Chapter 5

Properties of Geometric Figures

Section 5.1

Triangles

Lesson 1:

The Pythagorean Theorem for Right Triangles

The Pythagorean Theorem allows us to calculate a missing side length in a right triangle.
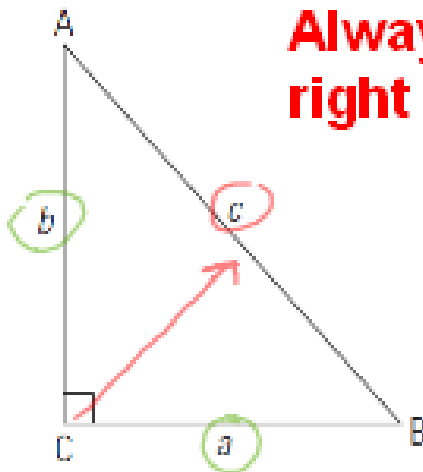
Every right triangle has a **hypotenuse** and **two legs**.

In this section, you will need to use the Pythagorean theorem when working with right triangles.

The Pythagorean theorem states that, for any right triangle:
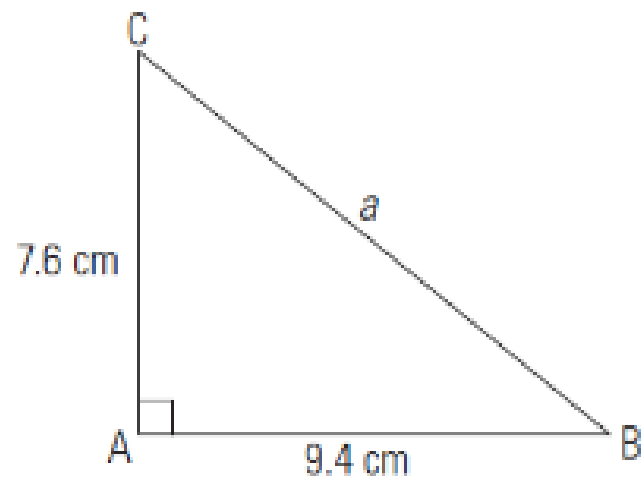
$$a^2 + b^2 = c^2$$

where a and b are legs of the triangle and c is the hypotenuse.
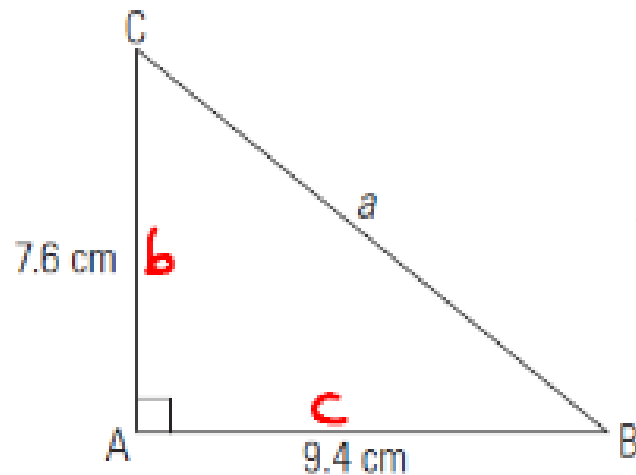
Always across from the right angle.

Example 1

Calculate the length of the missing side.

C
7.6 cm
a
A
9.4 cm
B

Example 1

Calculate the length of the missing side. **(hypotenuse)**

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

$$7.6^2 + 9.4^2 = a^2$$

$$57.76 + 88.36 = a^2$$
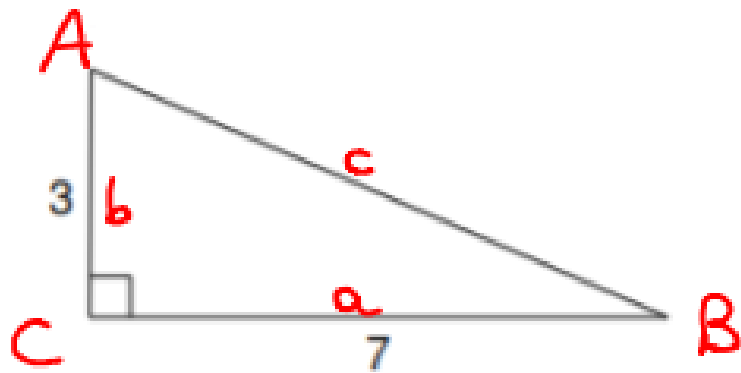
$$\sqrt{146.12} = \sqrt{a^2}$$

