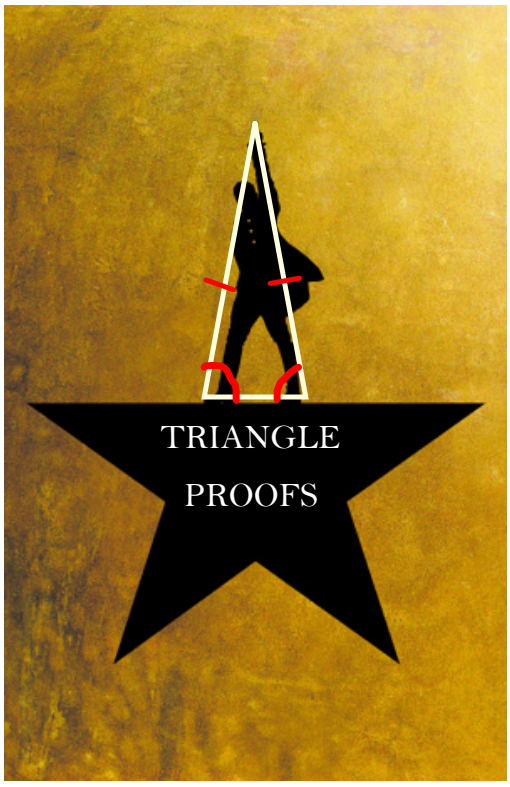



Good Morning!

1. First and Last name
2. "Here"
3. Notes on writing proofs
4. Quiz


come find me
when you have proof.
ICANHASCHEEZBURGER.COM

# Two Column Proof

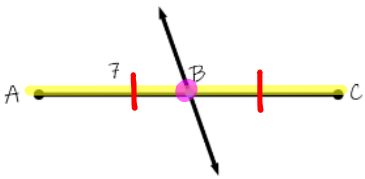
- A Two Column Proof is just a way to organize an argument. On the left side of the table, we put true Statements, and on the right side, we put the justification/reason for that statement.
- Each line of the proof is one of the steps we take towards proving our argument.
- The reasons that we use might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

| | Reasons/Justification |
|---|---|
| If something is marked in the diagram, or in the given information..... | Write.... GIVEN |
| If you see that the triangles are sharing a side..... | Reflexive Property |
| If you see parallel lines...<br>• Look for alternate interior angles<br>• Or Corresponding angles | • Alternate Interior angles are Congruent<br>• Corresponding angles are congruent |
| If you see vertical angles.... | Vertical Angles are Congruent |
| When you write a congruence statement for two triangles... | SSS, SAS, ASA, AAS, HL |
| If the proof involves triangles, but is asking you to prove a pair of side or angles for you final answer..... | CPCTC→ Corresponding parts of congruent triangles are congruent |

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 divides the segment into two congruent pieces.

