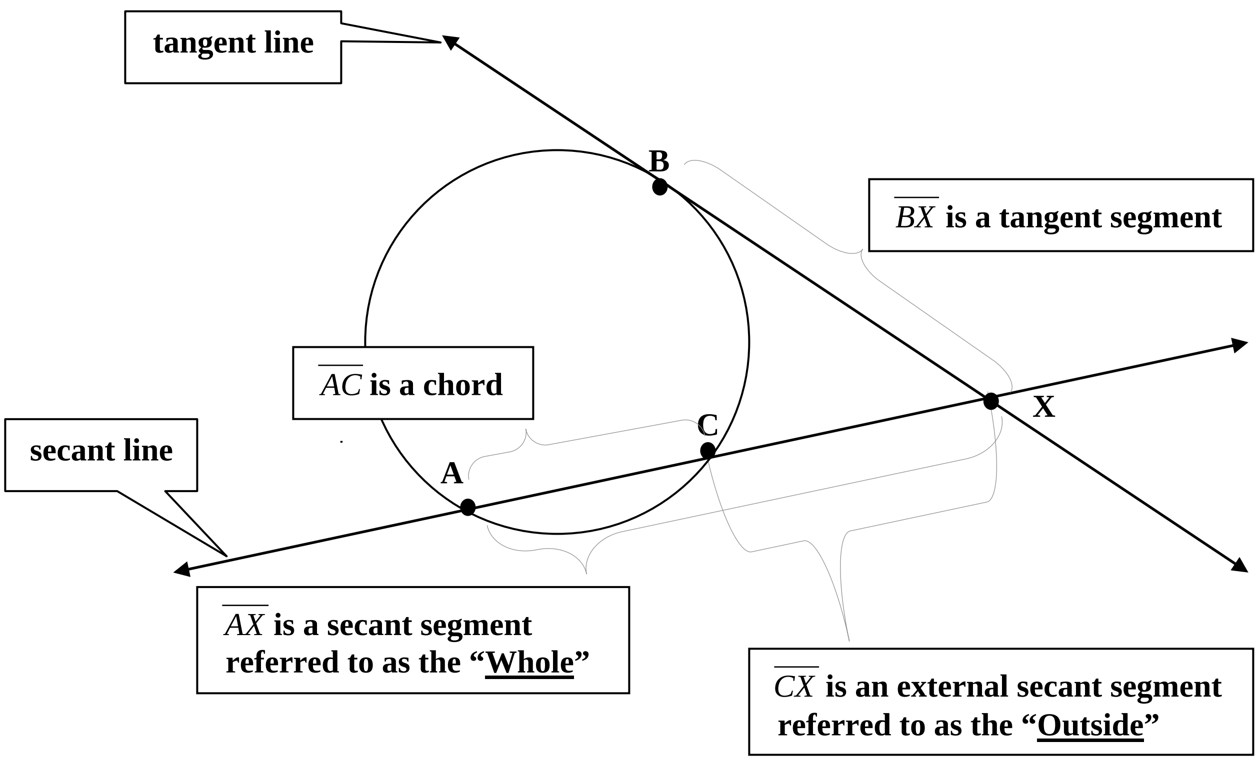
NOTES

GEOMETRY H

Segment Lengths - Unit 9 Day 6

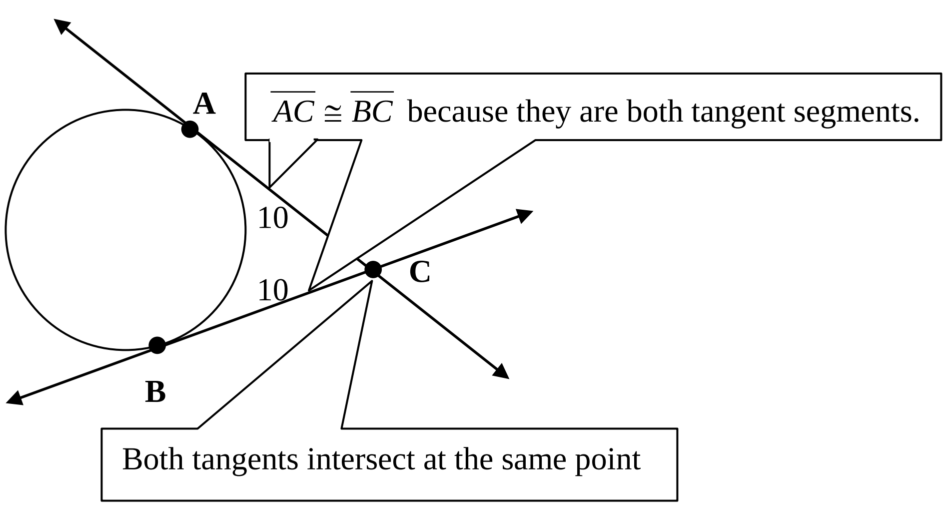
1. We can find the lengths of pieces of chords, secants and tangents…

   a. Identifying the different parts of secant and tangent lines.



