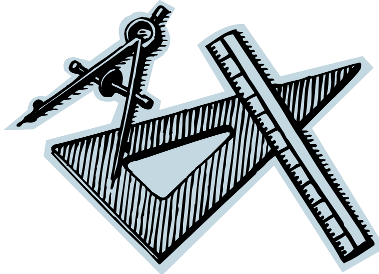
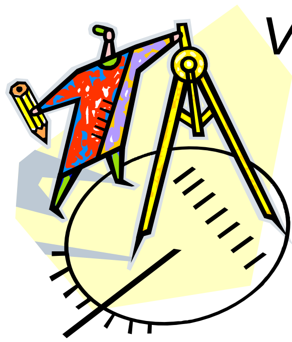
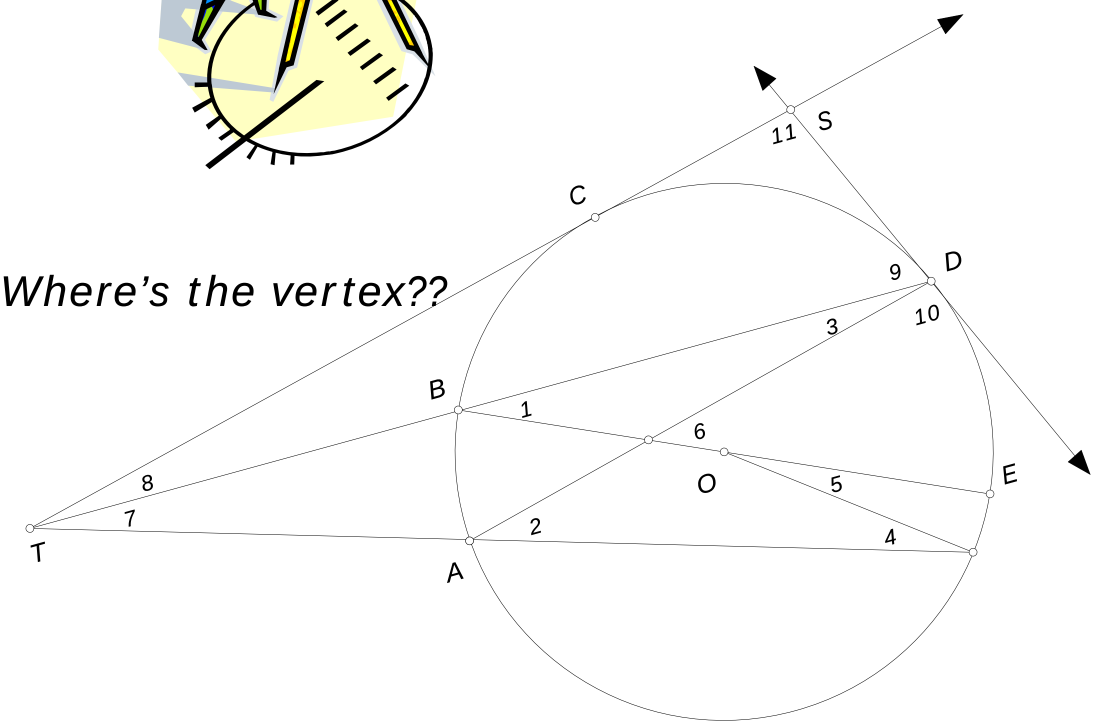


Geometry
Chapter 7

Circles, Arcs, Angles & Segments
Various Types of Angles



Where's the vertex??



Glossary for Chapter 7

Arc: An Unbroken part of a circle.

Central Angle: An angle whose vertex is at the center of a circle.

Chord: A line segment whose end points are on the circle.

Circle: Set of all points in a plane at a given distance (radius) from a given point (center).

Circumscribed Circle: A circle is circumscribed about a polygon if each vertex of the polygon is a point of the circle. That makes each side of the polygon a chord of the circle.

Circumscribed Polygon: A polygon is circumscribed about a circle if each side of the polygon is tangent to the circle.

Common Tangents: A line tangent to each of two coplanar circles. If the tangents pass through the segment joining the centers of the circles then they are internal tangents. If they do not pass through the segment joining the centers of the circles then they are external tangents.

Concentric Circles: Coplanar circles with the same center.

Diameter: The longest chord. A chord that contains the center of the circle.

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

Inscribed Polygon: A polygon is inscribed in a circle if each vertex of the polygon is a point of the circle. That makes each side of the polygon a chord of the circle.

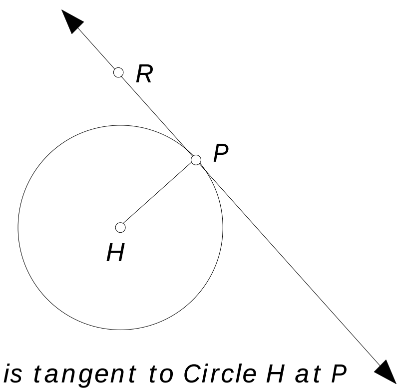
Major Arc: An arc of greater than 180°. You must use three letters to to name a major. Ex. $\overset{\frown}{SRT}$ starts at S passes through R and ends at T.

Minor Arc: *An arc of less than 180°.*

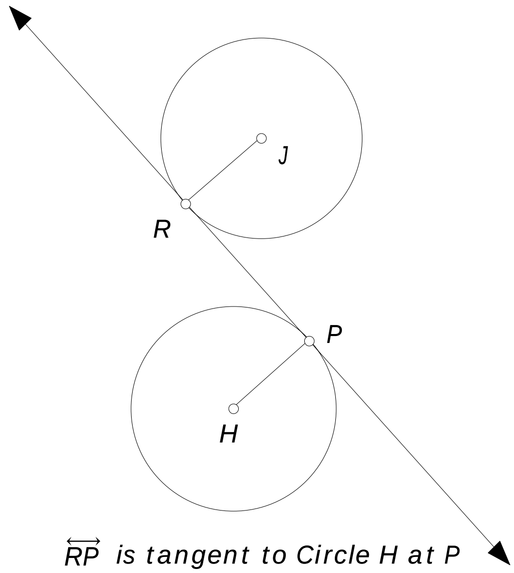
Protractor: *A tool used to measure angles.*

Secant: *A line that contains a chord.*

Tangent Line: *A line in the same plane of a circle and it contains only one point of the circle.*



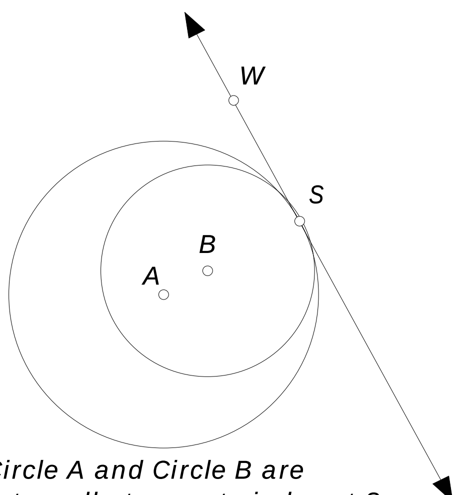
$\overleftrightarrow{RP}$ *is tangent to Circle H at P*



$\overleftrightarrow{RP}$ *is tangent to Circle H at P*

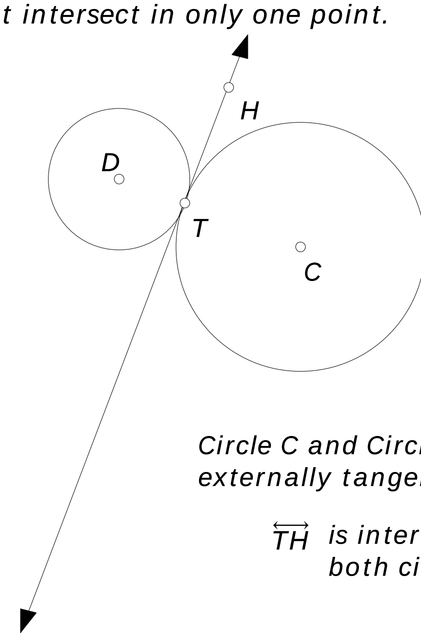
$\overleftrightarrow{RP}$ *is tangent to Circle J at R*

Tangent Circles: *Two coplanar circles that intersect in only one point.*



Circle A and Circle B are internally tangent circles at S

$\overleftrightarrow{SW}$ *is externally tangent to both circles*

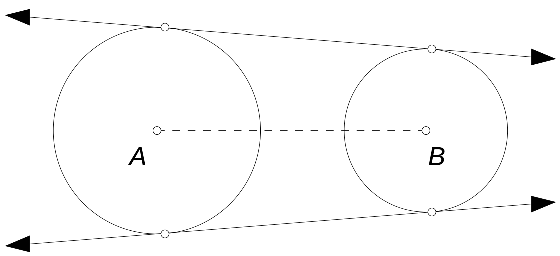


Circle C and Circle D are externally tangent circles at T

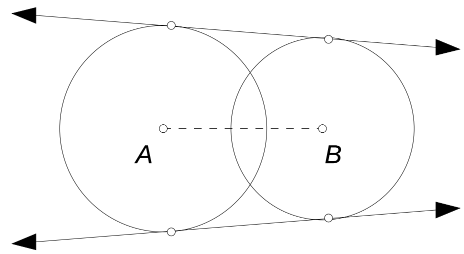
$\overleftrightarrow{TH}$ *is internally tangent to both circles*

Different Types of Tangents

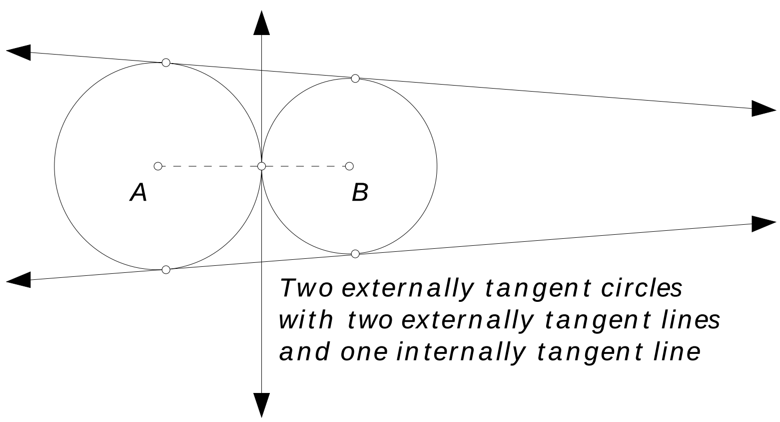
Common tangent lines are internal if they intersect the line segment joining the centers and they are external if they do not.



Two External Tangents

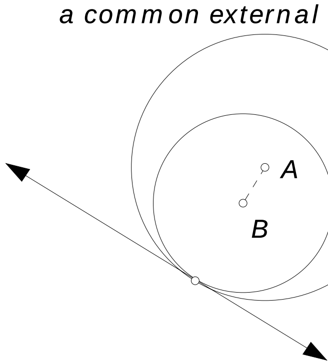


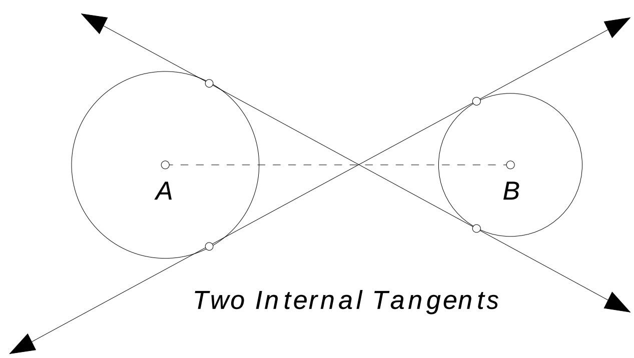
Two External Tangents



Two externally tangent circles with two externally tangent lines and one internally tangent line

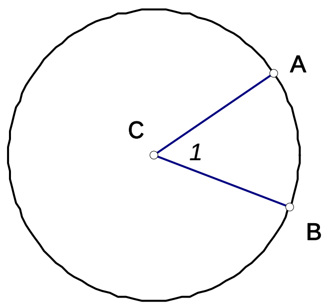
Two internally tangent circles with a common external tangent





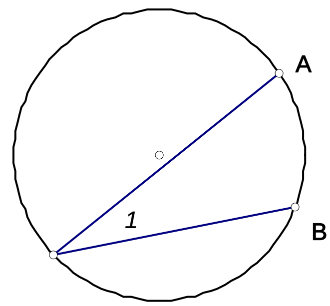
Two Internal Tangents

Central Angle



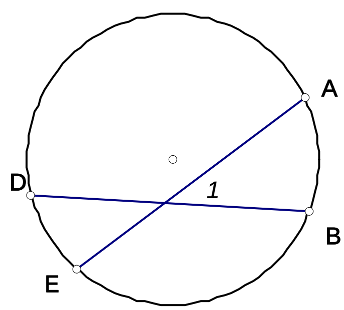
$\angle 1 =$

Inscribed Angle



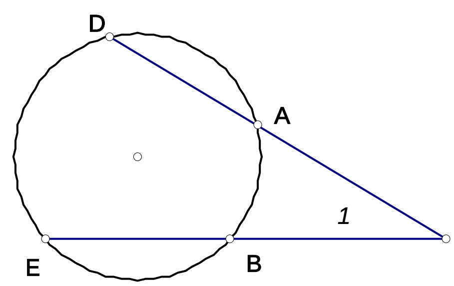
$\angle 1 =$

Angle formed by Two Chords

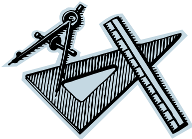


$\angle 1 =$

Angle formed by Two Secants



$\angle 1 =$

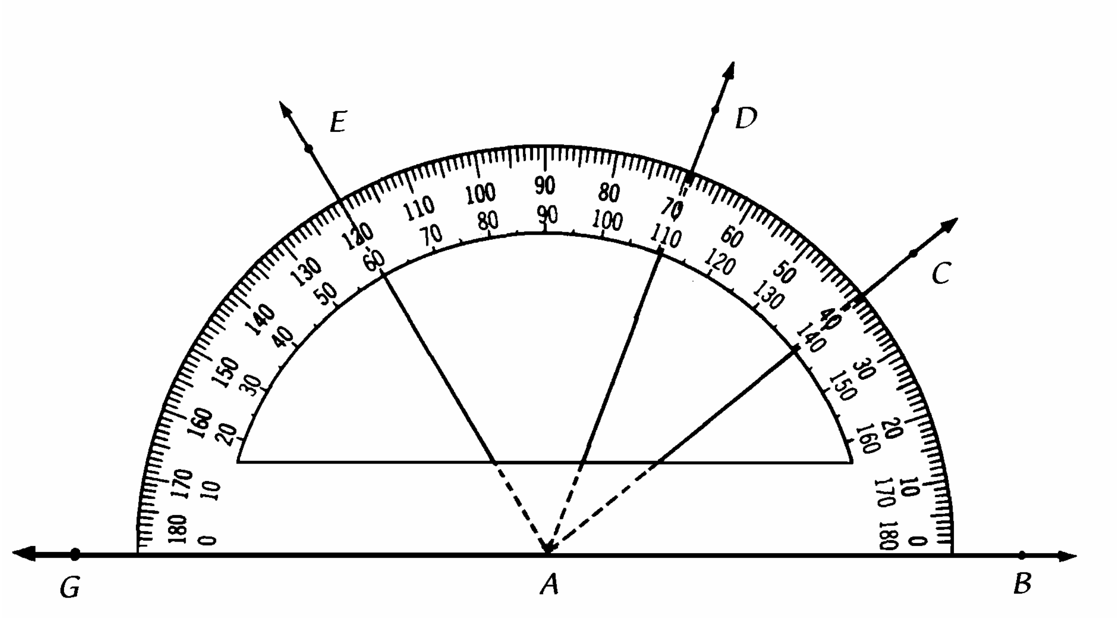


Geometry Chapter 7
Circles, Arcs & Angles

Navigation: Click on sheet number to find that sheet.
Sheet Numbers:

Angles & Circles *05*

I hope you realize there is a strong relationship between angles and circles. A circle is the tool used to measure angles. A circle is broken in 360 equal pieces that are called degrees. To measure an angle place the vertex at the center of the circle, the number of degrees on the circle included by the angle is the measure of the angle. Usually the circle is just half of a circle. Half of a circle is known as a **semi circle**. *When the degree marks are placed on the semi circle, the tool is known as a* **protractor**.



m∠BAC = ___________ *m∠BAD = ___________* *m∠BAE = ___________*

m∠DAC = ___________ *m∠EAD = ___________* *m∠EAC = ___________*

m∠GAC = ___________ *m∠GAD = ___________* *m∠GAE = ___________*

The angles above are known as **central angles**. *Central angles are angles whose vertex is at the center of the circle. The portion of the circle included between the sides is the* **included arc**. *We will move the vertex away from the center and discover how the measure of the angle and the measure of the included arc are related.*

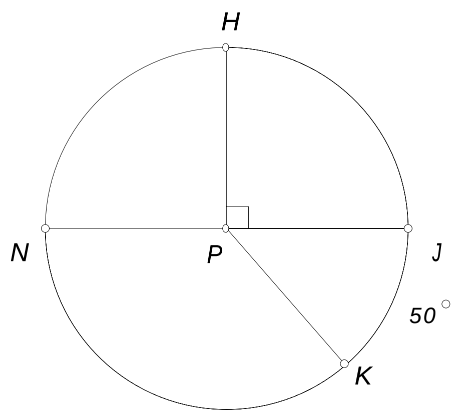
Answers to Odds

Navigation

Central Angle Worksheet 06

Note:

A **minor arc** *is less than 180°; a* **major arc** *is greater than 180°, you must use three points to name a major arc. When only two points are used to name an arc it must be a minor arc but a minor arc can be named using three points. In the figure below* $\overset{\frown}{HK}$ *is a minor arc but it can also be called* $\overset{\frown}{HJK}$.



