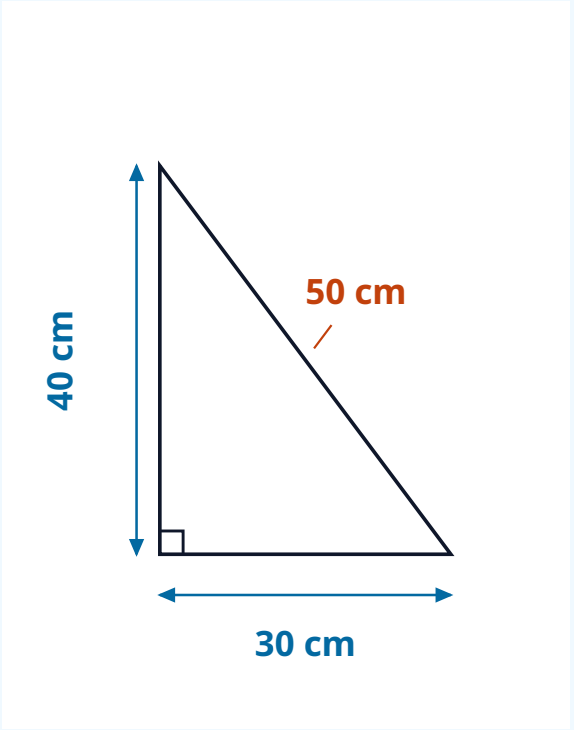
Mathematics 10-3

Unit G: Geometry and trigonometry

Right triangles and square corners

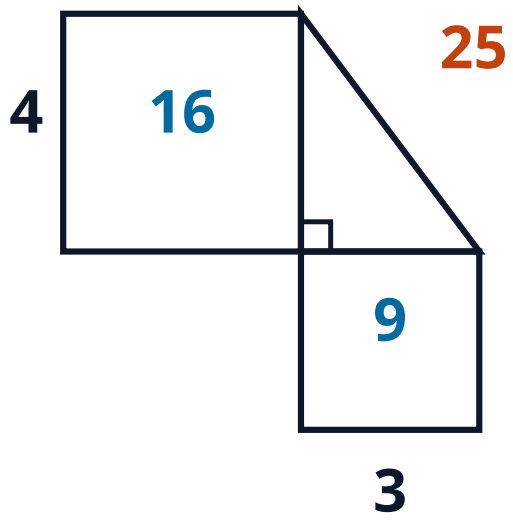
A corner that has to be square

- A framer marks 30 cm along one wall and 40 cm along the next wall.
- The diagonal between those marks should be 50 cm.
- The marks 30, 40, and 50 are 3, 4, and 5 each multiplied by 10.
- Builders have used a 3-4-5 rope to set a square corner, and a welder uses the same check on a frame.



Squares on the three sides

- The hypotenuse is the longest side, across from the right angle.
- Call the shorter sides a and b, and the hypotenuse c.
- The theorem says a squared plus b squared equals c squared.
- Squared means the number times itself.
- A 3-4-5 triangle gives 9 plus 16, which equals 25.
- A 2-3-4 triangle gives 4 plus 9, which is 13, while 4 squared is 16.



Key terms

hypotenuse

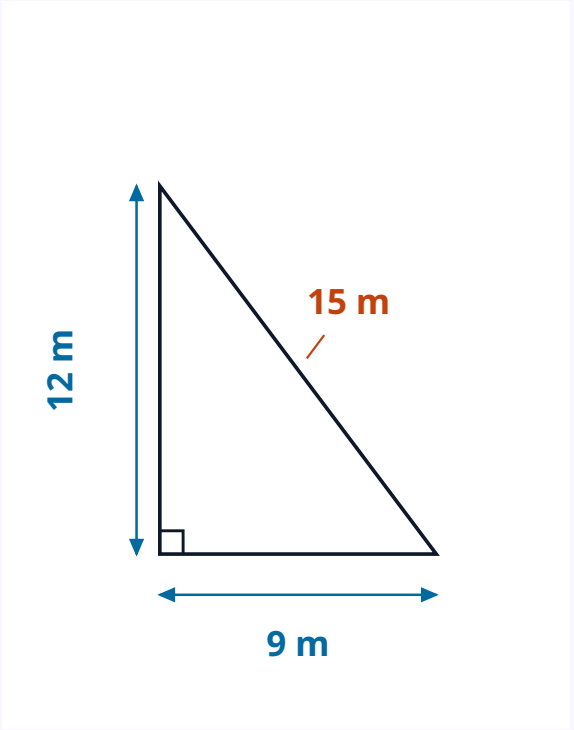
The longest side of a right triangle, the side across from the right angle. (c)

Pythagorean theorem

On a right triangle, the squares of the two shorter sides add to the square of the hypotenuse. ($a^2 + b^2 = c^2$)

