Edgenuity

Warm-Up | Exploring the Pythagorean Theorem

Lesson Question

Lesson Goals

Identify and **examine** right triangles.

- **Recognize** perfect _____.
- **Identify** sets of Pythagorean _____.
- **Apply** the Pythagorean theorem.

Words to Know

Fill in this table as you work through the lesson. You may also use the glossary to help you.

	a number that is the result of squaring a natural, or whole, number
	a set of three positive integers that satisfy the Pythagorean theorem and are possible side lengths in a right triangle
	the theorem stating that the sum of the squares of the lengths of the legs in a right triangle is equal to the square of the length of the hypotenuse
	the side of a right triangle that is opposite the right angle; always the longest side
	a triangle having an interior angle measuring 90 degrees
	in a right triangle, either of the two sides forming the right angle

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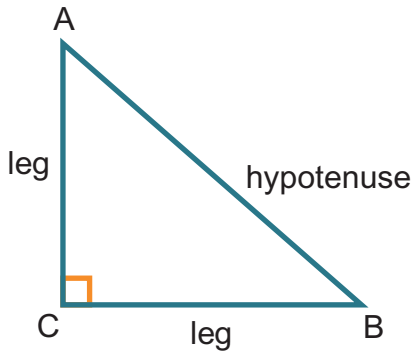
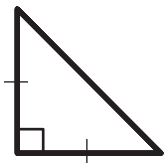
Parts of a Right Triangle

A **right triangle** is a triangle that contains one [ ] angle, which measures 90 degrees. The sides that make up the right angle are the **legs**, and the side [ ] the right angle is the **hypotenuse.**

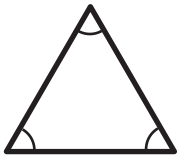
Right triangle ABC





- Right triangles can be isosceles triangles where we have one right angle and the other two angles are each [ ] degrees.

- It is possible that a right triangle is a scalene triangle. In this case, all the sides are [ ] lengths.



- Right triangles [ ] be equilateral.

- A right triangle cannot be [ ].
- A right triangle cannot be acute.

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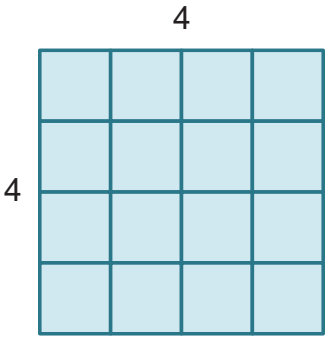
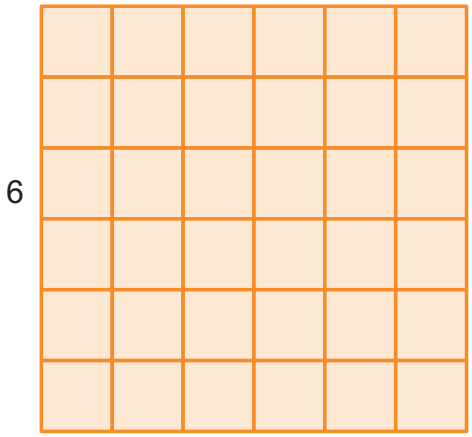
Perfect Squares

A perfect square is a number that is the result of [ ] a natural, or whole number.



$4 \cdot 4 = 4^2 =$ [ ]



$6 \cdot 6 = 6^2 =$ [ ]

Perfect Squares Versus Not Perfect Squares

EXAMPLE

- Perfect Squares
  - $4 = 2^2$
  - $25 =$ [ ]
  - $64 = 8^2$
- Not Perfect Squares
  - 18 $4^2 < 18 < 5^2$
  - 42 between 6^2 and [ ]
  - [ ] between 8^2 and 9^2

