Name:

Common Core Geometry

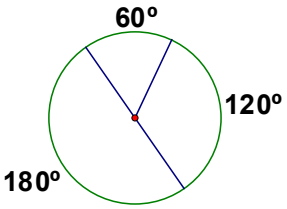
Unit 11

Circles

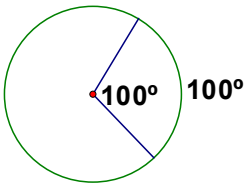
Mr. Schlansky

Lesson 1: I can find missing arcs and angles of a circle by adding to 360, 180 if given a diameter, central angles = the intercepted arc, and inscribed angles = half of the intercepted arc.

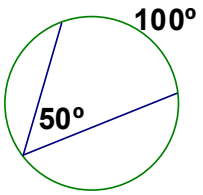
Angle and Segment Rules:



The arcs of a circle add to 360º
A diameter cuts a circle into 2 halves of 180º each



Central Angle: Has its vertex at the center of the circle
Central angle is equal to the measure of the intercepted arc



Inscribed Angle: Has its vertex on the circle
Inscribed angle is half of the measure of the intercepted arc

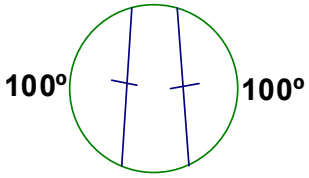
Lesson 2: I can find inscribed angles when a quadrilateral is inscribed in a circle using opposite angles are supplementary.

Quadrilateral inscribed in a circle

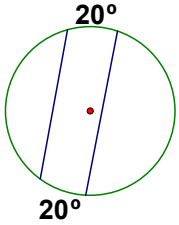
The opposite angles are supplementary (add to 180).

Lesson 3: I can find missing arcs and angles of a circle using congruent chords intercept congruent arcs and parallel chords intercept congruent arcs.

Congruent chords intercept congruent arcs



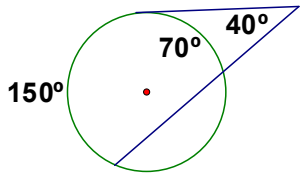
Parallel chords intercept congruent arcs



Lesson 4: I can find angles and arcs dealing with exterior angles using 2(EA)=major – minor.

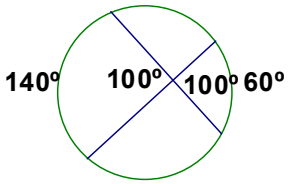
Exterior Angle:

2(Exterior Angle) = (Major Arc – Minor Arc)



Lesson 5: I can find arcs and angles dealing with interior angles using 2(VA) = arc + arc

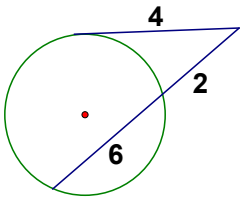
Interior Angles: 2(Vertical Angle) = Arc + Arc



Lesson 6: I can find segments dealing with exterior angles using we=we

Exterior Segments:

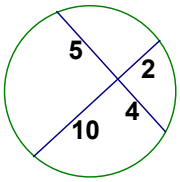
Whole • Exterior = Whole • Exterior



Lesson 7: I can find segments dealing with interior angles using pp=pp

Interior Segments

Part • Part = Part • Part

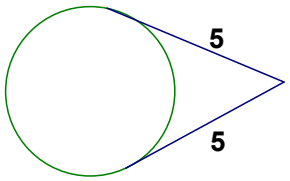


Lesson 8: I can practice finding segments, arcs, and angles using 2(EA), 2(VA). PP, and WEWE

Same notes as lessons 4-7

Lesson 9: I can find segments using all tangents drawn from the same point are congruent

Two tangents drawn from the same point are congruent



Lesson 10: I can find area of a sector using $A = \frac{\theta \pi r^2}{360}$.

Area of a sector: $A = \frac{\theta \pi r^2}{360}$

A = Area of the sector

θ = central angle (in degrees)

r = radius

Lesson 11: I can find a central angle of radius using $A = \frac{\theta \pi r^2}{360}$ and algebra.

If given area of a sector:

1) Substitute values into $A = \frac{\theta \pi r^2}{360}$
2) Cross multiply
3) Solve for the missing variable

Lesson 12: I can find arc length using $s = \theta r$.

Arc Length: $s = \theta r$

s = arc length

θ = central angle (in radians)

r = radius

Lesson 13: I can find area of a sector and arc length in degrees and radians using the area and circumference formulas.

Area of a Sector

Degrees: $A = \frac{\theta}{360}\pi r^2$

Radians: $A = \frac{\theta}{2\pi}\pi r^2$

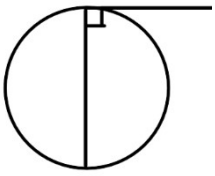
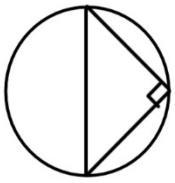
Arc Length

Degrees: $C = \frac{\theta}{360}\pi d$

Radians: $C = \frac{\theta}{2\pi}\pi d$

Lesson 14: I can determine congruent by using the 3 special angles rules

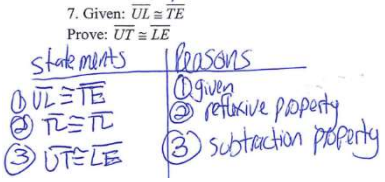
Special Angles in a Circle (Look for Inscribed Angles)

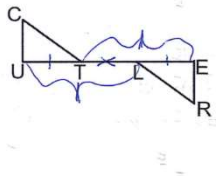
Angles inscribed to the same/congruent arcs are congruent.	
A tangent and radius/diameter intersect to form a right angle.	
An angle is inscribed to a semicircle/diameter is a right angle.	

Lesson 15: I can prove triangles are congruent using circle theorems.
If it is not specified, prove triangles are congruent
To prove triangles are congruent, prove 3 pairs of sides/angles are congruent
To prove segments or angles, use CPCTC
***If you get stuck, make something up and keep on going!**

1) Do a mini proof with your givens
Altitude creates two congruent right angles
Median creates two congruent segments
Line bisector creates two congruent segments
Midpoint creates two congruent segments
Angle bisector creates two congruent angles
Perpendicular lines create two congruent right angles
Parallel lines cut by a transversal create
Congruent corresponding angles (1 in, 1 out) OR congruent alternate interior angles (2 out) OR congruent alternate exterior angles (2 out)
*Perpendicular bisector is perpendicular and line bisector (1 pair of congruent right angles, 1 pair of congruent segs)
*If segments bisect each other, they are both cut in half (2 pairs of congruent segments)

2) Use additional tools:
Vertical Angles are congruent (Look for an X)
Reflexive Property (A side/angle is in both triangles and is congruent to itself)
Isosceles Triangles (In a triangle, congruent angles are opposite congruent sides)
Addition and Subtraction Property (If you need more or less of a shared side)
*You must use three congruent statements to get one congruent statement for the triangles. The two that you are adding/subtracting and the one that you want to prove in the triangle.

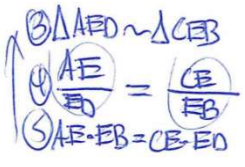


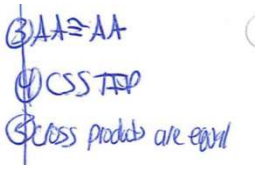


Parallelogram Theorems	Circle Theorems (Look for inscribed angles)
A parallelogram/rectangle/rhombus/square has: Two pairs of opposite sides congruent Two pairs of opposite sides parallel Diagonals that bisect each other Opposite angles congruent	**Angles inscribed to the same arc are congruent** **An angle inscribed to a semicircle is a right angle** **A tangent and a radius/diameter form a right angles** All radii/diameters of a circle are congruent Congruent arcs have congruent chords have congruent central angles Parallel Lines intercept congruent arcs Tangents drawn from the same point are congruent
A rectangle/square has: Congruent right angles Congruent diagonals	
A rhombus/square has: All sides congruent Perpendicular diagonals Diagonals that bisect the angles	

To prove triangles are SIMILAR, prove AA ≅ AA
If asked to prove a proportion/multiplication:
1) Prove triangles are similar
2) Corresponding Sides of Similar Triangle are In Proportion (CSSTIP)
3) Cross Products are Equal

Work Backwards!





Lesson 16: I can prove triangles are similar using circle theorems.
Same notes as Lesson 15.

Lesson 17: I can determine the center and radius of a circle by completing the square, negating what's in the parenthesis, and taking the square root of the right hand side.

Center and radius are key pieces of information for circles
To find center: Negate what is in the parenthesis. If there are no parentheses, the coordinate is 0.
Radius is the square root of the right hand side
$(x - a)^2 + (y - b)^2 = r^2$ where (a,b) is the center and r is the radius
To put into center-radius form: COMPLETE THE SQUARE TWICE
Completing the Square
1) Write the x's together, y's together, and move constant to the other side

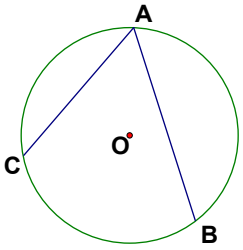
$$x^2 + bx + y^2 + by = c$$

2) Add $\left(\frac{b}{2}\right)^2$ to both sides for each variable
3) Factor each trinomial (Both factors must be the same)
4) Rewrite the factors as a binomial squared

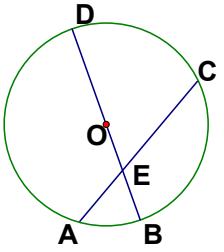
Name _____ Date _____
Mr. Schlansky Geometry

Arcs, Inscribed and Central Angles

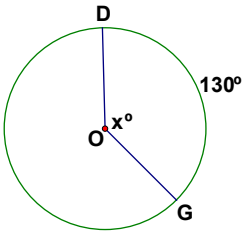
1. In circle O, $CA = 80^\circ$ and $AB = 150^\circ$. Find BC



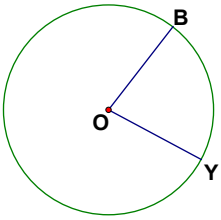
2. In circle O, $DC = 75^\circ$, find CB



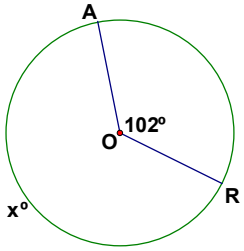
3. If $DG = 130^\circ$, find the measure of $\angle DOG$.



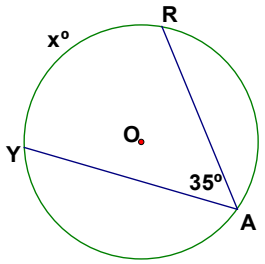
4. If $\angle BOY = 87^\circ$, find the measure of BY.