Given: ⊙*P with* $\overset{\frown}{JK} = 50°$ *& diameter* $\overline{NJ}$

Find the measure of each arc:

1) $\overset{\frown}{HJ}$ = __________

2) $\overset{\frown}{JK}$ = __________

3) $\overset{\frown}{HK}$ = __________

4) $\overset{\frown}{HNK}$ = __________

5) $\overset{\frown}{HNJ}$ = __________

6) $\overset{\frown}{NHJ}$ = __________

7) $\overset{\frown}{NKJ}$ = __________

8) $\overset{\frown}{JKH}$ = __________

9) $\overset{\frown}{NK}$ = __________

Using the letters in the above diagram, name:

10) 2 equal central angles ____________________

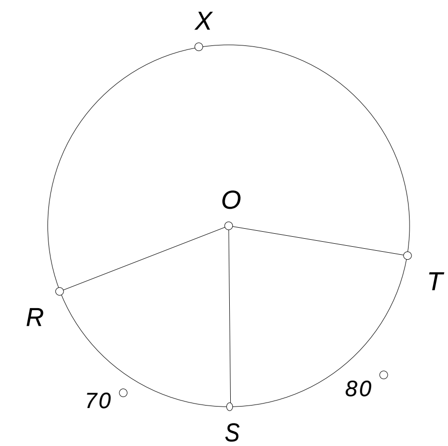
11) 2 equal minor arcs ____________________

12) Any 2 major arcs ____________________

➔

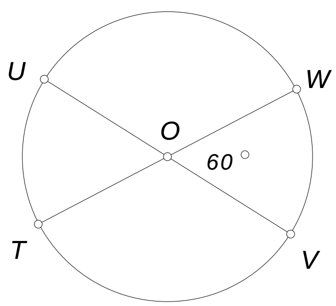
Given: $\odot O$ *with* $\overset{\frown}{RS} = 70^\circ$ & $\overset{\frown}{ST} = 80^\circ$

Find the measures:

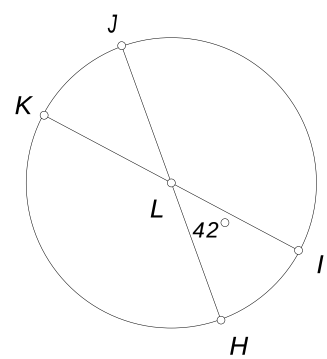


13) $\angle ROS$ = ________ 14) $\angle TOS$ = ________ 15) $\angle ROT$ = ________

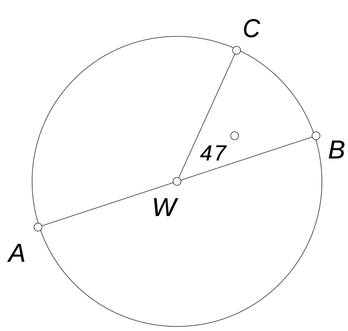
16) $\overset{\frown}{RT}$ = ___________ 17) $\overset{\frown}{RXT}$ = _________ 18) $\overset{\frown}{TXS}$ = __________



19) Given: $\odot O$ with diameters $\overline{UV}$ & $\overline{WT}$; $\overset{\frown}{UT}$ = _________



20) Given: $\odot L$ with diameters $\overline{JH}$ & $\overline{KI}$; $\overset{\frown}{KH}$ = ___________

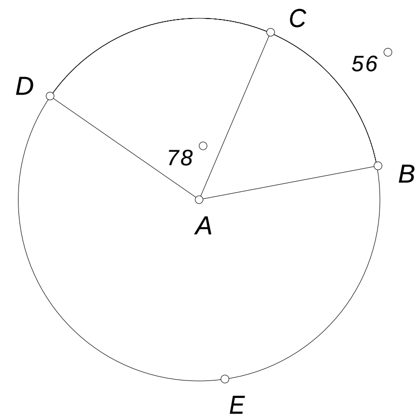


21) Given: $\odot W$ with diameter $\overline{AB}$; $\overset{\frown}{AC}$ = ________

The First Move

The first move we will make with the vertex is from the center to the circle. This type of angle is known as an **inscribed angle**. *Before we move the vertex, do the problems concerning central angles.*

Given: ⊙A with $\overset{\frown}{BC} = 56°$ & $\angle CAD = 78°0$



Find:

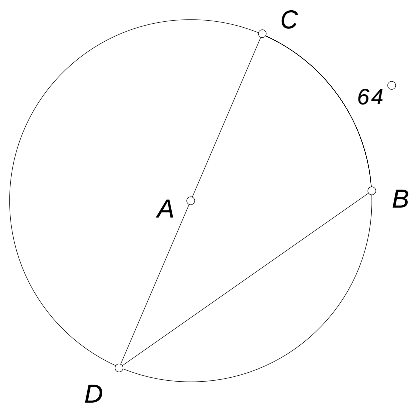
$\angle CAB$ = ________ $\overset{\frown}{DC}$ = ________

$\overset{\frown}{DB}$ = __________ $\angle DAB$ = ____________

$\overset{\frown}{BED}$ = __________ $\overset{\frown}{BEC}$ = ______________

$\overset{\frown}{CED}$ = __________

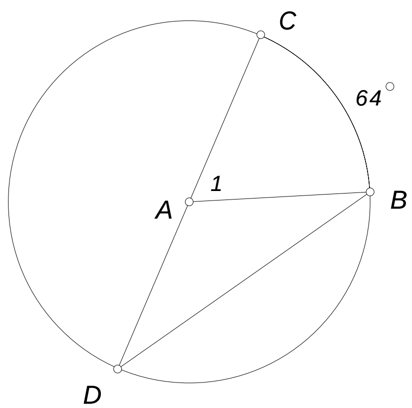
Now let's move the vertex to a point on the circle, an inscribed angle. Try to use what you already know to turn something you don't know into something you do know. Count on what you know not on what you don't know.



Given: ⊙A with $\overset{\frown}{BC} = 64°$

Find: $\angle CDB$ = ______________

Try your best. If you need a hint, I will draw one line segment that may help.➔



Now use your knowledge about central angles, supplementary angles and triangles to find the answer.

Given: ⊙A with $\overset{\frown}{BC} = 64°$

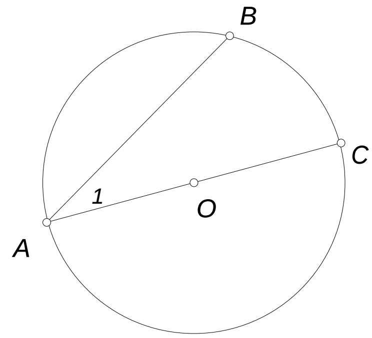
Find: ∠CDB = ____________

Inscribed Angles 15

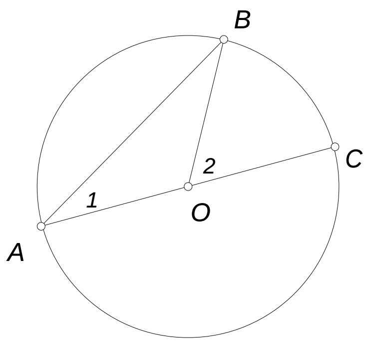
- *An inscribed angle is formed by two rays that contain chords with a common end point.*
- *The vertex of the angle is on the circle.*
- *An inscribed angle is equal to one half its intercepted arc.*

$\angle BAC$ is an inscribed angle. Its intercepted arc is $\overset{\frown}{BC}$.

$\angle 1 = \frac{1}{2}\overset{\frown}{BC}$



Proof:



We will say $\overline{AC}$ is a diameter, this will help us prove the theorem even when $\overline{AC}$ is not a diameter. An auxiliary line from B to the center should lead you to the proof.

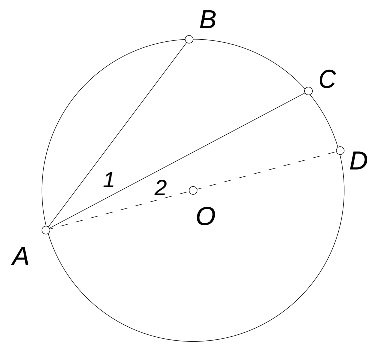
➔

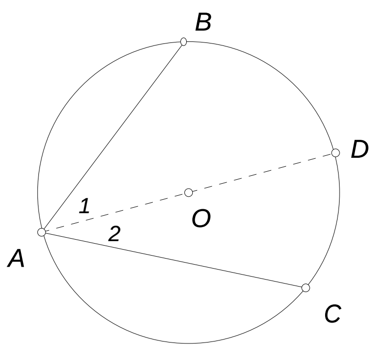
What happens if one of the sides of an inscribed angle does not pass through the center?

Answer:

It still equals one half its intercepted arc. See if you can prove this with the help of the following illustrations.

$\angle BAC$ is an inscribed angle with both sides on the same side of diameter $\overline{AD}$. Prove it is one half of $\overset{\frown}{BC}$.





$\angle BAC$ is an inscribed angle with sides on either side of diameter $\overline{AD}$. Prove it is one half of $\overset{\frown}{BC}$.

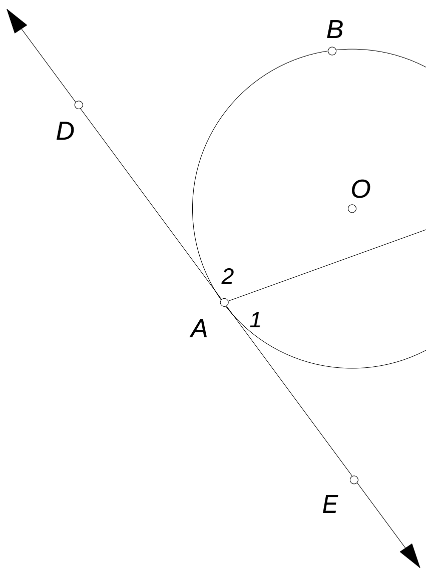
So no matter what an inscribed angle is equal to one half the intercepted arc.

Angle formed by a Tangent & Chord 16

- *This type of angle is formed by a tangent and a chord with one end point the point of tangency.*

- *The vertex of the angle is on the circle, just like an inscribed angle.*

- *An angle formed by a tangent and a chord is equal to one half its intercepted arc, just like an inscribed angle.*



$\angle EAC$ & $\angle DAC$ are angles formed by a tangent and a chord. $\angle EAC$'s intercepted arc is $\overset{\frown}{AC}$ and $\angle DAC$'s intercepted arc is $\overset{\frown}{ABC}$.

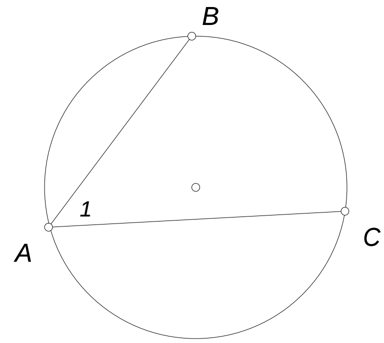
$\angle 1 = \frac{1}{2}\ \overset{\frown}{AC}$ & $\angle 2 = \frac{1}{2}\ \overset{\frown}{ABC}$

Note: $\angle 1 + \angle 2 = 180°$ and
$\overset{\frown}{ABC} + \overset{\frown}{AC} = 360°$

Answers to Odds

Navigation

Inscribed Angle Worksheet 20



Problems 1 through 10

1) $\overset{\frown}{BC} = 42°$, $\angle 1 =$ ____________

2) $\overset{\frown}{BC} = 63°$, $\angle 1 =$ ____________

3) $\angle 1 = 42°$, $\overset{\frown}{BC} =$ ____________

4) $\angle 1 = 37°$, $\overset{\frown}{BC} =$ ____________

5) $\overset{\frown}{BC} = p°$, $\angle 1 =$ ____________

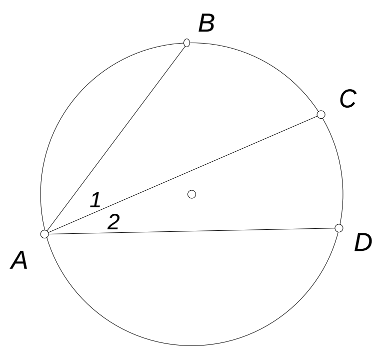
6) $\angle 1 = h°$, $\overset{\frown}{BC} =$ ____________

7) $\angle 1 = (7x + 3)°$, $\overset{\frown}{BC} = (15x + 1)°$, $x =$ ________________

8) $\overset{\frown}{BAC} = 242°$, $\angle 1 =$ ______________

9) $\overset{\frown}{BAC} = s°$, $\angle 1 =$ ________________

10) $\angle 1 = p°$, $\overset{\frown}{BAC} =$ ____________



Problems 11 through 14

11) $\angle 1 = 24°$, $\overset{\frown}{BD} = 124°$, $\angle 2 =$ ________

12) $\angle BAD = 62°$, $\overset{\frown}{BC} = 24°$, $\angle 2 =$ ________

13) $\overset{\frown}{BC} : \overset{\frown}{BD} = 2:5$, $\angle 1 = 14°$,

$\angle 2 =$ ____________

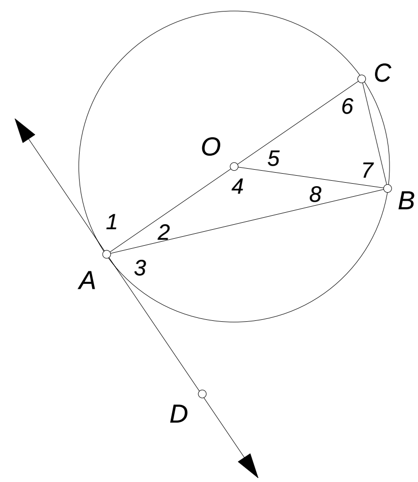
14) $\angle 1 = (x + 5)°$, $\angle 2 = (3x - 8)°$, $\overset{\frown}{BD} = (9x - 16)°$

$x =$ ______________

➔

Given: $\odot O$, diameter $\overline{AC}$, tangent $\overleftrightarrow{AD}$
and $\overset{\frown}{BC} = 42^\circ$

Find: All the numbered angles.



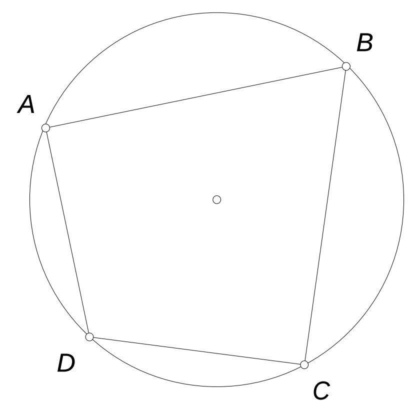
$\angle 1$ = ________ $\angle 2$ = ________

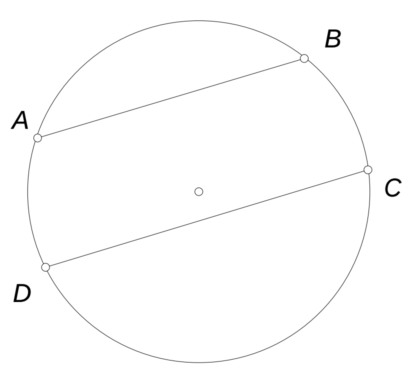
$\angle 3$ = ________ $\angle 4$ = ________

$\angle 5$ = ________ $\angle 6$ = ________

$\angle 7$ = ________ $\angle 8$ = ________

What will be true of the opposite angles of an inscribed quadrilateral?





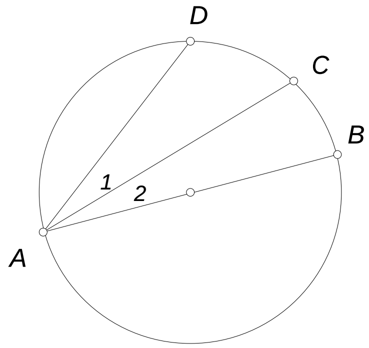
What will be true of the arcs between parallel chords?

Given: $\overline{AB} \parallel \overline{CD}$

What is true about $\overset{\frown}{AD}$ & $\overset{\frown}{BC}$ and why?

20 cont.

Given: $\overline{AB}$ is a diameter

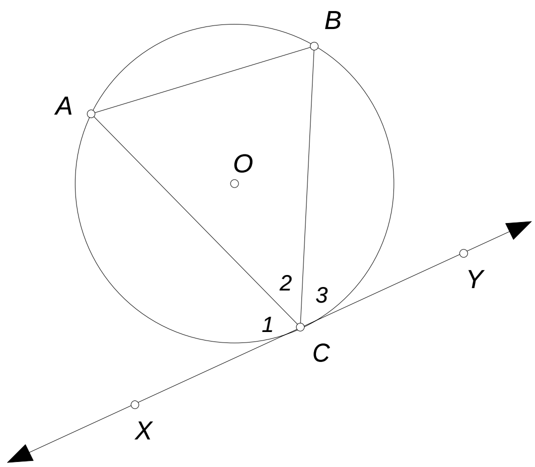


1) $\angle 2 = 16°$, $\overset{\frown}{BD} = 85°$, $\angle 1 =$ ________

2) $\angle BAD = 58°$, $\overset{\frown}{BC} = 40°$, $\angle 1 =$ ________

3) $\overset{\frown}{BC} : \overset{\frown}{BD} = 3:4$, $\angle 2 = 15°$, $\angle 1 =$ ________

Given: $\overleftrightarrow{XY}$ is a tangent



4) $\angle 3 = 44°$, $\overset{\frown}{AB} = 104°$

$\angle 2 =$ ________

$\angle A =$ ________

$\angle B =$ ________

$\overset{\frown}{BC} =$ ________

5) $\angle A = 56°$, $\angle B = 62°$

$\angle 1 =$ ________

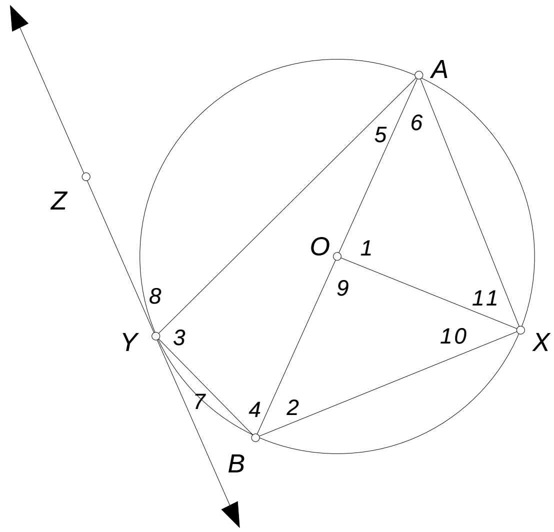
$\angle 2 =$ ________

$\angle 3 =$ ________

$\overset{\frown}{AB} =$ ________

➔

Given: ⊙O; diameter $\overline{AB}$; tangent $\overleftrightarrow{ZY}$
$\overset{\frown}{BY} = 42°$, $\overset{\frown}{BX} = 92°$



Find: All the numbered angles.

∠ 1 = _______ ∠ 2 = _______

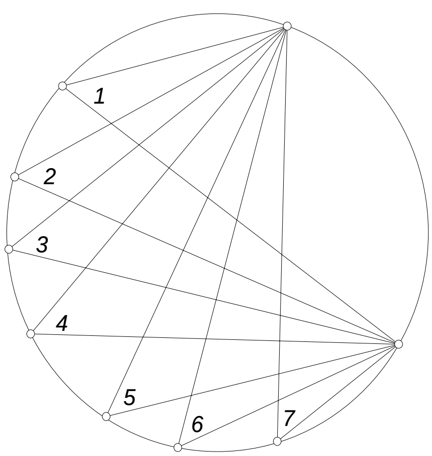
∠ 3 = _______ ∠ 4 = _______

∠ 5 = _______ ∠ 6 = _______

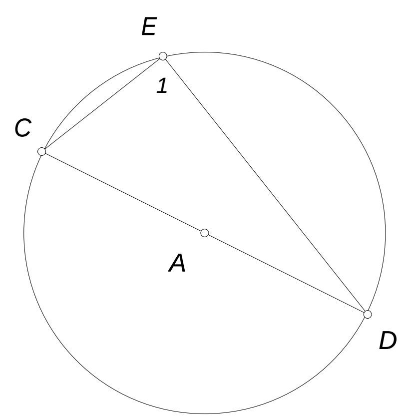
∠ 7 = _______ ∠ 8 = _______

∠ 9 = _______ ∠ 10 = ______

∠ 11 = ______



What is true about all the numbered angles in the illustration at the left?