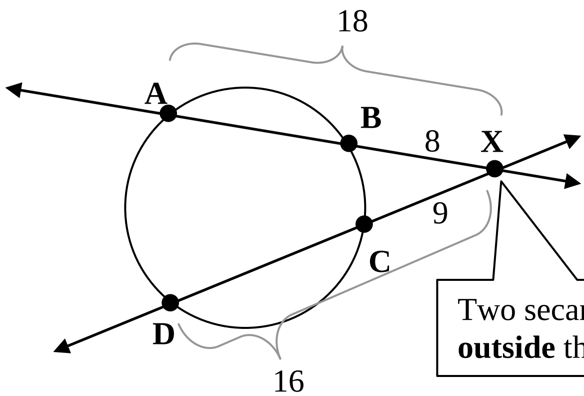
   b. Two Tangent Segments Theorem

      i. If two segments are tangent to a circle at the same external point, then the segments are congruent (we saw this on day 1 already!)



c. Two Secants Theorem

i. If two secants intersect 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



Two secants intersect **outside** the circle

$\overline{AX}$ and $\overline{DX}$ are both secant segments (Whole)

$\overline{BX}$ and $\overline{CX}$ are both external segments (Outside)

Whole X Outside = Whole X Outside

$\overline{AX} \cdot \overline{BX} = \overline{DX} \cdot \overline{CX}$

$18 \cdot 8 = 16 \cdot 9 \rightarrow = 144$

---

d. Secant and Tangent Theorem

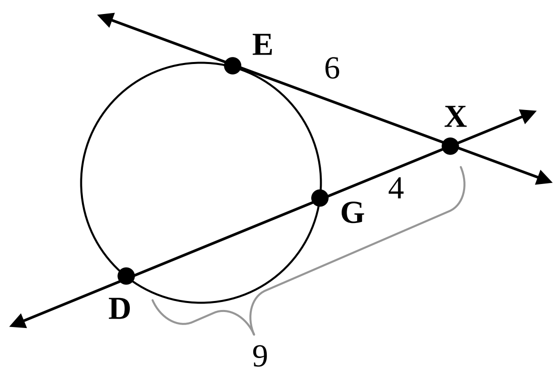
i. If a secant and a tangent intersect outside a circle, then the product of the lengths of the secant segment and its external segment equals the length of the tangent segment **squared**.

$\overline{EX}$ is a tangent segment
$\overline{DX}$ is a secant segment (Whole)
$\overline{GX}$ is an external secant segment (Outside)

Whole X Outside = Tangent Squared

$\overline{DX} \cdot \overline{GX} = \overline{EX}^2$

$9 \cdot 4 = 6^2 \rightarrow = 36$



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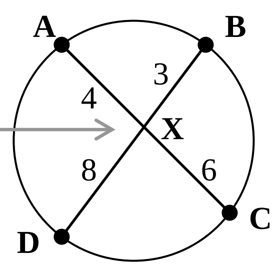
e. Two Chords Theorem

i. If two chords intersect inside a circle, then the product of the lengths of the segments of one chord equals the product of the lengths of the segment of the other chord.

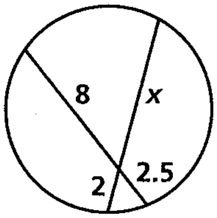
X is not the center!



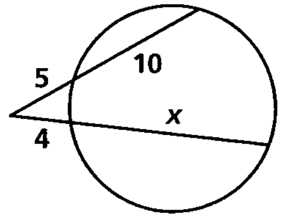
$\overline{AX} \cdot \overline{XC} = \overline{BX} \cdot \overline{XD}$

$4 \cdot 6 = 3 \cdot 8 \rightarrow = 24$

13.



14.



