Geometry H
Section 4.4 H-L Notes

Name : key
Date : ______ Period : ____

LEARNING TARGETS

- I can prove triangles congruent using H-L

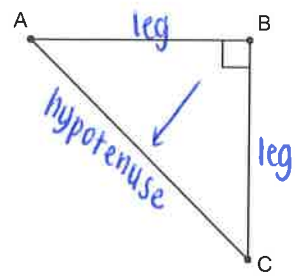
**Vocabulary:**

In a right triangle, the side opposite the right angle is called the hypotenuse.

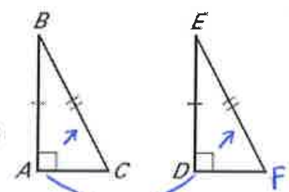
In a right triangle, the sides that form the right angle are called the legs.

In right triangle *ABC*, the hypotenuse is $\overline{AC}$.

The legs are $\overline{AB}$ and $\overline{BC}$.



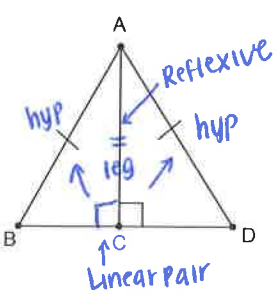

**There is a special method for proving right triangles are congruent. This method only works for right triangles!**

| **Hypotenuse – Leg Theorem (H-L)** | **Example:** |
|---|---|
| If the hypotenuse and leg of one right triangle are congruent to the hypotenuse and leg of a second right triangle, then the two triangles are congruent. | ① If **Hypotenuse** $\overline{BC} \cong$ $\overline{EF}$ ② and **Leg** $AB \cong$ $\overline{DE}$ in right triangles $\Delta ABC$ and $\Delta DEF$, then $\Delta ABC \cong$ $\Delta DEF$ by HL  ③ Right angles |

<u>**Example 1: Using H-L to identify congruent triangles**</u>

Can you prove the following triangles are congruent? Explain.

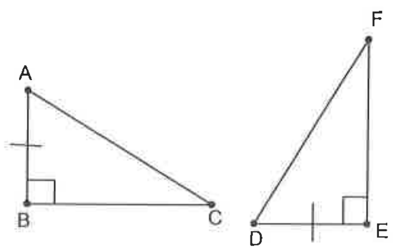
a.




Right <'s ✓
Hyp ✓
Leg ✓

Yes, $\Delta ABC \cong \Delta ADC$ by HL

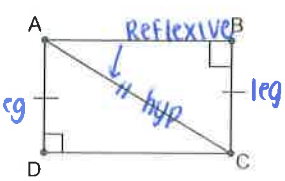
b.




Right <'s: ✓
Hyp: not marked
Leg: ✓

not enough info to prove $\cong$

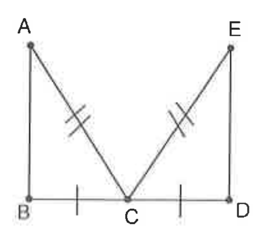
c.




Right <'s: ✓
Hyp: ✓
Leg: ✓

Yes, $\Delta ADC \cong \Delta ABC$ by HL

d.




Right <'s : not marked
Hyp: If no right <, no hyp
Leg: ✓

not enough info to prove $\cong$

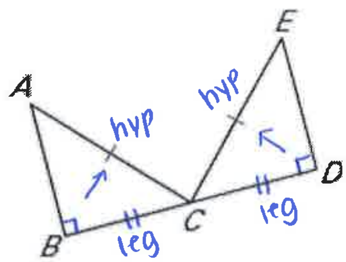
When writing a proof using H-L, it is important that you state the following three things in your explanation:

- That the two triangles are right triangles.
- One pair of legs is congruent.
- The two hypotenuse are congruent.

Example 2: Proofs involving H-L

a) **Given:** $\overline{AC} \cong \overline{EC}$; $\overline{AB} \perp \overline{BD}$; $\overline{ED} \perp \overline{BD}$;
$\overline{AC}$ *is a bisector of* $\overline{BD}$

**Prove:** $\triangle ABC \cong \triangle EDC$



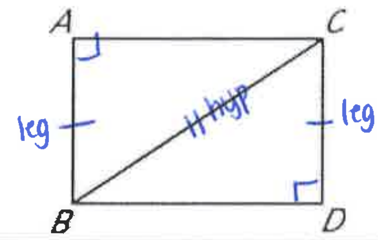

$\perp$ = perpendicular (right angles)

| Statements | Reasons |
|---|---|
| **1.** $\overline{AC} \cong \overline{EC}$ | **1.** Given |
| **2.** $\overline{AB} \perp \overline{BD}$; $\overline{ED} \perp \overline{BD}$ | **2.** Given |
| **3.** $\angle B$ and $\angle D$ are right angles | **3.** Def. of Perpendicular lines |
| **4.** $\triangle ABC$ and $\triangle DEC$ are right triangles | **4.** Def of Right Triangles |
| **5.** $\overline{AC}$ is a bisector of $\overline{BD}$ | **5.** Given |
| **6.** $\overline{BC} \cong \overline{DC}$ | **6.** Def. of Segment Bisector |
| **7.** $\triangle ABC \cong \triangle EDC$ | **7.** HL |

Right ∠'s ✓
Hyp ✓
leg ✓

b) **Given:** $\overline{AB} \cong \overline{DC}$; $\overline{BA} \perp \overline{AC}$; $\overline{CD} \perp \overline{DB}$

**Prove:** $\Delta ABC \cong \Delta DCB$



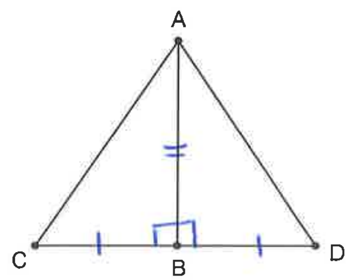

| Statements | Reasons |
|---|---|
| 1. $\overline{AB} \cong \overline{DC}$ | 1. Given |
| 2. $\overline{BA} \perp \overline{AC}$; $\overline{CD} \perp \overline{DB}$ | 2. Given |
| 3. $\angle A$ and $\angle D$ are right angles | 3. Def. of Perpendicular Lines |
| 4. $\Delta ABC$ and $\Delta DCB$ are right triangles | 4. Def. of Right Triangles |
| 5. $\overline{CB} \cong \overline{CB}$ | 5. Reflexive Prop |
| 6. $\Delta ABC \cong \Delta DCB$ | 6. HL |

Right ∠'s ✓
hyp ✓
leg ✓

## Does a right angle always mean we will use H-L? Let's see!

**Given:** $\overline{AB}$ is perpendicular bisector of $\overline{CD}$

**Prove:** $\Delta ABC \cong \Delta ABD$




| Statements | Reasons |
|---|---|
| 1. $\overline{AB}$ is perpendicular bisector of $\overline{CD}$ | 1. Given |
| 2. $\angle ABC$ and $\angle ABD$ are right angles | 2. Def. of Perpendicular Lines |
| 3. $\Delta ABC$ and $\Delta ABD$ are right triangles | 3. Def of right triangles |
| 4. $\overline{CB} \cong \overline{DB}$ | 4. Def. of Perpendicular Bisector |
| 5. $\overline{AB} \cong \overline{AB}$ | 5. Reflexive Prop |
| 6. $\Delta ABC \cong \Delta ABD$ | 6. SAS |

$$\left.\begin{array}{l}\text{Right ∠'s ✓} \\ \text{Hyp: not marked} \\ \text{Leg: ✓}\end{array}\right\} \text{can't use HL}$$