$$12.08801... = a$$

$$a = 12.1 \text{ cm}$$

C

7.6 cm b

a

A

c

9.4 cm

B

You Try: Calculating the length of the hypotenuse

$c = 7.6$

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

$7^2 + 3^2 = c^2$

$49 + 9 = c^2$

$\sqrt{58} = \sqrt{c^2}$

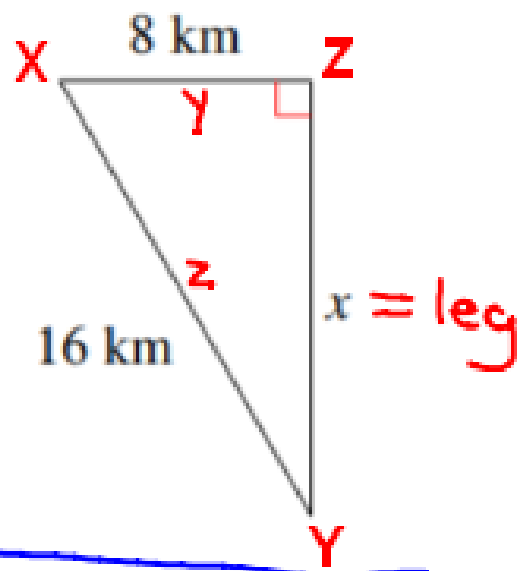$7.615... = c$

$$\text{leg}^2 + \boxed{\text{leg}^2} = \text{hyp}^2 - \text{leg}^2$$

$$- \text{leg}^2 \qquad\qquad - \text{leg}^2$$

↑
isolate

$$\text{leg}^2 = \text{hyp}^2 - \text{leg}^2$$

Ex: Calculating the length of a leg

X —— 8 km —— Z

Y

z

16 km

$x = \text{leg}$

$X = 13.9 \text{ km}$

$$X^2 = Z^2 - Y^2$$

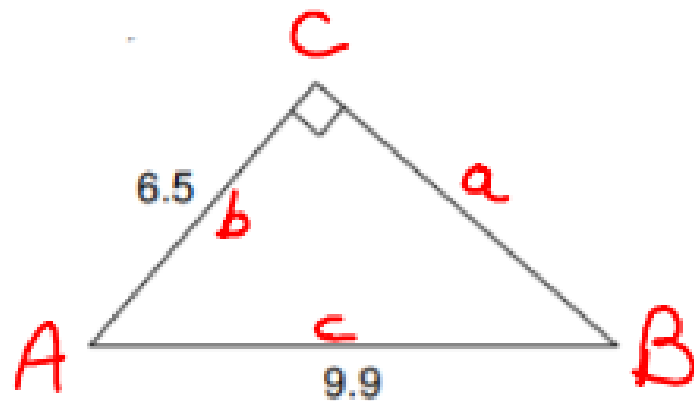$$X^2 = 16^2 - 8^2$$

$$X^2 = 256 - 64$$

$$\sqrt{X^2} = \sqrt{192}$$

$$X = 13.856\ldots$$

You Try: Calculating the length of a leg

$$a^2 = c^2 - b^2$$

$$a^2 = 9.9^2 - 6.5^2$$

$$a^2 = 98.01 - 42.25$$

$$\sqrt{a^2} = \sqrt{55.76}$$

$$a = 7.467\ldots$$

$$a = 7.5$$

Homework:

Build Your Skills
pg. 176
#1(a)(b)(c)

Worksheet: #7(a) - (l)