

LESSON
10

Right Triangles and the Pythagorean Theorem

Review It!

When you work with right triangles and the Pythagorean Theorem, remember these words:

hypotenuse side of a right triangle that is opposite the right angle

legs the two shorter sides of a right triangle

Pythagorean Theorem $a^2 + b^2 = c^2$, where a and b are legs of a right triangle, and c is the hypotenuse

converse an *if...then* statement that has its "if" and "then" parts reversed

The converse of "If a triangle is a right triangle, then $a^2 + b^2 = c^2$ " is "If $a^2 + b^2 = c^2$, then the triangle is a right triangle."

Is a triangle with sides that are 6 feet, 8 feet, and 11 feet long a right triangle?

Step 1 Write the Pythagorean Theorem.

$$a^2 + \underline{\quad}^2 = \underline{\quad}^2$$

REMEMBER The sum of each leg squared equals the hypotenuse squared.

Step 2 Substitute the values for a , b , and c into the equation.

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

$$6^2 + 8^2 = \underline{\quad}^2$$

REMEMBER The hypotenuse is the longest side.

Step 3 Square each number.

$$6^2 + 8^2 = 11^2$$

$$\underline{\quad} + \underline{\quad} = \underline{\quad}$$

Step 4 Add.

$$\underline{\quad} + \underline{\quad} = 121$$

$$\underline{\quad} \neq 121$$

THINK The sides of the equation are NOT equal.

So, a triangle with sides of lengths 6 feet, 8 feet, and 11 feet _____ a right triangle.

Try It!

The numbers are the side lengths of a right triangle. Which number is the hypotenuse?

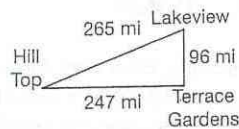
1. 17, 8, 15 17 2. 9, 40, 41 41
 3. 52, 48, 20 52 4. 16, 34, 30 34

Can the numbers be the side lengths of a right triangle? Write *yes* or *no*.

5. 5, 8, 12 N 6. 6, 8, 10 Y
 7. 7, 24, 25 Y 8. 2, 3, 4 N
 9. 5, 6, 7 N 10. 9, 12, 15 Y
 11. 10, 24, 26 Y 12. 21, 28, 35 Y
 $81 + 144 = 225$
 $441 + 784 = 1225$

Solve.

13. Lillian traveled in a straight line from Lakeview to Terrace Gardens. Then she traveled in a straight line to Hill Top, and then in a straight line back to Lakeview. Did Lillian's trip make a right triangle? Explain.



Yes

14. Martha drew a triangle with side lengths of 48 cm, 55 cm, and 73 cm. Did she draw a right triangle? YES

$$48^2 = 2304$$

$$55^2 = 3025$$

$$73^2 = 5329$$



1. Which is the hypotenuse? longest, or shortest side?

5. $5^2 = ?$
10, or 25?

13. How many miles is the longest side? 265, or 247?

On Your Own!

Circle the best answer for each question.

1. Which could be the side lengths of a right triangle?

- A. 15, 36, 39
- B. 10, 20, 27
- C. 8, 9, 10
- D. 2, 7, 8

2. Which could be the side lengths of a right triangle?

- A. 3, 4, 6
- B. 6, 8, 12
- C. 12, 15, 20
- D. 9, 40, 41

3. Which could be the side lengths of a right triangle?

- A. 17, 17, 22
- B. 16, 64, 65
- C. 15, 112, 115
- D. 11, 60, 61

4. Which could be the side lengths of a right triangle?

- A. 12, 13, 14
- B. 8, 15, 17 - 289
- C. 6, 19, 20
- D. 10, 96, 98

5. Which could be the side lengths of a right triangle?

- A. 98, 99, 100
- B. 17, 19, 21 - 441
- C. 12, 35, 37 - 1369
- D. 2, 50, 51 - 2601

6. Which could be the side lengths of a right triangle?

- A. 70, 210, 220
- B. 60, 100, 110
- C. 10, 20, 30
- D. 30, 40, 50

7. Which could be the side lengths of a right triangle?

- A. 13, 87, 89 - 7921
- B. 13, 83, 86
- C. 13, 84, 85 - 7225
- D. 13, 95, 97

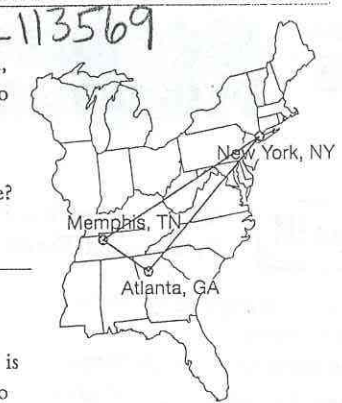
8. On a map, three cities form a right triangle. Which could be the distances between the cities?

- A. 468 mi, 595 mi, 758 mi
- B. 468 mi, 595 mi, 757 mi
- C. 468 mi, 596 mi, 757 mi
- D. 468 mi, 596 mi, 758 mi

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9. Janice flew 954 miles from New York, NY to Memphis, TN. Then she flew 337 miles to Atlanta, GA. Then she flew 748 miles from Atlanta back to New York, NY.



Part A Did Janice's trip make a right triangle?

No

Part B Use what you know about right triangles to explain why your answer is correct. Use words and/or numbers to support your decision.

Math Words

Fill in the blanks.

- 10. The legs of a right triangle are always shorter than the hypotenuse.
- 11. "If $a^2 + b^2 = c^2$, then the triangle is a right triangle" is the converse of the Pythagorean Theorem.
- 12. A right triangle has one right angle, two legs, and one hypotenuse.