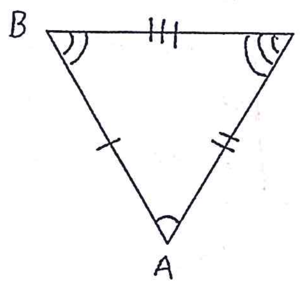
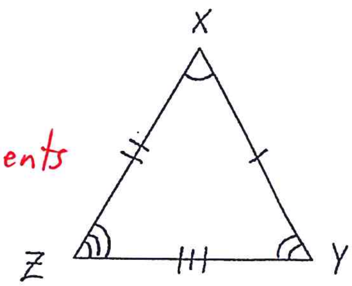
Unit 4: Similarities

PRE-TEST

For the following set of triangles provide CONGRUENCE statements showing Δ ABC ≅ Δ XYZ:

1. *This is NOT a proof!*





Remember congruence statements have 3 statements showing corresponding ∠'s of the Δ's are congruent, and 3 statements showing corresponding side lengths are congruent.

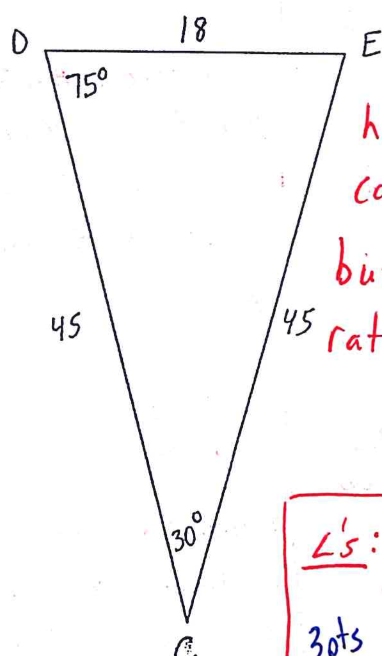
∠'s: $\angle A \cong \angle X$, $\angle B \cong \angle Y$, $\angle C \cong \angle Z$ — 3pts

Side Lengths: $\overline{AB} \cong \overline{XY}$, $\overline{AC} \cong \overline{XZ}$, $\overline{BC} \cong \overline{YZ}$ — 3pts

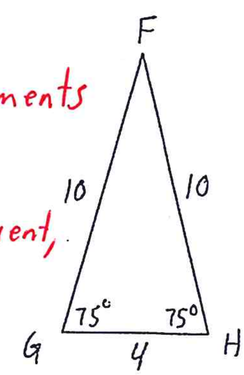
Answer Needed.

For the following set of triangles provide SIMILARITY statements showing Δ CDE ~ Δ FGH:

2. *This is NOT a proof!*



Remember similarity statements have 3 statements showing corresponding angles are congruent, but the sides show the ratios are proportional.



∠'s: $\angle C \cong \angle F$, $\angle D \cong \angle G$, $\angle E \cong \angle H$ — 3pts

sides: $\frac{CD}{FG} = \frac{DE}{GH} = \frac{CE}{FH} = \frac{9}{2}$ — 4pts

show work: $\frac{45 \div 5}{10 \div 5} = \frac{18 \div 2}{4 \div 2} = \frac{45 \div 5}{10 \div 5}$

$\frac{9}{2}$ $\frac{9}{2}$ $\frac{9}{2}$

For #3 and 4, SSS is not an option because I cannot say $\overline{AB} \cong \overline{DE}$. We only know they are parallel, not $\cong$.

Prove the following triangles are CONGRUENT using two different techniques (SSS, SAS, ASA, AAS, or HL):

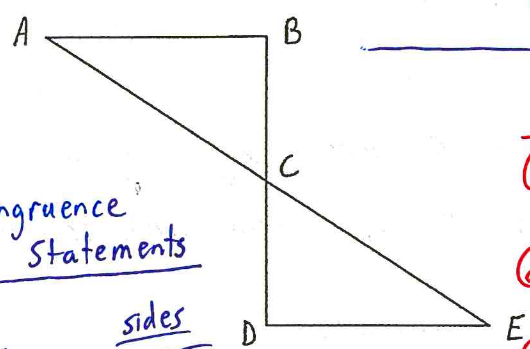
3. **Given:** C is the midpoint of $\overline{AE}$ & $\overline{BD}$

$\overline{AB} \parallel \overline{ED}$

$\overline{BD} \perp \overline{AB}$

$\overline{BD} \perp \overline{DE}$

Prove: $\Delta ABC \cong \Delta DEC$



Statements	Reasons
① $\overline{AB} \parallel \overline{ED}$; $\overline{BD} \perp \overline{AB}$; $\overline{BD} \perp \overline{DE}$; C is midpt of $\overline{AE}$ and $\overline{BD}$	① Given
② $\overline{AC} \cong \overline{EC}$ & $\overline{BC} \cong \overline{CD}$	② Definition Midpoint.
③ $\angle ACB \cong \angle ECD$	③ Vertical Angles
④ $\Delta ABC \cong \Delta DEC$	④ SAS