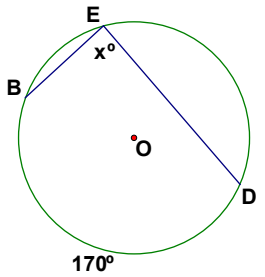
5. If $\angle AOR = 102^\circ$, find AR.



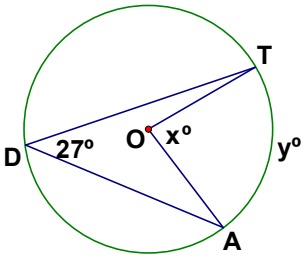
6. If $\angle RAY = 35^\circ$, find RY



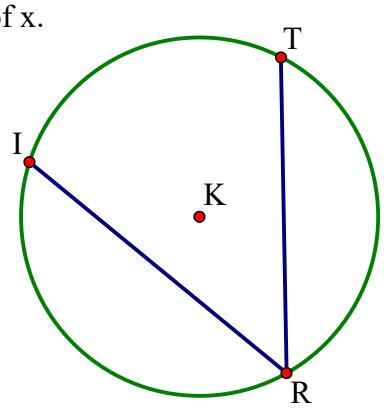
7. If BD = 170°, find the measure of $\angle BED$.



8. If $\angle TDA = 27^\circ$, find:
   a) $\angle TOA$
   b) TA



9. In circle K, $m\angle TRI = 4x + 6$ and $TI = 84^\circ$. Find the value of x.

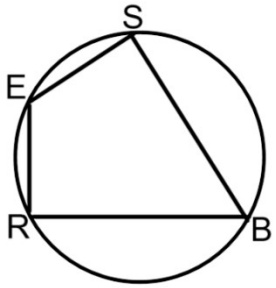


Name _____ Date _____

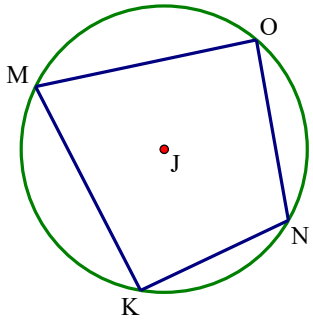
Mr. Schlansky Geometry

Quadrilaterals Inscribed In a Circle

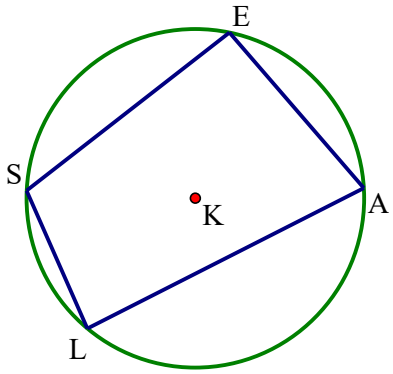
1. In the diagram below, quadrilateral *SBRE* is inscribed in the circle. If $m\angle BRE = 91^\circ$ and $m\angle SBR = 40^\circ$, find $m\angle BSE$ and $m\angle SER$



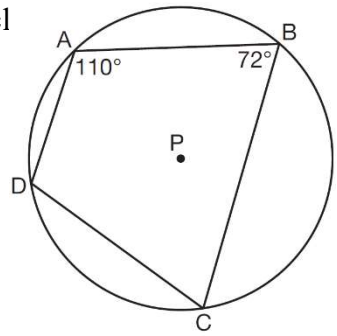
2. In the diagram below, quadrilateral MONK is inscribed in circle J, $m\angle KMO = 48^\circ$ and $m\angle MON = 80^\circ$. Find the measures of $m\angle KNO$ and $m\angle MKN$.



3. In the diagram below, quadrilateral SEAL is inscribed in circle K, $\overline{SE} \perp \overline{EA}$ and $m\angle EAL = 68^\circ$. Find the measures of $m\angle SLA$ and $m\angle ESL$.



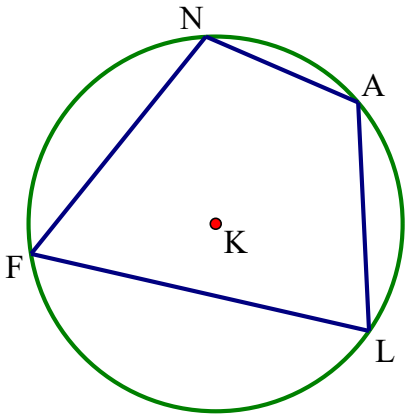
4. In the diagram below, quadrilateral *ABCD* is inscribed in circl



What is $m\angle ADC$?

1) 70°
2) 72°
3) 108°
4) 110°

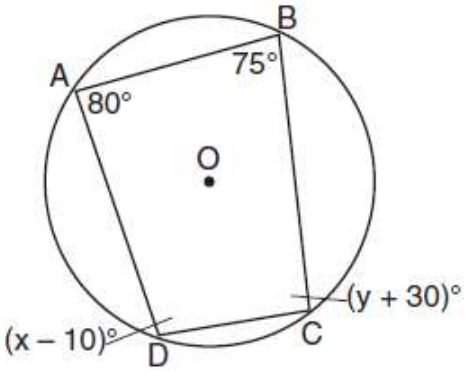
5. In the diagram below, quadrilateral FLAN is inscribed in circle K, $m\angle FNA = 9x + 10$ and $m\angle FLA = 6x + 20$. Find the measures of $m\angle FLA$.



6. Quadrilateral *ABCD* is inscribed in circle *O*, as shown below.

If $m\angle A = 80°$, $m\angle B = 75°$, $m\angle C = (y + 30)°$, and $m\angle D = (x - 10)°$, which statement is true?

1) $x = 85$ and $y = 50$
2) $x = 90$ and $y = 45$
3) $x = 110$ and $y = 75$
4) $x = 115$ and $y = 70$



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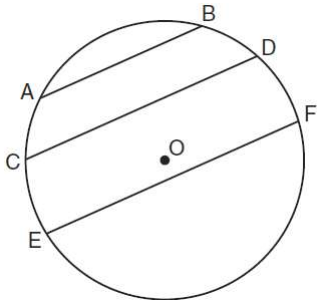
Parallel and Congruent Chords

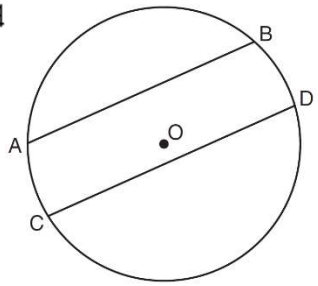
1. In the diagram below of circle O, chord $\overline{AB} \parallel$ chord $\overline{CD}$, and chord $\overline{CD} \parallel$ chord $\overline{EF}$.



Which statement must be true?

1) $\overset{\frown}{CE} \cong \overset{\frown}{DF}$
2) $\overset{\frown}{AC} \cong \overset{\frown}{DF}$
3) $\overset{\frown}{AC} \cong \overset{\frown}{CE}$
4) $\overset{\frown}{EF} \cong \overset{\frown}{CD}$

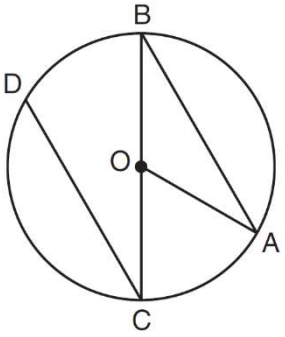
2. In the diagram below of circle O, chord $\overline{AB}$ is parallel to chord $\overline{\quad}$



Which statement must be true?

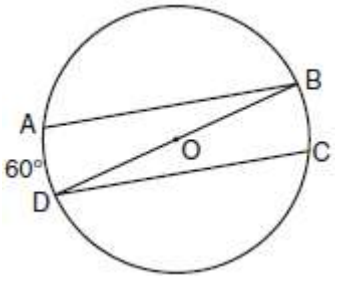
1) $\overset{\frown}{AC} \cong \overset{\frown}{BD}$
2) $\overset{\frown}{AB} \cong \overset{\frown}{CD}$
3) $\overline{AB} \cong \overline{CD}$
4) $\overset{\frown}{ABD} \cong \overset{\frown}{CDB}$

3. In the diagram below of circle O with diameter $\overline{BC}$ and radius $\overline{OA}$, chord $\overline{DC}$ is parallel to chord $\overline{BA}$.



If $m\angle BCD = 30°$, determine and state $m\angle AOB$.

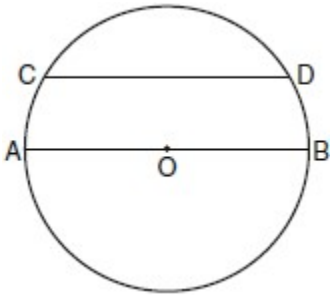
4. In the diagram of circle O below, chords $\overline{AB}$ and $\overline{CD}$ are parallel, and $\overline{BD}$ is a diameter of the circle.



If $m\overset{\frown}{AD} = 60$, what is $m\angle CDB$?

1) 20
2) 30
3) 60
4) 120

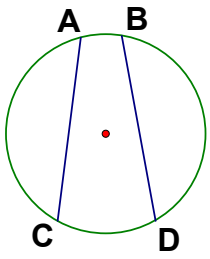
5. In the diagram of circle O below, chord $\overline{CD}$ is parallel to diameter $\overline{AOB}$ and $\text{m}\overset{\frown}{AC} = 30$



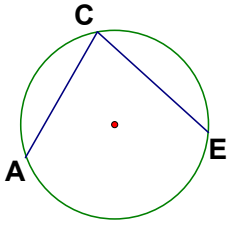
What is $\text{m}\overset{\frown}{CD}$?

1) 150
2) 120
3) 100
4) 60

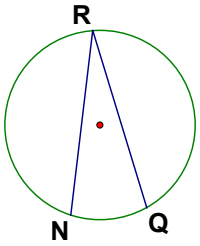
6. In the circle provided, $\overline{AC} \cong \overline{BD}$. If AB= 20º and CD= 60º, find AC.



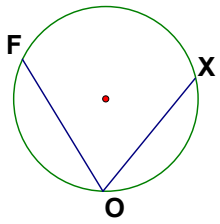
7. In the circle provided, $\overline{AC} \cong \overline{CE}$. If $m\angle ACE = 80º$, find CE.