If A is the center of the circle and $\overline{CD}$ is a diameter then

∠ 1 must be equal to ___________

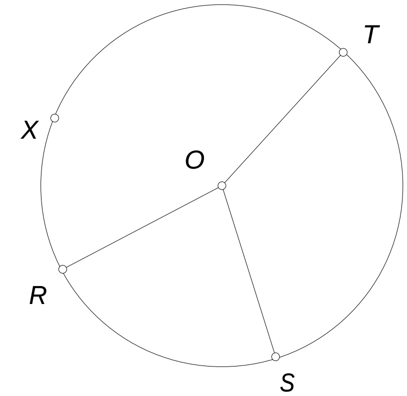
Any angle inscribed in a semi circle must

be a _________________________

If CE = 5in. and ED = 12in. what is the radius of ⊙A?

Central & Inscribed Angles Practice for Quiz 21

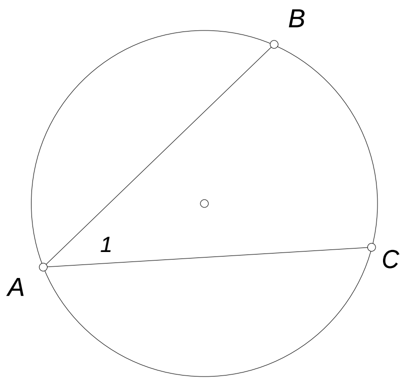
Given: $\odot O$; $\overset{\frown}{ST} = 120°$; $\overset{\frown}{RS} = 80°$
Find:



1) $\angle ROS =$ ______________ 2) $\angle TOS =$ ______________

3) $\angle ROT =$ ______________ 4) $\overset{\frown}{RST} =$ ______________

5) $\overset{\frown}{RT} =$ ______________ 6) $\overset{\frown}{RSX} =$ ______________



7) $\overset{\frown}{BC} = 70°$, $\angle 1 =$ ______________

8) $\overset{\frown}{BC} = d°$, $\angle 1 =$ ______________

9) $\angle 1 = 39°$, $\overset{\frown}{BC} =$ ______________

10) $\angle 1 = r°$, $\overset{\frown}{BC} =$ ______________

11) $\angle 1 = (2x - 4)°$, $\overset{\frown}{BC} = (3x + 11)°$, $x =$ ______________

12) $\angle 1 = (3x + 20)°$, $\overset{\frown}{BC} = (11x - 15)°$, $\angle 1 =$ ______________

➔

13) Given: ⊙O, diameter $\overline{AC}$, tangent $\overleftrightarrow{AD}$ and $\overset{\frown}{BC} = 74°$

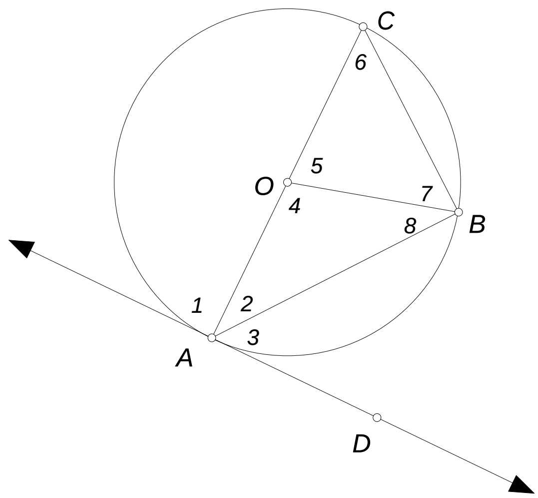
Find: All the numbered angles.

$\angle 1$ = ________ $\angle 2$ = ________

$\angle 3$ = ________ $\angle 4$ = ________

$\angle 5$ = ________ $\angle 6$ = ________

$\angle 7$ = ________ $\angle 8$ = ________



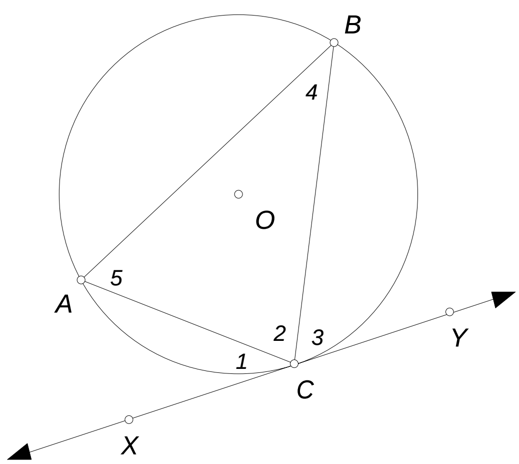
14) Given: ⊙O, tangent $\overleftrightarrow{XY}$, $\angle 1 = 40°$ and $\overset{\frown}{BC} = 130°$

Find:

$\overset{\frown}{AC}$ = ________ $\angle 2$ = ________

$\angle 3$ = ________ $\angle 4$ = ________

$\angle 5$ = ________ $\overset{\frown}{ABC}$ = ____________



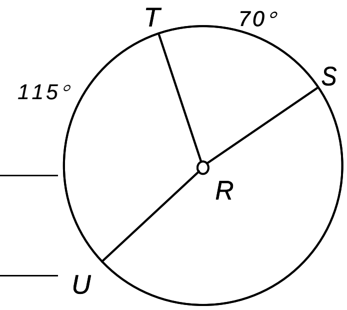
15) Point A lies on ⊙O. How many chords contain point A? __________

How many diameters contain point A? _____________

How Good R U? 24

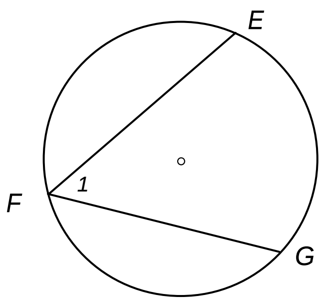
Given: $\odot R$; Given: $\odot R$; $\overset{\frown}{TS} = 70°$; $\overset{\frown}{TU} = 115°$

Find the measures:



1) $\angle TRU =$ ____________________ 2) $\angle SRU =$ ____________________

3) $\overset{\frown}{SUT} =$ ____________________ 4) $\overset{\frown}{STU} =$ ____________________



5) $\overset{\frown}{GFE} = 250°$, $\angle 1 =$ __________________

6) $\angle 1 = (3x + 21)°$, $\overset{\frown}{EG} = (10x - 10)°$, $\angle 1 =$ ____________

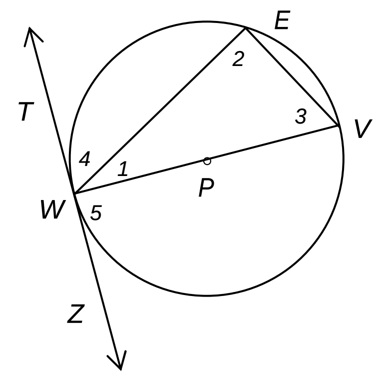
7) Given: $\odot P$, diameter $\overline{WV}$, tangent $\overleftrightarrow{TW}$ and $\overset{\frown}{WE} = 140°$

Find: All the numbered angles.

$\angle 1 =$ ________ $\angle 2 =$ ________

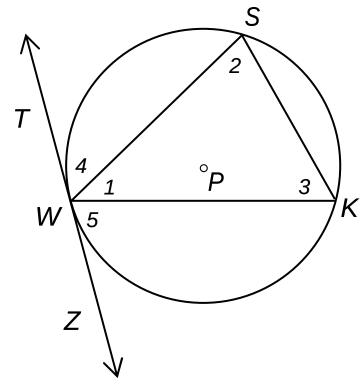
$\angle 3 =$ ________ $\angle 4 =$ ________

$\angle 5 =$ ________



➔

8) Given: ⊙P, tangent $\overleftrightarrow{TW}$, $\angle 2 = 70°$ and $\overset{\frown}{SK} = 80°$



Find:

$\overset{\frown}{SW}$ = ______________ $\angle 1$ = ______________

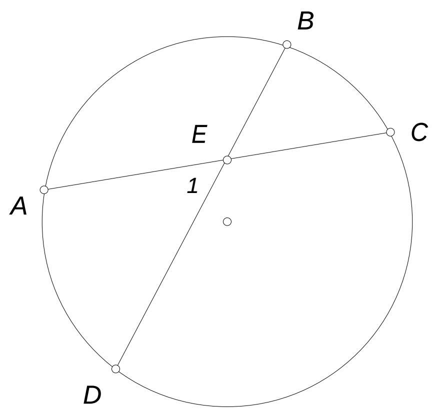
$\angle 3$ = ______________ $\angle 4$ = ______________

$\angle 5$ = ______________ $\overset{\frown}{WSK}$ = ______________

Angles formed by Intersecting Chords 30

So far, we have examined angles whose vertex is at the center of a circle and on the circle. We will now examine angles whose vertex is inside the circle.

- *The angle is formed by intersecting chords. (That's how it got its name.)*
- *The vertex will be a point in the interior of the circle.*
- *The angle will equal* ***one half the sum*** *of the intercepted arcs.*

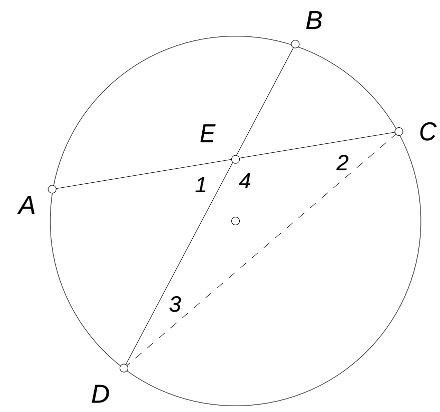


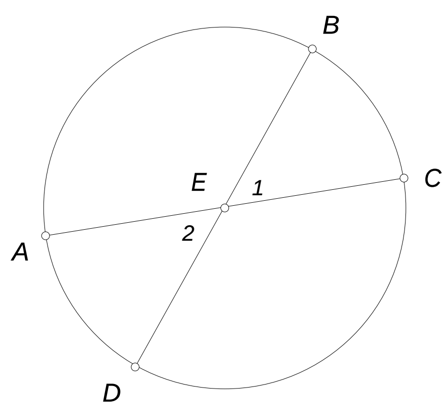
$\angle AED$ is an angle formed by intersecting chords, its intercepted arcs are $\overset{\frown}{BC}$ & $\overset{\frown}{AD}$.

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

Proof:

An auxiliary line from C to D should lead you to the proof.



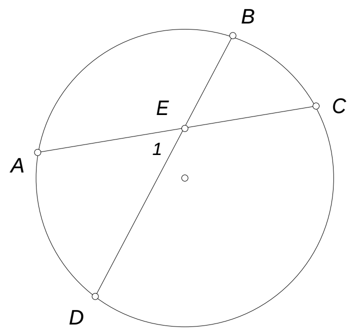


Note: This rule still works if the vertex is at the center and it's very easy to prove it does.

In the illustration E is now the center of the circle.

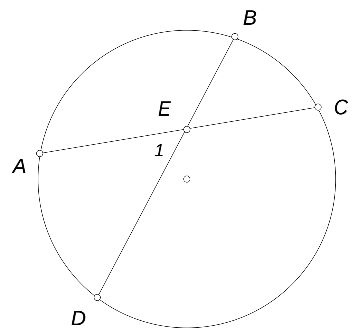
Intersecting Chords Worksheet 35

1) $\overset{\frown}{BC} = 24°$, $\overset{\frown}{AD} = 52°$, $\angle 1 =$ __________



2) $\overset{\frown}{BC} = 37°$, $\overset{\frown}{AD} = 64°$, $\angle 1 =$ __________

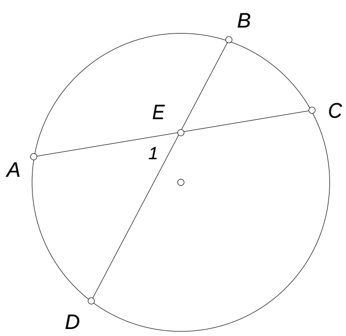
3) $\angle 1 = 42°$, $\overset{\frown}{AD} = 67°$, $\overset{\frown}{BC} =$ __________

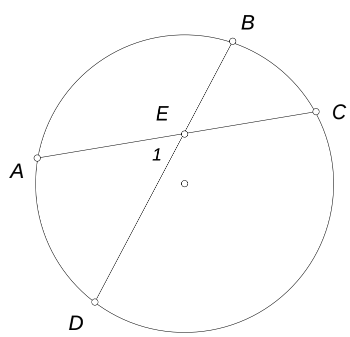


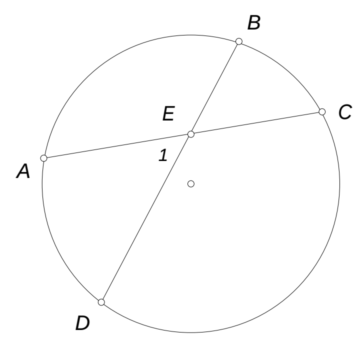
4) $\angle 1 = 37°$, $\overset{\frown}{BC} = 16°$, $\overset{\frown}{AD} =$ __________

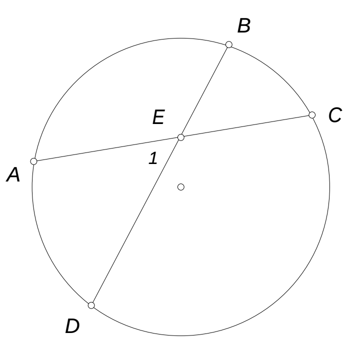
5) $\overset{\frown}{BC} = p°$, $\overset{\frown}{AD} = g°$, $\angle 1 =$ ____________

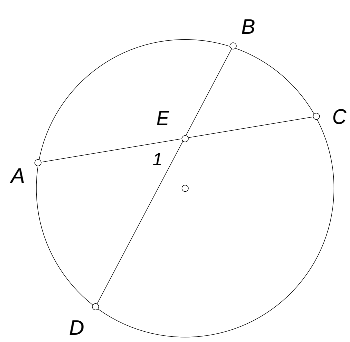
6) $\angle 1 = s°$, $\overset{\frown}{AD} = r°$, $\overset{\frown}{BC} =$ ____________________



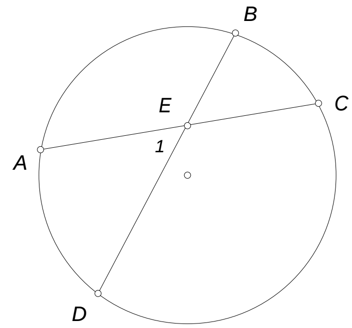






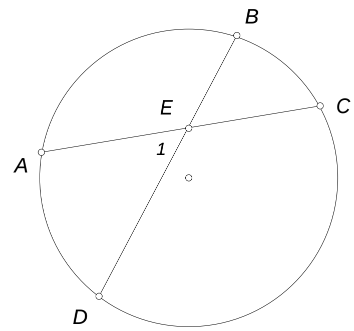


7) $\angle 1 = a°$, $\overset{\frown}{BC} = b°$, $\overset{\frown}{AD} =$ ____________________



8) $\overset{\frown}{AB} = 106°$, $\overset{\frown}{CD} = 120°$, $\angle 1 =$ ______

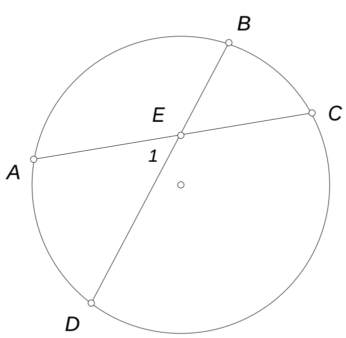
9) $\angle 1 = 43°$, $\overset{\frown}{AB} = 124°$, $\overset{\frown}{CD} =$ _________

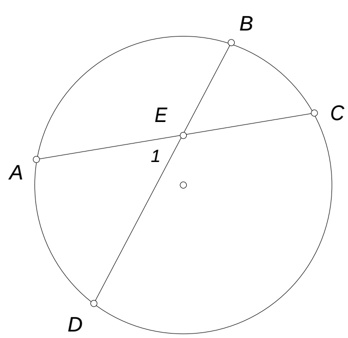


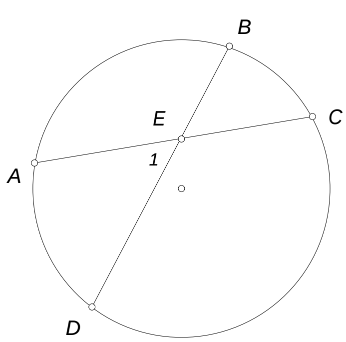
10) $\angle 1 = x°$, $\overset{\frown}{CD} = y°$, $\overset{\frown}{AB} =$ _____________

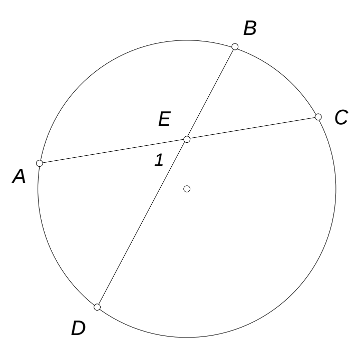
11) $\angle 1 = (4x + 3)°$, $\overset{\frown}{AD} = (5x + 4)°$, $\overset{\frown}{BC} = (4x - 6)°$, $x =$ ____________

12) $\angle 1 = (4x - 8)°$, $\overset{\frown}{AB} = (10x - 10)°$, $\overset{\frown}{CD} = (12x + 26)°$, $x =$ ________



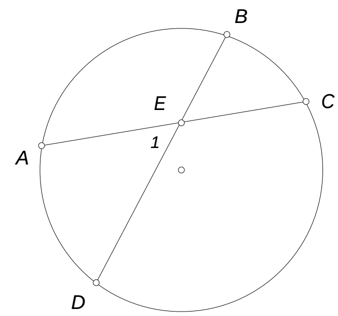






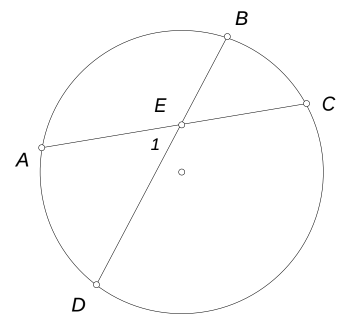
Another Intersecting Chords Worksheet 36

1) $\overset{\frown}{BC} = 35.5°$, $\overset{\frown}{AD} = 65.5°$, $\angle 1 =$ ____________



2) $\overset{\frown}{BC} = 41\frac{1}{2}°$, $\overset{\frown}{AD} = 62\frac{3}{4}°$, $\angle 1 =$ ____________

3) $\angle 1 = 48°$, $\overset{\frown}{AD} = 72°$, $\overset{\frown}{BC} =$ ________________

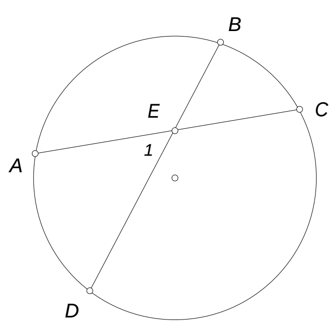


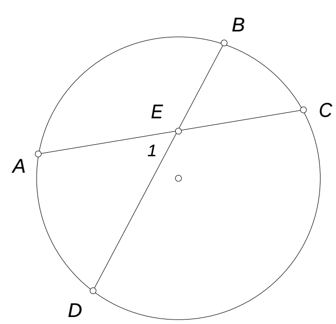
4) $\angle 1 = 36.7°$, $\overset{\frown}{BC} = 19.3°$, $\overset{\frown}{AD} =$ ____________

