

MYSTERY PICTURE

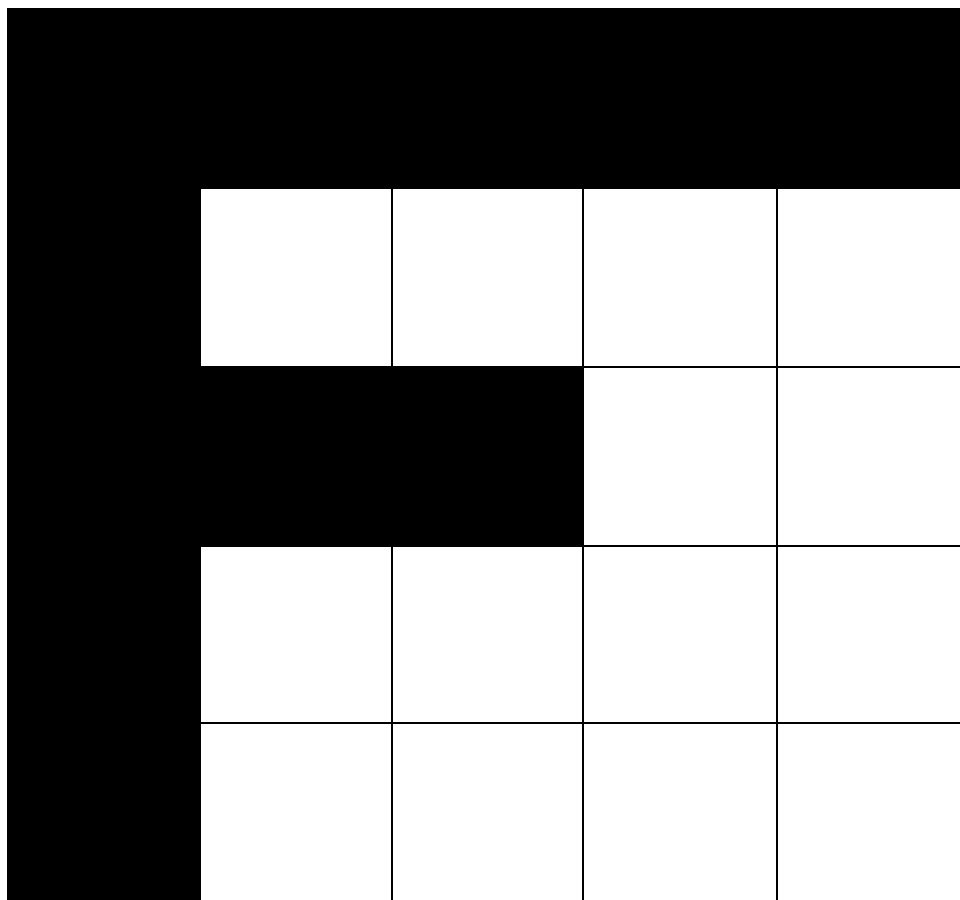


RIGHT TRIANGLE CONGRUENCE: HL

Does HL Prove It?

25 pairs of right triangles · HL or not

FREE



1. **Hand out page 3**, one per student. Pencils. Nothing else is needed.
2. **Say this once:** *“HL needs a small square in both triangles. Find the hypotenuse from the square. The hypotenuses must match, and one pair of legs must match. If all of that is true, fill the square. If not, leave it white.”*
3. **When a student finishes, look at the picture.** If it is not the letter F, a square is wrong. The student finds it and checks it again.

Student sheet	page 3, one per student. It shows the HL, SAS and AAS marks on three small right triangles.
Answers	page 4: the finished picture and the reason for every square.

This sheet practices one habit: check that HL applies before using it. HL says: if two right triangles have matching hypotenuses and one matching pair of legs, they are congruent. Students often use HL whenever they see two matching sides and something that looks like a right angle. Each white square is one way that goes wrong.

