LESSON MAKER PRO

# Triangle Truth Tests

*Use side lengths to calculate, test, and prove.*

**HIGH SCHOOL · MT.CORE.GEOM.ARG.1.b**

**MT.CORE.GEOM.ARG.1.b** "Investigate, conjecture, prove theorems, and communicate the proofs in a variety of ways by: Proving theorems about triangles. Theorems include: the sum of the measures of the interior angles of a triangle is 180˚, the Pythagorean Theorem..."

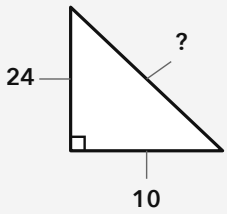
NAME _____ DATE _____

## THE BIG IDEA

In a right triangle, the squares of the leg lengths add to the square of the hypotenuse length: $a^2 + b^2 = c^2$. The hypotenuse is opposite the right angle and is the longest side. If the squares of a triangle's two shorter sides add to the square of its longest side, the triangle has a right angle.

## WORKED EXAMPLE

Find the missing side length in the figure.

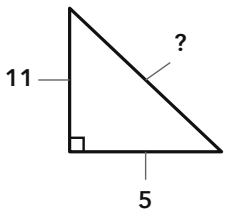



1. The missing side is opposite the right angle, so let its length be x.
2. $10^2 + 24^2 = x^2$
3. $100 + 576 = x^2$
4. $676 = x^2$, so $x = 26$.

**Answer: 26**

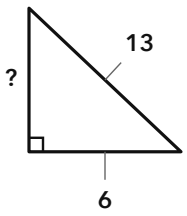
## PRACTICE 6 problems

**1** Find the missing side length. Write an exact answer and show your equation.



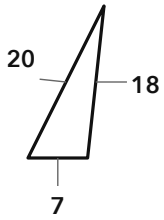

ANSWER _____

**2** Find the missing side length. Write an exact answer.



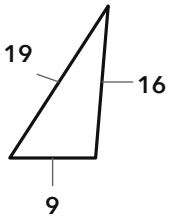

ANSWER _____

**3** Does this triangle have a right angle? Support your answer with a square comparison.



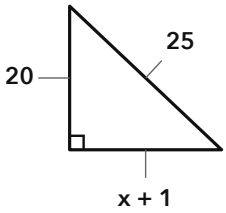

**ANSWER** _____

**4** A student adds the squares of the smallest and largest sides, then compares the result with the square of the middle side. Explain the error and decide whether this triangle is right.



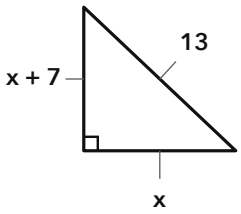

**ANSWER** _____

**5** Find x. Side lengths must be positive.




**ANSWER** _____

**6** Find x. Show why you reject any other solution to your equation.




**ANSWER** _____

## APPLY IT Show your work

**1** During a drone race, a drone is 12 m east of its launch point and 16 m above the ground. What is its direct distance from the launch point? Explain why the Pythagorean Theorem applies.

WORK SPACE

**ANSWER** _____

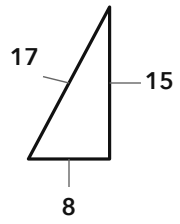
**2** A student builds a triangular frame for a skateboard ramp using bars that are 21 in, 28 in, and 35 in long. Can the frame have a right angle? Justify your answer with a square comparison.

WORK SPACE

**ANSWER** _____

## CHALLENGE One step up

Prove that the triangle in the figure has a right angle without assuming the converse of the Pythagorean Theorem. Construct a right triangle with the two shorter side lengths, then use the Pythagorean Theorem and SSS congruence.




WORK SPACE AND ANSWER

**ANSWER KEY**

# Triangle Truth Tests

**HIGH SCHOOL · MT.CORE.GEOM.ARG.1.b**

## PART 1 · PRACTICE

| # | PROBLEM | ANSWER |
|---|---|---|
| 1 | Find the missing side length. Write an exact answer and show your equation. | **sqrt(146); $5^2 + 11^2 = x^2 = 146$.** |
| 2 | Find the missing side length. Write an exact answer. | **sqrt(133)** |
| 3 | Does this triangle have a right angle? Support your answer with a square comparison. | **No. $7^2 + 18^2 = 373$, but $20^2 = 400$.** |
| 4 | A student adds the squares of the smallest and largest sides, then compares the result with the square of the middle side. Explain the error and decide whether this triangle is right. | **The square of the longest side must be compared with the sum of the squares of the two shorter sides. The triangle is not right because $9^2 + 16^2 = 337$, while $19^2 = 361$.** |
| 5 | Find x. Side lengths must be positive. | **14** |
| 6 | Find x. Show why you reject any other solution to your equation. | **$x = 5$. The equation $x^2 + (x + 7)^2 = 13^2$ gives $(x + 12)(x - 5) = 0$; $x = -12$ cannot be a side length.** |

## PART 2 · APPLY IT

1. **20 m** The horizontal and vertical distances are perpendicular. The direct distance is sqrt($12^2 + 16^2$) = sqrt(400) = 20 m.
2. **Yes; $21^2 + 28^2 = 35^2$.** The two shorter sides give 441 + 784 = 1225, and the longest side gives $35^2 = 1225$. By the converse of the Pythagorean Theorem, the frame has a right angle.

## CHALLENGE

**Construct a right triangle with legs 8 and 15. Its hypotenuse is 17 because $8^2 + 15^2 = 289 = 17^2$. This triangle and the given triangle are congruent by SSS, so the angle opposite the side of length 17 in the given triangle is 90°.**

Accept equivalent exact radical forms. For the challenge, accept any valid construction and congruence argument that establishes a right angle without citing the converse.