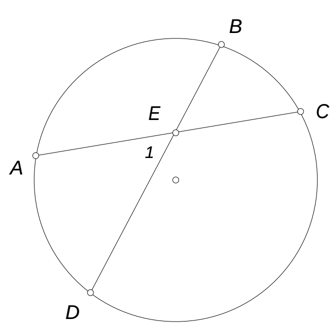
5) $\overset{\frown}{BC} = 6x°$, $\overset{\frown}{AD} = 10x°$, $\angle 1 =$ ______________

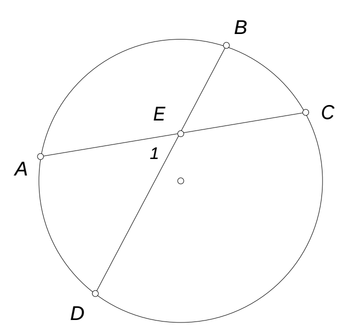
6) $\angle 1 = 6y°$, $\overset{\frown}{AD} = 3y°$, $\overset{\frown}{BC} =$ ________________

➔

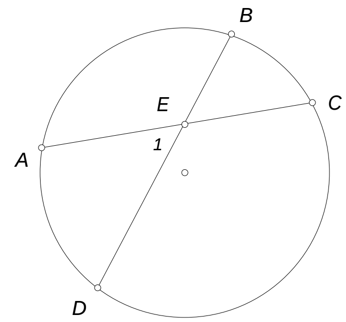




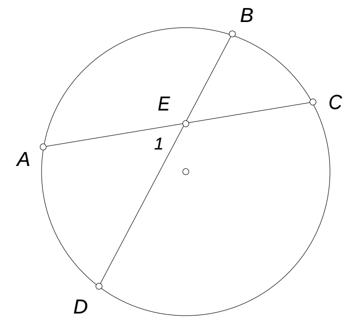




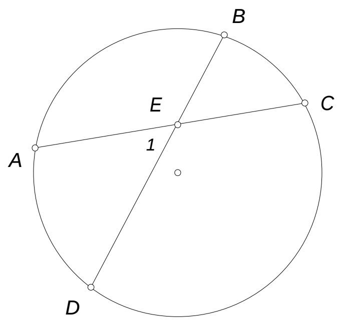
7) $\angle 1 = \dfrac{5x}{2}$, $\overset{\frown}{BC} = 3x^\circ$, $\overset{\frown}{AD} =$ ________________

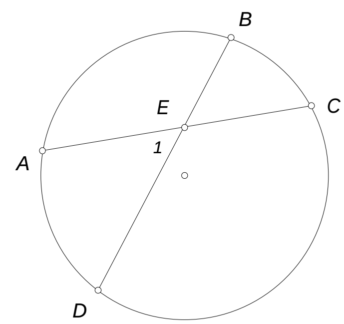


8) $\overset{\frown}{AB} = 110^\circ$, $\overset{\frown}{CD} = 132^\circ$, $\angle 1 =$ ____________



9) $\angle 1 = 48^\circ$, $\overset{\frown}{AB} = 136^\circ$, $\overset{\frown}{CD} =$ ________________

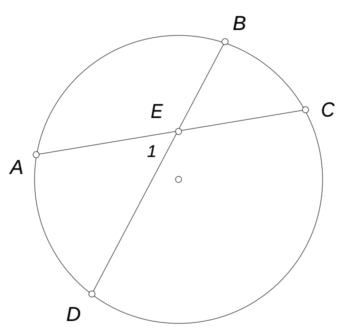


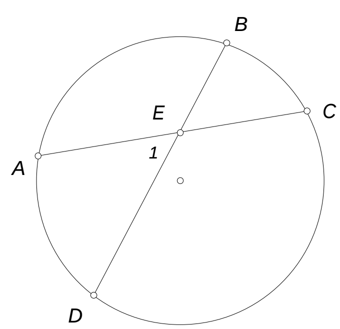


10) $\angle 1 = 6x^\circ$, $\overset{\frown}{CD} = 2x^\circ$, $\overset{\frown}{AB} =$ ________________

11) $\angle 1 = (5x - 8)^\circ$, $\overset{\frown}{AD} = (5x + 2)^\circ$, $\overset{\frown}{BC} = (4x - 4)^\circ$, $x =$ ___________________

12) $\angle 1 = (3x - 2)^\circ$, $\overset{\frown}{AB} = (16x + 2)^\circ$, $\overset{\frown}{CD} = (5x + 11)^\circ$, $x =$ ________________





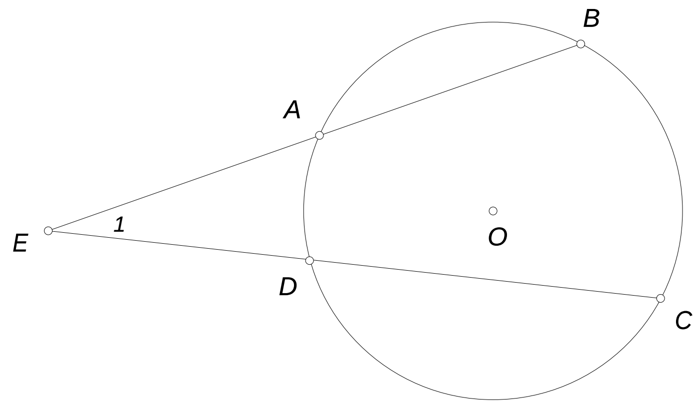
Angles formed by Intersecting Secants 40

It is time to move the vertex again. We will now examine angles whose vertex is outside the circle.

- *The angle is formed by intersecting secants. (I think you may have guessed that.)*
- *The vertex of the angle will be a point of the exterior of the circle. (outside the circle)*
- *The angle will equal one half the difference of the intercepted arcs.*

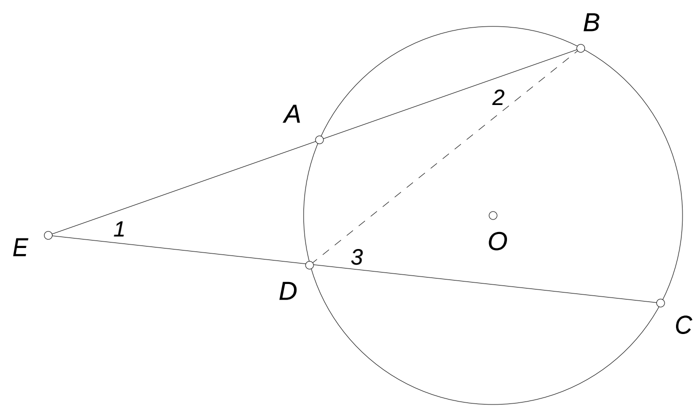
$\angle BEC$ *is an angle formed by intersecting secants,*
its intercepted arcs are $\overset{\frown}{BC}$ & $\overset{\frown}{AD}$.

$\angle 1 = \frac{1}{2}(\overset{\frown}{BC} - \overset{\frown}{AD})$



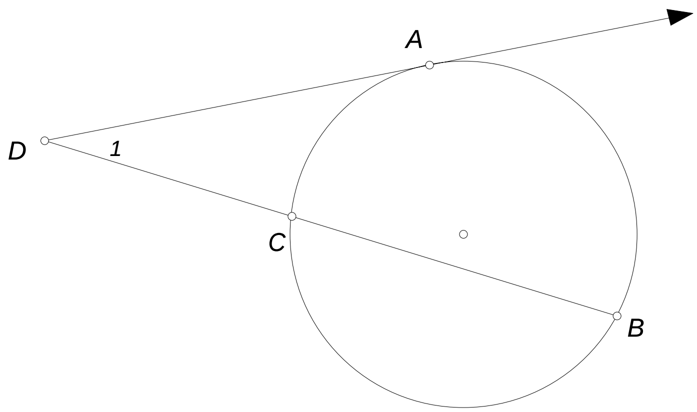
Proof:

An auxiliary line from B to D should lead you to the proof.



Angle formed by a Secant & Tangent

- The angle is formed by a secant and a tangent.
- The vertex of the angle will be a point of the exterior of the circle. (outside the circle)
- The angle will equal one half the difference of the intercepted arcs.

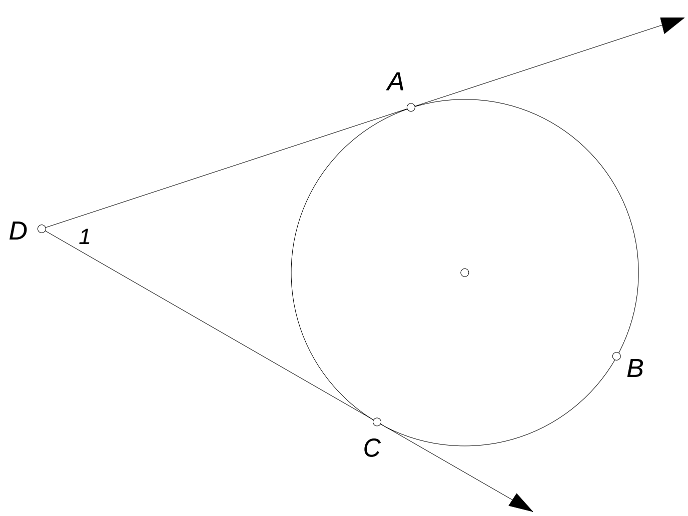


$\angle ADB$ is an angle formed by a secant intersecting a tangent, its intercepted arcs are $\overset{\frown}{AB}$ & $\overset{\frown}{AC}$.

$\angle 1 = \frac{1}{2}\left(\overset{\frown}{AB} - \overset{\frown}{AC}\right)$

Angle formed by Two Tangents

- The angle is formed by two intersecting tangents.
- The vertex of the angle will be a point of the exterior of the circle. (outside the circle)
- The angle will equal one half the difference of the intercepted arcs.



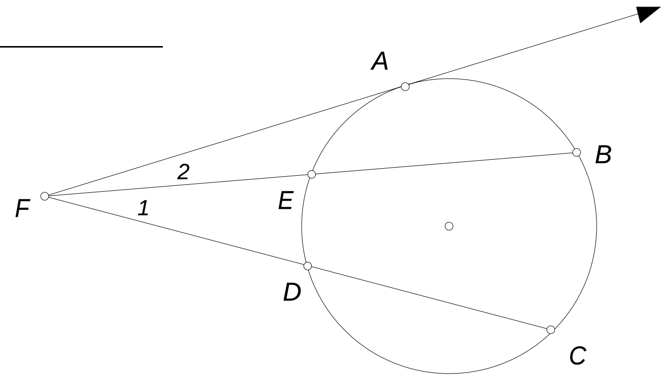
$\angle ADC$ is an angle formed by intersecting tangents, its intercepted arcs are $\overset{\frown}{ABC}$ & $\overset{\frown}{AC}$.

$\angle 1 = \frac{1}{2}\left(\overset{\frown}{ABC} - \overset{\frown}{AC}\right)$

Note: $\overset{\frown}{ABC} + \overset{\frown}{AC} = 360°$

Vertex of Angle Outside the Circle Worksheet 50

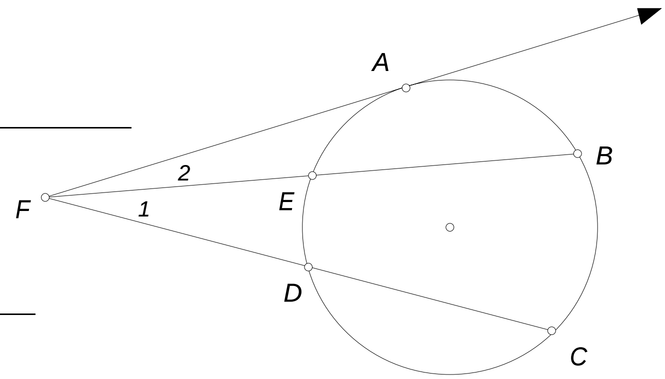
1) $\overset{\frown}{BC} = 150°$, $\overset{\frown}{ED} = 52°$; $\angle 1 =$ ____________



2) $\overset{\frown}{AB} = 85°$; $\overset{\frown}{AE} = 32°$,

$\angle 2 =$ ______________

3) $\angle 1 = 42°$, $\overset{\frown}{ED} = 67°$; $\overset{\frown}{BC} =$ ________________



4) $\angle 2 = 15°$, $\overset{\frown}{AB} = 58°$; $\overset{\frown}{AE} =$ ________________

5) $\overset{\frown}{BC} = p°$, $\overset{\frown}{ED} = g°$; $\angle 1 =$ ____________

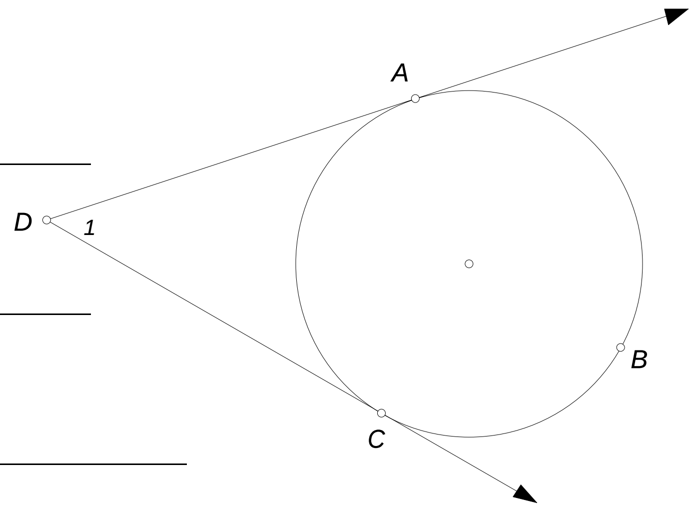
6) $\angle 1 = s°$, $\overset{\frown}{ED} = h°$; $\overset{\frown}{BC} =$ ___________________

7) $\angle 2 = 13°$, $\overset{\frown}{AE} = 28°$, $\overset{\frown}{AC} = 150°$, $\overset{\frown}{ED} = 32°$; $\angle 1 =$ _____________

8) $\angle 1 = (2x - 1)°$, $\overset{\frown}{ED} = (x + 12)°$, $\overset{\frown}{BC} = (3x + 46)°$; x _____ & $\angle 1 =$ __________

9) $\angle 2 = 15°$, $\overset{\frown}{AB} : \overset{\frown}{AE} = 5 : 2$; $\overset{\frown}{AE} =$ _________ $°$

$\overrightarrow{DC}$ & $\overrightarrow{DA}$ are tangents



10) $\overset{\frown}{AC} = 105°$; $\angle 1 =$ ___________

11) $\overset{\frown}{ABC} = 238°$; $\angle 1 =$ __________

12) $\angle 1 = 42°$; $\overset{\frown}{AC} =$ __________________

13) $\angle 1 = 62°$; $\overset{\frown}{ABC} =$ ___________

14) $\angle 1 = x°$; $\overset{\frown}{AC} =$ _______

15) $\overset{\frown}{ABC} : \overset{\frown}{AC} = 3 : 2$; $\angle 1 =$ __________________

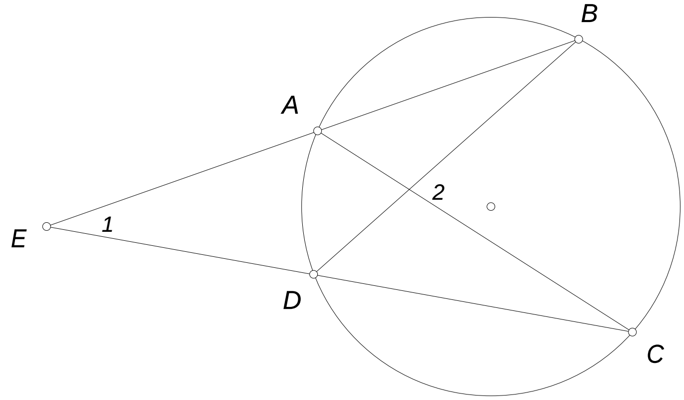
The Whole Nine Yards Worksheet 55

1) $\angle 1 = 22°$, $\overset{\frown}{AD} = 57°$,

$\angle 2 =$ ______________

2) $\angle 2 = 63°$, $\overset{\frown}{BC} = 93°$,

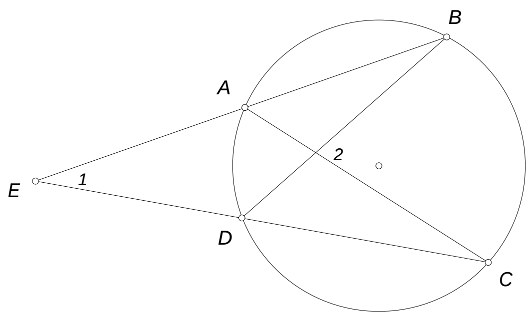
$\angle 1 =$ ______________

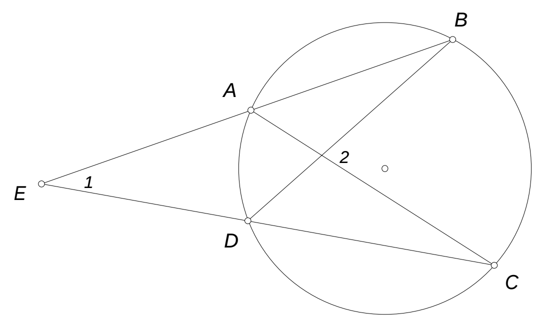


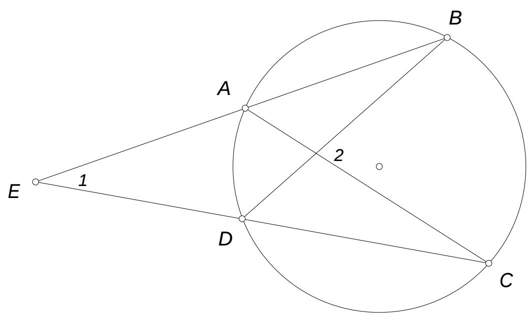
3) $\angle 1 = 30°$, $\angle 2 = 80°$, $\overset{\frown}{AD} =$ _______ & $\overset{\frown}{BC} =$ __________

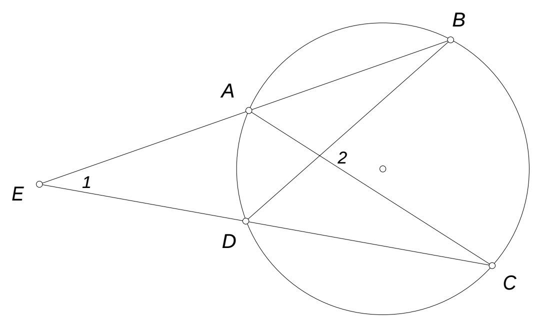
4) $\angle 1 = a°$, $\angle 2 = b°$, $\overset{\frown}{AD} =$ _________ & $\overset{\frown}{BC} =$ __________

Wait till you see this! ➔





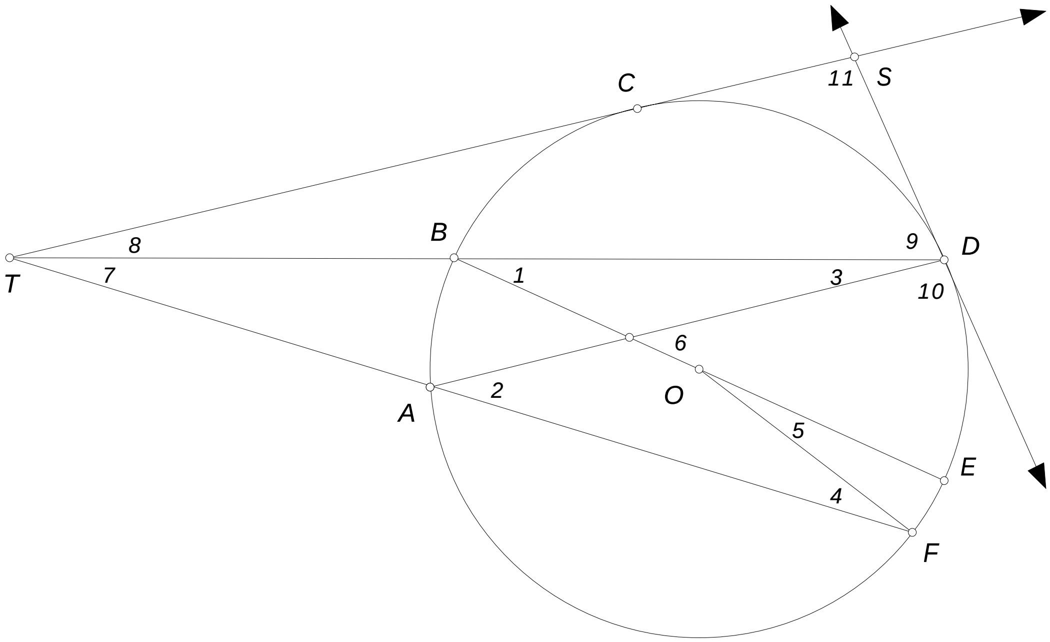




Given: $\odot O$, *diameter* $\overline{BE}$, *tangents* $\overrightarrow{TS}$ & $\overleftrightarrow{DS}$,

$\widehat{BC} = 52°$, $\widehat{DE} = 48°$, $\widehat{AB} = 28°$, $\widehat{AF} = 134°$

Find all numbered angles. (The whole nine yards.)



