

# The Pythagorean Theorem

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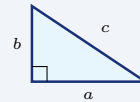
**Quick Review and Helpful Hints**

In a right triangle,  $a^2 + b^2 = c^2$ , where  $a$  and  $b$  are the legs and  $c$  is the hypotenuse (the side opposite the right angle, always the longest). To find the hypotenuse, add the squares of the legs and take the square root. To find a leg, subtract:  $b^2 = c^2 - a^2$ .

▷ **Example:** A right triangle has legs 3 and 4. Find the hypotenuse.

**Work:** Use  $a^2 + b^2 = c^2$ :  $3^2 + 4^2 = 9 + 16 = 25$ . The hypotenuse is the square root,  $\sqrt{25}$ .

★ **Answer:** 5

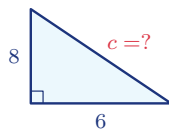


$$a^2 + b^2 = c^2$$

◆ **Practice Problems**

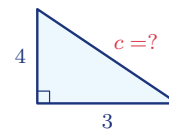
Use each right-triangle diagram to find the missing side. Simplify radicals.

1. Find the hypotenuse.



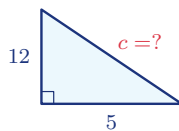
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5. Find the hypotenuse.



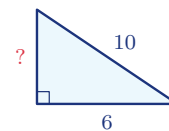
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2. Find the hypotenuse.



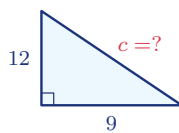
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6. Find the missing leg.



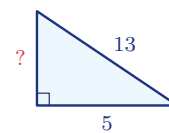
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3. Find the hypotenuse.



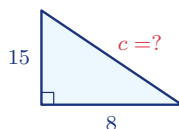
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7. Find the missing leg.



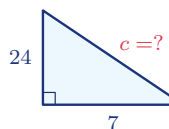
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4. Find the hypotenuse.



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8. Find the hypotenuse.

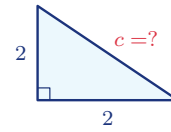


9. Find the missing leg.



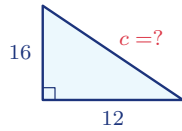
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12. Find the hypotenuse.



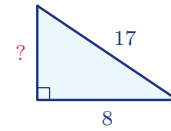
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10. Find the hypotenuse.



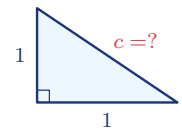
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13. Find the missing leg.



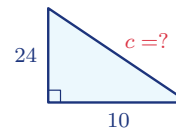
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11. Find the hypotenuse.



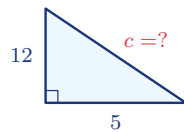
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14. Find the hypotenuse.



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◆ Word Problems

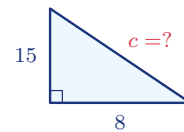


15. A ladder's base is 5 ft from a wall and it reaches 12 ft up. How long is the ladder?

Use  $a^2 + b^2 = c^2$

Work: \_\_\_\_\_

\_\_\_\_\_

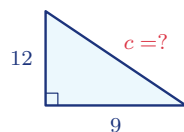


17. A right triangle has legs 8 and 15. Find the hypotenuse.

Use  $a^2 + b^2 = c^2$

Work: \_\_\_\_\_

\_\_\_\_\_

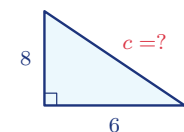


16. A rectangular field is 9 m by 12 m. How long is the diagonal walk across it?

Use  $a^2 + b^2 = c^2$

Work: \_\_\_\_\_

\_\_\_\_\_



18. A wire runs from the top of an 8-ft pole to a point 6 ft from its base. How long is the wire?

Use  $a^2 + b^2 = c^2$

Work: \_\_\_\_\_

\_\_\_\_\_



## Answer Keys

- |                                    |                                      |  |
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| 2. <input type="text" value="13"/> | 8. <input type="text" value="25"/>   | 14. <input type="text" value="26"/>    |
| 3. <input type="text" value="15"/> | 9. <input type="text" value="12"/>   | 15. <input type="text" value="13 ft"/> |
| 4. <input type="text" value="17"/> | 10. <input type="text" value="20"/>  | 16. <input type="text" value="15 m"/>  |
| 5. <input type="text" value="5"/>  | 11. <input type="text" value="√2"/>  | 17. <input type="text" value="17"/>    |
| 6. <input type="text" value="8"/>  | 12. <input type="text" value="2√2"/> | 18. <input type="text" value="10 ft"/> |

### Step-by-Step Explanations

1. Start by naming the process: For a right triangle, use  $a^2 + b^2 = c^2$  and solve for the missing side. The setup/work is Use  $a^2 + b^2 = c^2$ :  $6^2 + 8^2 = 36 + 64 = 100$ . The hypotenuse is  $\sqrt{100} = 10$ . So the final answer is 10.

2. A good way to think about this is: For a right triangle, use  $a^2 + b^2 = c^2$  and solve for the missing side. The setup/work is  $5^2 + 12^2 = 25 + 144 = 169$ , so  $c = \sqrt{169} = 13$ . So the final answer is 13.

