Two Column Proof

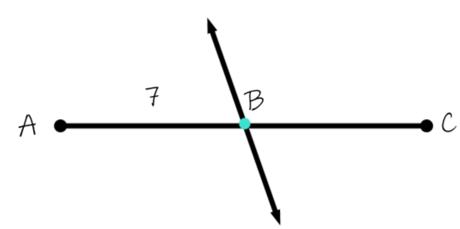
- A Two Column Proof is just a way to organize an argument. On the left side of the table, we put true ___________, and on the right side, we put the _________/_________ for that statement.
- Each line of the proof is one of the _________ we take towards proving our argument.
- The _________ that we use might be given in the problem, a definition, postulate, or theorem.

	Reasons/Justification
If something is marked in the diagram, or in the given information.....	
If you see that the triangles are sharing a side.....	
If you see parallel lines... • •	
If you see vertical angles....	
When you write a congruence statement for two triangles...	
If the proof involves triangles, but is asking you to prove a pair of side or angles for you final answer.....	

Let's review some definitions, and how we can use them in two column proof.

Example 1: Prove that the length of $\overline{BC} = 7$

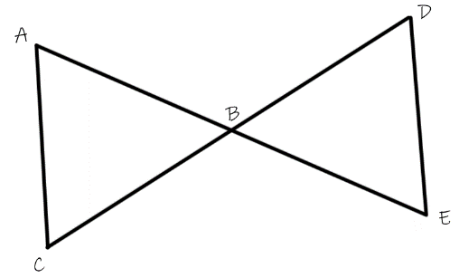
Given: $\overline{AB} = 7$, and B is the midpoint of $\overline{AC}$.



- The **Midpoint** of a segment __________ the segment into two _________ pieces.

Statements	Reasons/Justification
1. $\overline{AB} = 7$	
2. B is the midpoint of $\overline{AC}$.	
3. $\overline{AB} \cong \overline{BC}$	
4. $\overline{BC} = 7$	**Transitive Property of Equality**

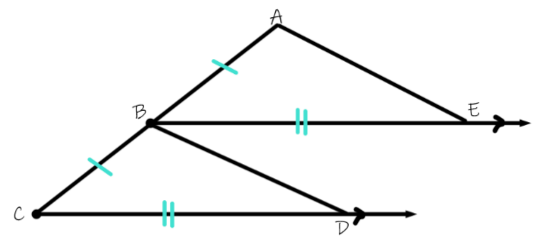
Now, lets see how it works with **Triangles.**



Example 2: Given: B is the midpoint of $\overline{AE}$, $\angle A \cong \angle E$

PROVE: $\triangle ABC \cong \triangle EBD$

Statements	Reasons/Justifications
1. B is the Midpoint of $\overline{AE}$	
2.	Definition of Midpoint
3. $\angle A \cong \angle E$	
4.	Vertical Angles are congruent
5. $\triangle ABC \cong \triangle EBD$	

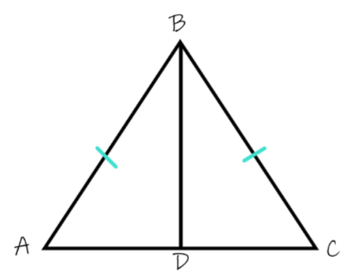


Example 3: Let's look at how parallel lines can help us with a proof.

Given: $\overline{CB} \cong \overline{BA}$, $\overline{CD} \cong \overline{BE}$, $\overline{CD} \parallel \overline{BE}$

PROVE: $\triangle ABE \cong \triangle BCD$

Statements	Reasons/Justifications
1. $\overline{CB} \cong \overline{BA}$	
2. $\overline{CD} \cong \overline{BE}$	
3. $\overline{CD} \parallel \overline{BE}$	
4.	Corresponding Angles are Congruent
5. $\triangle ABE \cong \triangle BCD$	



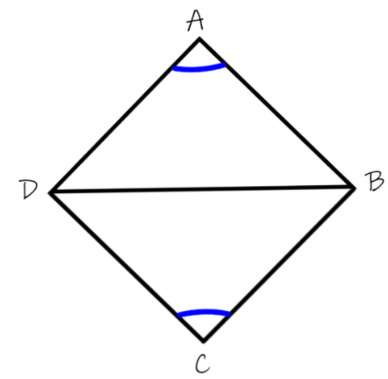
Example 4: Reminder...which Property do we use when triangles share a side? ______________________

Given: $\overline{AB} \cong \overline{CB}$, D is the midpoint of $\overline{AC}$.