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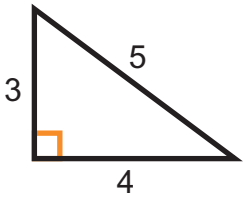
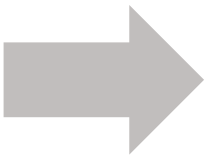
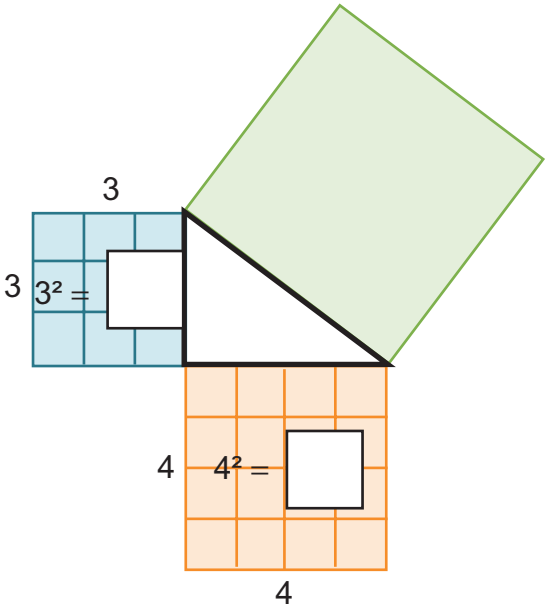
Perfect Squares of Right Triangles

EXAMPLE

[ ] can be created from the side lengths of a [ ] triangle.







$9 + 16 = 25$

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Pythagorean theorem

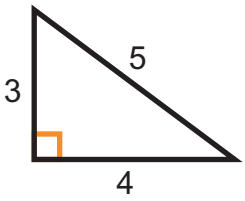
For any right triangle with legs *a* and *b* and [ ] *c*,

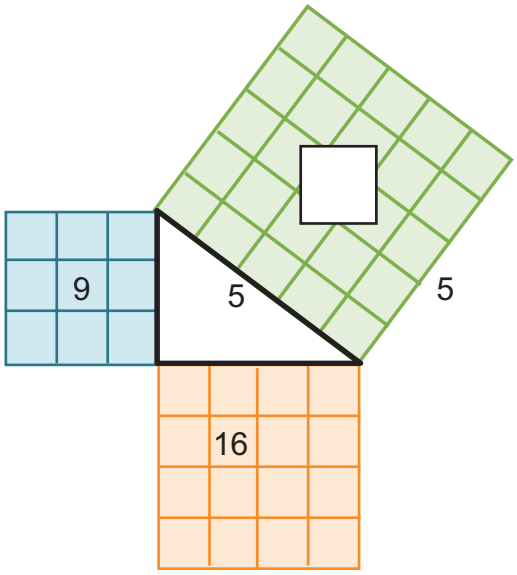
$$a^2 + \square = c^2$$

$3^2 + 4^2 = \square$

$9 + 16 = 25$

$25 = 25$





$9 + 16 = 25$

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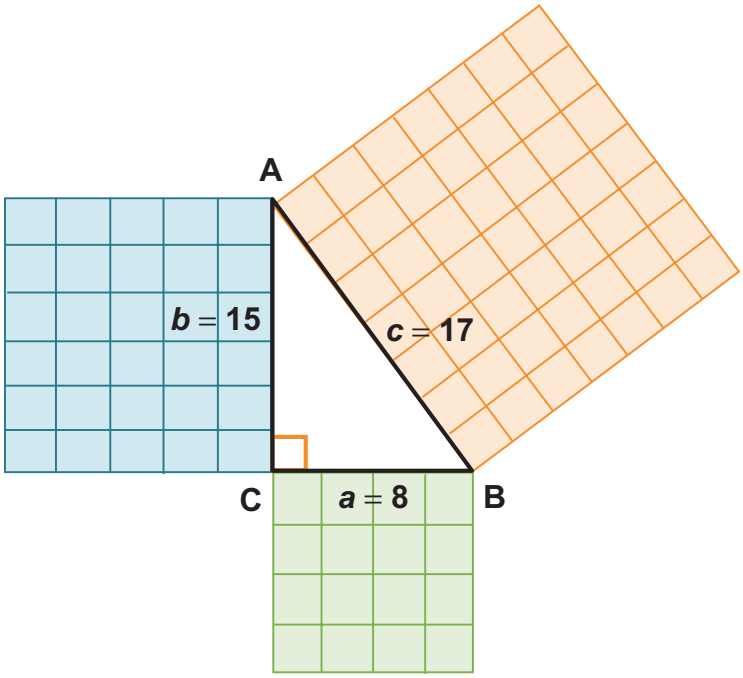
Sides of a Particular Right Triangle

