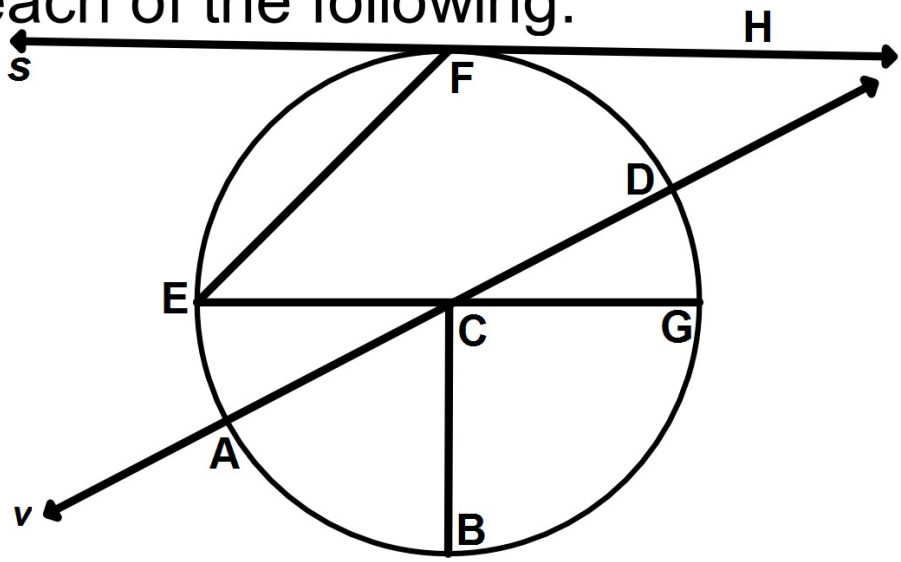
Bellwork

Identify each of the following:



1. Name the chord(s).
   $\overline{EF}$, $\overline{EG}$, $\overline{AD}$
2. Name the tangent(s).
   Line s or $\overleftrightarrow{HF}$
3. Name the circle.
   $\odot C$
4. Name the radius/radi.
   $\overline{AC}$, $\overline{CE}$, $\overline{BC}$, $\overline{CG}$, or $\overline{CD}$
5. Name the diameter(s).
   $\overline{EG}$ or $\overline{AD}$
6. Name the secant(s).
   Line v, $\overleftrightarrow{AC}$, $\overleftrightarrow{AD}$, or $\overleftrightarrow{CD}$

Focus on Tangents

Although there are a number of things that we could discuss about tangents, we will focus on just a couple of items:

1. The Perpendicular Tangent Theorem

2. The Intersecting Tangents Theorem

The Perpendicular Tangent Theorem

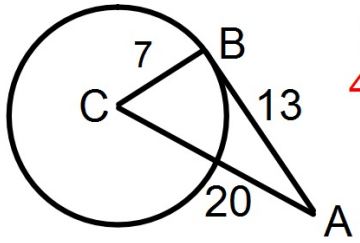
The theorem:

A line is tangent to a circle if and only if the line is perpendicular to a radius of the circle at its endpoint on the circle.

Examples

Are the lines AB tangent to the circle?

1.



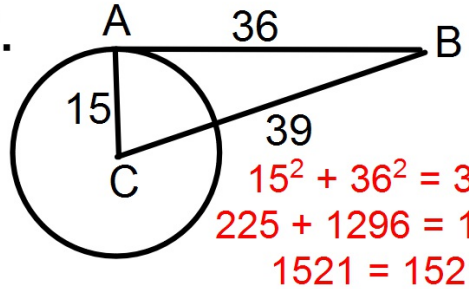
$7^2 + 13^2 = 20^2$

$49 + 169 = 400$

$218 = 400$

Since the two sides of the Pythagorean Theorem are not the same, AB is not tangent.

2.



$15^2 + 36^2 = 39^2$

$225 + 1296 = 1521$

$1521 = 1521$

Since the two sides of the Pythagorean Theorem are the same, AB is tangent.

The Intersecting Tangents Theorem

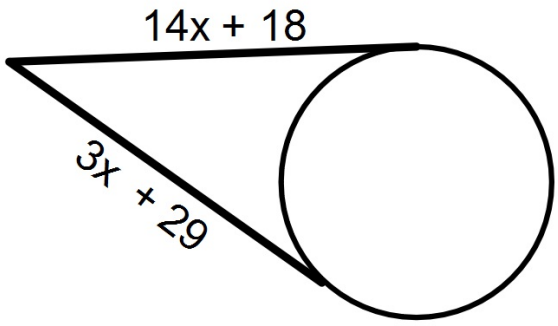
The theorem:

Tangent segments from a common external point are congruent.

