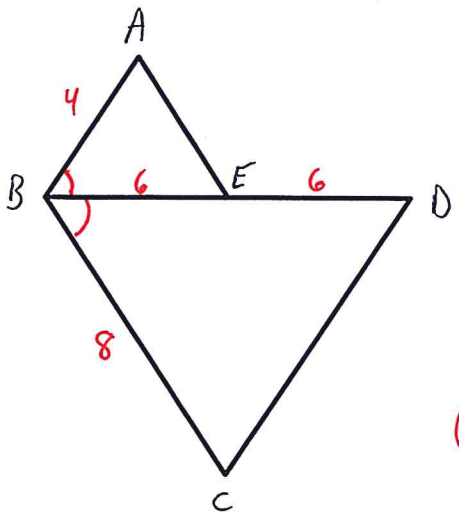
Geometric Proofs

Emphasis on Similarity by Side – Angle - Side

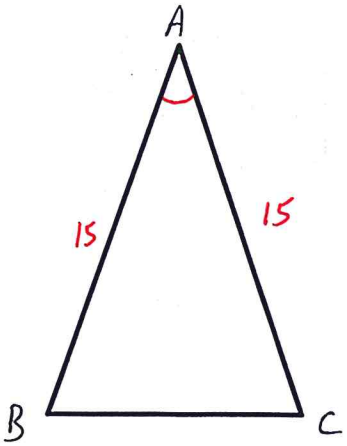
Prove each of the following using Side – Angle - Side:

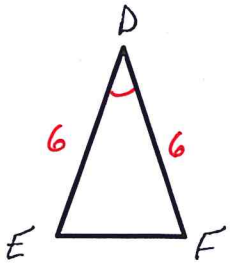
1. **Given:** ∠ B is bisected by $\overline{BD}$
   AB = 4, BE = 6
   CB = 8, ED = 6
   Prove: Δ ABE ~ Δ CBD



Statements	Reasons
① ∠B bisected by $\overline{BD}$; AB = 4; BE = 6; CB = 8; ED = 6	① Given
② ∠ABE ≅ ∠CBD	② Def bisected.
③ $\frac{AB}{CB} = \frac{4}{8} = \frac{1}{2}$	③ ÷ T/B by 4
④ $\frac{BE}{BD} = \frac{6}{12} = \frac{1}{2}$	④ ÷ T/B by 6
⑤ $\frac{AB}{CB} = \frac{BE}{BD} = \frac{1}{2}$	⑤ Transitive Property
⑥ Δ ABE ~ Δ CBD	⑥ SAS.

2. **Given:** AC = 15, AB = 15
   DF = 6, DE = 6
   ∠ A ≅ ∠ D
   Prove: Δ DEF ~ Δ ABC

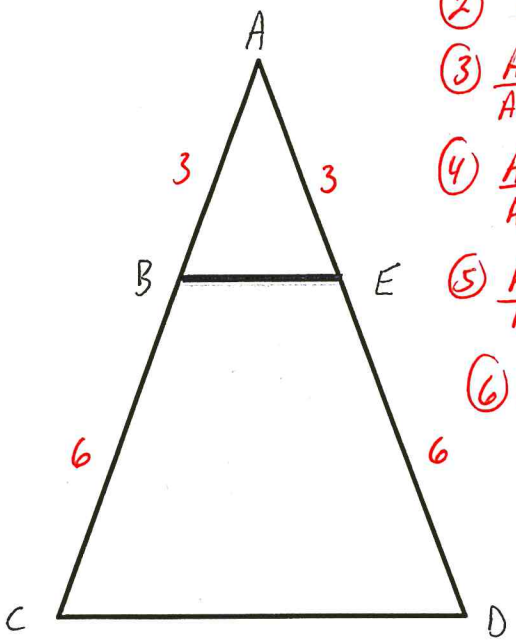




Statements	Reasons
① AC = 15, AB = 15, DF = 6, DE = 6; ∠A ≅ ∠D	① Given
② $\frac{DE}{AB} = \frac{6}{15} = \frac{2}{5}$	② ÷ T/B by 3
③ $\frac{DF}{AC} = \frac{6}{15} = \frac{2}{5}$	③ ÷ T/B by 3
④ $\frac{DE}{AB} = \frac{DF}{AC} = \frac{2}{5}$	④ Transitive Property
⑤ Δ DEF ~ Δ ABC	⑤ SAS.

3. **Given:** AB = 3, AE = 3
BC = 6, ED = 6

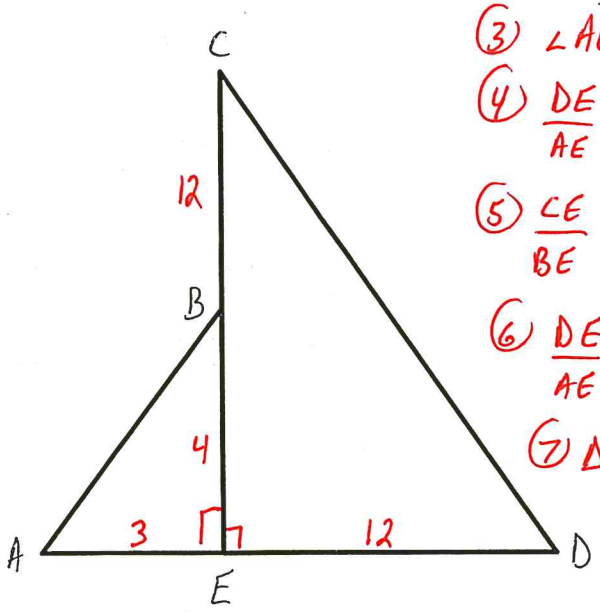
Prove: Δ ABE ~ Δ ACD



Statements	Reasons
① $AB = 3, AE = 3, BC = 6, ED = 6$	① Given
② $\angle A \cong \angle A$	② Reflexive Property
③ $\frac{AB}{AC} = \frac{3}{9} = \frac{1}{3}$	③ ÷ T/B by 3
④ $\frac{AE}{AD} = \frac{3}{9} = \frac{1}{3}$	④ ÷ T/B by 3
⑤ $\frac{AB}{AC} = \frac{AE}{AD} = \frac{1}{3}$	⑤ Transitive Property
⑥ $\Delta ABE \sim \Delta ACD$	⑥ SAS

4. **Given:** $\overline{CE} \perp \overline{AD}$
AE = 3, BE = 4
DE = 12, CB = 12

Prove: Δ CDE ~ Δ BAE



Statements	Reasons
① $\overline{CE} \perp \overline{AD}$; $AE = 3$; $BE = 4$; $DE = 12$; $CB = 12$	① Given
② $\angle AEB$ & $\angle DEC$ are Rt $\angle$'s	② Def $\perp$
③ $\angle AEB \cong \angle DEC$	③ Rt. $\angle$'s $\cong$ Thm
④ $\frac{DE}{AE} = \frac{12}{3} = \frac{4}{1}$	④ ÷ T/B by 3
⑤ $\frac{CE}{BE} = \frac{16}{4} = \frac{4}{1}$	⑤ ÷ T/B by 4
⑥ $\frac{DE}{AE} = \frac{CE}{BE} = \frac{4}{1}$	⑥ Transitive Prop.
⑦ $\Delta CDE \sim \Delta BAE$	⑦ SAS