Pythagorean Triple:

3 natural numbers that make the Pythagorean Theorem true.

3 natural numbers that actually form a right triangle.

Most common Pythagorean Triple: 3, 4, 5

Other common Pythagorean Triples:

5, 12, 13 8, 15, 17

Theorem 8-2 **Converse of the Pythagorean Theorem**

If the square of the length of one side of a triangle is equal to the sum of the squares of the lengths of the other two sides, then the triangle is a right triangle.

Do these lengths form a right triangle?

11, 40, 41?

only if

$41^2 = 11^2 + 40^2$

$1681 \neq 1721$

Since these three numbers don't make the Pythagorean Theorem true this must NOT be a right triangle.

12, 35, 37?

only if

$37^2 = 12^2 + 35^2$

$1369 = 1369$

Since these three numbers DO make the Pythagorean Theorem true this MUST be a right triangle.

Is this a Pythagorean Triple? 28, 45, 53

biggest number would have to be the hypotenuse

Only if: $53^2 = 28^2 + 45^2$

$2809 = 2809$

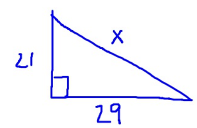
Since these numbers make the Pythagorean Theorem true they are a Pythagorean Triple.

Find the third side of the right triangle. All sides are whole numbers.

21, 29, ____

There is only two possibilities here. Either 21 and 29 are both legs and we're looking for the hypotenuse OR 21 is a leg and 29 is the hypotenuse and we're looking for the other leg. Try one of these situations and if it doesn't lead to a whole number answer then it must be the other situation.

1st attempt: assume that 21 and 29 are legs.

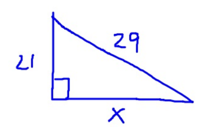


$x^2 = 21^2 + 29^2$

$\sqrt{x} = \sqrt{21^2 + 29^2}$ $\quad x = 35.81$

this means the missing side isn't the hypotenuse.

1st attempt: assume that 21 is a leg and 29 is the hypotenuse.



$29^2 = 21^2 + x^2$

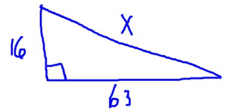
$\sqrt{x^2} = \sqrt{29^2 - 21^2}$ $\quad x = 20$

The missing side must be 20

Find the third side of the right triangle. All sides are whole numbers.

16, 63, ___

1st attempt: assume that 16 and 63 are legs.

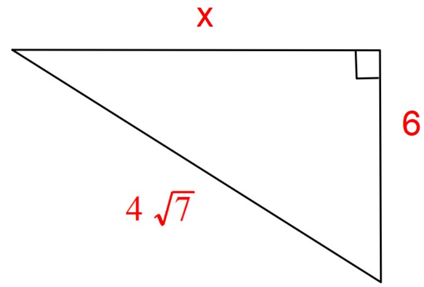


$$\sqrt{x^2} = \sqrt{16^2 + 63^2}$$

$$x = 65$$

The missing side must be 65

Find the missing side of this right triangle. Give answer in simplified radical form.



$$(4\sqrt{7})^2 = x^2 + 6^2$$

$$16 \cdot 7 = x^2 + 36$$

$$112 = x^2 + 36$$

$$-36 \qquad -36$$

$$\sqrt{x^2} = \sqrt{76}$$

$$x = \sqrt{4 \cdot 19}$$

$$\boxed{x = 2\sqrt{19}}$$

Do these lengths form a right triangle?

16, 20, 24 ?

ONLY IF $24^2 = 16^2 + 20^2$

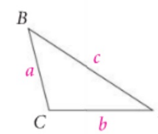
SINCE $576 \neq 656$ THIS ISN'T A RIGHT △

If it isn't a right triangle then it is either an acute triangle or an obtuse triangle. Which one?

Theorem 8-3

If the square of the length of the longest side of a triangle is greater than the sum of the squares of the lengths of the other two sides, the triangle is obtuse.

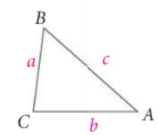
If $c^2 > a^2 + b^2$, the triangle is obtuse.



Theorem 8-4

If the square of the length of the longest side of a triangle is less than the sum of the squares of the lengths of the other two sides, the triangle is acute.

If $c^2 < a^2 + b^2$, the triangle is acute.



Right, acute, or obtuse? 40, 31, 35

c a b

c^2

$40^2 = 1600$

$a^2 + b^2$

$31^2 + 35^2 = 2186$

Since $c^2 < a^2 + b^2$ this must be an acute triangle.

Right, acute, or obtuse? 51, 63, 85

c^2

$85^2 = 7225$

$a^2 + b^2$

$51^2 + 63^2 = 6570$

Since $c^2 > a^2 + b^2$ this must be an obtuse triangle.

Hwk #15: Sec 8-1

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Problems: 8, 12, 16-18, 23, 24, 28, 37, 38