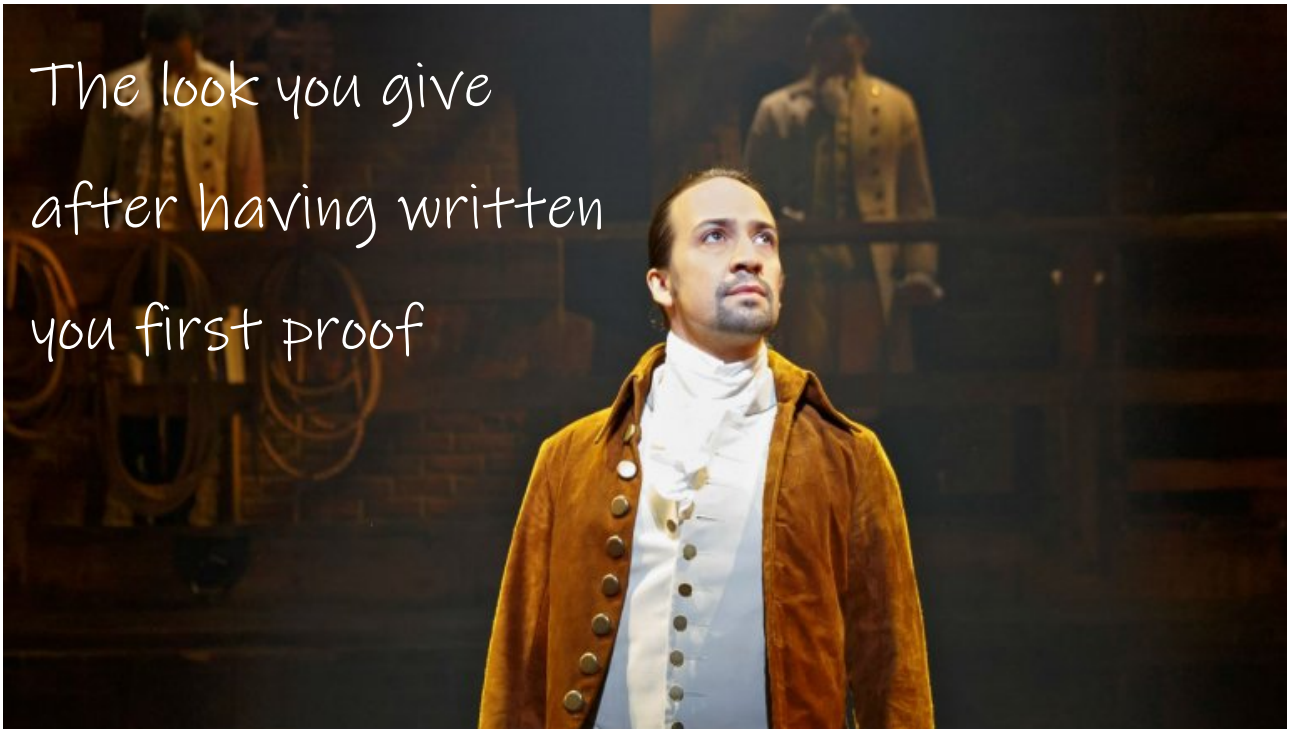
| Statements | Reasons/Justification |
|---|---|
| 1. $\overline{AB} = 7$ | GIVEN |
| 2. B is the midpoint of $\overline{AC}$. | GIVEN |
| 3. $\overline{AB} \cong \overline{BC}$ | Definition of midpoint |
| 4. $\overline{BC} = 7$ | Transitive Property of Equality |

$A = B = C$

$B = C$

$A = C$

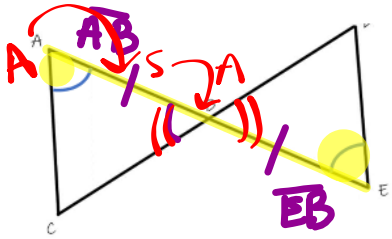
Transitive "Substitution"


The look you give
after having written
you first proof

Not Drawn to Scale!

Now, lets see how it works with Triangles.

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



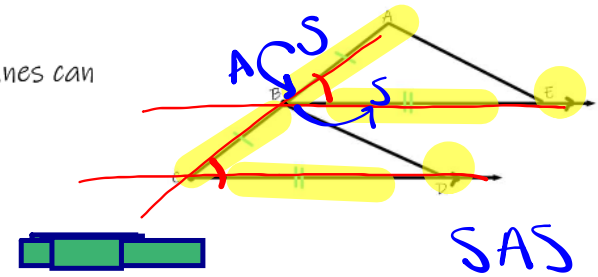

PROVE: $\triangle ABC \cong \triangle EBD$

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

**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: $\triangle ABE \cong \triangle BCD$

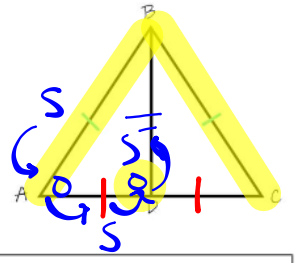



| Statements | Reasons/Justifications |
|---|---|
| 1. $\overline{CB} \cong \overline{BA}$ | Given |
| 2. $\overline{CD} \cong \overline{BE}$ | Given |
| 3. $\overline{CD} \parallel \overline{BE}$ | Given |
| 4. $\angle ABE \cong \angle BCD$ | Corresponding Angles are Congruent |
| 5. $\triangle ABE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