8. In the circle provided, $\overline{RN} \cong \overline{RQ}$. If RN = 140º, find $m\angle NRQ$.



9. In the circle provided, $\overline{FO} \cong \overline{OX}$. If $m\angle FOX = 60º$, find FO



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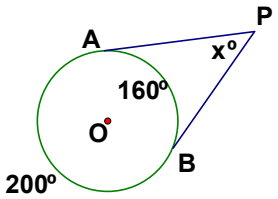
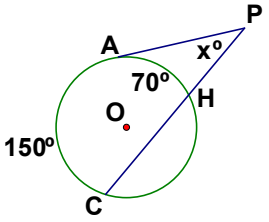
Exterior Angles in Circles

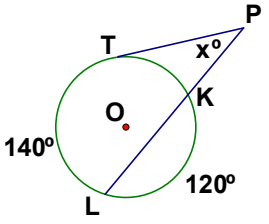
1. Major arc AB = 200º, Minor arc AB = 160º, find m ∠APB



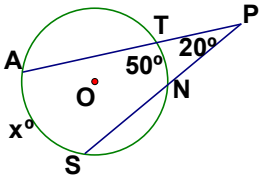
2. AC = 150º, AH = 70º, find m ∠APH



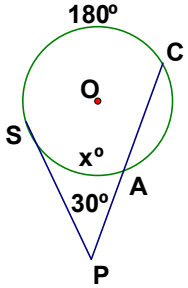
3. TL = 140º, LK = 120º, find m ∠TPK



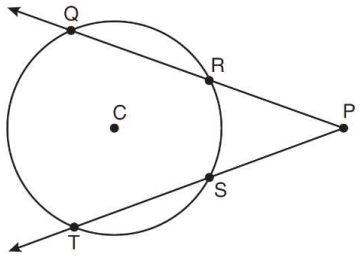
4. TN = 50º, ∠TPN = 20º, find AS



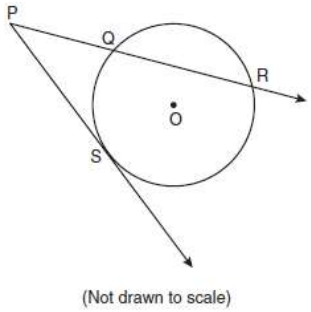
5. SC = 180º, ∠SPA = 30º, find AS



6. In the diagram below of circle C, $\text{m}\overset{\frown}{QT} = 140$, and $\text{m}\angle P = 40$. What is $\text{m}\overset{\frown}{RS}$?

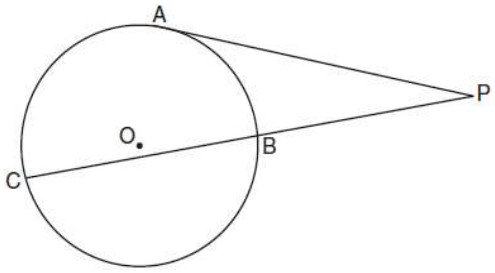


7. In the diagram below, $\overline{PS}$ is a tangent to circle O at point S, $\overline{PQR}$ is a secant, $m\angle QPS = 35$, $QS = 80$, find $\text{m}\overset{\frown}{RS}$

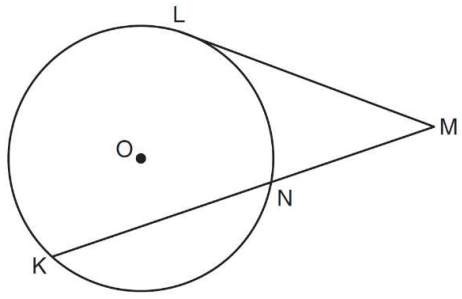


(Not drawn to scale)

8. In the diagram below, tangent $\overline{PA}$ and secant $\overline{PBC}$ are drawn to circle O from external point P. If $AC = 120$ and $AB = 80$, find $m\angle APB$



9. In the diagram below, tangent $\overline{ML}$ and secant $\overline{MNK}$ are drawn to circle O. The ratio $\text{m}\overset{\frown}{LN} : \text{m}\overset{\frown}{NK} : \text{m}\overset{\frown}{KL}$ is $3:4:5$. Find $\text{m}\angle LMK$.



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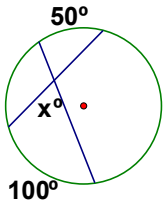
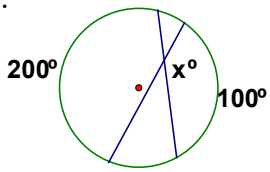
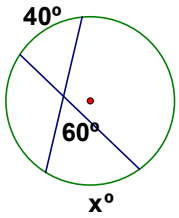
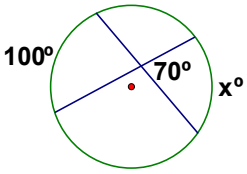
Intersecting Chords (Angles)

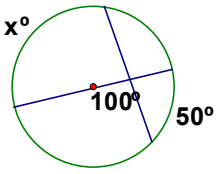
Find x in each of the following

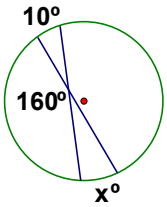
1. 

2. 

3. 

4. 

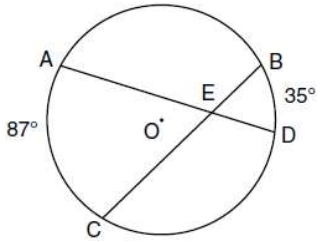
5. 

6. 

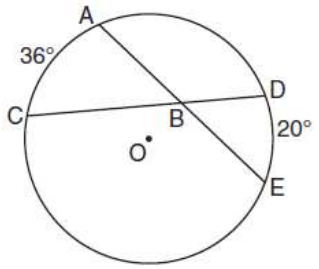
7. In the diagram below of circle O, chords $\overline{AD}$ and $\overline{BC}$ intersect at E, $m\overset{\frown}{AC} = 87$, and $m\overset{\frown}{BD} = 35$.

What is the degree measure of $\angle CEA$?

1) 87
2) 61
3) 43.5
4) 26

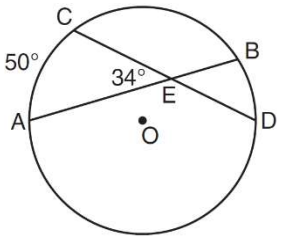


8. In the diagram below of circle *O*, chords $\overline{AE}$ and $\overline{DC}$ intersect at point *B*, such that $\text{m}\overset{\frown}{AC} = 36$ and $\text{m}\overset{\frown}{DE} = 20$.



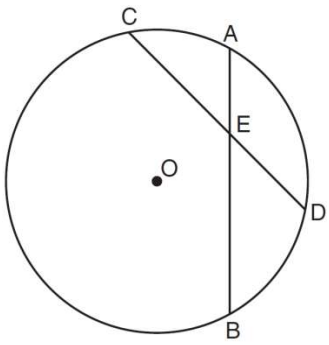
What is $\text{m}\angle ABC$?
1) 56
2) 36
3) 28
4) 8

9. In the diagram below of circle *O*, chords $\overline{AB}$ and $\overline{CD}$ intersect at *E*.



If $\text{m}\angle AEC = 34$ and $\text{m}\overset{\frown}{AC} = 50$, what is $\text{m}\overset{\frown}{DB}$?
1) 16
2) 18
3) 68
4) 118

10. In the diagram below of circle *O*, chords $\overline{AB}$ and $\overline{CD}$ intersect at *E*.



If $m\angle CEB = 110^{\circ}$ and $\text{m}\overset{\frown}{AC} = 50$, what is $\text{m}\overset{\frown}{DB}$?

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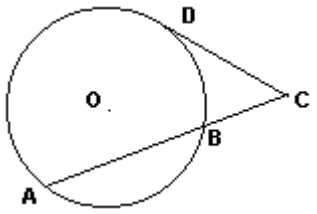
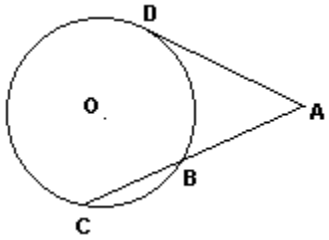
Exterior Angles (Segments)

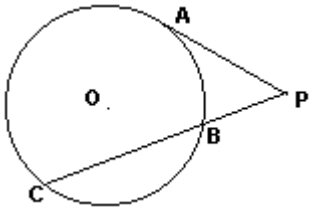
1. In the diagram, tangent $\overline{DC}$ and secant $\overline{CBA}$ are drawn to circle *O* from external point *C*. If $\overline{DC} = 4$ and $\overline{BC} = 2$, find $\overline{AC}$.



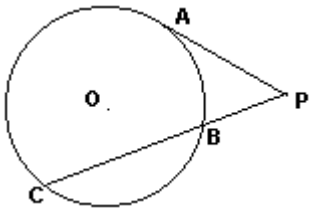
2. In the diagram, $\overline{AD}$ is tangent to circle *O* at *D*, and $\overline{CBA}$ is a secant. If $\overline{AD} = 6$ and $\overline{AC} = 9$, what is $\overline{AB}$?



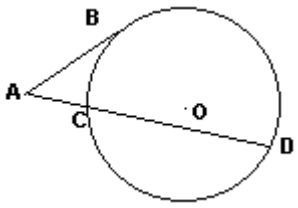
3. In the diagram, $\overline{AP}$ is a tangent and $\overline{PBC}$ is a secant to circle *O*. If $\overline{PC} = 12$ and $\overline{BC} = 9$, what is $\overline{AP}$?



4. In the diagram, $\overline{AP}$ is a tangent and $\overline{PBC}$ is a secant to circle *O*. If $\overline{PB} = 2$ and $\overline{BC} = 30$, what is $\overline{AP}$?



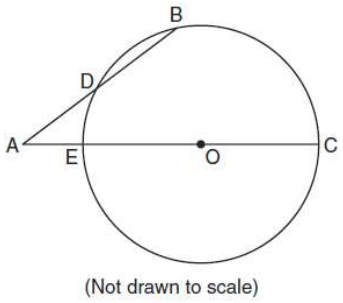
5. In the diagram, $\overline{AB}$ is tangent to circle O at B, and $\overline{ACD}$ is a secant. If $\overline{AB} = 9$ and $\overline{AD} = 27$, find $\overline{AC}$.



6. In the diagram below of circle O, secant $\overline{AB}$ intersects circle O at D, secant $\overline{AOC}$ intersects circle O at E, $AE = 4$, $AB = 12$, and $DB = 6$.

What is the length of $\overline{OC}$?

1) 4.5
2) 7
3) 9
4) 14

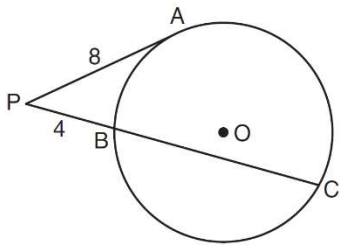


(Not drawn to scale)

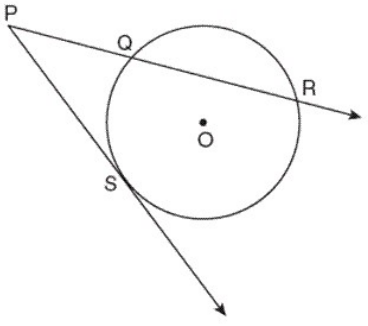
7. In the diagram below of circle O, $\overline{PA}$ is tangent to circle O at A, and $\overline{PBC}$ is a secant with points B and C on the circle.

