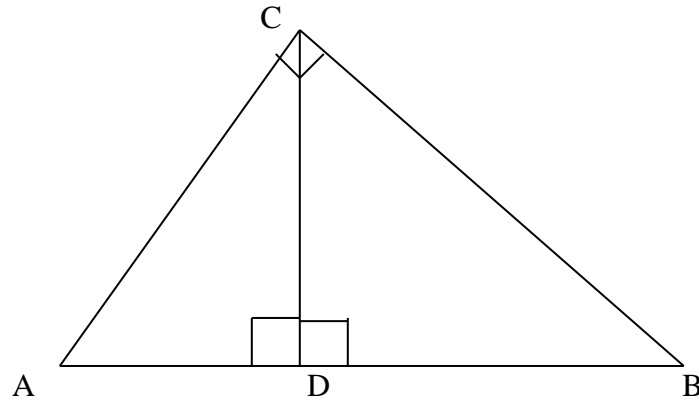


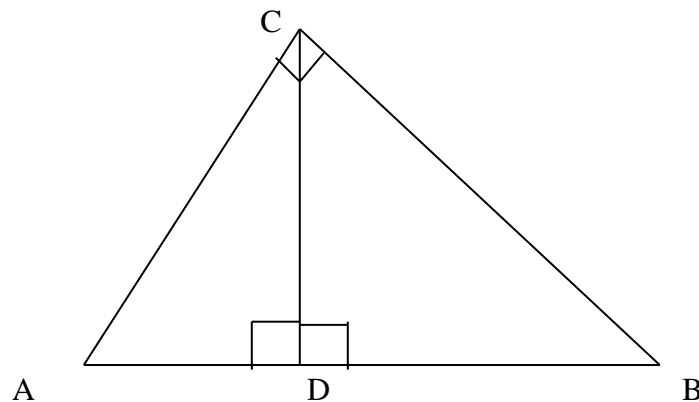
**Theorem 5.4.1:** The altitude drawn to the hypotenuse of a right triangle separates the right triangle into two right triangles that are similar to each other and to the original right triangle.



**Theorem 5.4.2:** The length of the altitude to the hypotenuse of a right triangle is the geometric mean of the lengths of the segments of the hypotenuse.

**Example 1:**

Given a right triangle ABC with altitude DC:



If  $BD = 3$ ,  $BC = 5$ ,  $AC = 6$ , find  $DC$  and  $AD$

**Lemma 5.4.3:** The length of each leg of a right triangle is the geometric mean of the length of the segment of the hypotenuse adjacent to that leg. Use figure 5.21page 235:

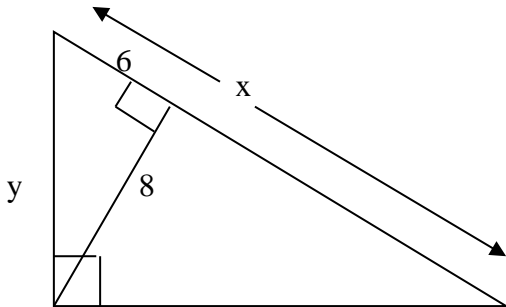
$$\frac{AB}{AC} = \frac{AC}{AD}$$

**Theorem 5.4.4: (Pythagorean Theorem)** The square of the length of the hypotenuse of a right triangle is equal to the sum of the squares of the lengths of the legs.

$c^2 = a^2 + b^2$      **c is the longest side or the hypotenuse and this theorem only works with right triangles.**

**Example 2:**

Find “x” and “y”.



**Example 3:**

**A hot air balloon is held in place by the ground crew at a position that is 21 feet from the point directly beneath the balloon. If the rope is of length 29 feet, how far above the ground level is the balloon?**

**Definition:** The Pythagorean triple is a set of three numbers ( a, b, c) for which.

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

**Theorem 5.4.7:** Let a, b and c represent the lengths of the three sides of the triangle with length c the length of the longest side.

1. If  $c^2 > a^2 + b^2$ , then the triangle is obtuse and the angle lies opposite the side of length c.
2. If  $c^2 < a^2 + b^2$ , then the triangle is acute.

**Example 4:** Determine the type of triangle represented if the lengths of its sides are as follows:

a.  $a = 1.5, b = 2$  and  $c = 2.5$

b.  $a = 5, b = 7$  and  $c = 9$

c.  $a = 10, b = 12$  and  $c = 16$

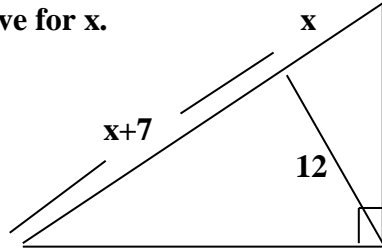
d.  $a = 6, b = 7$  and  $c = 8$

**Example 5:**

What is the length of a side of a square with a diagonal length of 10?

Draw a diagram.

**Example 6: Solve for  $x$ .**



**Example 7: Given a right triangle with right angle C,  $AC = 6$  and  $CB = 8$ . Find the length of  $AB$ .**

**Example 8: Given a right triangle with right angle C,  $AB = 13$  and  $CB = 12$ . Find the length of  $AC$ .**

**Example 9: Determine the type of triangle represented if the length of its sides are as follows:**

a. 3, 5, 7

b. 5, 12, 13

c. 7, 8, 9

d. 2, 6, 9