Example

Find the value of x:

1.



$$14x + 18 = 3x + 29$$
$$-3x \qquad -3x$$
$$11x + 18 = 29$$
$$-18 \quad -18$$
$$\frac{11x}{11} = \frac{11}{11}$$
$$x = 1$$

Focus on Arc Measures

Although there are a number of things that we could discuss about arc measures, we will focus on just a couple of items:

1. Central Angle
2. Minor Arc
3. Major Arc
4. Semicircle
5. Arc Addition Postulate

Definitions Important for Arc Measures

1. Central Angle:
   An angle in a circle whose vertex is the center.
2. Minor Arc:
   An arc that is less than $\overset{\frown}{180^{o}}$.
   Named by its endpoints (ex. AB)
3. Major Arc:
   An arc that is greater than $\overset{\frown}{180^{o}}$
   Named by its endpoints and one point between (ex. ABC)
4. Semicircle:
   An arc that is = $\overset{\frown}{180^{o}}$

Finding the Measure of an Arc

Minor Arc measures
= the measure of the central angle.

Major Arc measures
= 360^{o} - the minor arc.
= sum of all minor arcs that form it.

Arc Addition Postulate

The theorem:

The measure of an arc formed by 2 adjacent arcs is the sum of the measures of the two arcs.

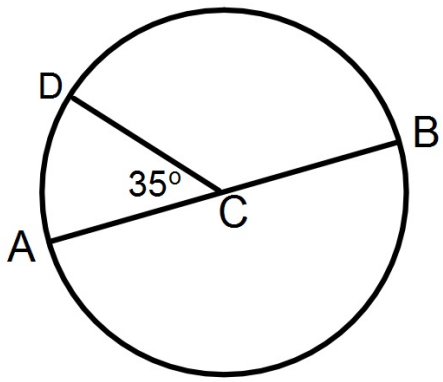
Example

Find the measure of each of the following & identify each as a minor arc, major arc, or semicircle:

1. $\overset{\frown}{DB}$ $= 180^\circ - 35^\circ = 145^\circ$
   Minor Arc

2. $\overset{\frown}{DAB}$ $= 180^\circ + 35^\circ = 215^\circ$
   Major Arc

3. $\overset{\frown}{ADB}$ $= 180^\circ$
   Semicircle



Focus on Chords

Although there are a number of things that we could discuss about chords, we will focus on just a couple of items:

1. The Perpendicular Bisector Chord Theorem

2. The Congruent Chord Theorem

The Perpendicular Bisector Chord Theorem

The theorem:

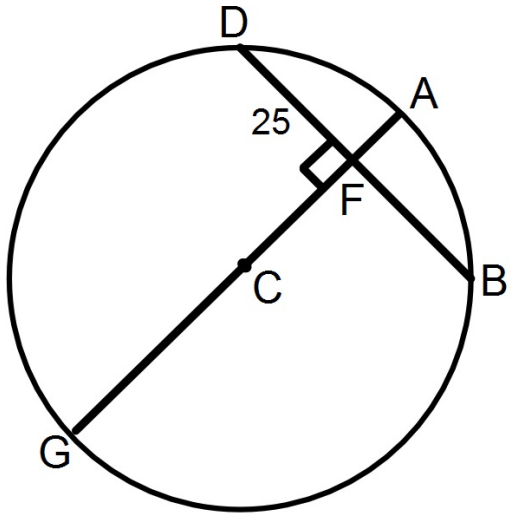
1. If one chord is a perpendicular bisector of another,
   Then the first chord is a diameter.

2. If a diameter of a circle is perpendicular to a chord,
   Then the diameter bisects the chord and its arc.

Example

In the diagram of $\odot C$, find the length of $\overline{BF}$.

1.



Since it is clear that $\overline{AG}$ is a diameter of circle C, and the diagram shows that $\overline{AG}$ is perpendicular to $\overline{DB}$, then we know that $\overline{AG}$ is a perpendicular bisector of BD.

Thus, since $\overline{DF} = 25$, $\overline{BF}$ must also be 25.

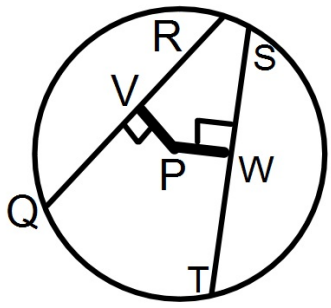
The Congruent Chord Theorem

The theorem:

In a circle, or in congruent circles, two chords are congruent if and only if they are equidistant from the center of the circle and perpendicular at the point of intersection.

Example

In the diagram of ⊙P, PV = PW, QR = 8x - 12 and ST = -2x + 8. Find the length of QR.



$8x - 12 = -2x + 8$

$+2x \quad +12 \quad +2x + 12$

$10x = 20$

$x = 2$

Now plug into QR:

$8(2) - 12$

$16 - 12$

$\boxed{4}$