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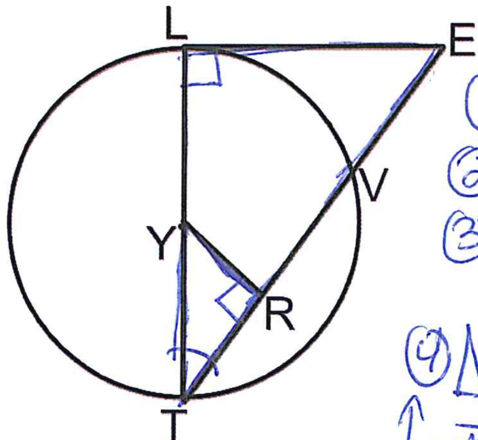
Geometry

Similar Triangle Proofs with Circle Theorems

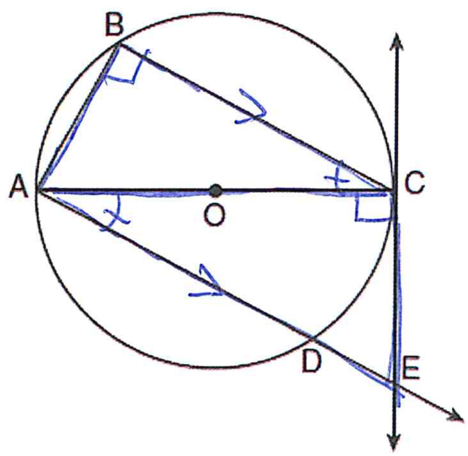
1. In circle Y, tangent $\overline{LE}$ is drawn to diameter $\overline{TYL}$ and $\overline{YR} \perp \overline{TE}$. Prove that $\frac{\overline{TE}}{\overline{TY}} = \frac{\overline{TL}}{\overline{TR}}$.



Statements	Reasons
(1) $\overline{YR} \perp \overline{TE}$	(1) given
(2) $\angle TRY \cong \angle TLE$	(2) A tangent intersecting a diameter and perpendicular lines form ≅ right angles
(3) $\angle T \cong \angle T$	(3) Reflexive Property
(4) $\triangle TRY \sim \triangle TLE$	(4) AA
(5) $\frac{\overline{TE}}{\overline{TY}} = \frac{\overline{TL}}{\overline{TR}}$	(5) CSSTIP

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.

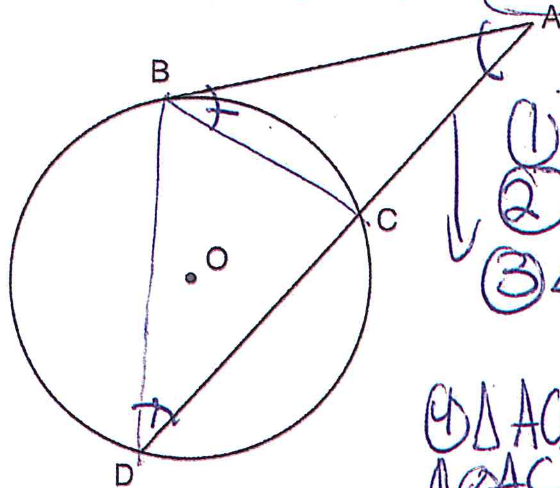
Prove: $\frac{BC}{CA} = \frac{AB}{EC}$



Statements	Reasons
(1) $\overline{BC} \parallel \overline{ADE}$	(1) given
(2) $\angle BCA \cong \angle EAC$	(2) Parallel lines cut by a transversal create ≅ alternate interior angles.
(3) $\angle ABC \cong \angle ACE$	(3) An inscribed angle that intercepts a semicircle and a tangent intersecting with a diameter form congruent right angles.
(4) $\triangle BCA \sim \triangle CAE$	(4) AA
(5) $\frac{\overline{BC}}{\overline{CA}} = \frac{\overline{AB}}{\overline{EC}}$	(5) CSSTIP

3. ~~11.~~ In the diagram below, secant $\overline{ACD}$ and tangent $\overline{AB}$ are drawn from external point A to circle O.

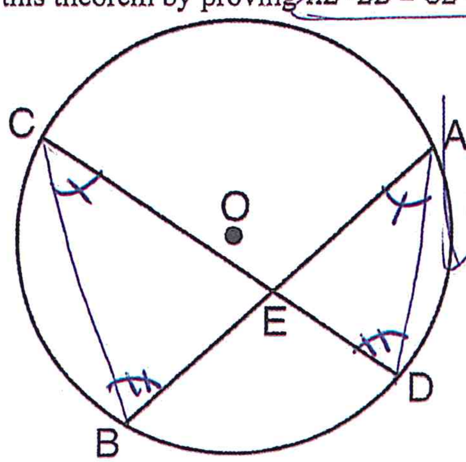
Prove the theorem: If a secant and a tangent are drawn to a circle from an external point, the product of the lengths of the secant segment and its external segment equals the length of the tangent segment squared. ($AC \cdot AD = AB^2$) → work backwards



Statements	Reasons
① $\overline{BC}, \overline{BD}$	① Auxiliary lines can be drawn
② $\angle BAC \cong \angle BAC$	② Reflexive Property
③ $\angle BDC \cong \angle ABC$	③ Angles inscribed to the same arc are $\cong$
④ $\triangle ACB \sim \triangle ABD$	④ AA $\cong$ AA
⑤ $\frac{AC}{AB} = \frac{AB}{AD}$	⑤ CSSTP
⑥ $AC \cdot AD = AB^2$	⑥ Cross products are equal

4. ~~12.~~ 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 $AE \cdot EB = CE \cdot ED$. → work backwards



Statements	Reasons
① $\overline{CB}, \overline{AD}$	① Auxiliary lines can be drawn
② $\angle BCE \cong \angle DAE$ $\angle CBE \cong \angle ADE$	② Angles inscribed to the same arc are $\cong$
③ $\triangle AED \sim \triangle CEB$	③ AA $\cong$ AA
④ $\frac{AE}{ED} = \frac{CE}{EB}$	④ CSSTP
⑤ $AE \cdot EB = CE \cdot ED$	⑤ Cross products are equal

* you could have also used vertical angles