If $PA = 8$ and $PB = 4$, what is the length of $\overline{BC}$?

1) 20
2) 16
3) 15
4) 12



8. In the diagram below, $\overline{PS}$ is a tangent to circle O at point S, $\overline{PR}$ is a secant, $PS = x$, $PQ = 3$, and $PR = x + 18$. What is the length of $\overline{PS}$?



(Not drawn to scale)

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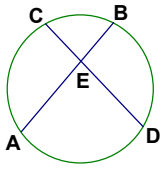
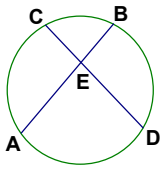
Intersecting Chords (Segments)

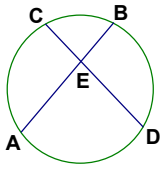
1. If $\overline{AE} = 8$, $\overline{EB} = 3$, $\overline{CE} = 6$, find $\overline{ED}$



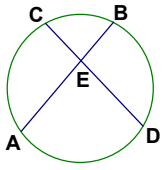
2. If $\overline{AE} = 16$, $\overline{EB} = 2$, $\overline{CE} = 4$, find $\overline{ED}$



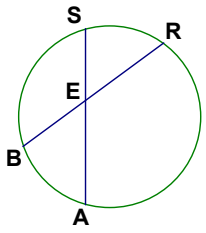
3. If $\overline{AB} = 11$, $\overline{EB} = 5$, $\overline{CE} = 10$, find $\overline{ED}$



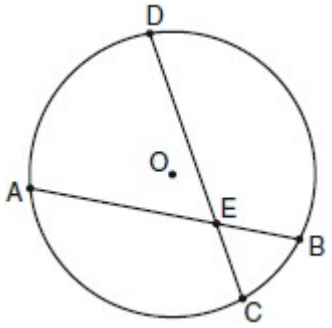
4. If $\overline{ED} = 10$, $\overline{EB} = 2$, $\overline{CE} = 4$, find $\overline{AB}$



5. If $\overline{BR} = 10$, $\overline{BE} = 4$, $\overline{AE} = 8$, find $\overline{ES}$



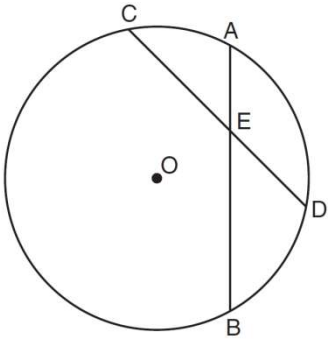
6. In the diagram of circle O below, chord $\overline{AB}$ intersects chord $\overline{CD}$ at E, $DE = 2x + 8$, $EC = 3$, $AE = 4x - 3$, and $EB = 4$.



What is the value of x?

1) 1
2) 3.6
3) 5
4) 10.25

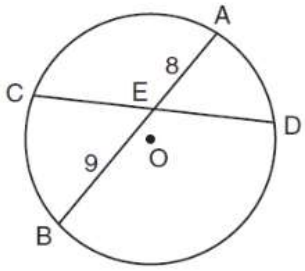
7. In the diagram below of circle O, chords $\overline{AB}$ and $\overline{CD}$ intersect at E.



If $CE = 10$, $ED = 6$, and $AE = 4$, what is the length of $\overline{EB}$?

1) 15
2) 12
3) 6.7
4) 2.4

8. In the diagram below of circle O, chord $\overline{AB}$ bisects chord $\overline{CD}$ at E. If $AE = 8$ and $BE = 9$, find the length of $\overline{CE}$ in simplest radical form.



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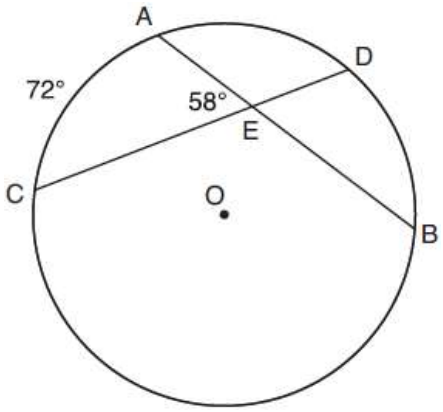
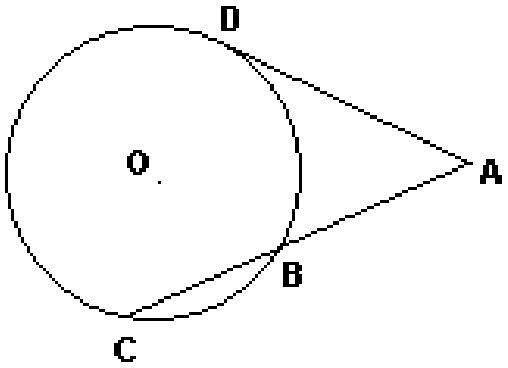
Circle Rules Practice

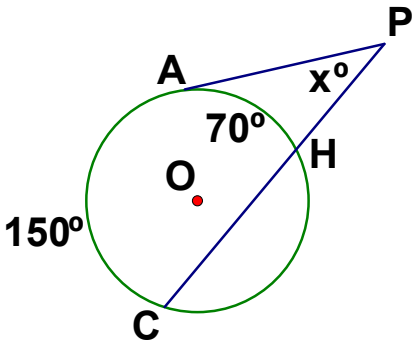
1. In the diagram below of circle *O*, chords $\overline{AB}$ and $\overline{CD}$ intersect at *E*.
If $m\overset{\frown}{AC} = 72°$ and $m\angle AEC = 58°$, how many degrees are in $m\overset{\frown}{DB}$?



2. In the diagram, $\overline{AD}$ is tangent to circle *O* at *D*, and $\overline{CBA}$ is a secant. If *AD* = 6 and *AC* = 9, what is *AB*?

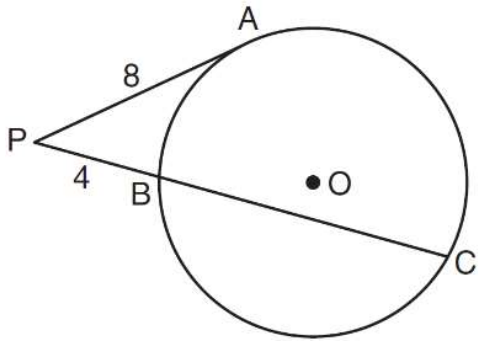


3. If AC = 150º, AH = 70º, find m ∠ APH

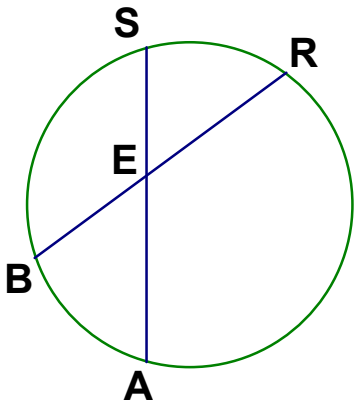


4. In the diagram below of circle O, $\overline{PA}$ is tangent to circle O at A, and $\overline{PBC}$ is a secant with points B and C on the circle.

If $PA = 8$ and $PB = 4$, what is the length of $\overline{BC}$?

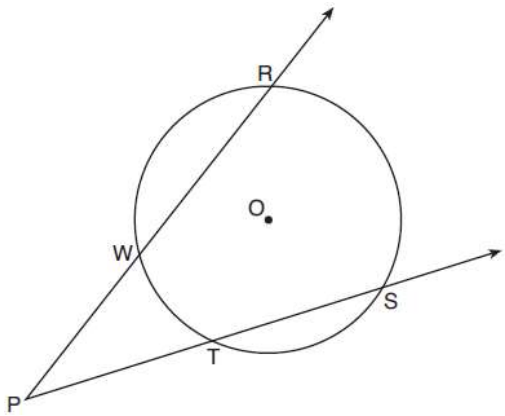


5. If $\overline{BR}$ =10, $\overline{BE}$ = 4, $\overline{AE}$ = 8, find $\overline{ES}$

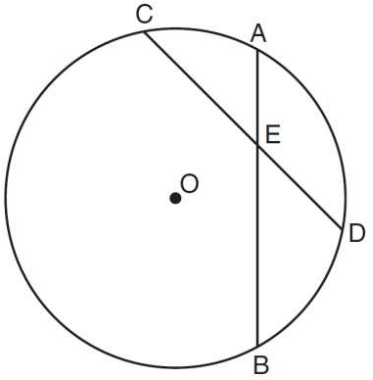


6. As shown in the diagram below, secants $\overrightarrow{PWR}$ and $\overrightarrow{PTS}$ are drawn to circle O from external point P.

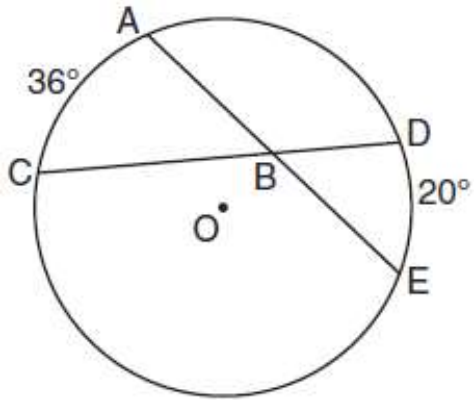
If $m\angle RPS = 35°$ and $m\overset{\frown}{RS} = 121°$, determine and state $m\overset{\frown}{WT}$.



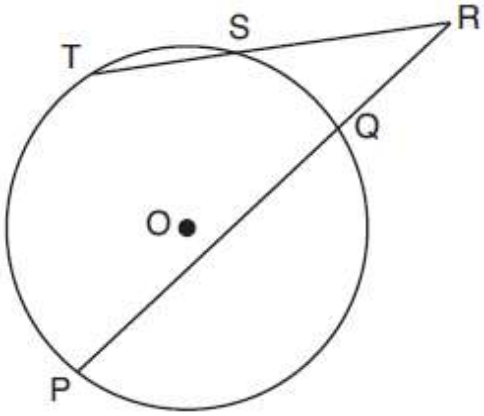
7. In the diagram below of circle O, chords $\overline{AB}$ and $\overline{CD}$ intersect at E.
If $CE = 10$, $ED = 6$, and $AE = 4$, what is the length of $\overline{EB}$?



