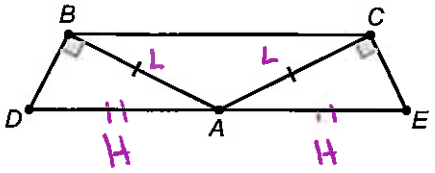
Geometry R – Mr. Bo
Unit 5 – Day 6 Notes

Name notes.
Date

Overlapping Triangles & HL Proofs

Given: Isosceles Triangle ABC
A midpoint of $\overline{DE}$
∠DBA and ∠ECA are Right

Prove: $\overline{BD} \cong \overline{CE}$



1. After assessing the problem situation, a student quickly decides they are going to use vertical angles to prove $\Delta ABD \cong \Delta ACE$ by A.S.A. Explain how the student has incorrectly assessed the situation.

the student miss took ∠BAD and ∠CAE as vertical. they are not vertical because vertical ∠'s are formed by the intersection of 2 lines not 3.

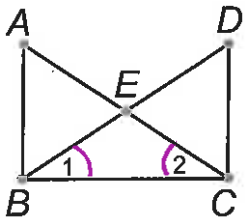
2. Complete a proof of the problem above that uses the HL congruency postulate.

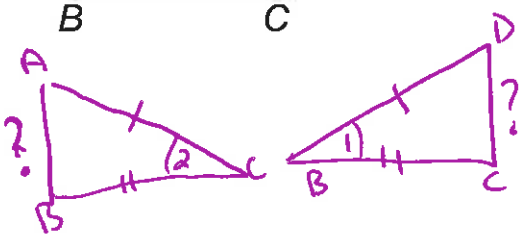
Statement	Reason
① Isosc. △ABC, A midpt of $\overline{DE}$, ∠DBA, ∠ECA are rt	① Given
Legs ② $\overline{BA} \cong \overline{CA}$	② Isosc. △ has 2 ≅ sides.
hypots. ③ $\overline{DA} \cong \overline{EA}$	③ midpt ⅁ segs into 2 ≅ segs.
④ △DBA ≅ △ECA	④ HL

Overlapping Triangles – Often times, a geometry picture will contain many overlapping triangles and it is unclear which triangles should be shown congruent. In these cases, redrawing the picture to single out the suspected congruent triangles can help determine a direction for the proof.

Example: For each problem, redraw the picture to separate out the suspected congruent triangles based on the given information. ***Hint: Which triangles contain the parts in the "given" statements?*** *Name the two triangles drawn and* complete a proof.

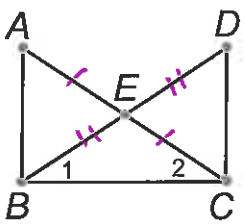
3a. Given: $\angle 1 \cong \angle 2$
$\overline{AC} \cong \overline{DB}$
Prove: $\overline{AB} \cong \overline{DC}$

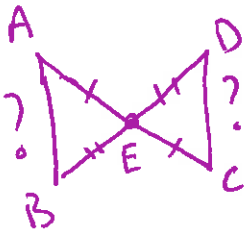




Statement	Reason
1) $\angle 1 \cong \angle 2$ $\overline{AC} \cong \overline{DB}$	1) Given
2) $\overline{BC} \cong \overline{BC}$	2) Reflexive.
3) $\triangle ABC \cong \triangle DCB$	3) SAS
4) $\overline{AB} \cong \overline{DC}$	4) CPCTC

3b. Given: $\overline{AC}$ & $\overline{BD}$ bisect each other
Prove: $\overline{AB} \cong \overline{DC}$





Statement	Reason
1) $\overline{AC}$ bisects $\overline{BD}$ $\overline{BD}$ bisects $\overline{AC}$	1) Given
2) Midpt of $\overline{BD}$ and $\overline{AC}$	2) Seg. bisector goes through m.p.
3) $\overline{AE} \cong \overline{CE}$ $\overline{BE} \cong \overline{DE}$	3) midpt ⇒ segs into 2 ≅ segs.
4) $\angle AEB \cong \angle CED$	4) vert. $\angle$'s ≅
5) $\triangle AEB \cong \triangle CED$	5) SAS
6) $\overline{AB} \cong \overline{DC}$	6) CPCTC

