MATHEMATICS · GRADES 7-9

Finding Missing Sides of Right Triangles

Difficulty level: Intermediate

Mathematics: Grades 7-9

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Overview of the concept

This is how you work out a side you cannot measure directly. The length of a ladder you need to reach a roof, or the height of a tree from its shadow, can both be found from the sides and angles you can measure. Right triangles give you the tools to find the missing piece. It is the maths builders and surveyors use every day.



Rule

Pythagoras theorem: in a right triangle, the square of the hypotenuse equals the sum of the squares of the other two sides, $a^2 + b^2 = c^2$.

To find a missing leg, subtract, and to find the hypotenuse, add, then take the square root.

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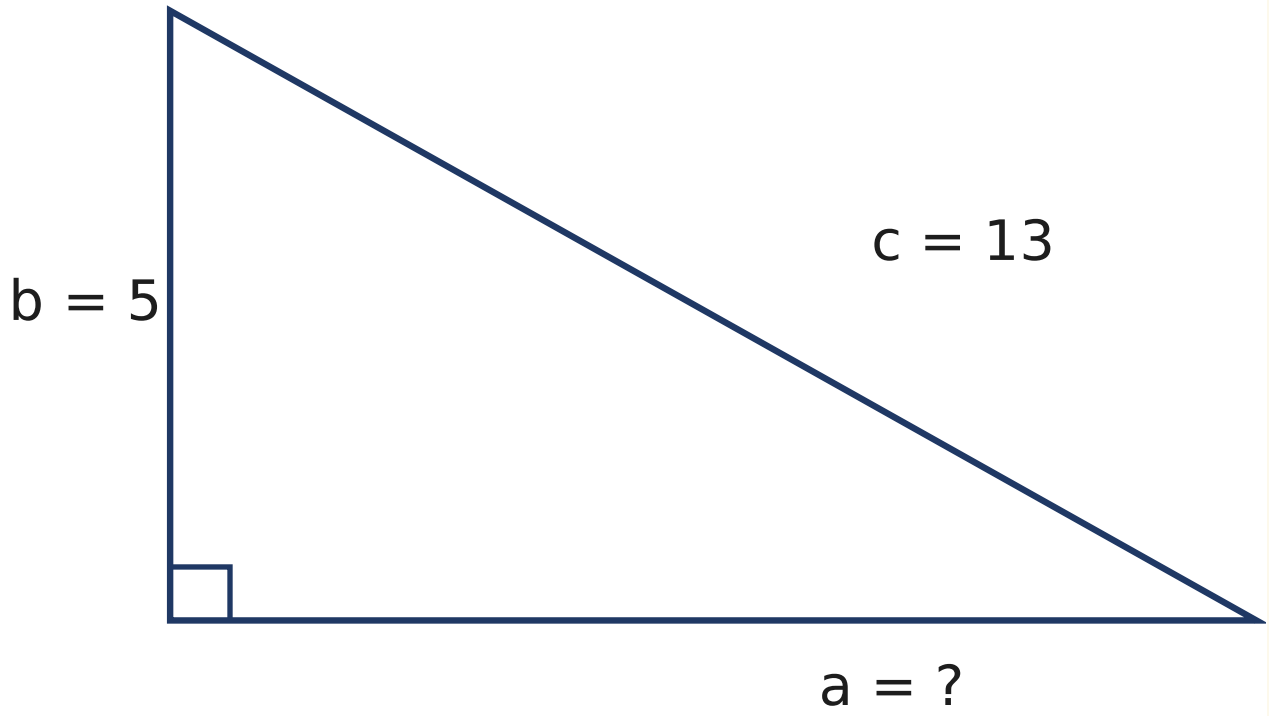
Worked examples