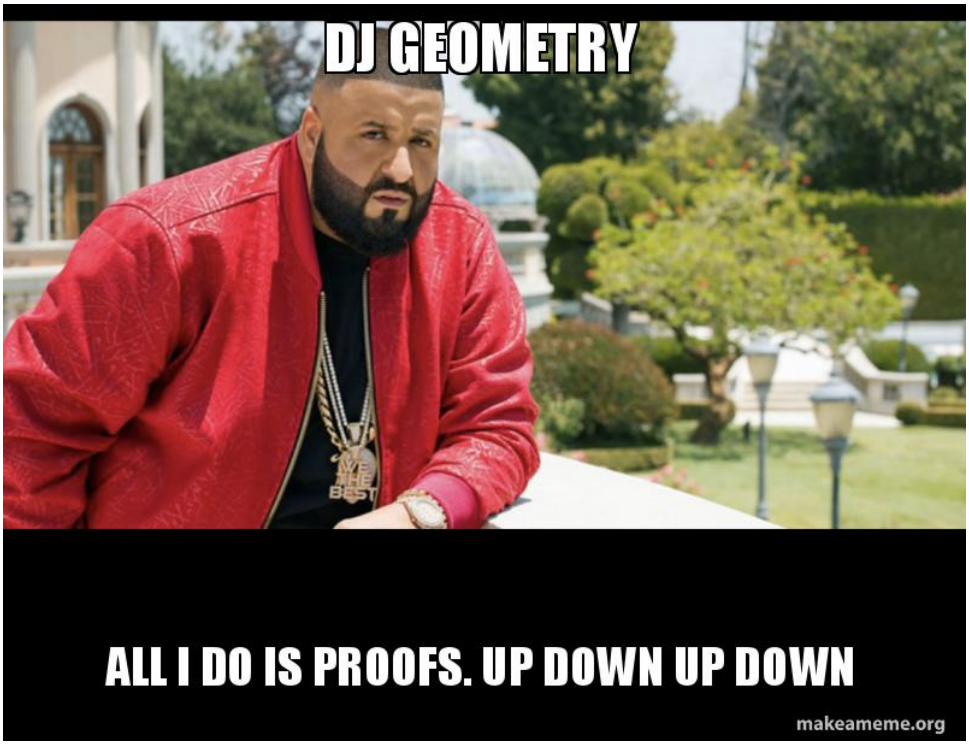
**Example 4:** Reminder...Which Property do we use when triangles share a side? REFLEXIVE PROPERTY

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

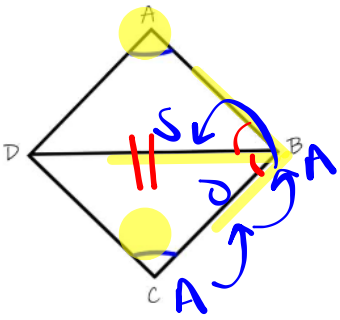
PROVE: $\triangle ADB \cong \triangle CDB$




| Statements | Reasons/Justifications |
|---|---|
| 1. $\overline{AB} \cong \overline{CB}$ | GIVEN |
| 2. D is the midpoint of $\overline{AC}$ | GIVEN |
| 3. $\overline{AD} \cong \overline{CD}$ | Definition of Midpoint |
| 4. $\overline{BD} \cong \overline{BD}$ | Reflexive Property |
| 5. $\triangle ADB \cong \triangle CDB$ | SSS |


DJ GEOMETRY
ALL I DO IS PROOFS. UP DOWN UP DOWN
makeameme.org

Example 6: Recall, an **angle bisector** divides one angle into two congruent angles.