Examine right triangle ABC with side lengths 8, 15, and 17.



The diagram shows:

- $\square + 15^2 = 17^2$
- $64 + 225 = \square$
- $a^2 + b^2 = c^2$

When three ____ numbers form the sides of a right triangle, they are called **Pythagorean triples.**

So 8, ____ and 17 represent a Pythagorean ____.

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Pythagorean Triples

A Pythagorean triple is a set of three [ ] integers that satisfy the Pythagorean theorem and are possible [ ] lengths of a right triangle.

- Side lengths 3, 4, and [ ] is a Pythagorean triple because $3^2 + 4^2 = 5^2$.
- (5, 12, 13)

$5^2 + \square = 13^2$

$25 + 144 = 169$

$169 = 169$✓

- (7, 24, 25)

$7^2 + 24^2 = \square$

$49 + 576 = 625$

$625 = 625$✓

We can also use whole number multiples of known Pythagorean triples to develop other Pythagorean triples. If I multiply the triple (3, 4, 5) by 3, I get:

$(\square, 12, 15)$

$9^2 + \square = 15^2$

$81 + 144 = 225$

$225 = 225$✓

Since I can choose any whole number to multiply by in creating these triples, I know that there are infinitely many Pythagorean triples.

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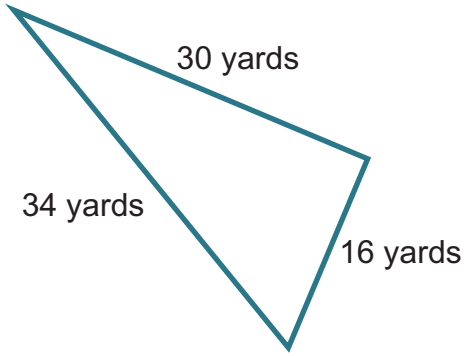
Real-World Use of the Pythagorean Theorem

Stella purchased a small plot of land with dimensions of 30 yards, 16 yards, and 34 yards. How can we determine if this triangular lot forms a right triangle?



$$\square + b^2 = c^2$$

$$30^2 + 16^2 = \square$$

$$900 + \square = 1156$$

$$1156 = 1156$$

These side lengths satisfy the Pythagorean theorem. Therefore, her plot of land is in the shape of a ☐ triangle.

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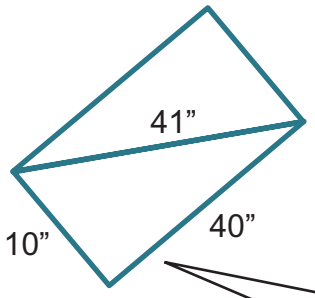
Real-World Use of Pythagorean Triples

Carson found a piece of wood he wants to use to make a table top. The wood measures 40 inches by 10 inches. The diagonal of the wood is 41 inches. Is the piece of wood rectangular?



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

$10^2 + 40^2 \stackrel{?}{=}$ ☐

$100 +$ ☐ $\stackrel{?}{=} 1681$

☐ $\neq 1681$

If this is a right triangle, then 10, 40, and 41 must satisfy the Pythagorean theorem.

So, the piece of wood he has is a non-rectangular ☐.

The numbers 10, 40, and 41 are close to the Pythagorean triple 9, 40, and 41.

Summary | Exploring the Pythagorean Theorem

Lesson Question	What are properties of right triangles?

Answer

Use this space to write any questions or thoughts about this lesson.