Statements	Reasons
① $\overline{AB} \parallel \overline{ED}$; $\overline{BD} \perp \overline{AB}$; $\overline{BD} \perp \overline{DE}$; C is midpt of $\overline{AE}$ and $\overline{BD}$	① Given
② $\angle A \cong \angle E$	② Alternate Interior Angles.
③ $\overline{AC} \cong \overline{EC}$	③ Definition Midpoint
④ $\angle ACB \cong \angle ECD$	④ Vertical Angles.
⑤ $\Delta ABC \cong \Delta DEC$	⑤ ASA

Congruence Statements

$\angle$'s	sides
$\angle A \cong \angle E$	$\overline{AB} \cong \overline{DE}$
$\angle B \cong \angle D$	$\overline{BC} \cong \overline{CD}$
$\angle ACB \cong \angle ECD$	$\overline{AC} \cong \overline{EC}$

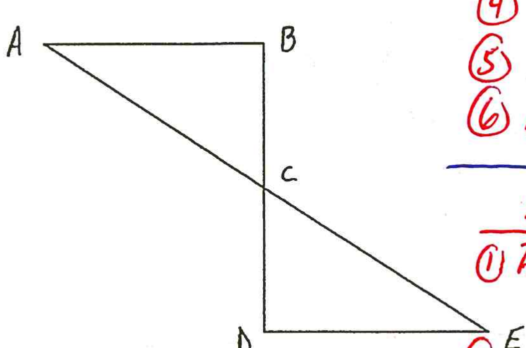
4. **Given:** C is the midpoint of $\overline{AE}$ & $\overline{BD}$

$\overline{AB} \parallel \overline{ED}$

$\overline{BD} \perp \overline{AB}$

$\overline{BD} \perp \overline{DE}$

Prove: $\Delta ABC \cong \Delta DEC$



Statements	Reasons
① $\overline{AB} \parallel \overline{ED}$; $\overline{BD} \perp \overline{AB}$; $\overline{BD} \perp \overline{DE}$; C is midpt of $\overline{AE}$ and $\overline{BD}$	① Given
② $\angle ACB \cong \angle ECD$	② Vertical Angles
③ $\overline{BC} \cong \overline{CD}$	③ Definition Midpoint.
④ $\angle B$ and $\angle D$ are Rt. $\angle$'s.	④ Definition $\perp$
⑤ $\angle B \cong \angle D$	⑤ Rt $\angle$'s $\cong$ Thm
⑥ $\Delta ABC \cong \Delta DEC$	⑥ ASA

Statements	Reasons
① $\overline{AB} \parallel \overline{ED}$; $\overline{BD} \perp \overline{AB}$; $\overline{BD} \perp \overline{DE}$; C midpoint of $\overline{AE}$ and $\overline{BD}$	① Given
② $\angle A \cong \angle E$	② Alt. Int. $\angle$'s.
③ $\angle B$ and $\angle D$ are Rt $\angle$'s	③ Definition $\perp$
④ $\angle B \cong \angle D$	④ Rt $\angle$'s $\cong$ Thm
⑤ $\overline{BC} \cong \overline{CD}$	⑤ Definition Midpt.
⑥ $\Delta ABC \cong \Delta DEC$	⑥ AAS

Continuing #3 and #4

Statements	Reasons
① $\overline{AB} \parallel \overline{ED}$; $\overline{BD} \perp \overline{AB}$; $\overline{BD} \perp DE$ C midpt of $\overline{AE}$ and $\overline{BD}$	① Given
② $\angle A \cong \angle E$	② Alternate Interior Angles
③ $\angle B$ and $\angle D$ are Rt $\angle$'s	③ Definition $\perp$
④ $\angle B \cong \angle D$	④ Right $\angle$'s $\cong$ Thm.
⑤ $\overline{AC} \cong \overline{EC}$	⑤ Definition midpoint.
⑥ $\triangle ABC \cong \triangle DEC$	⑥ AAS

Statements	Reasons
① $\overline{AB} \parallel \overline{ED}$; $\overline{BD} \perp \overline{AB}$; $\overline{BD} \perp DE$ C is midpoint of $\overline{AE}$ and $\overline{BD}$	① Given
② $\angle B$ and $\angle D$ are Rt $\angle$'s	② Definition $\perp$
③ $\triangle ABC$ and $\triangle DEC$ are Right $\triangle$'s	③ Definition of Rt. $\triangle$
④ $\overline{AC} \cong \overline{CE}$ $\overline{BC} \cong \overline{CD}$	④ Definition of midpoint.
⑤ $\triangle ABC \cong \triangle DEC$	⑤ HL.

I have provided 6 proofs for #3 and #4. You will need to choose 2 paths to prove them on the test. Which two you choose are completely up to you, based on the information given.