The white squares. In three squares no small square is drawn, so no right angle is given. In two of them the corners look square; in one, the marked angle is plainly not a right angle. In two, only one triangle has a right angle. In two, the hypotenuse of one triangle is matched with a leg of the other; those triangles are really different sizes. In five, both legs are marked: the triangles are congruent, but by SAS, not HL. In two, the marks are the hypotenuse and an angle (AAS).

The filled squares. In two of them the two triangles share a side. That side is a leg of both triangles, and it matches itself, so it needs no tick. Seven squares are sentences about $\triangle ABC$ and $\triangle DEF$. The right angle is not always at C, so students must find the hypotenuse from the letter of the right angle.

Eleven squares are filled and fourteen are white. Guessing does not work. Every simple guessing rule, such as filling every square with two small squares, gets at least three squares wrong.



This is the free lesson this activity came from. The worksheet, the full answers and the lesson plan are on it, at three levels of difficulty.

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Mystery Picture

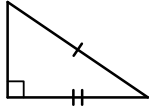
Does HL prove it?

Name _____

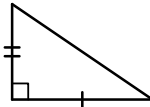
Period _____

Date _____

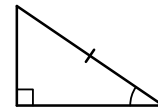
Each square shows two triangles, or tells you about $\triangle ABC$ and $\triangle DEF$ (A goes with D, B with E, C with F). Sides with the same ticks are equal. Does HL prove the two triangles congruent? If yes, fill the square with slanted lines. If no, leave it white. When you finish, look at the picture. If part of it is missing, or one square does not fit, check that square again.



HL Both have the small square. The **hypotenuses** match, and one pair of **legs** match.



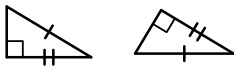
SAS The small square is **between** the two marked legs.



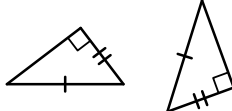
AAS The small square, one more angle, and the hypotenuse.

The **hypotenuse** is the side across from the small square. The other two sides are the **legs**. A right angle counts only when it has the small square. HL needs all three: a small square in **both** triangles, the two hypotenuses marked the same, and one pair of legs marked the same. A side that both triangles share matches itself.

1



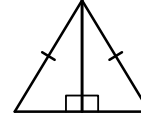
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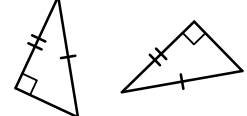
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Right angles at C and F.
 $AB \cong DE$ and $AC \cong DF$.

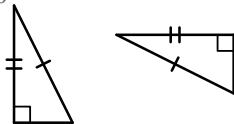
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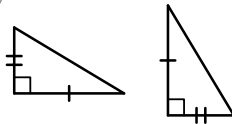
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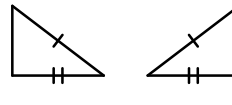
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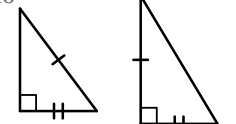
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Right angles at C and F.
 $AC \cong DF$ and $BC \cong EF$.

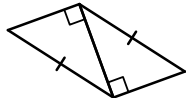
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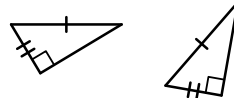
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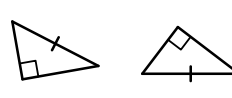
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Right angles at B and E.
 $AC \cong DF$ and $BC \cong EF$.

13



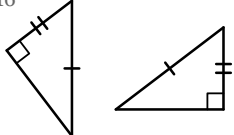
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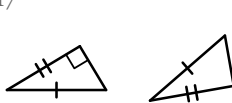
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Right angle at C only.
 $AB \cong DE$ and $AC \cong DF$.

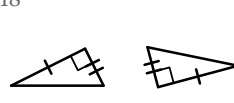
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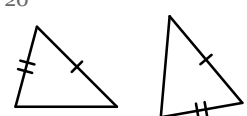
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19

Right angles at C and F.
 $\angle A \cong \angle D$. $AB \cong DE$.

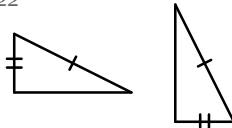
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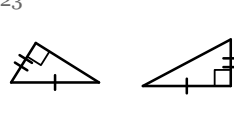
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Right angles at A and D.
 $BC \cong EF$ and $AB \cong DE$.