EXAMPLE 1

Q Find the leg a when hypotenuse c = 13 and leg b = 5



SOLUTION

Write $a^2 = c^2 - b^2 = 169 - 25 = 144$

Take the square root: $a = \sqrt{144}$

$a = 12$

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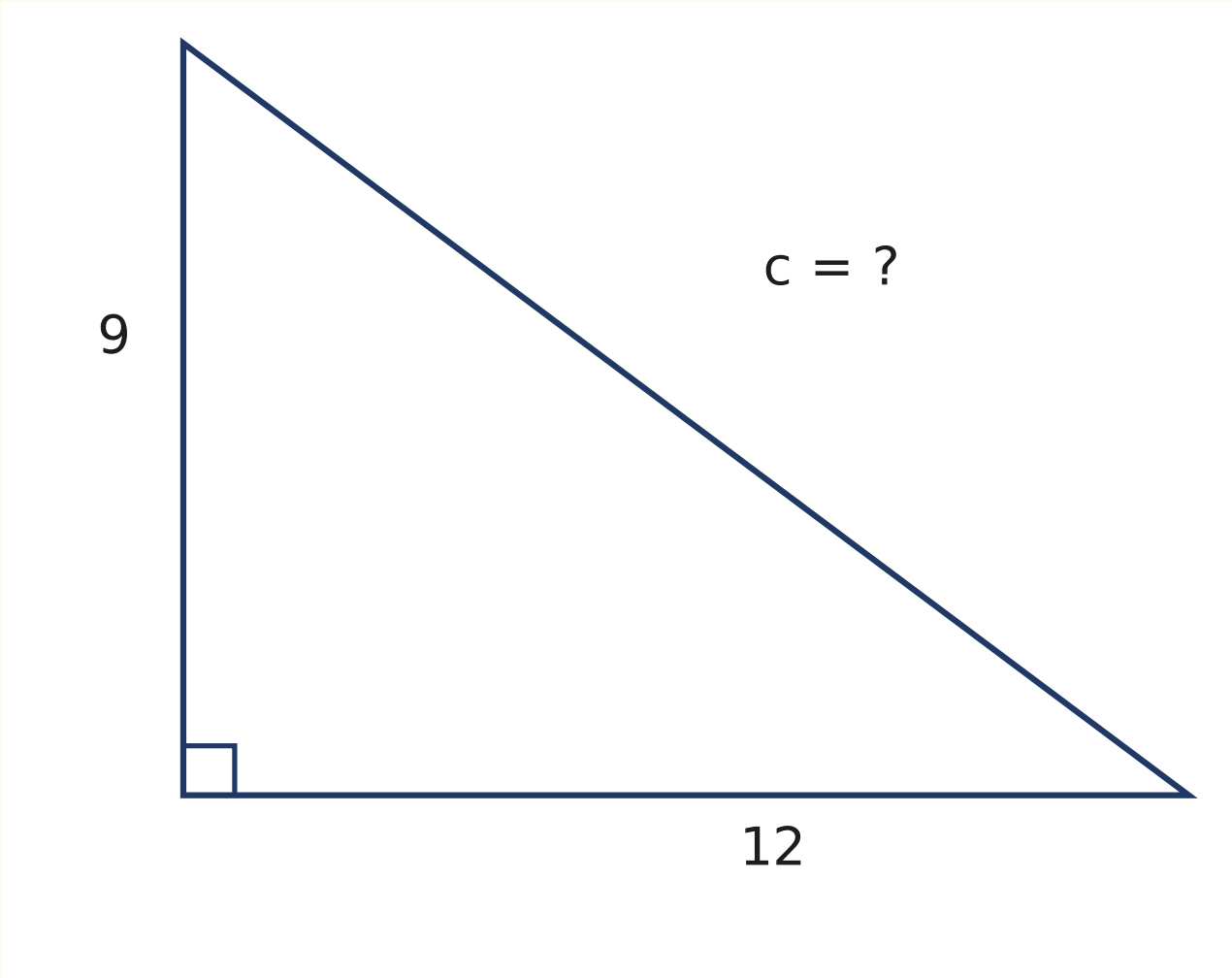
EXAMPLE 2

Q Find the hypotenuse when one side is 9 and the other side is 12



SOLUTION

Write $c^2 = 9^2 + 12^2 = 81 + 144 = 225$

Take the square root: $c = \sqrt{225}$

$c = 15$

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Practice questions

1. A ladder leans against a wall. The ladder is the hypotenuse, 10 m long, and one leg is 6 m. Find the other leg.

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2. A ramp forms a right triangle. The hypotenuse is 10 m and one leg is 4 m. Find the other leg, to 2 decimal places.

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3. A kite string forms the hypotenuse of a right triangle, with legs 5 m and 6 m. Find the length of the string, to 2 decimal places.

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4 A rectangular garden is 3 m by 4 m. Find the length of the diagonal.

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5 A right triangle has a hypotenuse of 25 m and one leg of 15 m. Find the perimeter of the triangle.

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6 A ladder is 12.5 m long and stands 7.5 m from a wall. Find the height the ladder reaches.

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7 A football field is 6.5 m by 7.2 m. Find the length of the diagonal.

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8 A slide is 20 m long and its base is 12 m from the platform. Find the area of the triangle formed by the slide, the platform and the ground.

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9 A right triangle has legs 6 m and 8 m. A second, similar triangle has legs twice as long. What is the hypotenuse of the second triangle?

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10 A right triangle has two equal legs, each 5 m long. Find the hypotenuse, to 2 decimal places.

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ANSWER KEY

1. 8

2. 9.17

3. 7.81

4. 5

5. 60

6. 10

7. 9.7

8. 96

9. 20

10. 7.07

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