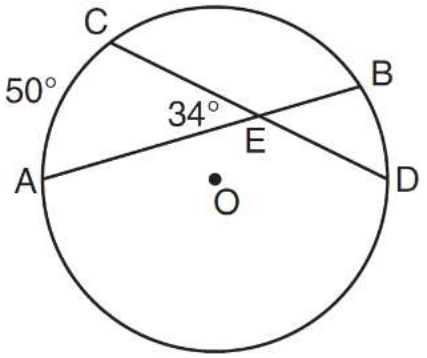
8. In the diagram below of circle O, chords $\overline{AE}$ and $\overline{DC}$ intersect at point B, such that $\text{m}\overset{\frown}{AC} = 36$ and $\text{m}\overset{\frown}{DE} = 20$. What is $\text{m}\angle ABC$?



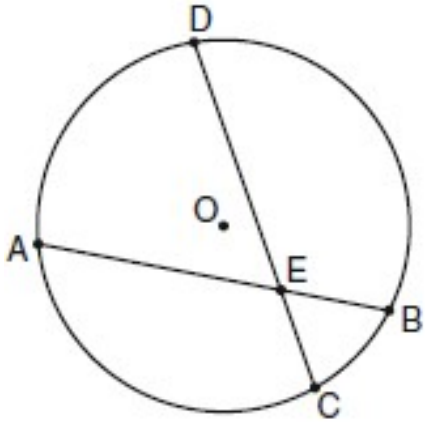
9. In the diagram below, secants $\overline{RST}$ and $\overline{RQP}$, drawn from point R, intersect circle O at S, T, Q, and P.
If $RS = 6$, $ST = 4$, and $RP = 15$, what is the length of $\overline{RQ}$?



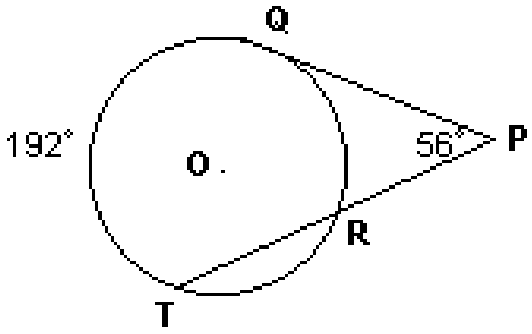
10. In the diagram below of circle O, chords $\overline{AB}$ and $\overline{CD}$ intersect at E.
If $m\angle AEC = 34$ and $m\overset{\frown}{AC} = 50$, what is $m\overset{\frown}{DB}$?



11. In the diagram of circle O below, chord $\overline{AB}$ intersects chord $\overline{CD}$ at E, $DE = 2x + 8$, $EC = 3$, $AE = 4x - 3$, and $EB = 4$.
What is the value of x?



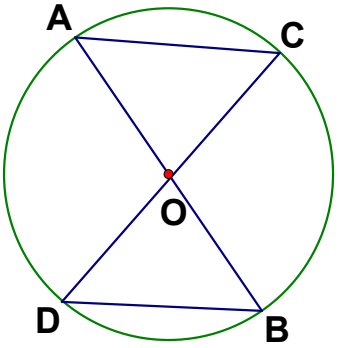
12. In the diagram of circle O, $\overline{PQ}$ is tangent to O at Q and $\overline{PRT}$ is a secant. If $m\angle P = 56$ and mQT = 192, find mQR



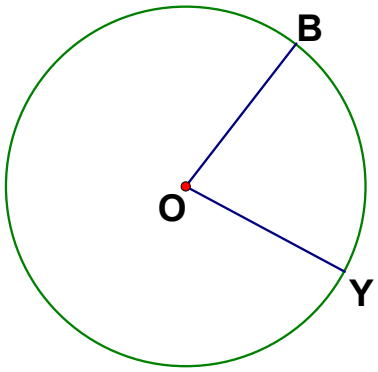
Name _____ Date _____
Mr. Schlansky Geometry

Area of a Sector

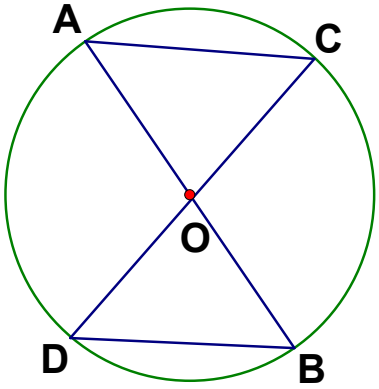
1. In circle O, $m\angle AOC = 70$ and $\overline{AO} = 2\ in$. Find the area of sector COA to the nearest square inch.



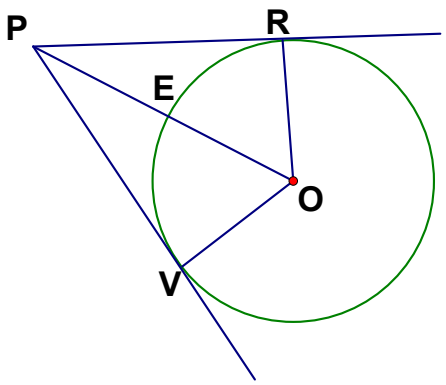
2. In circle O, if $\angle$BOY = 80º and $\overline{BO} = 8\ cm$, find the area of sector BOY in terms of π.



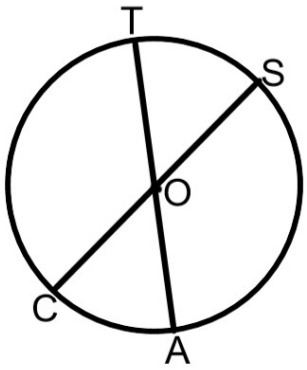
3. In circle O, $m\angle AOC = 65$ and $\overline{DO} = 6\ in$. Find the area of sector COB in terms of π.



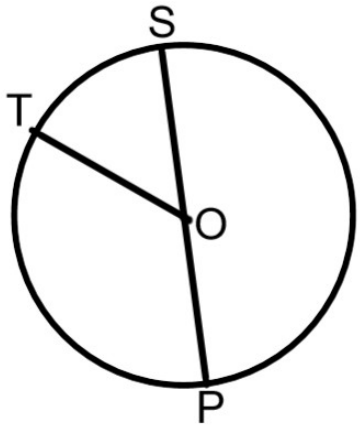
4. In circle O, tangents $\overline{PR}$ and $\overline{PV}$ are drawn. If $m\angle ROP = 80$ and $\overline{RO} = 4\ cm$, find the area of sector ROE to the nearest tenth of a square cm.



5. In circle O, diameters $\overline{TA}$ and $\overline{CS}$ are drawn. If $m\angle COA = 60$ and $\overline{TA} = 10\ cm$, find the area of sector SOA to the nearest hundredth of a square centimeter.



6. In circle O, diameter $\overline{SP}$ and radius $\overline{TO}$ are drawn. If $m\angle SOT = 40$ and $\overline{TO} = 2\ meters$, find the area of sector TOP in terms of π.



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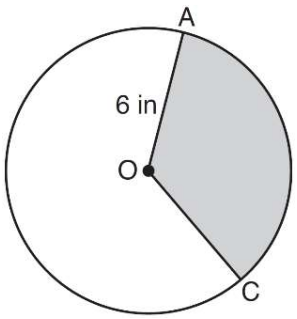
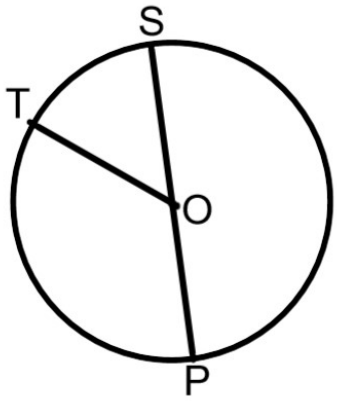
Mr. Schlansky Geometry

Given Area of a Sector

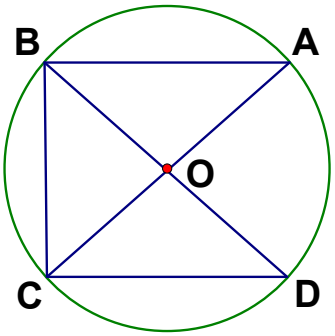
1. In the diagram below of circle *O*, the area of the shaded sector *AOC* is 12π in^2 and the length of $\overline{OA}$ is 6 inches. Determine and state $m\angle AOC$.



2. In the diagram below of circle *O*, the area of sector *STO* is $48\pi\ in^2$ and the length of $\overline{OP}$ is 12 inches. Determine and state $m\angle SOT$



3. In circle O, diameters $\overline{BOD}$ and $\overline{COA}$ intersect at the center of the circle O. If the area of sector OCD = 240π square inches and $m\angle AOD = 80$, find the measure of $\overline{OB}$ to the nearest tenth of an inch.



4. In a circle with a diameter of 32, the area of a sector is $\frac{512\pi}{3}$. The measure of the angle of the sector, in radians, is

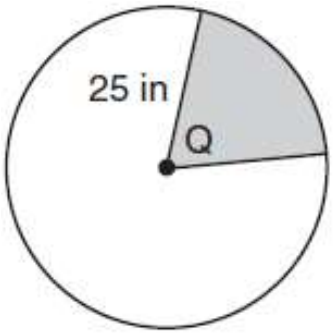
1) $\frac{\pi}{3}$

2) $\frac{4\pi}{3}$

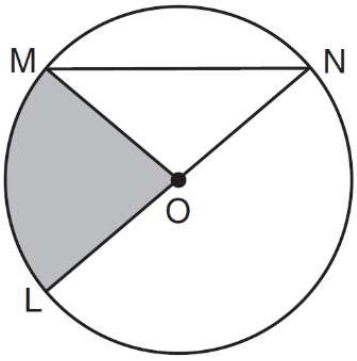
3) $\frac{16\pi}{3}$

4) $\frac{64\pi}{3}$

5. In the diagram below, the circle has a radius of 25 inches. The area of the *unshaded* sector is 500π in^2.
Determine and state the degree measure of angle *Q*, the central angle of the shaded sector.



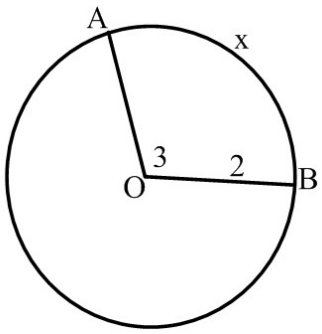
6. In the diagram below of circle *O*, the area of the shaded sector *LOM* is 2π cm^2.
If the length of $\overline{NL}$ is 6 cm, what is $m\angle N$?