$\angle 1$ = ______________ $\angle 2$ = ______________ $\angle 3$ = ______________

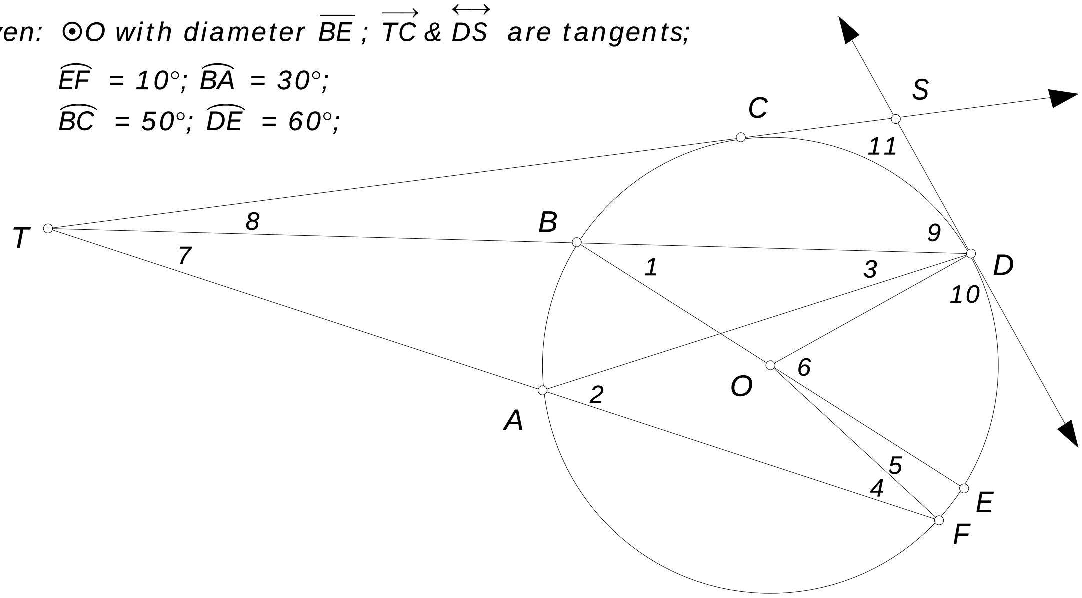
$\angle 4$ = ______________ $\angle 5$ = ______________ $\angle 6$ = ______________

$\angle 7$ = ______________ $\angle 8$ = ______________ $\angle 9$ = ______________

$\angle 10$ = ______________ $\angle 11$ = ______________

A Little More Practice 60

Given: $\odot O$ with diameter $\overline{BE}$; $\overrightarrow{TC}$ & $\overleftrightarrow{DS}$ are tangents;
$\overset{\frown}{EF} = 10°$; $\overset{\frown}{BA} = 30°$;
$\overset{\frown}{BC} = 50°$; $\overset{\frown}{DE} = 60°$;



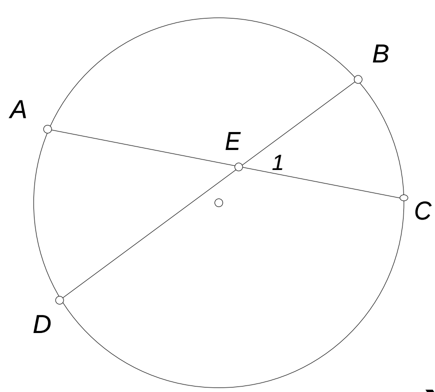
$\angle 1$ = ______________ $\angle 2$ = ______________ $\angle 3$ = ______________

$\angle 4$ = ______________ $\angle 5$ = ______________ $\angle 6$ = ______________

$\angle 7$ = ______________ $\angle 8$ = ______________ $\angle 9$ = ______________

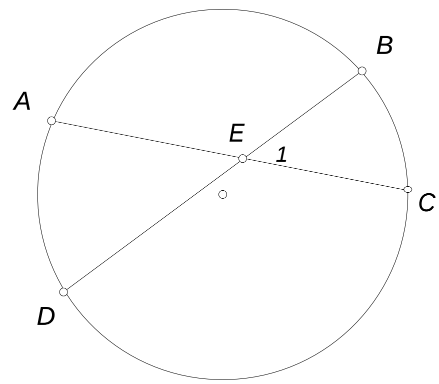
$\angle 10$ = ______________ $\angle 11$ = ______________

12) $\overset{\frown}{AD} = 46°$; $\overset{\frown}{BC} = 22°$; $\angle 1$ = ________________



➔

13) $\overset{\frown}{BC} = 14°$; $\angle 1 = 28°$; $\overset{\frown}{AD} =$ ___________

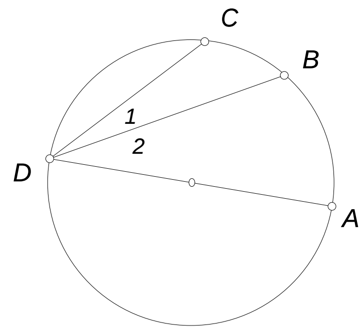


14) $\overline{AD}$ is a diameter; $\angle 1 = 10°$; $\overset{\frown}{DC} = 100°$;

$\overset{\frown}{BC}$ = _____________

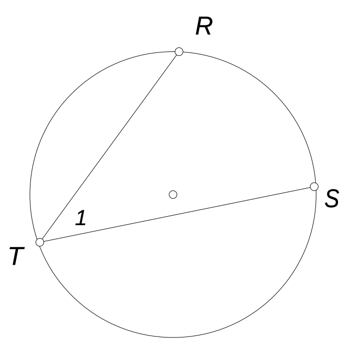
$\angle 2$ = ______________

$\overset{\frown}{ADC}$ = ____________



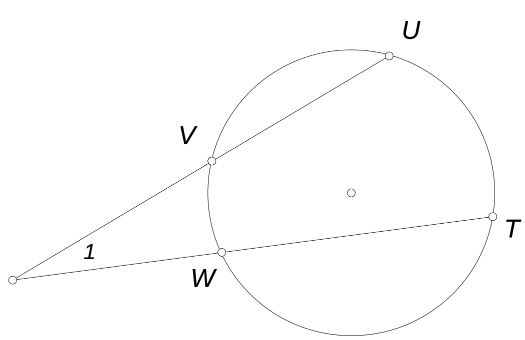
15) $\angle 1 = (3x - 1)°$; $\overset{\frown}{RS} = (5x + 11)°$

$\angle 1$ = _______



16) $\overset{\frown}{TU} = 105°$; $\overset{\frown}{VW} = 57°$

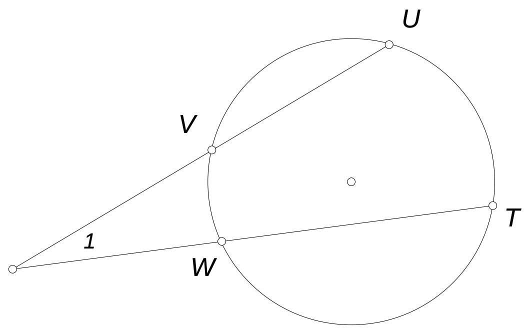
$\angle 1$ = ______________



60 cont.

17) $\angle 1 = 31°$; $\overset{\frown}{TU} = 106°$

$\overset{\frown}{VW}$ = ___________________



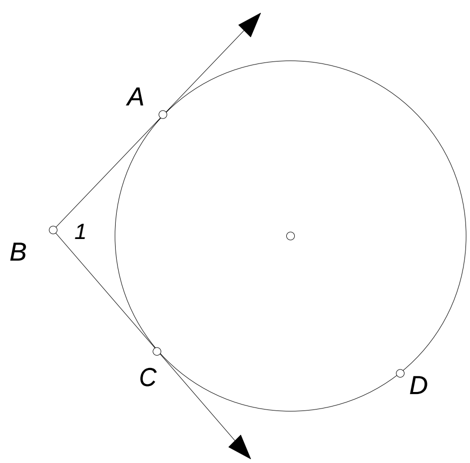
18) $\angle 1 = x°$; $\overset{\frown}{VW} = y°$

$\overset{\frown}{TU}$ = ___________________

$\overrightarrow{BC}$ & $\overrightarrow{BA}$ are tangents

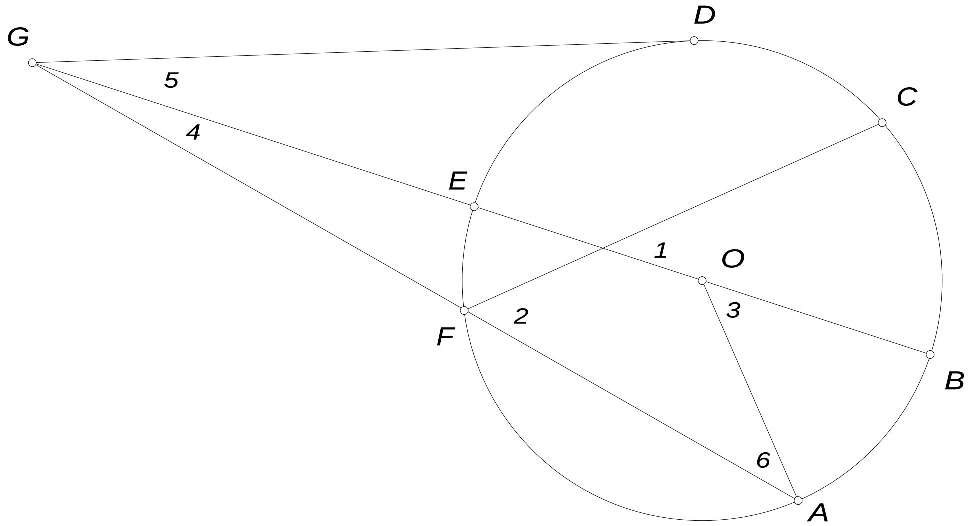
19) $\overset{\frown}{ADC} = 275°$

$\angle 1$ = _____________



Practice for Test 70

Given: ⊙O; $\overline{EB}$ is a diameter; $\overset{\frown}{AB} = 48°$; $\overset{\frown}{AF} = 106°$; $\overset{\frown}{DC} = 50°$; $\overset{\frown}{BC} = 60°$



Find all numbered angles.

∠ 1 = ______________ ∠ 2 = ______________ ∠ 3 = ______________

∠ 4 = ______________ ∠ 5 = ______________ ∠ 6 = ______________

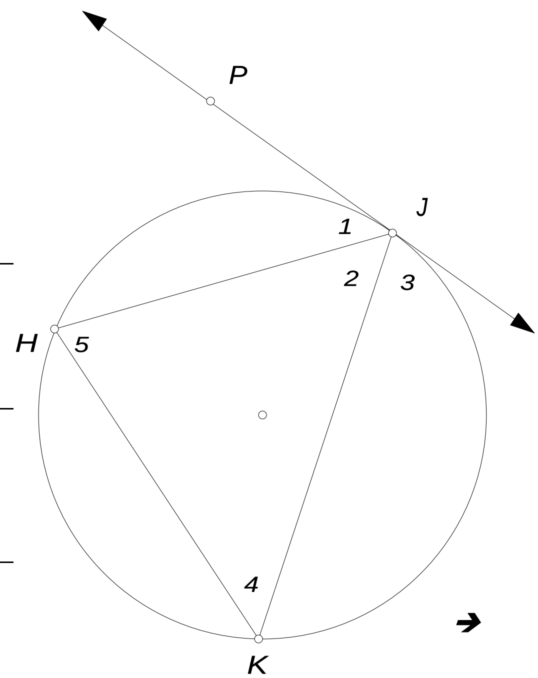
Given: tangent $\overleftrightarrow{PJ}$, ∠ 4 = 52°
and $\overset{\frown}{HK}$ = 112°

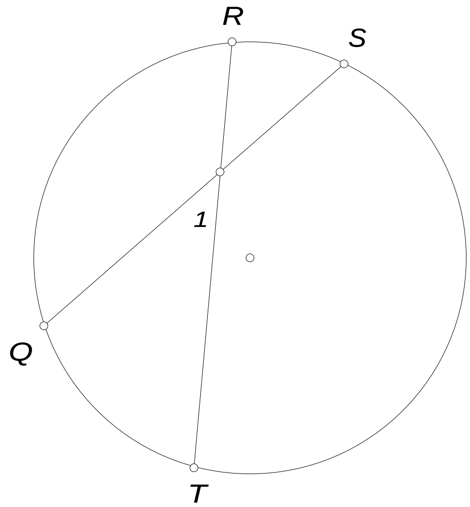
Find:

1) $\overset{\frown}{KJ}$ = __________ 2) ∠ 2 = __________

3) ∠ 3 = __________ 4) ∠ 1 = __________

5) ∠ 5 = __________ 6) $\overset{\frown}{JHK}$ = __________





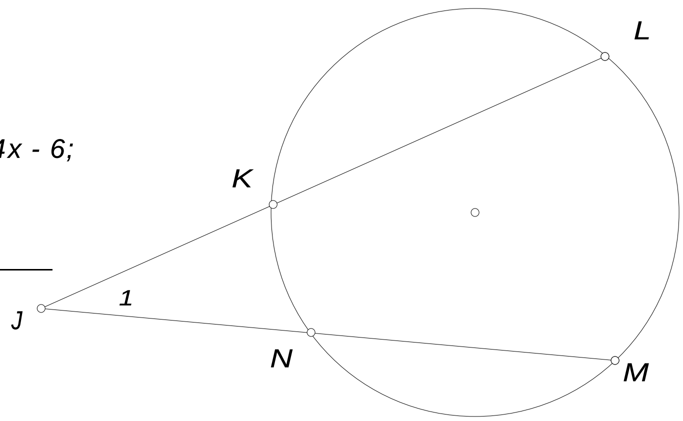
7) $\angle 1 = 23°$; $\overset{\frown}{RS} = 13°$; $\overset{\frown}{QT}$ =__________________

8) $\angle 1 = 44°$; $\overset{\frown}{RQ} = 103°$; $\overset{\frown}{ST}$ =_________________

9) $\angle 1 = 6x - 1$; $\overset{\frown}{RS} = 5x - 2$; $\overset{\frown}{QT} = 5x + 12$;

x = _________ $\overset{\frown}{RS}$ =______________

10) $\angle 1 = 32°$; $\overset{\frown}{KN} = 13°$; $\overset{\frown}{ML}$ =__________________



11) $\angle 1 = 2x + 8$; $\overset{\frown}{LM} = 10x - 12$; $\overset{\frown}{KN} = 4x - 6$;

x = _________ $\angle 1$ =______________

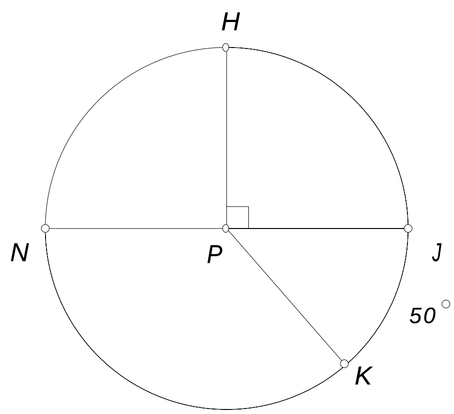
12) $\angle 1 = 42°$; $\overset{\frown}{KL} = 140°$; $\overset{\frown}{NM} = 104°$;

$\overset{\frown}{KN}$ =______________

Central Angle Worksheet 06

Note:

A **minor arc** is less than 180°; a **major arc** is greater than 180°, you must use three points to name a major arc. When only two points are used to name an arc it must be a minor arc but a minor arc can be named using three points. In the figure below $\overparen{HK}$ is a minor arc but it can also be called $\overparen{HJK}$.