Proving Triangles congruent using parts from other congruent triangles

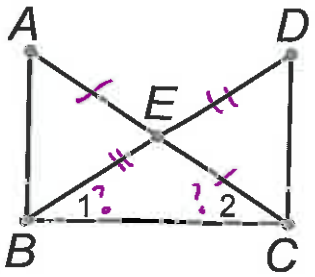
Sometimes a proof problem may require you to prove two triangles congruent based off parts from other congruent triangles. Essentially, this requires you to prove more than one pair of triangles congruent in a single proof.

Consider this example:

Given: $\overline{AC}$ & $\overline{BD}$ bisect each other

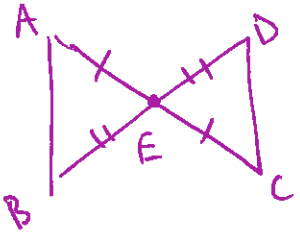
$\overline{AC} \cong \overline{DB}$

Prove: $\angle 1 \cong \angle 2$



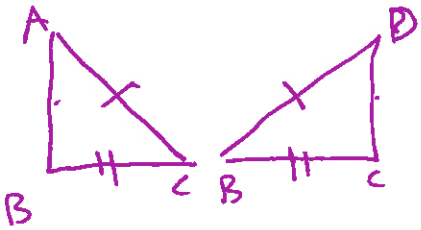
4. For each "given" statement, redraw the picture to separate out the suspected congruent triangles and name the two triangles drawn.

a. $\overline{AC}$ & $\overline{BD}$ bisect each other



△AEB and △CED

b. $\overline{AC} \cong \overline{DB}$



△ABC and △DCB

5. Of the two pairs of triangles drawn and named in #4, which pair does ∠1 and ∠2 belong to?

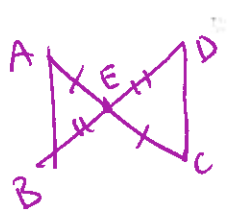
△ABC and △DCB.

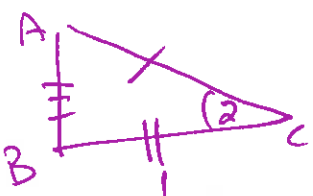
6. Based on your drawings in #4, how will showing $\Delta AEB \cong \Delta CED$ help in showing $\Delta ACB \cong \Delta DBC$? Explain.

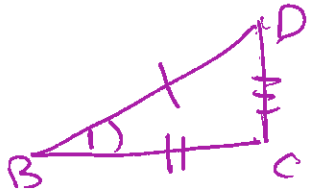
We can use △AEB and △CED to show $\overline{AB} \cong \overline{CD}$

Since $\overline{AB}$ and $\overline{CD}$ are in △'s ABC and DCB, we can use them to show △ABC ≅ △DCB by SSS.

7. Complete a proof for this problem on the back of this page.







Statement	Reason.
(1.) $\overline{AC}$ and $\overline{DB}$ bisect eachother $\overline{AC} \cong \overline{DB}$	(1) Given
(2.) E midpt of $\overline{AC}$ and $\overline{BD}$	(2) Seg. bisector goes through midpt.
(3.) $\overline{AE} \cong \overline{CE}$, $\overline{BE} \cong \overline{DE}$	(3) midpt $\Rightarrow$ segs. into 2 $\cong$ segs.
(4.) $\angle AEB \cong \angle CED$	(4) Vert. $\angle$'s $\cong$
(5.) $\triangle AEB \cong \triangle CED$	(5) SAS
(6.) $\overline{AB} \cong \overline{CD}$	(6) cpctc
(7.) $\overline{BC} \cong \overline{BC}$	(7) Reflexive
(8.) $\triangle ABC \cong \triangle DCB$	(8) SSS
(9.) $\angle 1 \cong \angle 2$	(9) cpctc.