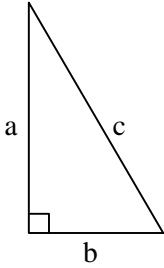


MATD 0370 (ELEMENTARY ALGEBRA)
EXERCISE SET 3.1

A right triangle is a triangle in which one of the angles is a right (that is, 90-degree) angle. The right angle in a triangle is often indicated by a small square in the corner (see figure below.) Also in a right triangle, the side opposite the right angle is called the hypotenuse and is always the longest side. The two sides next to the right angle are called legs.



If the lengths of two sides of a right triangle are known, the length of the remaining side can be found using the Pythagorean Theorem: the sum of the squares of the lengths of the legs is equal to the square of the length of the hypotenuse [note that the Scarecrow got this wrong in *The Wizard of Oz*.] If we call the lengths of the legs of a right triangle a and b , and the length of the hypotenuse c , then $a^2 + b^2 = c^2$.

Example 1: In a right triangle, use the Pythagorean Theorem to find the length of the side not given. Give an exact answer and, where appropriate, give an approximation to three decimal places.

$$\text{Given: } a = 3 \text{ and } c = \sqrt{15}$$

$$\begin{aligned} \text{Solution: } \quad a^2 + b^2 &= c^2 \\ (3)^2 + b^2 &= (\sqrt{15})^2 \\ 9 + b^2 &= \sqrt{225} \\ 9 + b^2 &= 15 \\ b^2 &= 6 \\ b &= \sqrt{6} \approx 2.449 \quad (\text{Exact Answer is } \sqrt{6}, \text{ Approximation is } 2.449) \end{aligned}$$

Example 2: A water pipe is being prepared to run diagonally under a rectangular kitchen floor. If the kitchen is 11 m by 14 m, approximately how long must the pipe be? Round your answer to the nearest tenth of a meter.

$$\begin{aligned} \text{Solution: } \quad a^2 + b^2 &= c^2 \\ (11)^2 + (14)^2 &= c^2 \\ 121 + 196 &= c^2 \\ 317 &= c^2 \\ c &= \sqrt{317} \approx 17.8 \text{ m} \end{aligned}$$

In addition to the problems assigned from your Personal Academic Notebook for lesson 3.1, work the following problems:

For problems 1–3, find the length of the side not given in a right triangle. Give an exact answer and, where appropriate, give an approximation to three decimal places.

1. $a = 12$ and $b = 5$
2. $a = 7$ and $c = 10$
3. $b = \sqrt{5}$ and $c = 6$
4. A 20 ft ladder is leaning against a building. The top of the ladder reaches a height of 17 ft. How far from the building is the bottom of the ladder? Round your answer to the nearest tenth of a foot.
5. Find the length of a diagonal of a square that has sides 8 cm long. Round your answer to the nearest thousandth of a centimeter.
6. A 32 m pipe is running diagonally under a rectangular room. The width of the room is 19 m. Find the length of the room. Round your answer to the nearest hundredth of a meter.

ANSWERS:

1. 13
2. $\sqrt{51} \approx 7.141$
3. $\sqrt{31} \approx 5.568$
4. 10.5 ft
5. 11.314 cm
6. 25.75 m