Given: ⊙P with $\overparen{JK} = 50°$ & diameter $\overline{NJ}$

Find the measure of each arc:

1) $\overparen{HJ} = 90°$

2) $\overparen{JK} =$

3) $\overparen{HK} = 140°$

4) $\overparen{HNK} =$

5) $\overparen{HNJ} = 270°$

6) $\overparen{NHJ} =$

7) $\overparen{NKJ} = 180°$

8) $\overparen{JKH} =$

9) $\overparen{NK} = 130°$

Using the letters in the above diagram, name:

10) 2 equal central angles

11) 2 equal minor arcs $\overparen{NH}$ & $\overparen{HJ}$

12) Any 2 major arcs

➔

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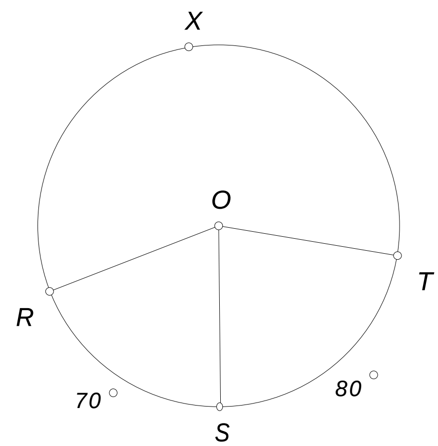
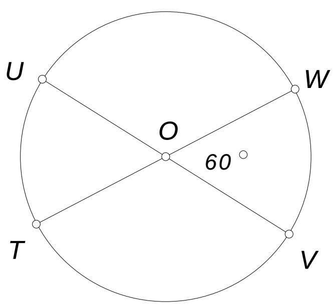
Given: ⊙O with $\overset{\frown}{RS}$ = 70° & $\overset{\frown}{ST}$ = 80°



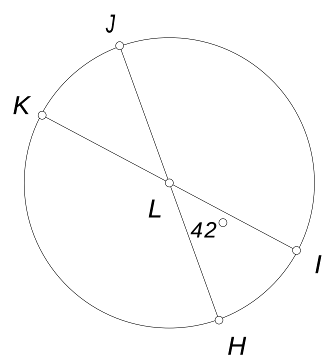
Find the measures:

13) ∠ROS = 70°   14) ∠TOS =   15) ∠ROT = 150°

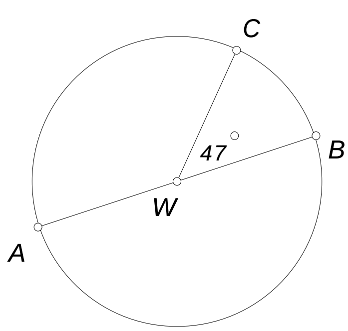
16) $\overset{\frown}{RT}$ =   17) $\overset{\frown}{RXT}$ = 210°   18) $\overset{\frown}{TXS}$ =



19) Given: ⊙O with diameters $\overline{UV}$ & $\overline{WT}$; $\overset{\frown}{UT}$ = 60°



20) Given: ⊙L with diameters $\overline{JH}$ & $\overline{KI}$; $\overset{\frown}{KH}$ =



21) Given: ⊙W with diameter $\overline{AB}$; $\overset{\frown}{AC}$ = 133°

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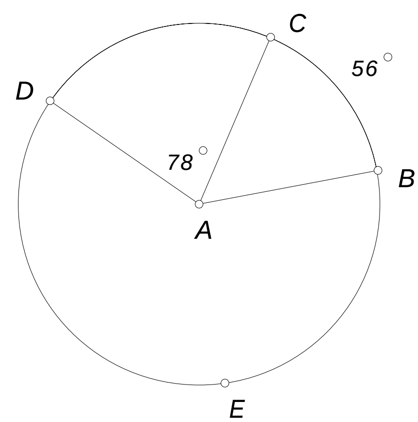
The first move we will make with the vertex is from the center to the circle. This type of angle is known as an **inscribed angle**. *Before we move the vertex, do the problems concerning central angles.*

Given: ⊙*A with* $\overset{\frown}{BC} = 56°$ & $\angle CAD = 78°$



Find:

$\angle CAB = 56°$

$\overset{\frown}{DC} =$

$\overset{\frown}{DB} = 134°$

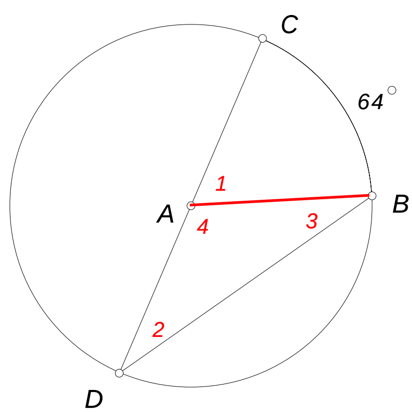
$\angle DAB =$

$\overset{\frown}{BED} = 226°$

$\overset{\frown}{BEC} =$

$\overset{\frown}{CED} = 282°$

Now let's move the vertex to a point on the circle, an inscribed angle. Try to use what you already know to turn something you don't know into something you do know. Count on what you know not on what you don't know.



Given: ⊙*A with* $\overset{\frown}{BC} = 64°$

Find: $\angle CDB =$

Try your best. If you need a hint, I will draw one line segment that may help.➔

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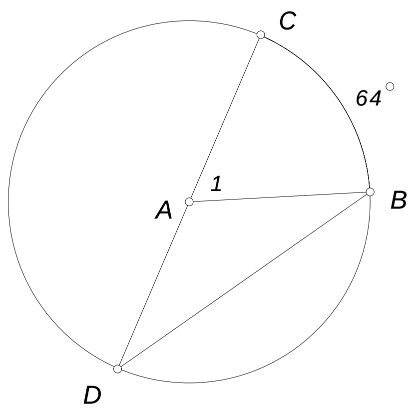

Now use your knowledge about central angles, supplementary angles and triangles to find the answer.

Given: $\odot A$ *with* $\overset{\frown}{BC} = 64°$

Find: $\angle CDB$ = ____________

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Inscribed Angle Worksheet

1) $\overset{\frown}{BC} = 42°$, $\angle 1 = 21°$

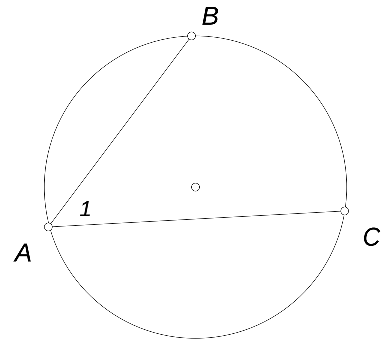
2) $\overset{\frown}{BC} = 63°$, $\angle 1 =$

3) $\angle 1 = 42°$, $\overset{\frown}{BC} = 84°$

4) $\angle 1 = 37°$, $\overset{\frown}{BC} =$

5) $\overset{\frown}{BC} = p°$, $\angle 1 = \frac{p°}{2}$

6) $\angle 1 = h°$, $\overset{\frown}{BC} =$



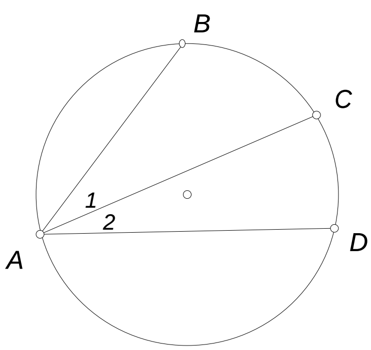
Problems 1 through 10

7) $\angle 1 = (7x + 3)°$, $\overset{\frown}{BC} = (15x + 1)°$, $x = 5$

8) $\overset{\frown}{BAC} = 242°$, $\angle 1 =$

9) $\overset{\frown}{BAC} = s°$, $\angle 1 = \frac{(360 - s)°}{2}$

10) $\angle 1 = p°$, $\overset{\frown}{BAC} =$



Problems 11 through 14

11) $\angle 1 = 24°$, $\overset{\frown}{BD} = 124°$, $\angle 2 = 38°$

12) $\angle BAD = 62°$, $\overset{\frown}{BC} = 24°$, $\angle 2 =$

13) $\overset{\frown}{BC} : \overset{\frown}{BD} = 2 : 5$, $\angle 1 = 14°$,

$\angle 2 = 21°$

14) $\angle 1 = (x + 5)°$, $\angle 2 = (3x - 8)°$, $\overset{\frown}{BD} = (9x - 16)°$

$x =$

➔

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Given: $\odot O$, diameter $\overline{AC}$, tangent $\overleftrightarrow{AD}$
and $\overset{\frown}{BC} = 42°$

Find: All the numbered angles.

$\angle 1$ = 90°

$\angle 2$ =

$\angle 3$ = 69°

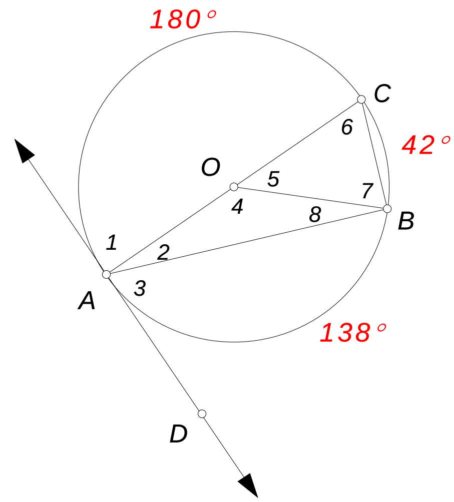
$\angle 4$ =

$\angle 5$ = 42°

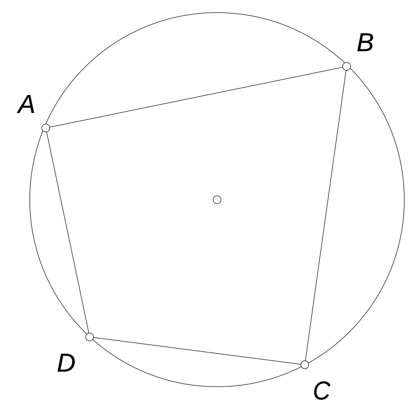
$\angle 6$ =

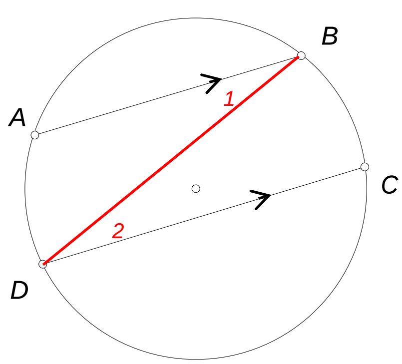
$\angle 7$ = 69°

$\angle 8$ =



What will be true of the opposite angles of an inscribed quadrilateral?





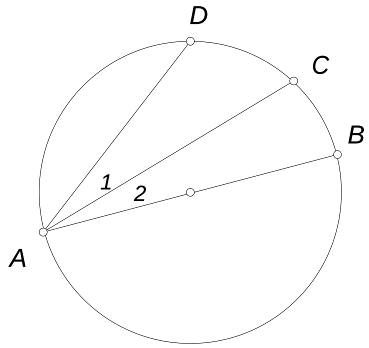
What will be true of the arcs between parallel chords?

Given: $\overline{AB} \parallel \overline{CD}$

What is true about $\overset{\frown}{AD}$ & $\overset{\frown}{BC}$ *and why?*

20 cont.

Given: $\overline{AB}$ is a diameter



1) $\angle 2 = 16°$, $\overset{\frown}{BD} = 85°$, $\angle 1 =$ 26.5°

2) $\angle BAD = 58°$, $\overset{\frown}{BC} = 40°$, $\angle 1 =$

3) $\overset{\frown}{BC} : \overset{\frown}{BD} = 3:4$, $\angle 2 = 15°$, $\angle 1 =$ 5°

Given: $\overleftrightarrow{XY}$ is a tangent

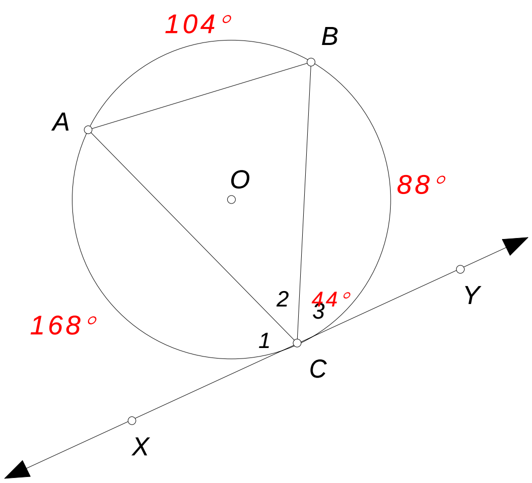
4) $\angle 3 = 44°$, $\overset{\frown}{AB} = 104°$

$\angle 2 =$

$\angle A =$ 44°

$\angle B =$

$\overset{\frown}{BC} =$ 88°



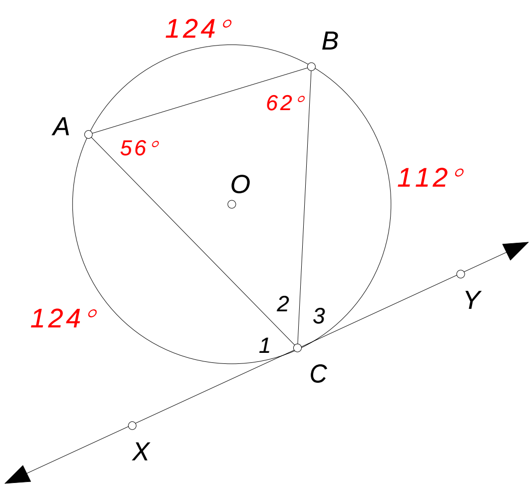
5) $\angle A = 56°$, $\angle B = 62°$

$\angle 1 =$ 62°

$\angle 2 =$

$\angle 3 =$ 56°

$\overset{\frown}{AB} =$



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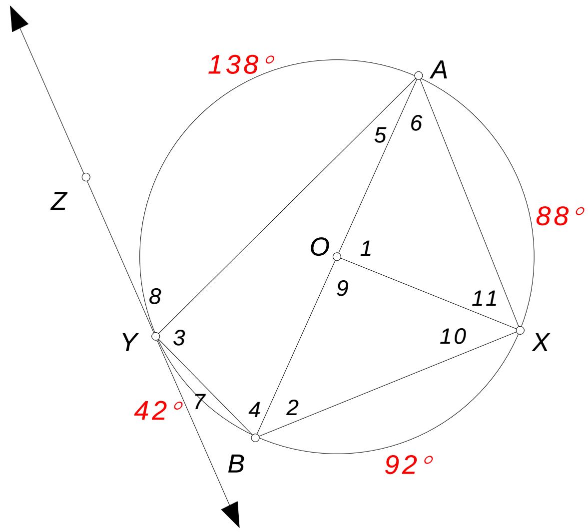
Given: ⊙O; diameter $\overline{AB}$; tangent $\overleftrightarrow{ZY}$

$\widehat{BY} = 42°$, $\widehat{BX} = 92°$

Find: All the numbered angles.



$\angle 1 = 88°$ $\angle 2 =$

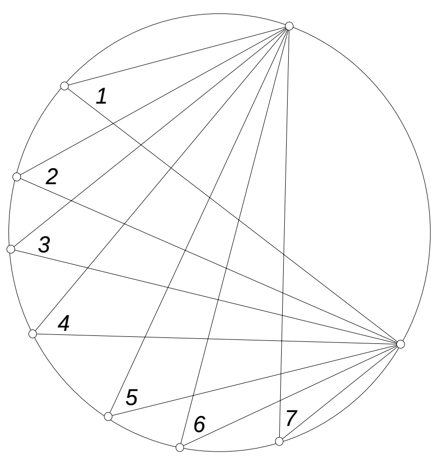
$\angle 3 = 90°$ $\angle 4 =$

$\angle 5 = 21°$ $\angle 6 =$

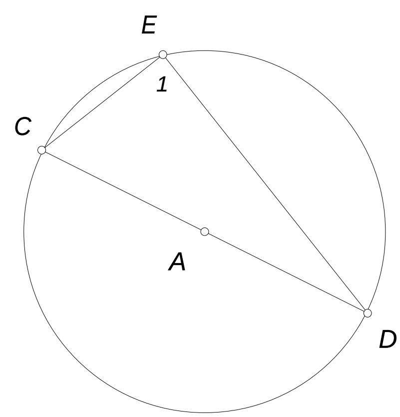
$\angle 7 = 21°$ $\angle 8 =$

$\angle 9 = 92°$ $\angle 10 = 44°$

$\angle 11 = 46°$



What is true about all the numbered angles in the illustration at the left?



If A is the center of the circle and $\overline{CD}$ *is a diameter then*

$\angle 1$ *must be equal to*

Any angle inscribed in a semi circle must

be a

If CE = 5in. and ED = 12in. what is the radius of ⊙A? 6.5 in.

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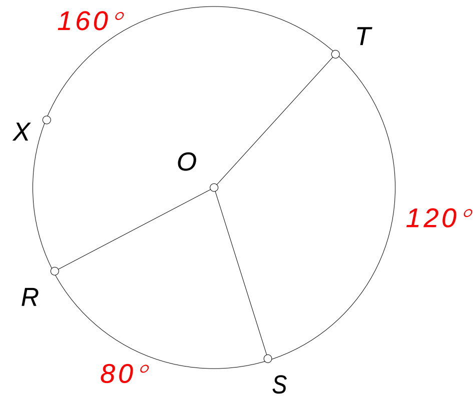
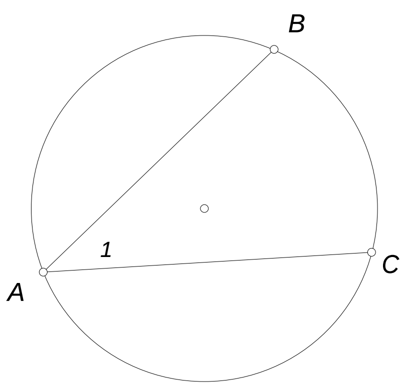
Central & Inscribed Angles Practice for Quiz 21

Given: ⊙O; $\overset{\frown}{ST} = 120°$; $\overset{\frown}{RS} = 80°$
Find:

1) $\angle ROS = 80°$
2) $\angle TOS =$
3) $\angle ROT = 160°$
4) $\overset{\frown}{RST} =$
5) $\overset{\frown}{RT} = 160°$
6) $\overset{\frown}{RSX} =$





7) $\overset{\frown}{BC} = 70°$, $\angle 1 = 35°$

8) $\overset{\frown}{BC} = d°$, $\angle 1 =$

9) $\angle 1 = 39°$, $\overset{\frown}{BC} = 78°$

10) $\angle 1 = r°$, $\overset{\frown}{BC} =$

11) $\angle 1 = (2x - 4)°$, $\overset{\frown}{BC} = (3x + 11)°$, $x = 19$

$4x - 8 = 3x + 11; x - 8 = 11$

12) $\angle 1 = (3x + 20)°$, $\overset{\frown}{BC} = (11x - 15)°$, $\angle 1 =$

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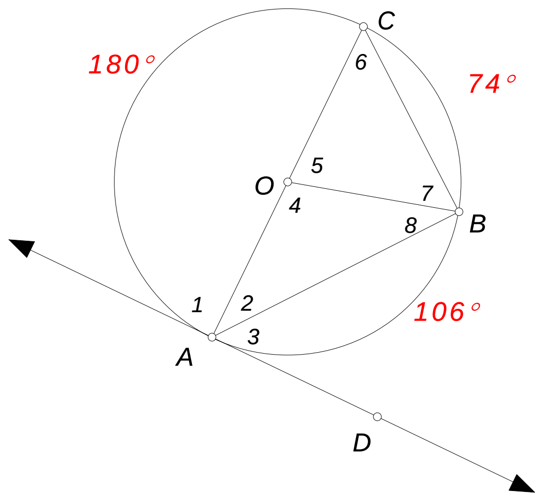
13) Given: ⊙O, diameter $\overline{AC}$, tangent $\overleftrightarrow{AD}$ and $\overset{\frown}{BC} = 74°$

Find: All the numbered angles.