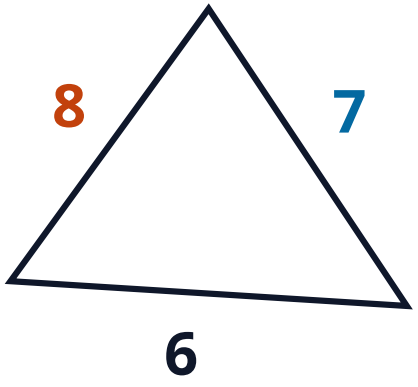
When the squares agree

- If a squared plus b squared equals c squared, the angle opposite c is a right angle.
- Square 9 to get 81 and square 12 to get 144.
- Adding 81 and 144 equals 225.
- Squaring 15 gives 225, so the 9 m by 12 m diagonal is 15 m.
- Square 6 to get 36 and square 8 to get 64.
- Adding 36 and 64 equals 100.
- Squaring 10 gives 100, so the brace on an 8 m run is 10 m.



A triangle that fails the square test

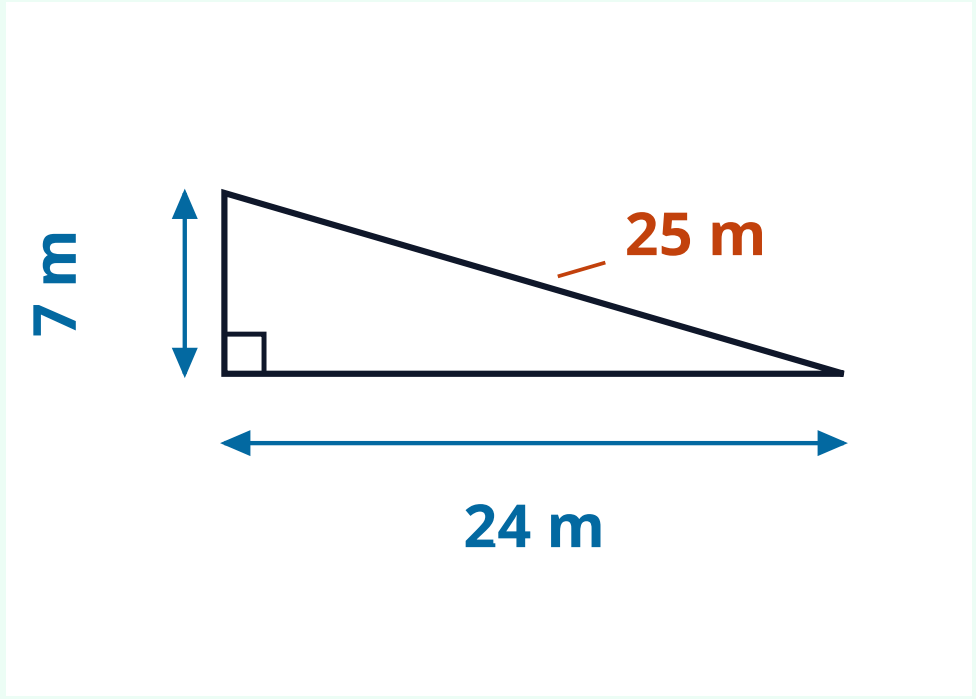
- Sides 6, 7, and 8 ask you to test the longest side, 8.
- Squaring 6 gives 36 and squaring 7 gives 49.
- Those add to 85.
- Squaring 8 gives 64.
- The totals 85 and 64 disagree, so this triangle fails the right-angle test.



$36 + 49 = 85$, and $8^2 = 64$

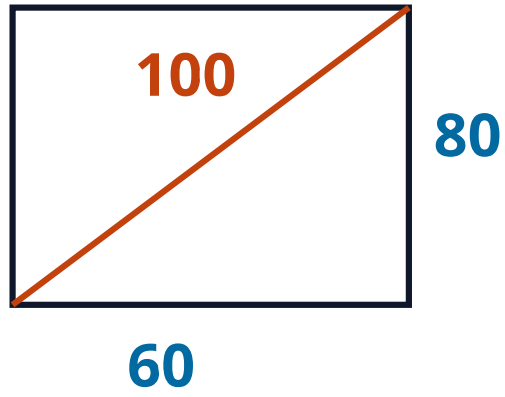
A 7 m by 24 m brace

- A gate opening is 7 m across the base and 24 m up the post.
- You need the diagonal brace.
- Squaring 7 gives 49 and squaring 24 gives 576.
- Those add to 625.
- Squaring 25 gives 625, so the brace is 25 m.



Square a corner on the job

- Multiply 3, 4, and 5 by the same number to get a larger square check.
- Times 10 gives 30, 40, and 50.
- If the measured diagonal matches 50 cm, the corner between the 30 cm and 40 cm marks is a right angle.
- A parallelogram with a 3-4-5 corner and equal diagonals is a rectangle.
- The square corner is what makes the frame true.



Square-corner check

- Find the diagonal of a 9 m by 12 m frame.
- Say what 36 plus 49 versus 64 tells you about a 6-7-8 triangle.

