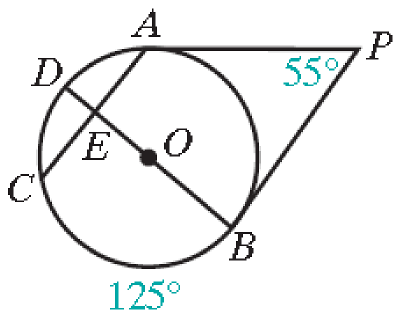
**Name: ________________________________________**

## Angles Formed by Tangents, Chords, and Secants

Exercise 1: In the diagram $\overleftrightarrow{PA}$ and $\overleftrightarrow{PB}$ are tangent to the circle of center O at A and B respectively. Diameter $\overline{BD}$ and chord $\overline{AC}$ intersects at E, $m\overset{\frown}{CB} = 125^0$ and $m\angle P = 55^0$. Find:




1) $m\overset{\frown}{AB}$

2) $m\overset{\frown}{AD}$

3) $m\overset{\frown}{CD}$

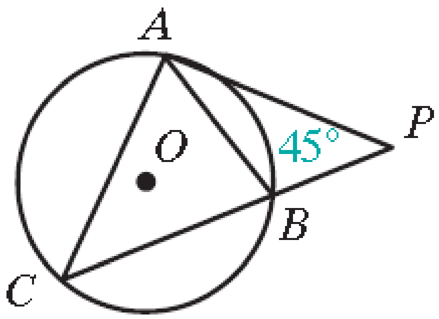
4) $m\angle DEC$

5) $m\angle PBD$

6) $m\angle PAC$

7) Show that $\overline{BD}$ is perpendicular to $\overline{AC}$ and bisects $\overline{AC}$

Exercise 2: Tangent segment $\overline{PA}$ and secant segment $\overline{PBC}$ are drawn to the circle of center O. $\overline{AC}$ and $\overline{AB}$ are chords. If $m\angle P = 45^0$ and $m\overset{\frown}{AC} : m\overset{\frown}{AB} = 5:2$, find:




1) $m\overset{\frown}{AC}$

2) $m\overset{\frown}{BC}$

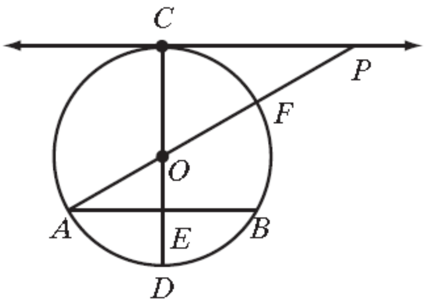
3) $m\angle ACB$

4) $m\angle PAB$

5) $m\angle CAB$

6) $m\angle PAC$

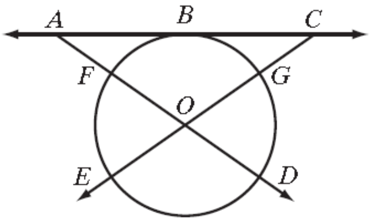
**Exercise 3:** Tangent $\overleftrightarrow{PC}$ intersects the circle of center O at C, $\overline{AB} \square \overleftrightarrow{CP}$, diameter $\overline{COD}$ intersects $\overline{AB}$ at E, and diameter $\overline{AOF}$ is extended to P.



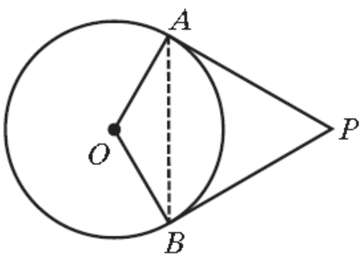

1) Prove that: $\square OPC \square\square OAE$

2) If $m\angle OAE = 30^0$, find $mAD$, $mCF$, $mFB$, $mBD$, $mAC$, and $m\angle P$

**Exercise 4:** Tangent $\overleftrightarrow{ABC}$ intersects the circle of center O at B, secant $\overleftrightarrow{AFOD}$ intersects the circle at F and D, and secant $\overleftrightarrow{CGOE}$ intersects the circle at G and E. If $mEFB = mDGB$, prove that $\square AOC$ is an isosceles triangle.




**Exercise 5:** Segments $\overline{AP}$ and $\overline{BP}$ are tangent to the circle of center O at A and B, respectively, and $m\angle AOB = 120^0$. Prove that $\square ABP$ is an equilateral triangle.




**Exercise 6:** Secant $\overleftrightarrow{ABC}$ intersects a circle at A and B. Chord $\overline{BD}$ is drawn. Prove that

$m\angle CBD \neq \frac{1}{2} mBD$