$\angle 1 = 90°$ $\angle 2 =$

$\angle 3 = 53°$ $\angle 4 =$

$\angle 5 = 74°$ $\angle 6 =$

$\angle 7 = 53°$ $\angle 8 =$

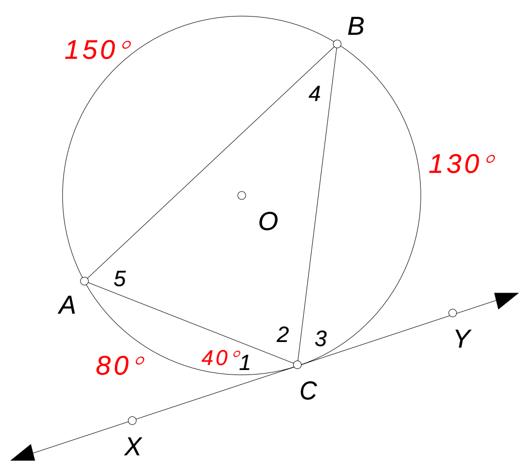
14) Given: ⊙O, tangent $\overleftrightarrow{XY}$, $\angle 1 = 40°$ and $\overset{\frown}{BC} = 130°$

Find:

$\overset{\frown}{AC} = 80°$ $\angle 2 =$

$\angle 3 = 65°$ $\angle 4 =$

$\angle 5 = 65°$ $\overset{\frown}{ABC} =$



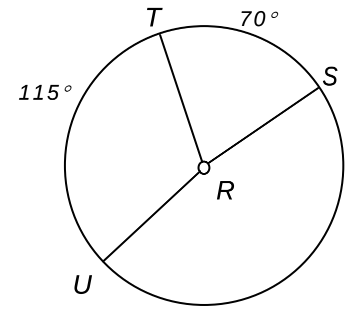
15) Point A lies on ⊙O. How many chords contain point A?

How many diameters contain point A?

How Good R U?

Given: $\odot R$; $\overset{\frown}{TS} = 70°$; $\overset{\frown}{TU} = 115°$

Find the measures:

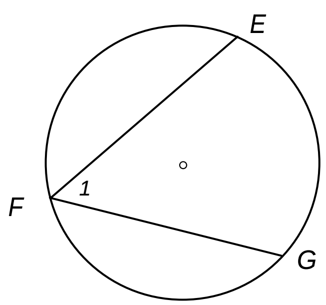


1) $\angle TRU = 115°$

2) $\angle SRU =$

3) $\overset{\frown}{SUT} = 290°$

4) $\overset{\frown}{STU} =$



5) $\overset{\frown}{GFE} = 250°$, $\angle 1 = 55°$

6) $\angle 1 = (3x + 21)°$, $\overset{\frown}{EG} = (10x - 10)°$, $\angle 1 =$

7) Given: $\odot P$, diameter $\overline{WV}$, tangent $\overleftrightarrow{TW}$ and $\overset{\frown}{WE} = 140°$

Find: All the numbered angles.

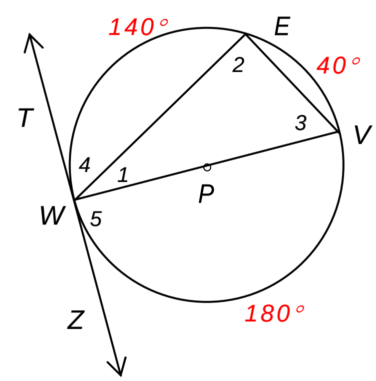
$\angle 1 = 20°$

$\angle 2 =$

$\angle 3 = 70°$

$\angle 4 =$

$\angle 5 = 90°$



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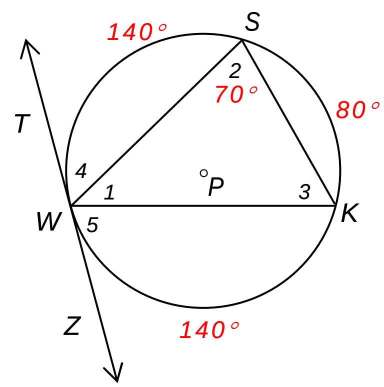
8) Given: $\odot P$, tangent $\overleftrightarrow{TW}$, $\angle 2 = 70°$ and $\overset{\frown}{SK} = 80°$



Find:

$\overset{\frown}{SW} = 160°$ $\angle 1 =$

$\angle 3 = 70°$ $\angle 4 =$

$\angle 5 = 70°$ $\overset{\frown}{WSK} =$

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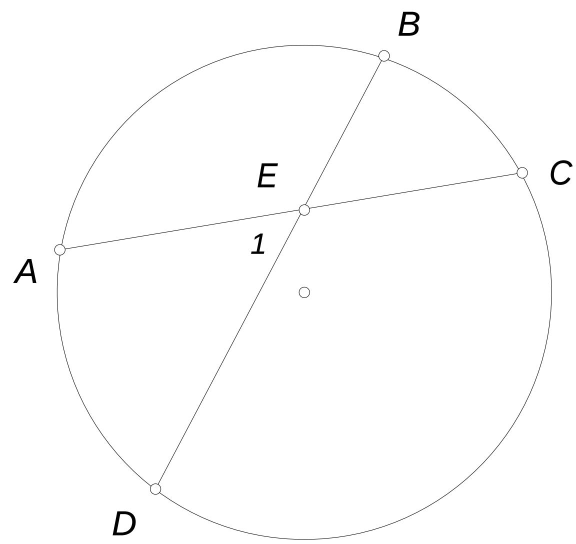
1) $\overset{\frown}{BC} = 24°$, $\overset{\frown}{AD} = 52°$, $\angle 1 = 38°$

2) $\overset{\frown}{BC} = 37°$, $\overset{\frown}{AD} = 64°$, $\angle 1 =$



3) $\angle 1 = 42°$, $\overset{\frown}{AD} = 67°$, $\overset{\frown}{BC} = 17°$

4) $\angle 1 = 37°$, $\overset{\frown}{BC} = 16°$, $\overset{\frown}{AD} =$

5) $\overset{\frown}{BC} = p°$, $\overset{\frown}{AD} = g°$, $\angle 1 = \dfrac{p° + g°}{2}$

6) $\angle 1 = s°$, $\overset{\frown}{AD} = r°$, $\overset{\frown}{BC} =$

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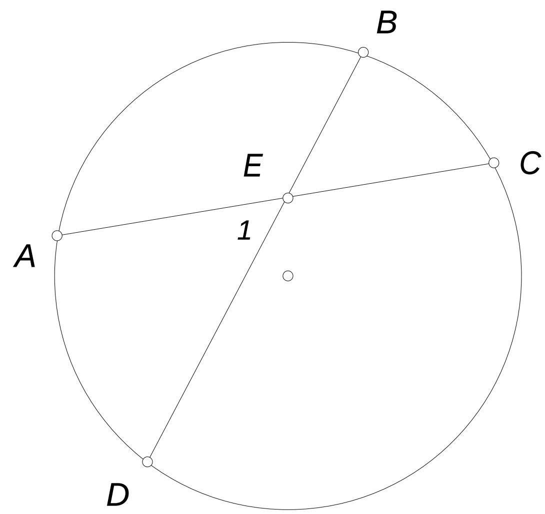
7) $\angle 1 = a°$, $\overset{\frown}{BC} = b°$, $\overset{\frown}{AD} = (2a - b)°$

8) $\overset{\frown}{AB} = 106°$, $\overset{\frown}{CD} = 120°$, $\angle 1 =$

9) $\angle 1 = 43°$, $\overset{\frown}{AB} = 124°$, $\overset{\frown}{CD} = 150°$

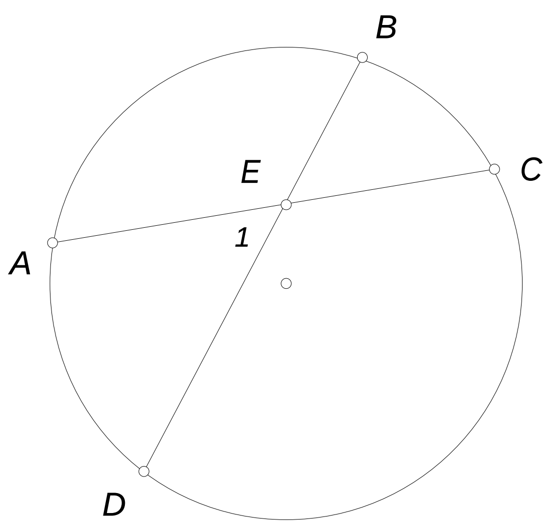


10) $\angle 1 = x°$, $\overset{\frown}{CD} = y°$, $\overset{\frown}{AB} =$

11) $\angle 1 = (4x + 3)°$, $\overset{\frown}{AD} = (5x + 4)°$, $\overset{\frown}{BC} = (4x - 6)°$, $x = 8$

$8x + 6 = 9x - 2$; $6 = x - 2$

12) $\angle 1 = (4x - 8)°$, $\overset{\frown}{AB} = (10x - 10)°$, $\overset{\frown}{CD} = (12x + 26)°$, $x =$



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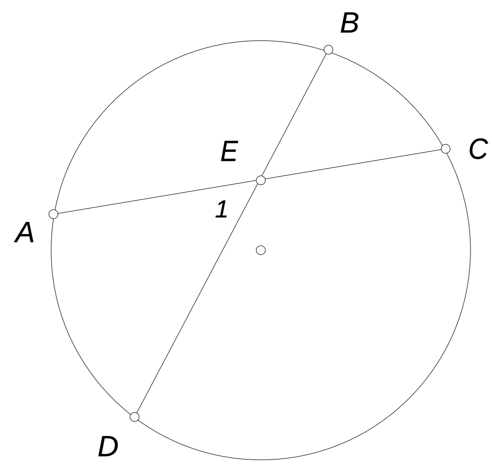
Another Intersecting Chords Worksheet

1) $\overset{\frown}{BC} = 35.5°$, $\overset{\frown}{AD} = 65.5°$, $\angle 1 = 50.5°$

2) $\overset{\frown}{BC} = 41\frac{1}{2}°$, $\overset{\frown}{AD} = 62\frac{3}{4}°$, $\angle 1 =$



3) $\angle 1 = 48°$, $\overset{\frown}{AD} = 72°$, $\overset{\frown}{BC} = 24°$

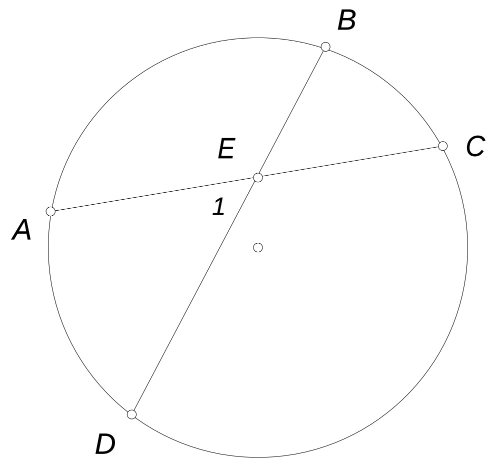
4) $\angle 1 = 36.7°$, $\overset{\frown}{BC} = 19.3°$, $\overset{\frown}{AD} =$

5) $\overset{\frown}{BC} = 6x°$, $\overset{\frown}{AD} = 10x°$, $\angle 1 = 8x°$

6) $\angle 1 = 6y°$, $\overset{\frown}{AD} = 3y°$, $\overset{\frown}{BC} =$

7) $\angle 1 = \frac{5x}{2}$, $\overparen{BC} = 3x°$, $\overparen{AD} = 2x°$

8) $\overparen{AB} = 110°$, $\overparen{CD} = 132°$, $\angle 1 =$



9) $\angle 1 = 48°$, $\overparen{AB} = 136°$, $\overparen{CD} = 128°$

10) $\angle 1 = 6x°$, $\overparen{CD} = 2x°$, $\overparen{AB} =$

11) $\angle 1 = (5x - 8)°$, $\overparen{AD} = (5x + 2)°$, $\overparen{BC} = (4x - 4)°$, $x = 14$

$10x - 16 = 9x - 2$; $x - 16 = -2$

12) $\angle 1 = (3x - 2)°$, $\overparen{AB} = (16x + 2)°$, $\overparen{CD} = (5x + 11)°$, $x =$

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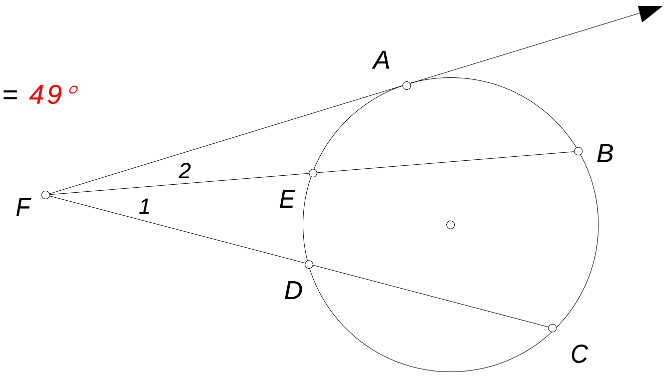
Vertex of Angle Outside the Circle Worksheet 50

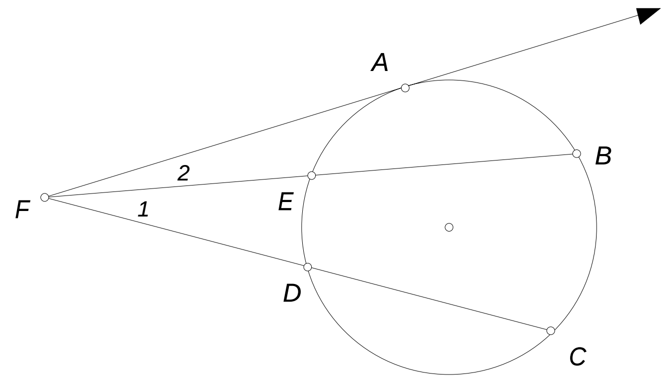


1) $\overset{\frown}{BC} = 150°$, $\overset{\frown}{ED} = 52°$; $\angle 1 =$ 49°

2) $\overset{\frown}{AB} = 85°$; $\overset{\frown}{AE} = 32°$,

$\angle 2 =$

3) $\angle 1 = 42°$, $\overset{\frown}{ED} = 67°$; $\overset{\frown}{BC} =$ 151°



4) $\angle 2 = 15°$, $\overset{\frown}{AB} = 58°$; $\overset{\frown}{AE} =$

5) $\overset{\frown}{BC} = p°$, $\overset{\frown}{ED} = g°$; $\angle 1 = \dfrac{p° - g°}{2}$

6) $\angle 1 = s°$, $\overset{\frown}{ED} = h°$; $\overset{\frown}{BC} =$

7) $\angle 2 = 13°$, $\overset{\frown}{AE} = 28°$, $\overset{\frown}{AC} = 150°$, $\overset{\frown}{ED} = 32°$; $\angle 1 =$ 32°

8) $\angle 1 = (2x - 1)°$, $\overset{\frown}{ED} = (x + 12)°$, $\overset{\frown}{BC} = (3x + 46)°$; $x =$ & $\angle 1 =$

9) $\angle 2 = 15°$, $\overset{\frown}{AB} : \overset{\frown}{AE} = 5:2$; $\overset{\frown}{AE} =$ 20°

2x

$5x - 2x = 30$; $3x = 30$; $x = 10$

➔

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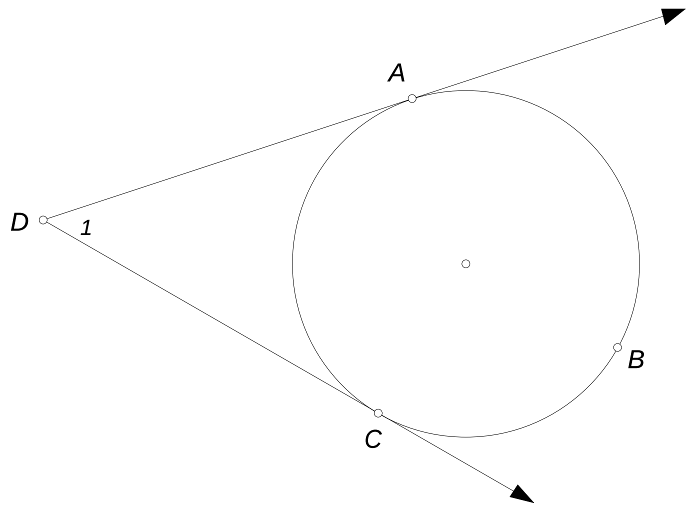
$\overrightarrow{DC}$ & $\overrightarrow{DA}$ are tangents



10) $\overset{\frown}{AC} = 105°$; $\angle 1$ =

11) $\overset{\frown}{ABC} = 238°$; $\angle 1$ = 58°

12) $\angle 1 = 42°$; $\overset{\frown}{AC}$ =

13) $\angle 1 = 62°$; $\overset{\frown}{ABC}$ = 242°

14) $\angle 1 = x°$; $\overset{\frown}{AC}$ =

15) $\overset{\frown}{ABC} : \overset{\frown}{AC} = 3 : 2$; $\angle 1$ = 108°

$3x + 2x = 180$; $5x = 180$; $x = 36$; $\overset{\frown}{AC} = 72°$

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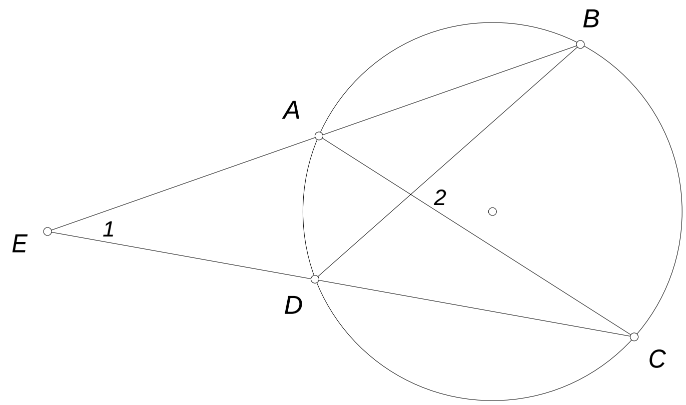


1) $\angle 1 = 22°$, $\overset{\frown}{AD} = 57°$;

$\angle 2 =$ 79°

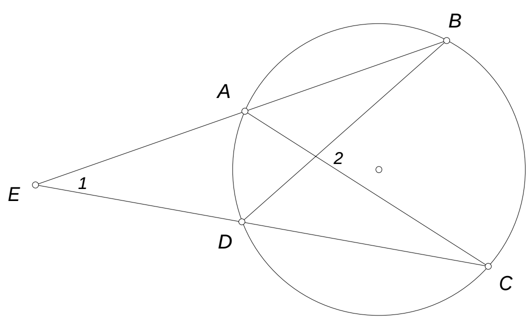
2) $\angle 2 = 63°$, $\overset{\frown}{BC} = 93°$;

