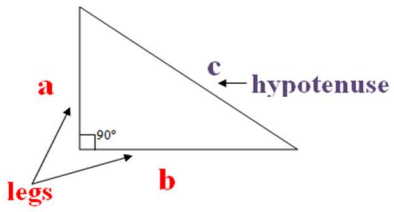
Section 9.2 – The Converse of the Pythagorean Theorem

Converse of the Pythagorean Theorem:

If the lengths of the three sides of a triangle satisfy the Pythagorean equation, then the triangle is a right triangle.

The Pythagorean Theorem:

In a right triangle, the sum of the squares of the lengths of the legs equals the square of the length of the hypotenuse.



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

**Remember that in a right triangle the hypotenuse should be the longest side.

Example 1: Is the triangle a right triangle?

Determine whether the triangle with side lengths 76, 120, and 98 is a right triangle.

**The longest side (120) would be the hypotenuse if this is a right triangle, so I will plug that in for c. The other two lengths would be the legs, so I will plug those in for a and b (which one goes into a or b does not matter)

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

$76^2 + 98^2 \stackrel{?}{=} 120^2$ **We use $\stackrel{?}{=}$ to say we are trying to see if both sides of this relation are equal.

$5776 + 9604 \stackrel{?}{=} 14400$ **Now add the two numbers on the left side of the relation

$15380 \neq 14400$

Since the two sides of the relation are not equal this cannot be a right triangle.

Not a right triangle.

Example 2: Is the triangle a right triangle?

Determine whether the triangle with side lengths 221, 204, and 85 is a right triangle.

**The longest side (221) would be the hypotenuse if this is a right triangle, so I will plug that in for c. The other two lengths would be the legs, so I will plug those in for a and b (which one goes into a or b does not matter)

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

$204^2 + 85^2 \stackrel{?}{=} 221^2$ **Square all the numbers (multiply them by themselves)

$41616 + 7225 \stackrel{?}{=} 48841$ **Now add the two numbers on the left side of the relation

$48841 = 48841$

Since the two sides of the relation are equal this must be a right triangle.

Is a right triangle.

Example 3: Is the triangle a right triangle?

Determine whether the triangle with side lengths 5.0, 1.4, and 4.8 is a right triangle.

**The longest side (5.0) would be the hypotenuse if this is a right triangle, so I will plug that in for c. The other two lengths would be the legs, so I will plug those in for a and b (which one goes into a or b does not matter)

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

$1.4^2 + 4.8^2 \stackrel{?}{=} 5.0^2$

$1.96 + 23.04 \stackrel{?}{=} 25.00$

$25.00 = 25.00$

Since the two sides of the relation are equal this must be a right triangle.

Is a right triangle.

Example 4: Is the triangle a right triangle?

Determine whether the triangle with side lengths 80, 82, and 18 is a right triangle.

**The longest side (82) would be the hypotenuse if this is a right triangle, so I will plug that in for c. The other two lengths would be the legs, so I will plug those in for a and b (which one goes into a or b does not matter)

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

$80^2 + 18^2 \stackrel{?}{=} 82^2$

$6400 + 324 \stackrel{?}{=} 6724$

$6724 = 6724$

Since the two sides of the relation are equal this must be a right triangle.

Is a right triangle.

Example 5: Is the triangle a right triangle?

Determine whether the triangle with side lengths 3, 4, and 6 is a right triangle.

**The longest side (6) would be the hypotenuse if this is a right triangle, so I will plug that in for c. The other two lengths would be the legs, so I will plug those in for a and b (which one goes into a or b does not matter)

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

$3^2 + 4^2 \stackrel{?}{=} 6^2$

$9 + 16 \stackrel{?}{=} 36$

$25 \neq 36$

Since the two sides of the relation are not equal this cannot be a right triangle.

Not a right triangle.

***Don't forget that you may have to use some of the examples from section 9.1 to complete the homework!