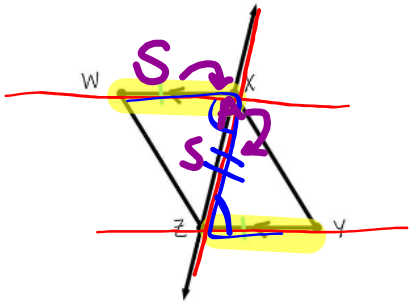

Given: $\angle A \cong \angle C$, and $\overline{DB}$ is bisecting $\angle ABC$.

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

| Statements | Reasons/Justifications |
|---|---|
| 1. $\angle A \cong \angle C$ | Given |
| 2. $\overline{DB}$ is bisecting $\angle ABC$ | Given |
| 3. $\angle ABD \cong \angle CBD$ | Definition of Angle Bisector |
| 4. $\overline{BD} \cong \overline{BD}$ | Reflexive Property |
| 5. $\triangle DAB \cong \triangle DCB$ | AAS |

7. You Try!

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



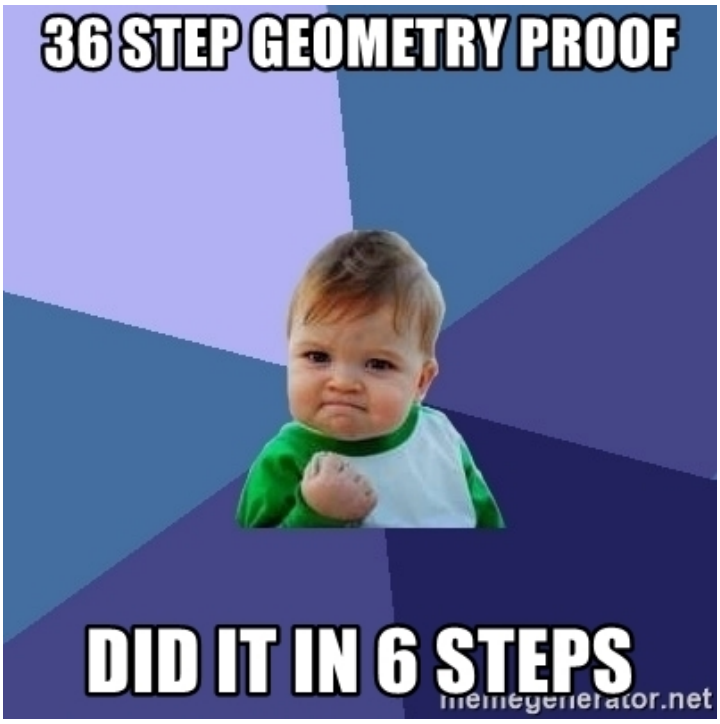

PROVE: $\triangle WXZ \cong \triangle YZX$

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

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. FALSE; we can use any of them. HL is just an extra one that only works on right triangles.

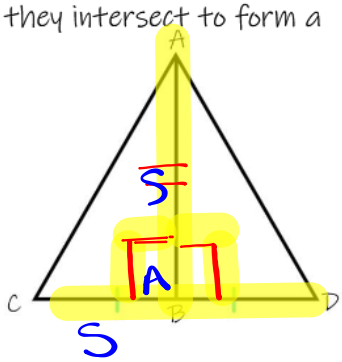

36 STEP GEOMETRY PROOF
DID IT IN 6 STEPS

9. Recall, if two lines are perpendicular 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. $\overline{CB} \cong \overline{DB}$ | Given |
| 2. $\overline{AB} \perp \overline{CD}$ | Given |
| 3. $\angle ABC$ and $\angle ABD$ are 90° | Definition of perpendicular. |
| 4. $\angle ABC \cong \angle ABD$ | ALL Right Angles are Congruent |
| 5. $\overline{AB} \cong \overline{AB}$ | Reflexive Property |
| 6. $\triangle ABC \cong \triangle ABD$ | SAS |

** 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.

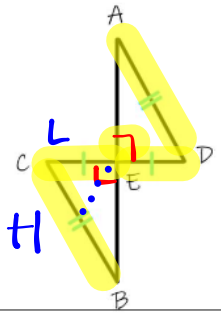
Quick Question...What is the only kind of triangle that we can use HL on? RIGHT $\triangle$s

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.