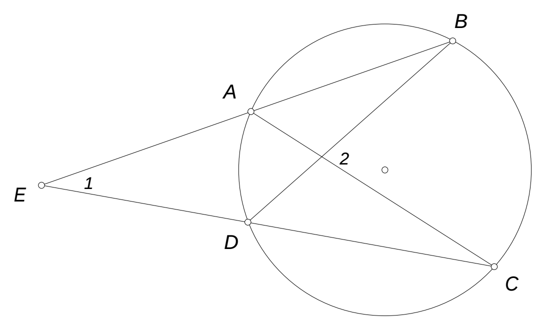
$\angle 1 =$

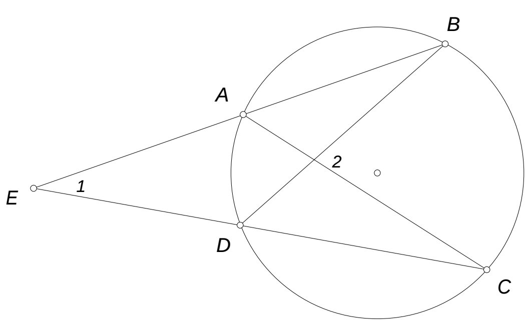
3) $\angle 1 = 30°$, $\angle 2 = 80°$, $\overset{\frown}{AD} =$ 50° & $\overset{\frown}{BC} =$ 110°

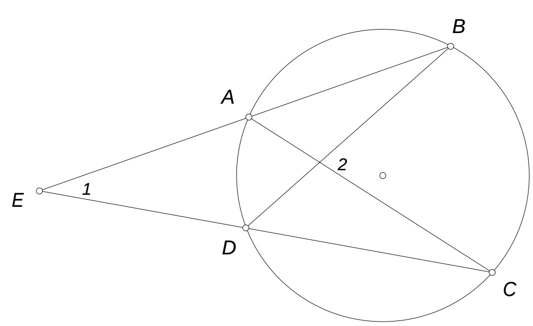
4) $\angle 1 = a°$, $\angle 2 = b°$, $\overset{\frown}{AD} =$ & $\overset{\frown}{BC} =$

Wait till you see this! ➔





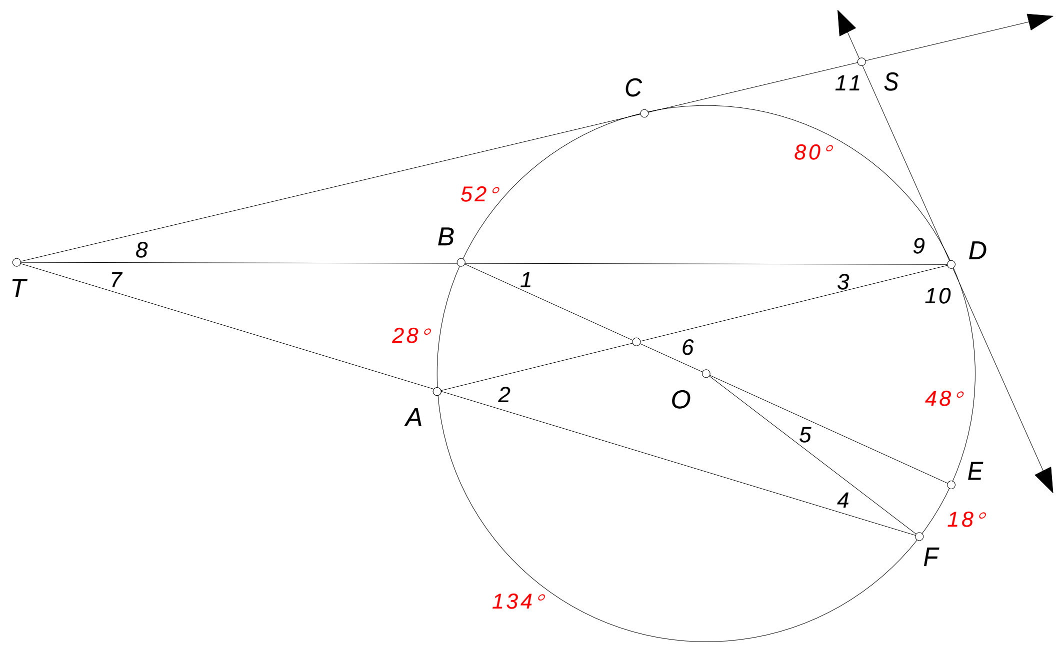




Given: $\odot O$, *diameter* $\overline{BE}$, *tangents* $\overrightarrow{TS}$ & $\overleftrightarrow{DS}$,

$\overset{\frown}{BC} = 52°$, $\overset{\frown}{DE} = 48°$, $\overset{\frown}{AB} = 28°$, $\overset{\frown}{AF} = 134°$

Find all numbered angles. (The whole nine yards.)



$\angle 1 = 24°$ $\angle 2 =$ $\angle 3 = 14°$

$\angle 4 =$ $\angle 5 = 18°$ $\angle 6 =$

$\angle 7 = 19°$ $\angle 8 =$ $\angle 9 = 66°$

$\angle 10 =$ $\angle 11 = 100°$

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A Little More Practice

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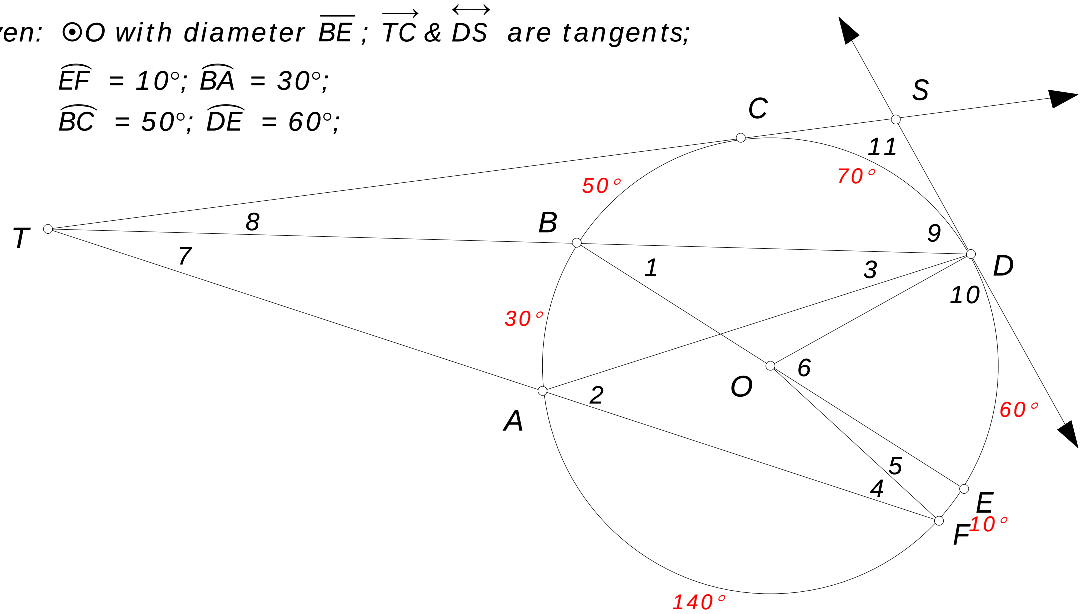
Given: ⊙O with diameter $\overline{BE}$; $\overrightarrow{TC}$ & $\overleftrightarrow{DS}$ are tangents;

$\overset{\frown}{EF}$ = 10°; $\overset{\frown}{BA}$ = 30°;

$\overset{\frown}{BC}$ = 50°; $\overset{\frown}{DE}$ = 60°;



∠ 1 = 30°

∠ 2 =

∠ 3 = 15°

∠ 4 =

∠ 5 = 10°

∠ 6 =

∠ 7 = 20°

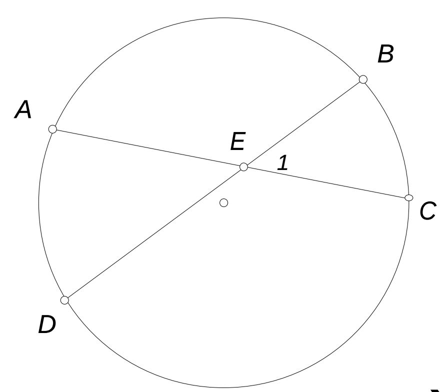
∠ 8 =

∠ 9 = 60°

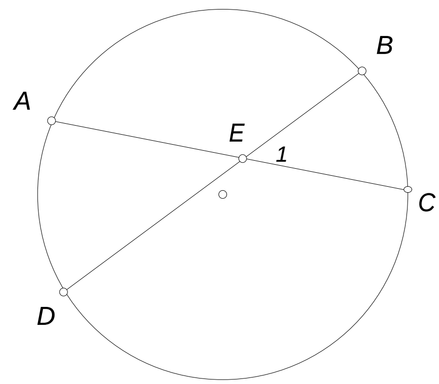
∠ 10 =

∠ 11 = 110°

12) $\overset{\frown}{AD}$ = 46°; $\overset{\frown}{BC}$ = 22°; ∠1 =



13) $\overparen{BC} = 14°$; $\angle 1 = 28°$; $\overparen{AD} = 42°$

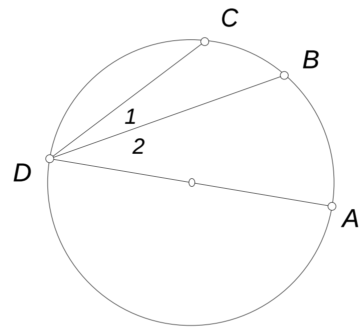


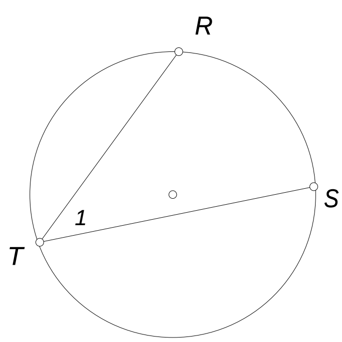
14) $\overline{AD}$ is a diameter; $\angle 1 = 10°$; $\overparen{DC} = 100°$;

$\overparen{BC}$ =

$\angle 2$ =

$\overparen{ADC}$ =





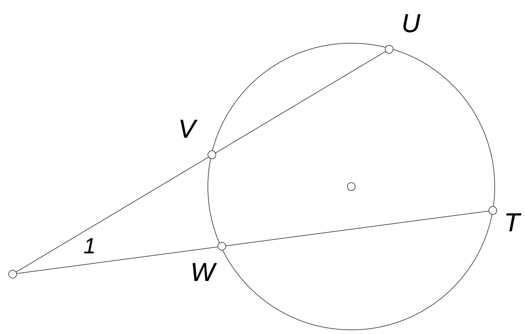
15) $\angle 1 = (3x - 1)°$; $\overparen{RS} = (5x + 11)°$

$6x - 2 = 5x + 11$; $x - 2 = 11$; $x = 13$

$\angle 1 = 38°$

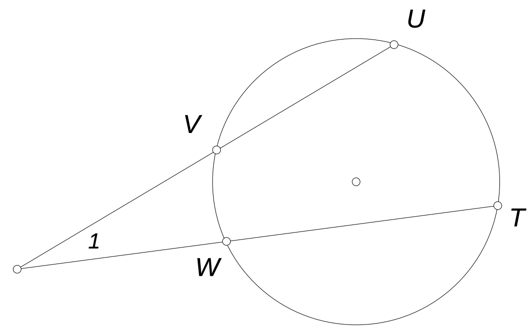
16) $\overparen{TU} = 105°$; $\overparen{VW} = 57°$

$\angle 1$ =



17) $\angle 1 = 31°$; $\overset{\frown}{TU} = 106°$

$\overset{\frown}{VW} = 44°$



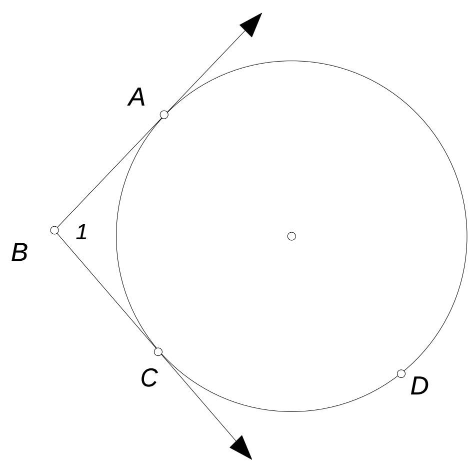
18) $\angle 1 = x°$; $\overset{\frown}{VW} = y°$

$\overset{\frown}{TU} =$

$\overrightarrow{BC}$ & $\overrightarrow{BA}$ are tangents

19) $\overset{\frown}{ADC} = 275°$

$\angle 1 = 95°$



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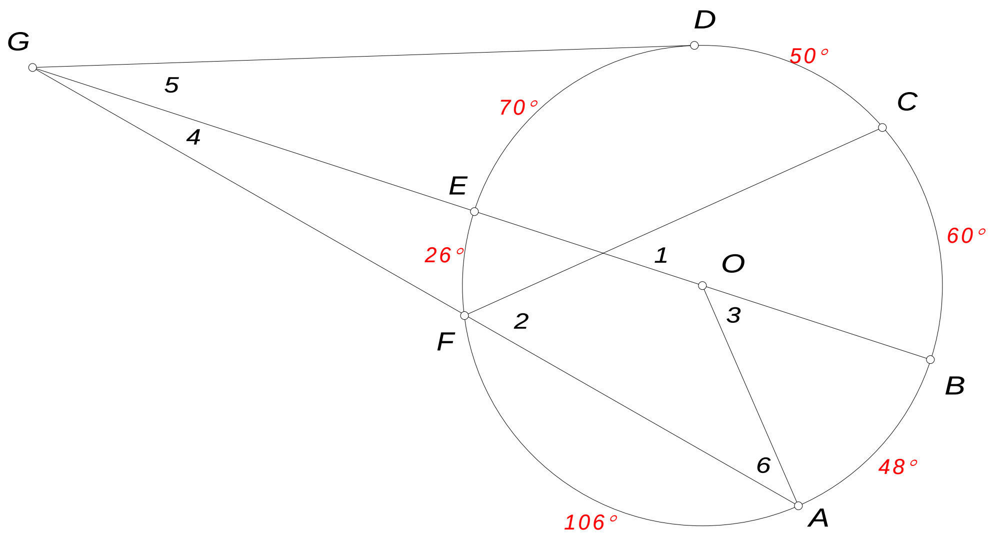
Practice for Test

Given: ⊙O; $\overline{EB}$ is a diameter; $\overset{\frown}{AB} = 48°$; $\overset{\frown}{AF} = 106°$; $\overset{\frown}{DC} = 50°$; $\overset{\frown}{BC} = 60°$



Find all numbered angles.

$\angle 1$ = 43°

$\angle 2$ =

$\angle 3$ = 48°

$\angle 4$ =

$\angle 5$ = 20°

$\angle 6$ =

Given: tangent $\overleftrightarrow{PJ}$, $\angle 4 = 52°$

and $\overset{\frown}{HK} = 112°$

Find:

1) $\overset{\frown}{KJ}$ = 144°

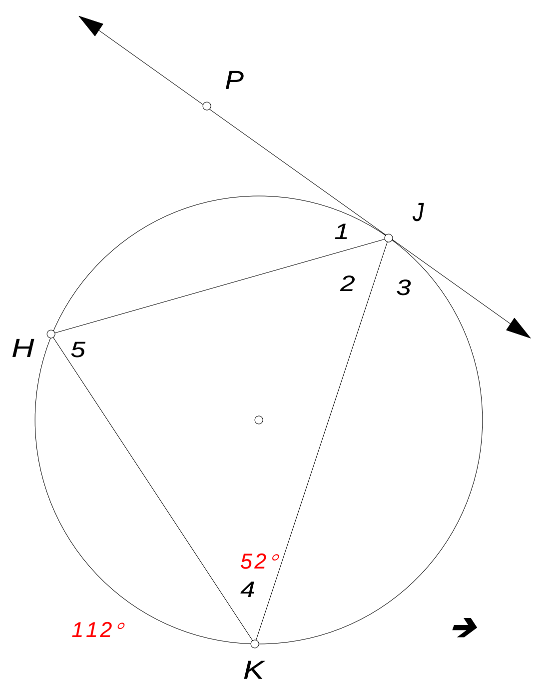
2) $\angle 2$ =

3) $\angle 3$ = 72°

4) $\angle 1$ =

5) $\angle 5$ = 72°

6) $\overset{\frown}{JHK}$ =



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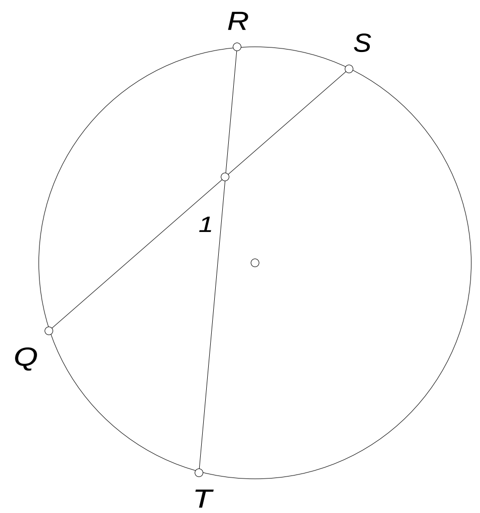


7) $\angle 1 = 23°$; $\overset{\frown}{RS} = 13°$; $\overset{\frown}{QT} =$ 33°

8) $\angle 1 = 44°$; $\overset{\frown}{RQ} = 103°$; $\overset{\frown}{ST} =$

9) $\angle 1 = 6x - 1$; $\overset{\frown}{RS} = 5x - 2$; $\overset{\frown}{QT} = 5x + 12$;

$12x - 2 = 10x + 10$; $2x - 2 = 10$

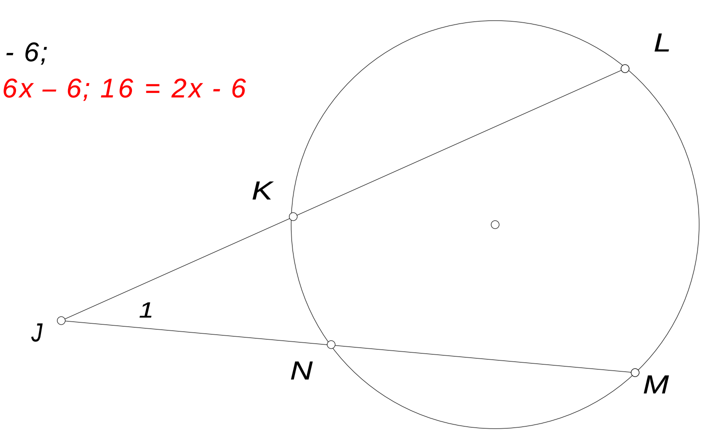
$x =$ 6 $\overset{\frown}{RS} =$ 28°

10) $\angle 1 = 32°$; $\overset{\frown}{KN} = 13°$; $\overset{\frown}{ML} =$

11) $\angle 1 = 2x + 8$; $\overset{\frown}{LM} = 10x - 12$; $\overset{\frown}{KN} = 4x - 6$;

$4x + 16 = 10x - 12 - (4x - 6)$; $4x + 16 = 6x - 6$; $16 = 2x - 6$

$x =$ 11 $\angle 1 =$ 30°



12) $\angle 1 = 42°$; $\overset{\frown}{KL} = 140°$; $\overset{\frown}{NM} = 104°$;

$\overset{\frown}{KN} =$