22



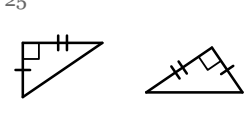
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24

Right angles at B and E.
 $AB \cong DE$ and $BC \cong EF$.

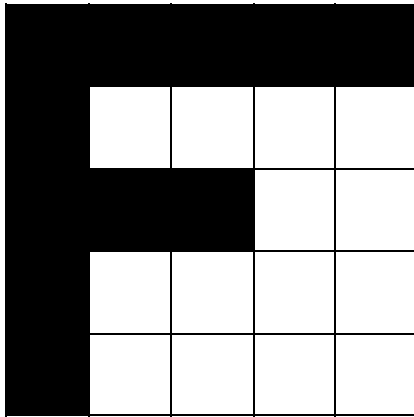
25



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Mystery Picture — answers

For the teacher



The finished picture is **the letter F**: a bar down the left side, a bar along the top, and a shorter bar in the middle.

A square is filled when both triangles have a right angle given, the two hypotenuses match, and one pair of legs match. The hypotenuse is the side across from the right angle.

For a drawing, point to the small square in each triangle first. Then point to the side across from it.

1–5	1 · FILL Both have the small square. The one-tick sides are across from the squares: the hypotenuses. The two-tick sides are legs. That is HL.	2 · FILL Both have the small square. The one-tick sides are across from the squares: the hypotenuses. The two-tick sides are legs. That is HL.	3 · FILL The side across from C is AB, the hypotenuse, and its match is given. AC is a leg. That is HL.	4 · FILL Both have the small square. The one-tick sides are the hypotenuses. The shared side is a leg of both and matches itself. That is HL.	5 · FILL Both have the small square. The one-tick sides are across from the squares: the hypotenuses. The two-tick sides are legs. That is HL.
6–10	6 · FILL Both have the small square. The one-tick sides are across from the squares: the hypotenuses. The two-tick sides are legs. That is HL.	7 · white Both marked sides touch the small square, so both are legs. The right angle is between them: SAS, not HL.	8 · white Both given sides of $\triangle ABC$ touch C, so they are legs. The right angle is between them: SAS, not HL.	9 · white No small square is drawn. The corners look square, but no right angle is given.	10 · white The one-tick side is across from the square in one triangle (a hypotenuse) and touches it in the other (a leg).
11–15	11 · FILL Both have the small square. The one-tick sides are the hypotenuses. The shared side is a leg of both and matches itself. That is HL.	12 · FILL The side across from B is AC, the hypotenuse, and its match is given. BC is a leg. That is HL.	13 · FILL Both have the small square. The one-tick sides are across from the squares: the hypotenuses. The two-tick sides are legs. That is HL.	14 · white The marks are the right angle, one more angle, and the hypotenuse: AAS, not HL. No legs are marked.	15 · white A right angle is given only at C, not in $\triangle DEF$. HL needs one in both.
16–20	16 · FILL Both have the small square. The one-tick sides are across from the squares: the hypotenuses. The two-tick sides are legs. That is HL.	17 · white Only one triangle has the small square. HL needs a right angle given in both.	18 · white Both marked sides touch the small square, so both are legs. The right angle is between them: SAS, not HL.	19 · white Two pairs of angles and the hypotenuse AB are given: AAS, not HL. No pair of legs is given.	20 · white No small square is drawn, so no right angle is given, and HL cannot be used. The marked angle is not a right angle.
21–25	21 · FILL The side across from A is BC, the hypotenuse, and its match is given. AB is a leg. That is HL.	22 · white No small square is drawn. The corners look square, but no right angle is given.	23 · white The one-tick side is across from the square in one triangle (a hypotenuse) and touches it in the other (a leg).	24 · white Both given sides of $\triangle ABC$ touch B, so they are legs. The right angle is between them: SAS, not HL.	25 · white Both marked sides touch the small square, so both are legs. The right angle is between them: SAS, not HL.