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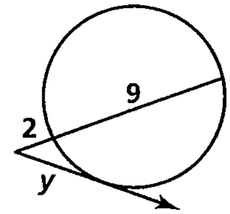

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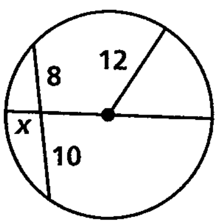

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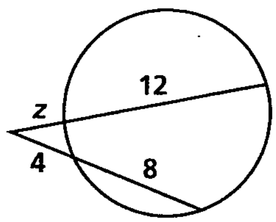

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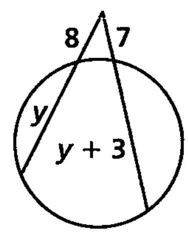
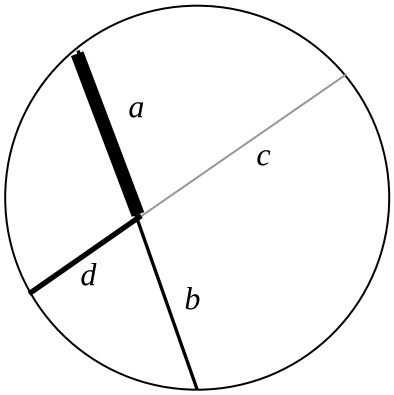
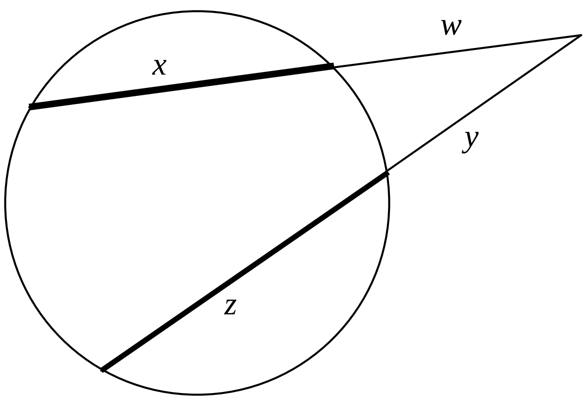
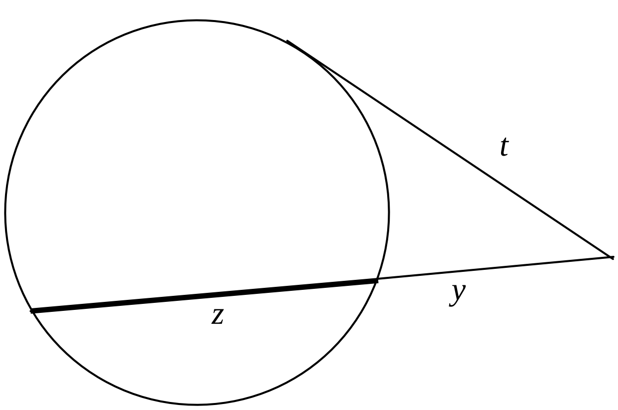


Wrap Up - Summary of Segment Lengths…

Directions: Write formulas, in terms of the letters given, that illustrate the 3 formulas…







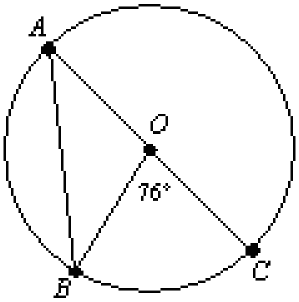
NAME ____________________ **REVIEW!**

Date __________ Period__________ GEOMETRY H

Unit 9 Review – Unit 9 Day 7

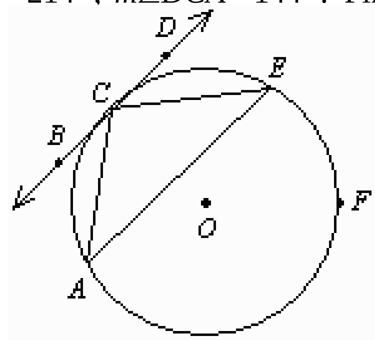
1)

Find $m\angle BAC$

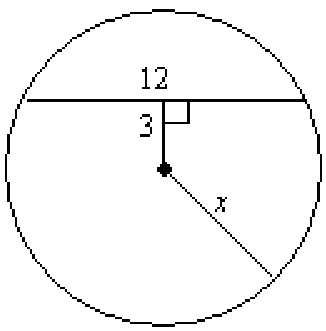


2)