Example 10:

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. $\overline{CB} \cong \overline{DA}$ | GIVEN |
| 2. $\overline{CE} \cong \overline{DE}$ | Given |
| 3. $\overline{AB} \perp \overline{CD}$ | Given |
| 4. $\angle CEB$ and $\angle DEA$ are 90° | Definition of Perpendicular |
| 5. $\triangle ECB$ and $\triangle EDA$ are right triangles. | If a triangle has a right angle, it is a right triangle. |
| 6. $\triangle ECB \cong \triangle EDA$ | HL |

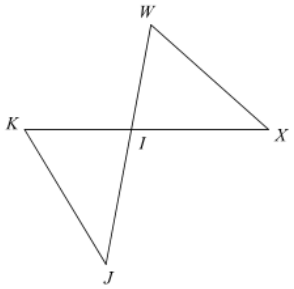
Geometry Name_____ ID: 1



Quiz Review Date_____ Period____

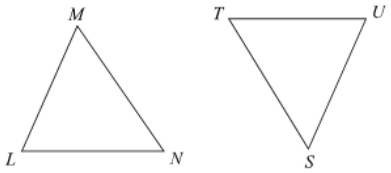
**Complete each congruence statement by naming the corresponding angle or side.**

1) $\triangle IJK \cong \triangle IXW$




$\overline{IJ} \cong$ ?

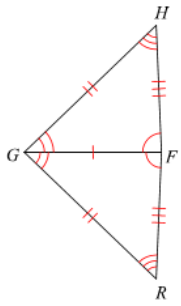
2) $\triangle LMN \cong \triangle UTS$



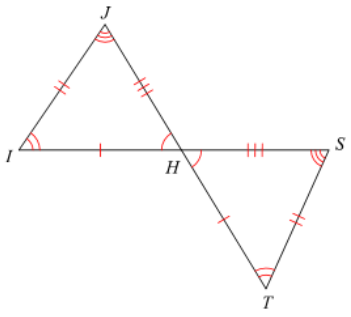

$\overline{LM} \cong$ ?

**The Triangles below are conguent. Write a congruence statement showing how the angles and sides match up.**

3)

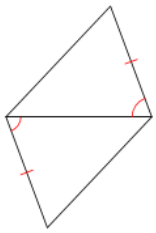



4)

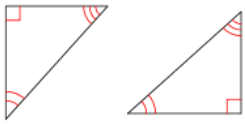



**Which postulate or theorem can be used to prove the triangles congruent? If none of them can be used, write "none."**

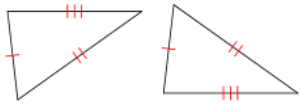
5)



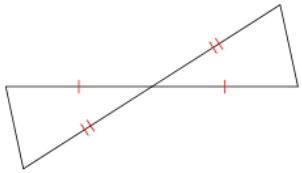
6)



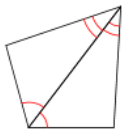
7)



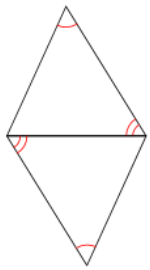
8)



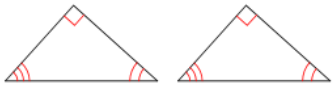
9)



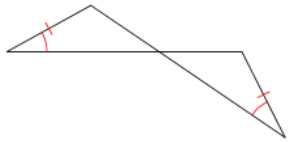
10)



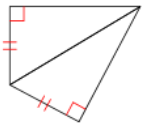
11)



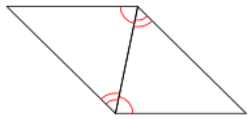
12)



13)



14)



15)