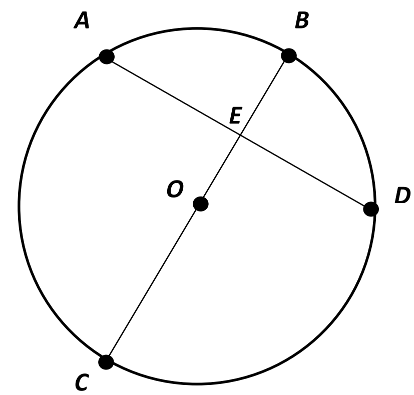
Name:_______________________________

11.3
Measuring Angles Inside and Outside of Circles

**<u>The vertex of an angle can be located inside of a circle, outside of a circle, or on a circle.</u>

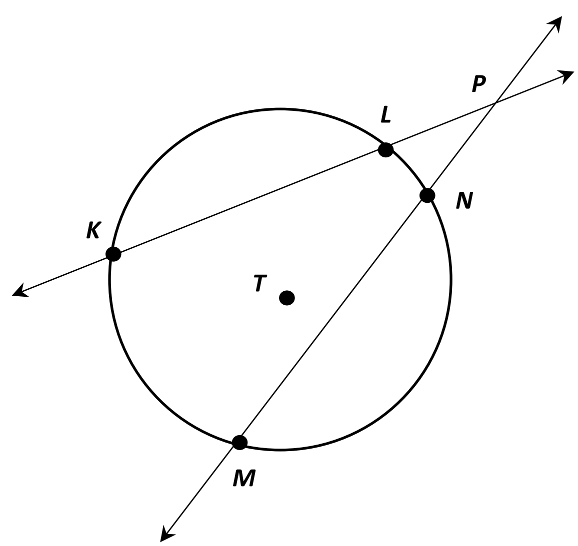


In circle O, $m\widehat{BD} = 70°$ and $m\widehat{AC} = 110°$

Notice how $\angle BED$ is different than central and inscribed angles.

The **<u>Interior Angles of a Circle Theorem</u>** states that if an angle is formed by two intersecting chords or secants of a circle such that the vertex of the angle is in the interior of the circle, then the measure of the angle is half of the sum of the measures of the arcs intercepted by the angle and its vertical angle.

Find the measure of $\angle BED$.

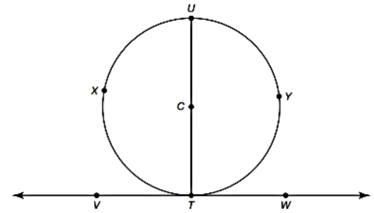


In circle O, $m\widehat{KM} = 80°$ and $m\widehat{LN} = 30°$

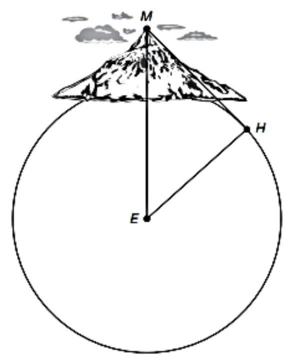
The **<u>Exterior Angles of a Circle Theorem</u>** states that if an angle is formed by two intersecting chords or secants of a circle such that the vertex of the angle is in the exterior of the circle, then the measure of the angle is half of the difference of the measures of the arcs intercepted by the angle.

Find the measure of $\angle KPN$.

The **Tangent to a Circle Theorem** states that a line drawn tangent to a circle is perpendicular to a radius drawn to the point of tangency.



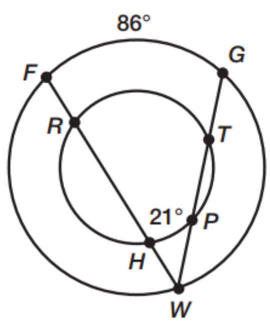
Example: Molly is standing at the top of Mount Everest, which has an elevation of 29,029 feet. Her eyes are 5 feet above the ground. The radius of Earth is approximately 3960 miles. How far can molly see on the horizon?



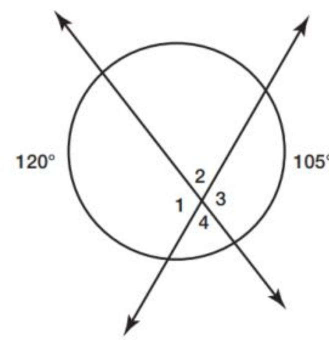
Use the theorems involving circles to solve the example problems:

1. Find $m\angle W$ and $m\widehat{RT}$.

$m\widehat{FG} = 86°$
$m\widehat{HP} = 21°$



2. Find $m\angle 2$.



3. Find $m\widehat{CD}$.

$m\widehat{AB} = 88°$
$m\angle AED = 80°$