3. Step by step: For a right triangle, use  $a^2 + b^2 = c^2$  and solve for the missing side. The setup/work is  $9^2 + 12^2 = 81 + 144 = 225$ , so  $c = \sqrt{225} = 15$ . So the final answer is 15.

4. Take it one move at a time: For a right triangle, use  $a^2 + b^2 = c^2$  and solve for the missing side. The setup/work is  $8^2 + 15^2 = 64 + 225 = 289$ , so  $c = \sqrt{289} = 17$ . So the final answer is 17.

5. Start by naming the process: For a right triangle, use  $a^2 + b^2 = c^2$  and solve for the missing side. The setup/work is  $3^2 + 4^2 = 9 + 16 = 25$ , so  $c = \sqrt{25} = 5$ . So the final answer is 5.

6. A good way to think about this is: For a right triangle, use  $a^2 + b^2 = c^2$  and solve for the missing side. The setup/work is To find a leg, subtract:  $10^2 - 6^2 = 100 - 36 = 64$ , so the leg is  $\sqrt{64} = 8$ . So the final answer is 8.

7. Step by step: For a right triangle, use  $a^2 + b^2 = c^2$  and solve for the missing side. The setup/work is  $13^2 - 5^2 = 169 - 25 = 144$ , so the leg is  $\sqrt{144} = 12$ . So the final answer is 12.

8. Take it one move at a time: For a right triangle, use  $a^2 + b^2 = c^2$  and solve for the missing side. The setup/work is  $7^2 + 24^2 = 49 + 576 = 625$ , so  $c = \sqrt{625} = 25$ . So the final answer is 25.

9. Start by naming the process: For a right triangle, use  $a^2 + b^2 = c^2$  and solve for the missing side. The setup/work is  $15^2 - 9^2 = 225 - 81 = 144$ , so the leg is  $\sqrt{144} = 12$ . So the final answer is 12.

10. A good way to think about this is: For a right triangle, use  $a^2 + b^2 = c^2$  and solve for the missing side. The setup/work is  $12^2 + 16^2 = 144 + 256 = 400$ , so  $c = \sqrt{400} = 20$ . So the final answer is 20.

11. Step by step: For a right triangle, use  $a^2 + b^2 = c^2$  and solve for the missing side. The setup/work is  $1^2 + 1^2 = 2$ , so  $c = \sqrt{2}$  (already in simplest form). So the final answer is  $\sqrt{2}$ .

12. Take it one move at a time: For a right triangle, use  $a^2 + b^2 = c^2$  and solve for the missing side. The setup/work is  $2^2 + 2^2 = 8$ , so  $c = \sqrt{8} = 2\sqrt{2}$ . So the final answer is  $2\sqrt{2}$ .

13. Start by naming the process: For a right triangle, use  $a^2 + b^2 = c^2$  and solve for the missing side. The setup/work is  $17^2 - 8^2 = 289 - 64 = 225$ , so the leg is  $\sqrt{225} = 15$ . So the final answer is 15.

14. A good way to think about this is: For a right triangle, use  $a^2 + b^2 = c^2$  and solve for the missing side. The setup/work is  $10^2 + 24^2 = 100 + 576 = 676$ , so  $c = \sqrt{676} = 26$ . So the final answer is 26.

15. Step by step: For a right triangle, use  $a^2 + b^2 = c^2$  and solve for the missing side. The setup/work is The wall height and the base distance are the legs:  $5^2 + 12^2 = 25 + 144 = 169$ , so the ladder is  $\sqrt{169} = 13$  ft. So the final answer is 13 ft.

16. Take it one move at a time: For a right triangle, use  $a^2 + b^2 = c^2$  and solve for the missing side. The setup/work is The diagonal is the hypotenuse:  $9^2 + 12^2 = 81 + 144 = 225$ , so  $\sqrt{225} = 15$  m. So the final answer is 15 m.

17. Start by naming the process: For a right triangle, use  $a^2 + b^2 = c^2$  and solve for the missing side. The setup/work is  $8^2 + 15^2 = 64 + 225 = 289$ , so the hypotenuse is  $\sqrt{289} = 17$ . So the final answer is 17.

18. A good way to think about this is: For a right triangle, use  $a^2 + b^2 = c^2$  and solve for the missing side. The setup/work is The pole height and the ground distance are the legs:  $8^2 + 6^2 = 64 + 36 = 100$ , so the wire is  $\sqrt{100} = 10$  ft. So the final answer is 10 ft.



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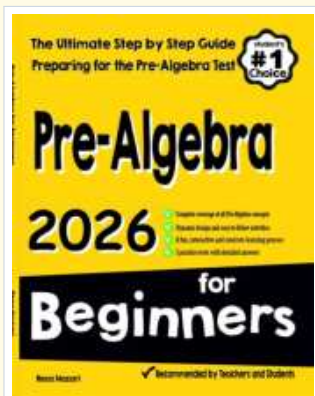
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