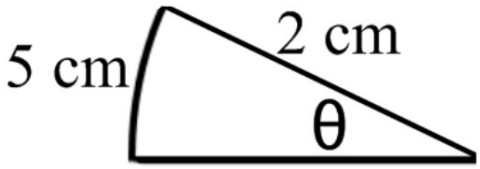
Name _____ Date _____
Mr. Schlansky Geometry

Arc Length

1. In circle O, the measure of central angle AOB is 3 radians and the length of $\overline{OB}$ is 2 cm. What is the measure of arc AB?



2. What is the measure of the central angle below?



3. What is the measure of the radius of a sector whose arc length is 12 inches and has a central angle of 4 radians?

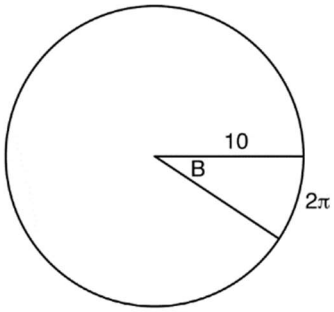
4. A wheel has a radius of 18 inches. Which distance, to the *nearest inch*, does the wheel travel when it rotates through an angle of $\frac{2\pi}{5}$ radians?

5. What is the measure of a central angle in degrees whose arc length is 6 meters and whose radius measures 8 meters?

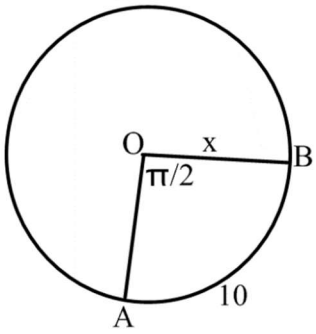
6. In the diagram below, the circle shown has radius 10. Angle *B* intercepts an arc with a length of 2π.

What is the measure of angle *B*, in radians?

1) $10 + 2\pi$
2) 20π
3) $\frac{\pi}{5}$
4) $\frac{5}{\pi}$

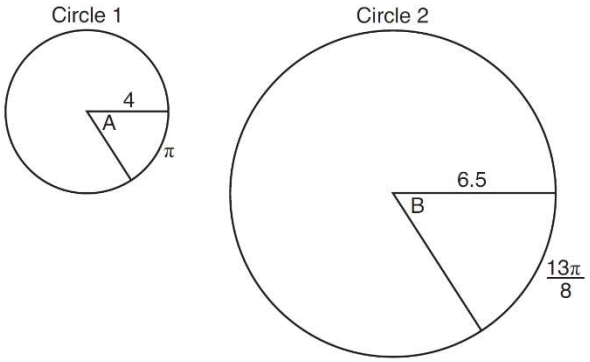


7. In circle O, the measure of central angle AOB is $\frac{\pi}{2}$ radians and the length of arc AB is 10 cm. What is the measure of radius $\overline{OB}$ to the *nearest tenth of a cm*?



8. In the diagram below, Circle 1 has radius 4, while Circle 2 has radius 6.5. Angle *A* intercepts an arc of length π, and angle *B* intercepts an arc of length $\frac{13\pi}{8}$.

Dominic thinks that angles *A* and *B* have the same radian measure. State whether Dominic is correct or not. Explain why.



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Mr. Schlansky Geometry

Conversions with Arc Length and Area of a Sector

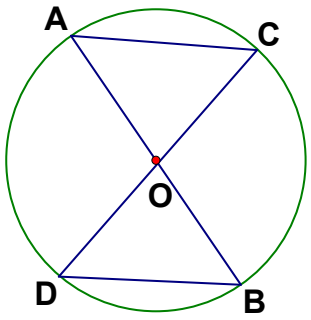
1. Find the arc length of a sector that has a diameter of 10 inches and a central angle of $\frac{\pi}{3}$ radians in terms of π.

2. Find the arc length of a sector that has a radius of 4 inches and has a central angle of 45º to the nearest tenth of an inch.

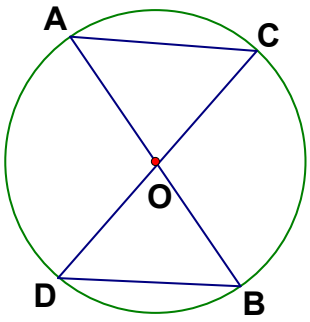
3. Find the area of a sector whose radius is 7 centimeters and central angle is 40º to the nearest hundredth of a square centimeter.

4. Find the area of a sector whose diameter is 20 centimeters and central angle is $\frac{2\pi}{3}$ radians to the nearest square centimeter.

5. If arc AC = 8, and $\overline{AB} = 10$, find $m\angle AOC$ to the *nearest hundredth of a degree*.



6. If the area of sector AOC is 12π and $\overline{AO} = 6$, find $m\angle AOC$ to the *nearest radian*.

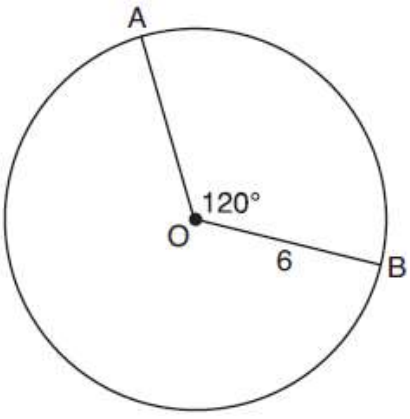


7. In a circle with a diameter of 32, the area of a sector is $\frac{512\pi}{3}$. The measure of the angle of the sector, in radians, is

1) $\frac{\pi}{3}$
2) $\frac{4\pi}{3}$
3) $\frac{16\pi}{3}$
4) $\frac{64\pi}{3}$

8. The diagram below shows circle *O* with radii $\overline{OA}$ and $\overline{OB}$. The measure of angle *AOB* is 120°, and the length of a radius is 6 inches.
Which expression represents the length of arc *AB*, in inches?

1) $\frac{120}{360}(6\pi)$
2) $120(6)$
3) $\frac{1}{3}(36\pi)$
4) $\frac{1}{3}(12\pi)$



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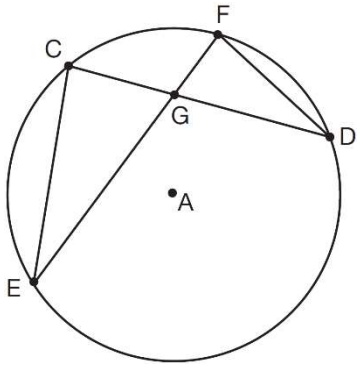
Mr. Schlansky Geometry

Special Angles in Circles

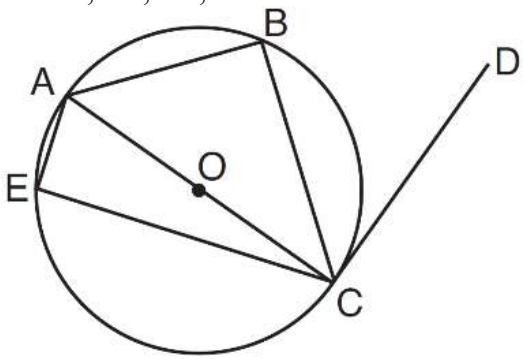
1. In the diagram of circle *A* shown below, chords $\overline{CD}$ and $\overline{EF}$ intersect at *G*, and chords $\overline{CE}$ and $\overline{FD}$ are drawn.



Which statement is *not* always true?

1) $\overline{CG} \cong \overline{FG}$
2) $\angle CEG \cong \angle FDG$
3) $\frac{CE}{EG} = \frac{FD}{DG}$
4) $\Delta CEG \sim \Delta FDG$

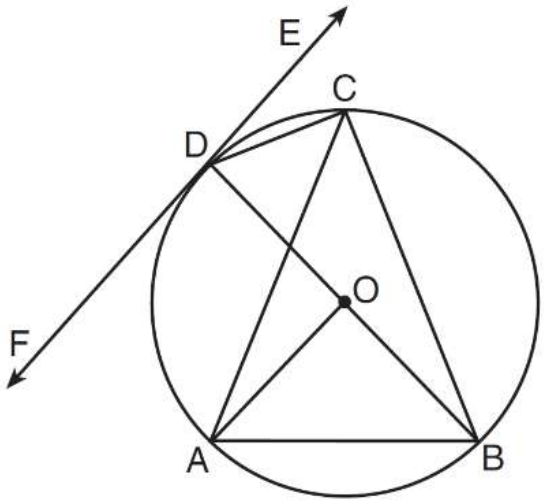
11. In circle *O* shown below, diameter $\overline{AC}$ is perpendicular to $\overline{CD}$ at point *C*, and chords $\overline{AB}$, $\overline{BC}$, $\overline{AE}$, and $\overline{CE}$ are drawn.



Which statement is *not* always true?

1) $\angle ACB \cong \angle BCD$
2) $\angle ABC \cong \angle ACD$
3) $\angle BAC \cong \angle DCB$
4) $\angle CBA \cong \angle AEC$

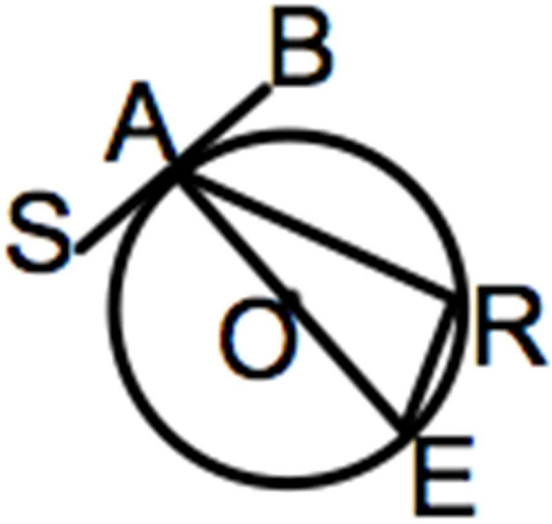
3. In the diagram below, $\overline{DC}$, $\overline{AC}$, $\overline{DOB}$, $\overline{CB}$, and $\overline{AB}$ are chords of circle O, $\overleftrightarrow{FDE}$ is tangent at point D, and radius $\overline{AO}$ is drawn. Sam decides to apply this theorem to the diagram: "An angle inscribed in a semi-circle is a right angle."



Which angle is Sam referring to?