PROVE: $\triangle ADB \cong \triangle CDB$

Statements	Reasons/Justifications
1. $\overline{AB} \cong \overline{CB}$	
2. D is the midpoint of $\overline{AC}$	
3.	Definition of Midpoint
4. $\overline{BD} \cong \overline{BD}$	
5. $\triangle ADB \cong \triangle CDB$	

Example 6: Recall, an **angle bisector** divides one angle into _______ congruent ______.

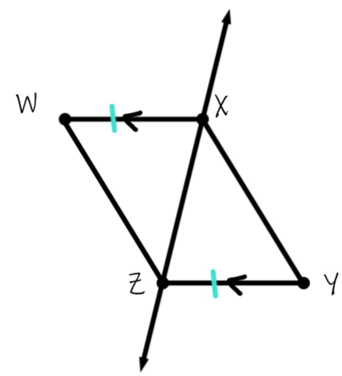


Given: $\angle A \cong \angle C$, and $\overline{DB}$ is bisecting $\angle ABC$.

PROVE: $\triangle DAB \cong \triangle DCB$

Statements	Reasons/Justifications
1.	Given
2.	Given
3. $\angle ABD \cong \angle CBD$	Definition of _________
4. $\overline{BD} \cong \overline{BD}$	
5. $\triangle DAB \cong \triangle DCB$	

7. You Try!



Given: $\overline{WX} \cong \overline{YZ}$, and $\overline{WX} \parallel \overline{YZ}$

PROVE: $\triangle WXZ \cong \triangle YZX$

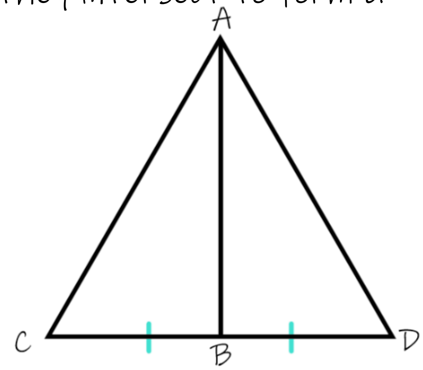
Statements	Reasons/Justifications
1.	Given
2. $\overline{WX} \parallel \overline{YZ}$	
3.	Alternate Interior Angles are Congruent
4. $\overline{XZ} \cong \overline{XZ}$	
5. $\triangle WXZ \cong \triangle YZX$	

Lets talk about **right triangles**!

QUICK QUIZ....

8. **True or False:** Hypotenuse leg is the only theorem/postulate that can be used to show that two right triangles are congruent. ________________

9. Recall, if two lines are __________ to each other then they intersect to form a right angle.



Let's look at a proof that uses this property!

Given: $\overline{AB} \perp \overline{CD}$, $\overline{CB} \cong \overline{DB}$

PROVE: $\triangle ABC \cong \triangle ABD$

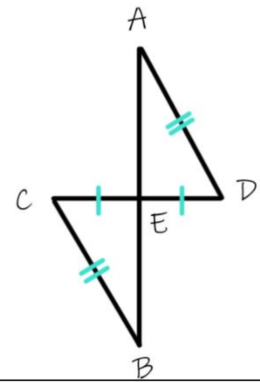
Statements	Reasons/Justifications
1. $\overline{CB} \cong \overline{DB}$	
2.	Given
3. $\angle ABC$ and $\angle ABD$ are 90°	Definition of __________.
4.	ALL Right Angles are Congruent
5.	
6. $\triangle ABC \cong \triangle ABD$	

** When using SSS, SAS, ASA, or AAS for right triangles, we must state that our 90° angles are congruent**

HL Proofs are a little bit different! Lets take a look.

Quick Question...What is the only kind of triangle that we can use **HL** on? __________

So as we are writing our proof, we will need a statement and a justification that what we are working with is actually a right triangle.



<u>Example 10:</u>

Given: $\overline{AB} \perp \overline{CD}$, $\overline{CB} \cong \overline{DA}$, $\overline{CE} \cong \overline{DE}$

PROVE: $\triangle ECB \cong \triangle EDA$

Statements	Reasons/Justifications
1. $\overline{CB} \cong \overline{DA}$	
2.	Given
3. $\overline{AB} \perp \overline{CD}$	
4. _____ and ______ are 90°	Definition of Perpendicular
5. $\triangle ECB$ and $\triangle EDA$ are right triangles.	
6. $\triangle ECB \cong \triangle EDA$	