**?**

**W2K**

**Words to Know**

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

**Apply** the Pythagorean

theorem.

**Identify** sets of Pythagorean

.

**Recognize** perfect

.

**Identify** and **examine** right triangles.

**Lesson Goals**

**Lesson Question**

|  |  |
| --- | --- |
|  | 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 |

### 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

A

leg

hypotenuse

C leg B

* 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.

**2**

between 82 and 92

•

* 64 = 82
* 42 between 62 and
* 25 =

42 < 18 < 52

* 18
* Not Perfect Squares
* Perfect Squares
	+ 4 = 22

**Perfect Squares Versus Not Perfect Squares**

**EXAMPLE**

**Slide**

**Perfect Squares**

A perfect square is a number that is the result of whole number.

4

a natural, or

4

6

4 ⋅ 4 = 42 =

6

6 ⋅ 6 = 62 =

|  |  |  |  |
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**Slide**

### Perfect Squares of Right Triangles

#### EXAMPLE

can be created from the side lengths of a

triangle.

3

3 5 3 =

3

4

9 + 16 = 25

4 4 =

**5**

4

**Slide**

### Pythagorean theorem

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

*a*2 + = *c*2

**5**

32 + 42 =

9 + 16 = 25

25 = 25

5

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  | 5 |
|  | 9 |  |
|  |  |  |
|  |  |  |  |  |
|  | 16 |  |  |
|  |  |  |  |
|  |  |  |  |

3 5

4

9 + 16 = 25

**Slide**

### Sides of a Particular Right Triangle

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

**8**

#### A

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | ***c*** = **17** |
|  |  |  |  |  |
|  |  |  | ***b*** = | **15** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| **C** |  | ***a*** | = **8** |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

**B**

The diagram shows:

• + 152 = 172

* + - 64 + 225 =
		- *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 .

**Slide**

### 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

32 + 42 = 52.

* + (5, 12, 13)

52 + = 132

25 + 144 = 169

169 = 169

* + (7, 24, 25)

72 + 242 =

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:

( , 12, 15)

92 + = 152

81 + 144 = 225

225 = 225

**8**

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

**Slide**

### 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?

30 yards

+ *b*2 = *c*2

34 yards

16 yards

302 + 162 =

900 + = 1156

1156 = 1156

**11**

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

**Slide**

### 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?

41” 100 

*a*2 + *b*2 = *c*2

102  402 ?

? 1681

10” 40”

≠ 1681

**13**

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

**Lesson Question**

**??**

What are properties of right triangles?

**Lesson Question**

**Answer**

## Exploring the Pythagorean Theorem

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