1) $\angle AOB$
2) $\angle BAC$
3) $\angle DCB$
4) $\angle FDB$

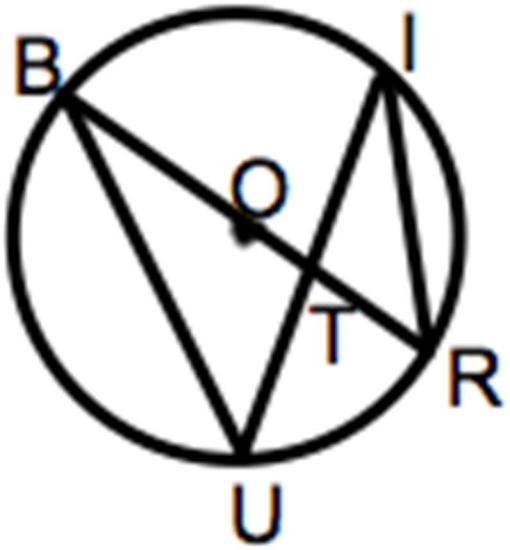
4. In circle O shown below, $\overline{AE}$ is a diameter, $\overline{SB}$ is a tangent, and chord $\overline{AR}$ and $\overline{RE}$ are drawn.



Which of the following statements is true?

1) $\angle EAR \cong \angle RAB$
2) $\angle REA \cong \angle SAE$
3) $\angle SAR \cong \angle BAE$
4) $\angle ERA \cong \angle BAE$

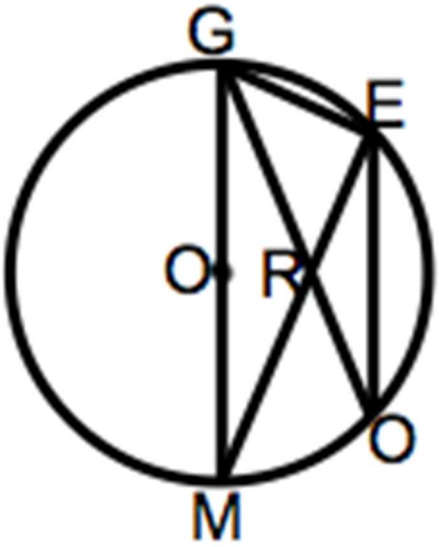
5. In circle O shown below, $\overline{BR}$ is a diameter and chords $\overline{BU}$, $\overline{IU}$, and $\overline{IR}$ are drawn.



Which of the following statements is *not* true?

1) $\angle BUI \cong \angle BRI$
2) $\angle ITR \cong \angle BTU$
3) $\angle UBT \cong \angle BRI$
4) $\angle RBU \cong \angle RIU$

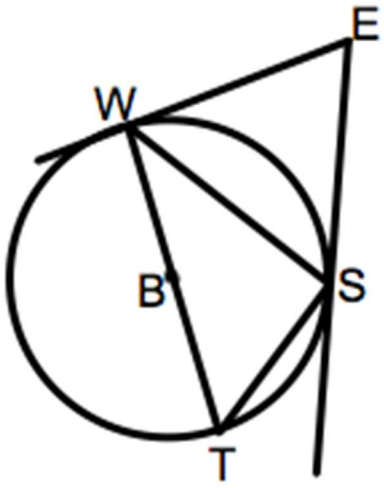
6. In circle O shown below, $\overline{GM}$ is a diameter and chords $\overline{EM}$, $\overline{OG}$, $\overline{EG}$ and $\overline{EO}$ are drawn.



Which of the following statements is *not* true?

1) $\angle MEO \cong \angle OGM$
2) $\angle GRM \cong \angle ORE$
3) $\Delta MGR \cong \Delta EOR$
4) $\angle GEM$ is a right angle

7. In circle B shown below, $\overline{TW}$ is a diameter, tangents $\overline{EW}$ and $\overline{ES}$ are drawn and chords $\overline{WS}$ and $\overline{TS}$ are drawn.



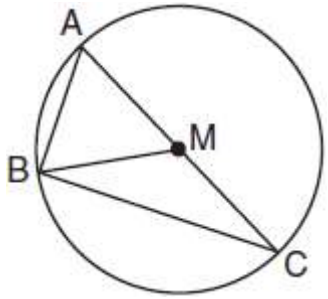
Which of the following statements is *not* true?

1) $\angle ESW \cong \angle WTS$
2) $\angle WST \cong \angle EWT$
3) $\angle EWS \cong \angle ESW$
4) $\angle TWS \cong \angle STW$

8. In circle M below, diameter $\overline{AC}$, chords $\overline{AB}$ and $\overline{BC}$, and radius $\overline{MB}$ are drawn.

Which statement is *not* true?

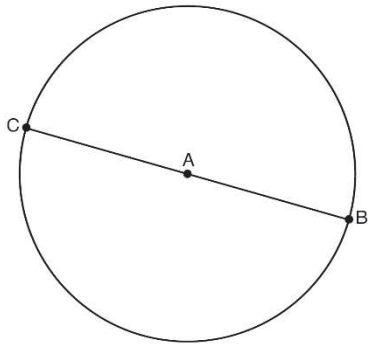
1) $\triangle ABC$ is a right triangle.
2) $\triangle ABM$ is isosceles.
3) $m\overset{\frown}{BC} = m\angle BMC$
4) $m\overset{\frown}{AB} = \frac{1}{2} m\angle ACB$



9. In the diagram below, $\overline{BC}$ is the diameter of circle A.

Point D, which is unique from points B and C, is plotted on circle A. Which statement must always be true?

1) $\triangle BCD$ is a right triangle.
2) $\triangle BCD$ is an isosceles triangle.
3) $\triangle BAD$ and $\triangle CBD$ are similar triangles.
4) $\triangle BAD$ and $\triangle CAD$ are congruent triangles.



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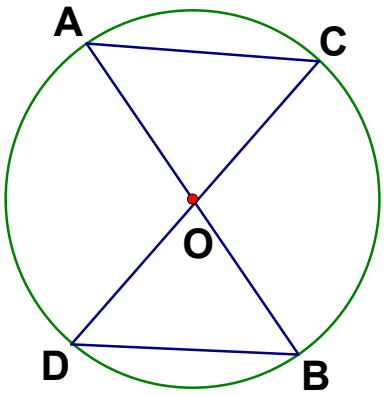
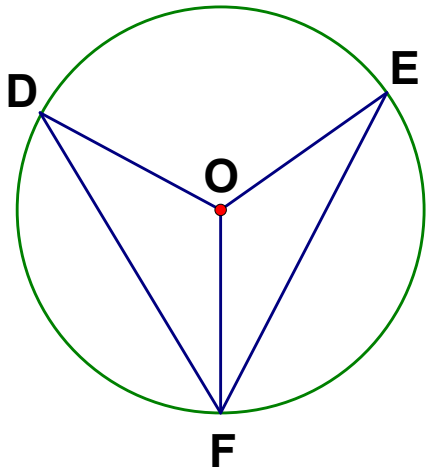
Congruent Triangle Proofs with Circle Theorems

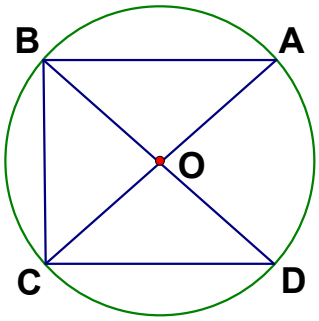
1. Given: Circle O with diameters $\overline{AOB}$ and $\overline{COD}$, and chords $\overline{AC}$ and $\overline{DB}$
   Prove: $\overline{AC} \cong \overline{DB}$



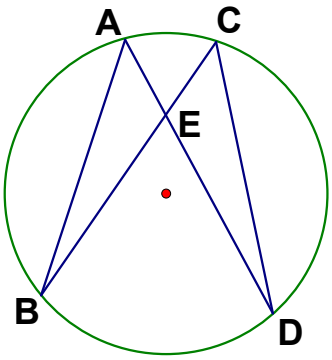
2. In circle O, $\overline{FD} \cong \overline{FE}$
   Prove: $\angle ODF \cong \angle OEF$



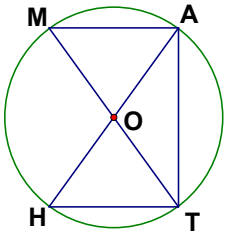
3. Given: Diameters $\overline{BOD}$ and $\overline{COA}$ intersect at the center of the circle O.
   Prove: Δ ABC $\cong$ Δ DCB



4. Given: Chords $\overline{AD}$ and $\overline{BC}$ of circle O intersect at E, $\overline{AB} \cong \overline{CD}$
   Prove: $\overline{BE} \cong \overline{ED}$



5. Given: Circle O with diameters $\overline{MOT}$ and $\overline{AOH}$.
   Prove: $\overline{MA} \cong \overline{HT}$



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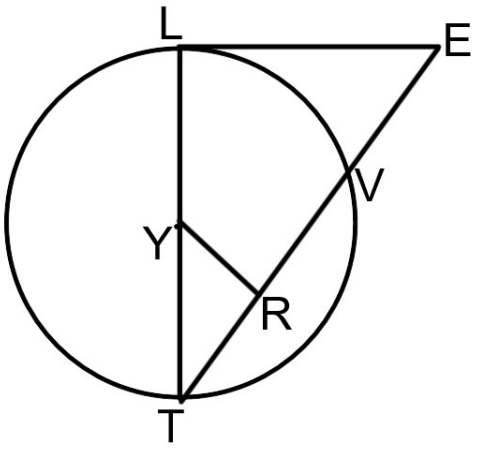
Mr. Schlansky Geometry

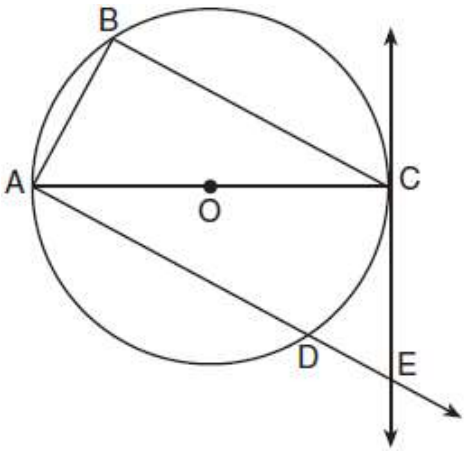
Similar Triangle Proofs with Circle Theorems

1. In circle Y, tangent $\overline{LE}$ is drawn to diameter $\overline{TYL}$ and $\overline{YR} \perp \overline{TE}$. Prove that $\frac{\overline{TE}}{\overline{TY}} = \frac{\overline{TL}}{\overline{TR}}$.