Similarity Statements

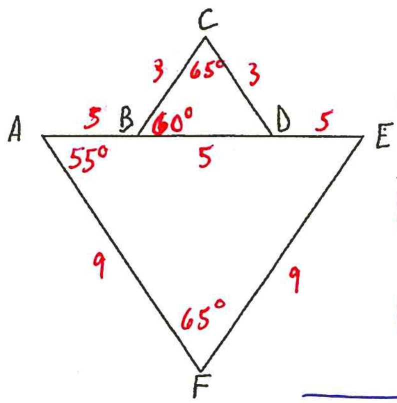
$\angle C \cong \angle F$
$\angle A \cong \angle CDB$
$\angle E \cong \angle CBD$

$\frac{FE}{CB} = \frac{EA}{BD} = \frac{FA}{CD} = ?$

Prove the following triangles are SIMILARITY using two different techniques (SSS, SAS, or AA):

5. Given: $\overline{AB} = 5$, $\overline{BD} = 5$, $\overline{DE} = 5$, $\overline{BC} = 3$, $\overline{CD} = 3$, $\overline{AF} = 9$, $\overline{EF} = 9$, $\angle A = 55^\circ$, $\angle F = 65^\circ$, $\angle C = 65^\circ$, $\angle CBD = 60^\circ$

Prove: Δ FEA ~ Δ CBD



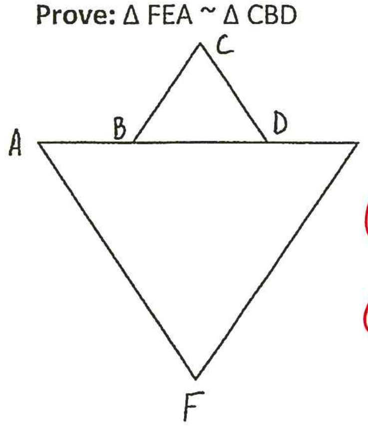
Statements	Reasons
① $\overline{AB} = 5, \overline{BD} = 5, \overline{DE} = 5; \overline{BC} = 3; \overline{CD} = 3$; $\overline{AF} = 9; \overline{EF} = 9; \angle A = 55^\circ; \angle F = 65^\circ$; $\angle C = 65^\circ$; $\angle CBD = 60^\circ$	① Given
② $\angle E = 180^\circ - 65^\circ - 55^\circ$; $\angle E = 60^\circ$; $\angle CDB = 180 - 65 - 60$; $\angle CDB = 55^\circ$	② Triangle Sum Thm.
③ $\angle E = \angle CBD$; $\angle CDB = \angle A$	③ Transitive Property
④ $\angle E \cong \angle CBD$; $\angle CDB \cong \angle A$	④ Definition $\cong$
⑤ $\Delta FEA \sim \Delta CBD$	⑤ AA

could also use $\angle F = \angle C$

Then say $\angle F \cong \angle C$

6. Given: $\overline{AB} = 5$, $\overline{BD} = 5$, $\overline{DE} = 5$, $\overline{BC} = 3$, $\overline{CD} = 3$, $\overline{AF} = 9$, $\overline{EF} = 9$, $\angle A = 55^\circ$, $\angle F = 65^\circ$, $\angle C = 65^\circ$, $\angle CBD = 60^\circ$

Prove: Δ FEA ~ Δ CBD



Statements	Reasons
① $\overline{AB} = 5; \overline{BD} = 5; \overline{DE} = 5; \overline{BC} = 3; \overline{CD} = 3$; $\overline{AF} = 9; \overline{EF} = 9; \angle A = 55^\circ; \angle F = 65^\circ$; $\angle C = 65^\circ$; $\angle CBD = 60^\circ$	① Given
② $\frac{FE}{CB} = \frac{9}{3} = \frac{3}{1}$	② Divide Top & Bottom by 3.
③ $\frac{EA}{BD} = \frac{15}{5} = \frac{3}{1}$	③ Divide Top & Bottom by 5
④ $\frac{FA}{CD} = \frac{9}{3} = \frac{3}{1}$	④ Divide Top & Bottom by 3
⑤ $\frac{FE}{CB} = \frac{EA}{BD} = \frac{FA}{CD} = \frac{3}{1}$	⑤ Transitive Property
⑥ $\Delta FEA \sim \Delta CBD$	⑥ SSS

Continuing #5 and #6

Statements	Reasons
(1) $\overline{AB} = 5$; $\overline{BD} = 5$; $\overline{DE} = 5$, $\overline{BC} = 3$; $\overline{CD} = 3$; $\overline{AF} = 9$ $\overline{EF} = 9$; $\angle A = 55°$; $\angle F = 65°$; $\angle C = 65°$; $\angle CBD = 60°$	(1) Given
(2) $\angle C = \angle F$	(2) Transitive Property
(3) $\angle C \cong \angle F$	(3) Definition of $\cong$.
(4) $\frac{FE}{CB} = \frac{9}{3} = \frac{3}{1}$ $\frac{FA}{CD} = \frac{9}{3} = \frac{3}{1}$	(4) Divide Top and Bottom by 3
(5) $\frac{FE}{CB} = \frac{FA}{CD} = \frac{3}{1}$	(5) Transitive Property
(6) $\Delta FEA \sim \Delta CBD$	(6) SAS

For AA, You need a combination of 2 angles. Which 2 you choose is up to you.

For SAS, you need a corner. I chose the top corners, but you could use all 3 here with the proper steps taken.

Remember you need 2 proofs using 2 different techniques!