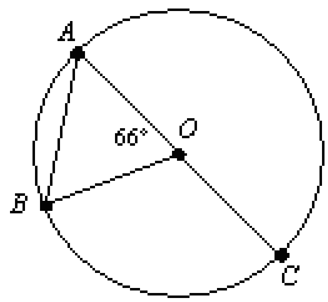
Given: $\overleftrightarrow{BD}$ is tangent to circle O at C, $m\widehat{EFA} = 214°$, $m\angle DCA = 144°$. Find $m\widehat{CE}$



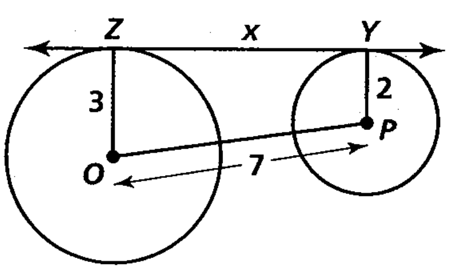
3)



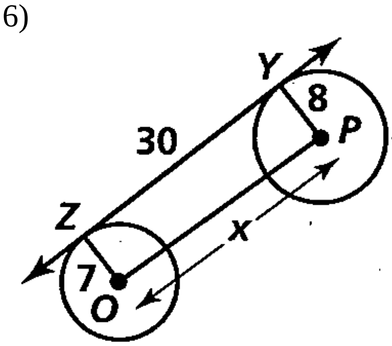
4) Find $m\angle BAC$



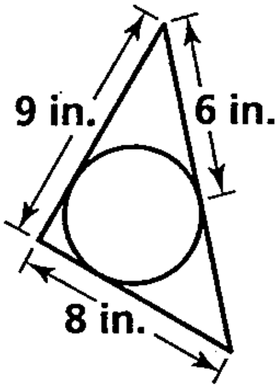
5)



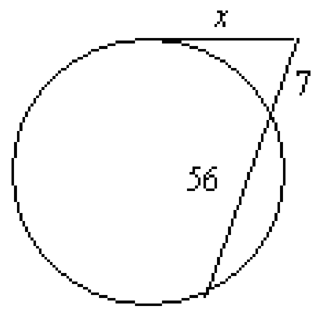
6)



7)



8)



9)

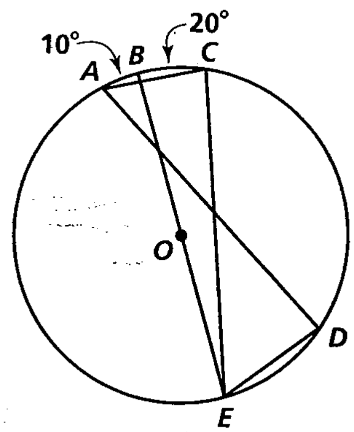
1

$m\widehat{AE}$

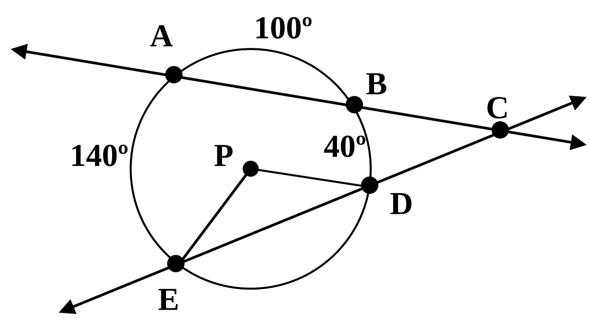
$m\angle C$

$m\angle BEC$

$m\angle D$



10)



$\angle ACE$

$\angle PDE$

$\angle PED$

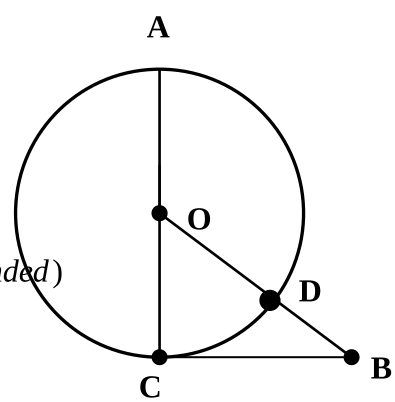
$\angle EPD$

11)