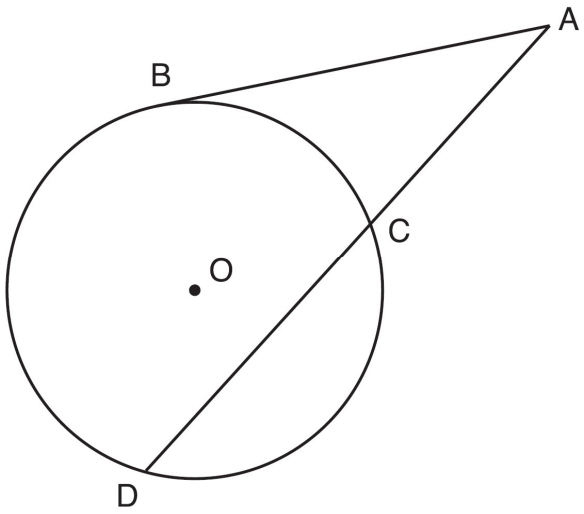


2. In the diagram below of circle *O*, tangent $\overleftrightarrow{EC}$ is drawn to diameter $\overline{AC}$. Chord $\overline{BC}$ is parallel to secant $\overline{ADE}$, and chord $\overline{AB}$ is drawn.

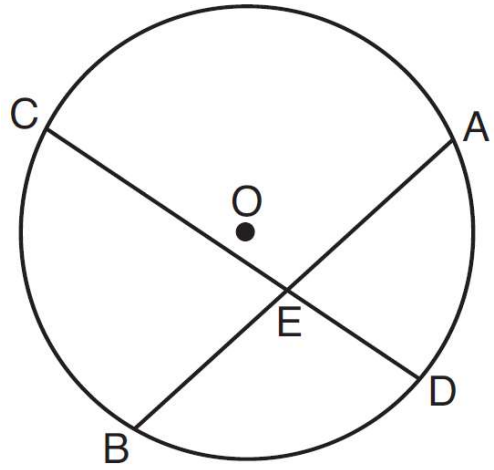
Prove: $\frac{BC}{CA} = \frac{AB}{EC}$



3. In the diagram below, secant $\overline{ACD}$ and tangent $\overline{AB}$ are drawn from external point A to circle O.
Prove the theorem: If a secant and a tangent are drawn to a circle from an external point, the product of the lengths of the secant segment and its external segment equals the length of the tangent segment squared. $(AC \cdot AD = AB^2)$



4. Given: Circle O, chords $\overline{AB}$ and $\overline{CD}$ intersect at E
Theorem: If two chords intersect in a circle, 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. Prove this theorem by proving $AE \cdot EB = CE \cdot ED$.



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Completing the Square with Circles

1. What is the center and radius of the circle with the following equations:

1. $x^2+y^2+6x-8y=0$

2. $x^2+y^2+10x-4y-6=1$

3. $x^2+y^2+16x+6y+9=0$

4. $x^2+y^2-12x-14y=15$

5. $x^2+8y+10+y^2-4x=6$

6. $x^2+4x+12+y^2-2y-1=22$

7. $y^2+6x+x^2-12y+2=11$

8. $x^2+y^2+6x-10y+4=-5$

8. What are the coordinates of the center of a circle whose equation is $x^2 + y^2 - 16x + 6y + 53 = 0$?

1) $(-8,-3)$
2) $(-8,3)$
3) $(8,-3)$
4) $(8,3)$

9. The equation $x^2 + y^2 - 2x + 6y + 3 = 0$ is equivalent to

1) $(x-1)^2 + (y+3)^2 = -3$
2) $(x-1)^2 + (y+3)^2 = 7$
3) $(x+1)^2 + (y+3)^2 = 7$
4) $(x+1)^2 + (y+3)^2 = 10$

10. The equation of a circle is $x^2 + y^2 + 6y = 7$. What are the coordinates of the center and the length of the radius of the circle?

1) center $(0,3)$ and radius 4
2) center $(0,-3)$ and radius 4
3) center $(0,3)$ and radius 16
4) center $(0,-3)$ and radius 16

11. What are the coordinates of the center and length of the radius of the circle whose equation is $x^2 + 6x + y^2 - 4y = 23$?

1) $(3,-2)$ and 36
2) $(3,-2)$ and 6
3) $(-3,2)$ and 36
4) $(-3,2)$ and 6

12. If $x^2 + 4x + y^2 - 6y - 12 = 0$ is the equation of a circle, the length of the radius is

1) 25
2) 16
3) 5
4) 4

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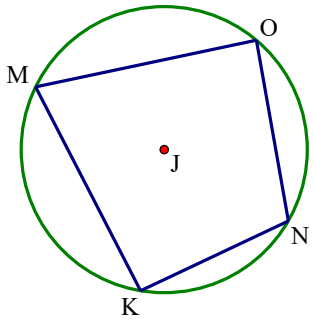
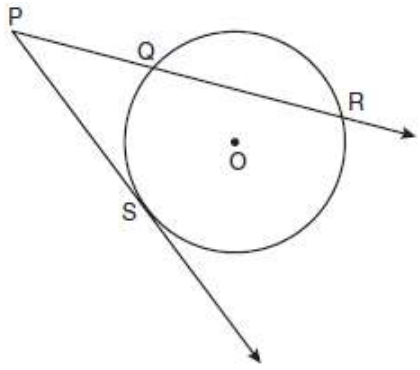
Circle Review Sheet

1. Find the center and radius of the circle with the following equation:
$x^2 + 8y + 10 + y^2 - 4x = 6$

2. In the diagram below, quadrilateral MONK is inscribed in circle J, $m\angle KMO = 48^\circ$ and $m\angle MON = 80^\circ$. Find the measures of $m\angle KNO$ and $m\angle MKN$.

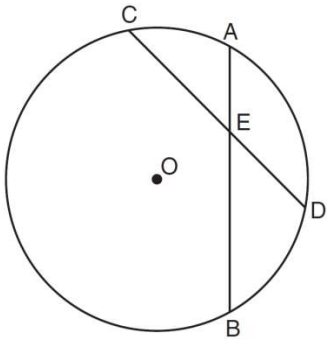


3. In the diagram below, $\overline{PS}$ is a tangent to circle O at point S, $\overline{PQR}$ is a secant, $m\angle QPS = 35$, $QS = 80$, find $\text{m}\overset{\frown}{RS}$



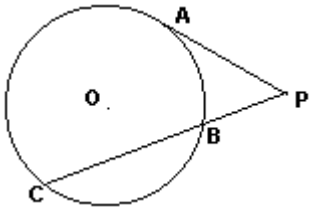
(Not drawn to scale)

4. In the diagram below of circle *O*, chords $\overline{AB}$ and $\overline{CD}$ intersect at *E*.



If $m\angle CEB = 110^{\circ}$ and $\overset{\frown}{\text{m}AC} = 50$, what is $\overset{\frown}{\text{m}DB}$?

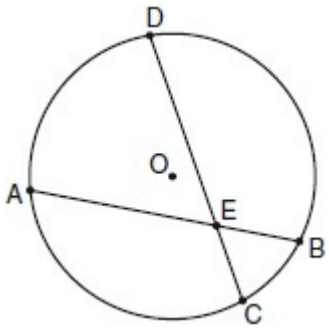
5. In the diagram, $\overline{AP}$ is a tangent and $\overline{PBC}$ is a secant to circle *O*. If $\overline{PB} = 2$ and $\overline{BC} = 30$, what is $\overline{AP}$?



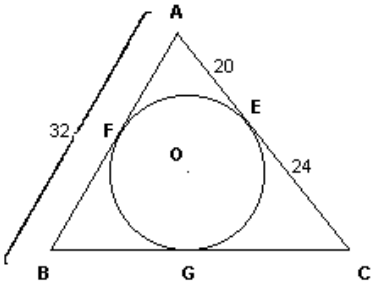
6. In the diagram of circle *O* below, chord $\overline{AB}$ intersects chord $\overline{CD}$ at *E*, $DE = 2x + 8$, $EC = 3$, $AE = 4x - 3$, and $EB = 4$.

What is the value of *x*?

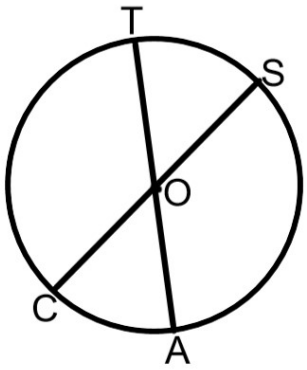
1) 1
2) 3.6
3) 5
4) 10.25



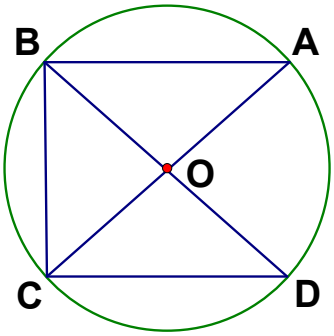
7. In the diagram, $\overline{AFB}$, $\overline{AEC}$, and $\overline{BGC}$ are tangent to circle O at F, E, and G, respectively. If $AB = 32$, $AE = 20$, and $EC = 24$, what is BC?



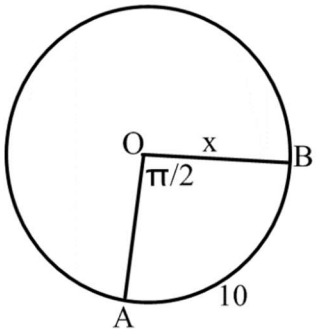
8. In circle O, diameters $\overline{TA}$ and $\overline{CS}$ are drawn. If $m\angle COA = 60$ and $\overline{TA} = 10\ cm$, find the area of sector SOA to the nearest hundredth of a square centimeter.



9. In circle O, diameters $\overline{BOD}$ and $\overline{COA}$ intersect at the center of the circle O. If the area of sector OCD = 240π square inches and $m\angle AOD = 80$, find the measure of $\overline{OB}$ to the nearest tenth of an inch.



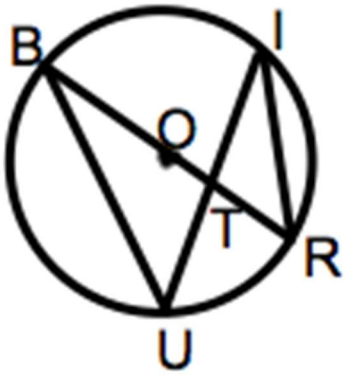
10. In circle O, the measure of central angle AOB is $\frac{\pi}{2}$ radians and the length of arc AB is 10 cm. What is the measure of radius $\overline{OB}$ to the *nearest tenth of a cm*?



11. In circle *O* shown below, $\overline{BR}$ is a diameter and chords $\overline{BU}$, $\overline{IU}$, and $\overline{IR}$ are drawn.

Which of the following statements is *not* true?

1) $\angle BUI \cong \angle BRI$
2) $\angle ITR \cong \angle BTU$
3) $\angle UBT \cong \angle BRI$
4) $\angle RBU \cong \angle RIU$



12. Given: Circle O with diameters $\overline{MOT}$ and $\overline{AOH}$.
Prove: $\overline{MA} \cong \overline{HT}$