Pythagorean Theorem word problems ws #1

Solve each of the following. Please draw a picture and use the Pythagorean Theorem to solve. **Be sure to label all answers and leave answers in exact simplified form.**

1. The bottom of a ladder must be placed 3 feet from a wall. The ladder is 12 feet long. How far above the ground does the ladder touch the wall?

   \[ 12^2 - 3^2 = b^2 \]
   \[ 144 - 9 = b^2 \]
   \[ 135 = b^2 \]
   \[ b = 11.62 \text{ ft} \]

2. A soccer field is a rectangle 90 meters wide and 120 meters long. The coach asks players to run from one corner to the corner diagonally across the field. How far do the players run?

   \[ 120^2 + 90^2 = c^2 \]
   \[ 14400 + 8100 = c^2 \]
   \[ c^2 = 22500 \]
   \[ c = 150 \text{ m} \]

3. How far from the base of the house do you need to place a 15’ ladder so that it exactly reaches the top of a 12’ wall?

   \[ 15^2 - 12^2 = a^2 \]
   \[ 225 - 144 = a^2 \]
   \[ a^2 = 81 \]
   \[ a = 9 \text{ ft} \]

4. What is the length of the diagonal of a 10 cm by 15 cm rectangle?

   \[ 15^2 + 10^2 = c^2 \]
   \[ 225 + 100 = c^2 \]
   \[ c^2 = 325 \]
   \[ c = 18.03 \text{ cm} \]

5. The diagonal of a rectangle is 25 in. The width is 15 in. What is the area of the rectangle?

   \[ 25^2 - 15^2 = b^2 \]
   \[ 625 - 225 = b^2 \]
   \[ b^2 = 400 \]
   \[ b = 20 \]

   \[ a = 1 \cdot 15 = 300 \text{ in}^2 \]
6. Two sides of a right triangle are 8” and 12”.
   A. Find the area of the triangle if 8 and 12 are legs.
      \[ a^2 + b^2 = c^2 \]
      \[ 8^2 + 12^2 = c^2 \]
      \[ c = 14.4 \]
      \[ A = \frac{1}{2} (8 \text{ in}) (12 \text{ in}) \]
      \[ A = 48 \text{ in}^2 \]
   B. Find the area of the triangle if 8 and 12 are a leg and hypotenuse.
      \[ 12^2 - 8^2 = x^2 \]
      \[ x = 8.94 \]
      \[ A = \frac{1}{2} (8 \text{ in})(8.94 \text{ in}) \]
      \[ A = 35.8 \text{ in}^2 \]

7. The area of a square is 81 cm². Find the perimeter of the square.
   \[ \sqrt{81} = 9 \text{ cm} \]
   \[ P = 4 \cdot 9 = 36 \text{ cm} \]

8. An isosceles triangle has congruent sides of 20 cm. The base is 10 cm. What is the area of the triangle?
   \[ 20^2 - 5^2 = b^2 \]
   \[ 400 - 25 = b^2 \]
   \[ b^2 = 375 \]
   \[ b = 19.4 \text{ cm} \]
   \[ A = \frac{1}{2} (10 \text{ cm})(19.4 \text{ cm}) \]
   \[ A = 97 \text{ cm}^2 \]

9. A baseball diamond is a square that is 90’ on each side. If a player throws the ball from 2nd base to home, how far will the ball travel?
   \[ 90^2 + 90^2 = c^2 \]
   \[ 8100 + 8100 = c^2 \]
   \[ 16200 = c^2 \]
   \[ c = 127.23 \text{ ft} \]

10. Jill’s front door is 42” wide and 84” tall. She purchased a circular table that is 96 inches in diameter. Will the table fit through the front door?
    \[ 84^2 + 42^2 = c^2 \]
    \[ 7056 + 1764 = c^2 \]
    \[ c^2 = 8820 \]
    \[ c = 93.91 \text{ in} \]
    No, the door is about 2 inches too small.