

Triangle Truth Check

Use square areas to test right triangles.

GRADE 8 • 8.G.B.6

CCSS.Math.Content.8.G.B.6 "Explain a proof of the Pythagorean Theorem and its converse."

NAME _____

DATE _____

THE BIG IDEA

For a right triangle, if the legs are a and b and the hypotenuse is c , $a^2 + b^2 = c^2$. One area proof places four matching right triangles in a square, then compares the area of the whole square with the areas of the triangles and the center square. The converse says that if the squares of the two shorter sides add to the square of the longest side, the triangle is right.

WORKED EXAMPLE

A right triangle has legs 8 cm and 15 cm. Find the hypotenuse.

- $c^2 = 8^2 + 15^2$
- $c^2 = 64 + 225 = 289$
- $c = 17$

Answer: 17 cm

PRACTICE 6 problems

- 1** A right triangle has legs 7 cm and 24 cm. Find its hypotenuse.

ANSWER _____

- 2** A right triangle has hypotenuse 13 m and one leg 5 m. Find the other leg.

ANSWER _____

- 3** Can side lengths 9, 40, and 41 form a right triangle?

ANSWER _____

- 4** Can side lengths 10, 11, and 14 form a right triangle?

ANSWER _____

- 5** Can side lengths 16, 30, and 34 form a right triangle?

ANSWER _____

- 6** A triangle has side lengths 12, 35, and 37. Which side is the hypotenuse? Verify that the triangle is right.

ANSWER _____

APPLY IT Show your work

- 1** A school esports club makes a rectangular banner that is 20 inches wide and 21 inches tall. What is the length of the banner's diagonal?

WORK SPACE

ANSWER _____

- 2** At a skate park, a triangular rail support has side lengths 27 inches, 36 inches, and 45 inches. Does the support form a right triangle?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Four congruent right triangles with legs u and v and hypotenuse w fit inside a large square with side length $u+v$. The uncovered center is a square with side length w . Write exactly 2 sentences that use the two area expressions to prove $u^2 + v^2 = w^2$.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A right triangle has legs 7 cm and 24 cm. Find its hypotenuse.	25 cm
2	A right triangle has hypotenuse 13 m and one leg 5 m. Find the other leg.	12 m
3	Can side lengths 9, 40, and 41 form a right triangle?	Yes, because $9^2 + 40^2 = 41^2$.
4	Can side lengths 10, 11, and 14 form a right triangle?	No, because $10^2 + 11^2$ does not equal 14^2.
5	Can side lengths 16, 30, and 34 form a right triangle?	Yes, because $16^2 + 30^2 = 34^2$.
6	A triangle has side lengths 12, 35, and 37. Which side is the hypotenuse? Verify that the triangle is right.	37; $12^2 + 35^2 = 37^2$.

PART 2 • APPLY IT

- 29 inches** Use the Pythagorean Theorem: $d^2 = 20^2 + 21^2 = 841$. Since $29^2 = 841$, the diagonal is 29 inches.
- Yes, it forms a right triangle.** Use the converse: $27^2 + 36^2 = 729 + 1296 = 2025$, and $45^2 = 2025$. Since the sums are equal, the triangle is right.

CHALLENGE

The large square has area $(u+v)^2$, and its pieces have total area $4(uv/2) + w^2$. Since the areas are equal, $u^2 + 2uv + v^2 = 2uv + w^2$, so $u^2 + v^2 = w^2$.

Accept equivalent equations and correct statements of the converse. For the challenge, accept any two-sentence explanation that gives both area expressions and correctly cancels $2uv$.