$AO = 5$

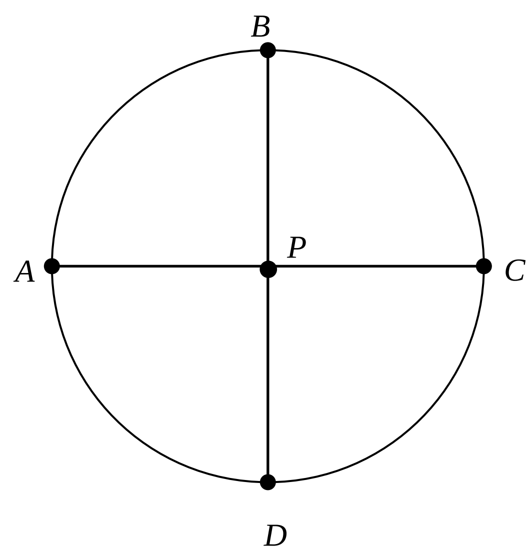
$DB = 2\sqrt{3}$

$BC = ?$ (*rounded*)



12) *P* is the center.

Prove: $\Delta APB \cong \Delta CPD$



NAME ____________________

Date __________ Period__________

BONUS!

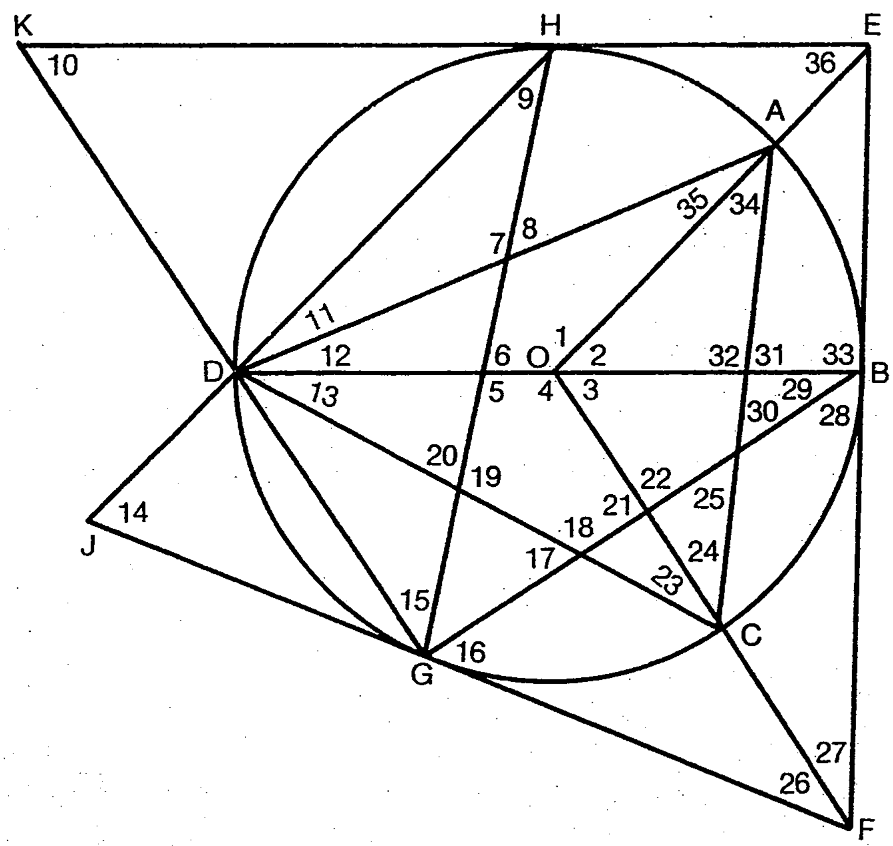
GEOMETRY H

You must get at least 10 angles correct to receive any points

$\overline{EF}$ is tangent to circle O at B; $\overline{KE}$ is tangent at H, and $\overline{JF}$ is tangent at G.

$m\overset{\frown}{AB} = m\overset{\frown}{AD}/3 \qquad m\overset{\frown}{BC} = m\overset{\frown}{DC}/2$

Deduce the measure of each angle listed below.



∠1 _____	∠7 _____	∠13_____	∠19_____	∠25_____	∠31_____
∠2 _____	∠8 _____	∠14_____	∠20_____	∠26_____	∠32_____
∠3 _____	∠9 _____	∠15_____	∠21_____	∠27_____	∠33_____
∠4 _____	∠10_____	∠16_____	∠22_____	∠28_____	∠34_____
∠5 _____	∠11_____	∠17_____	∠23_____	∠29_____	∠35_____
∠6 _____	∠12_____	∠18_____	∠24_____	∠30_____	∠36_____