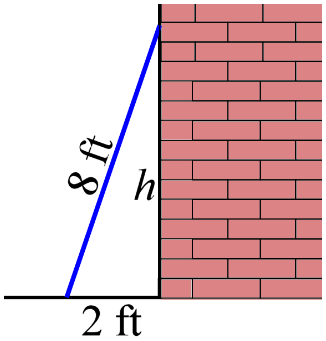
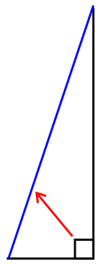
The Pythagorean Theorem: Applications

Example 1. An eight-foot ladder is placed against a wall so that the base of the ladder is 2 ft away from the wall. What is the height of the top of the ladder?



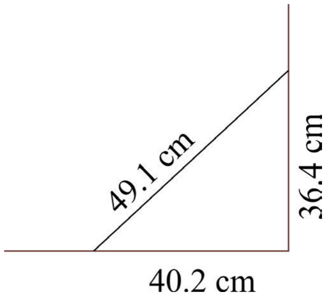
Since the ladder, the wall, and the ground form a right triangle, this problem is easily solved by using the Pythagorean Theorem. Let h be the distance asked. From the Pythagorean Theorem, we get:

$$\begin{aligned} 2^2 + h^2 &= 8^2 \\ 4 + h^2 &= 64 \\ h^2 &= 60 \\ h &= \sqrt{60} \\ h &\approx 7.75 \end{aligned}$$



Our answer, 7.75, is in feet. This means the ladder reaches to about 7 3/4 ft = 7 ft 9 in. high.

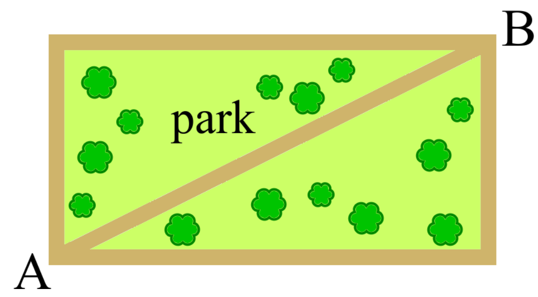
1. Is this corner a right angle?



2. How long is the diagonal of a laptop screen that is 9.0 inches high and 14.4 inches wide?

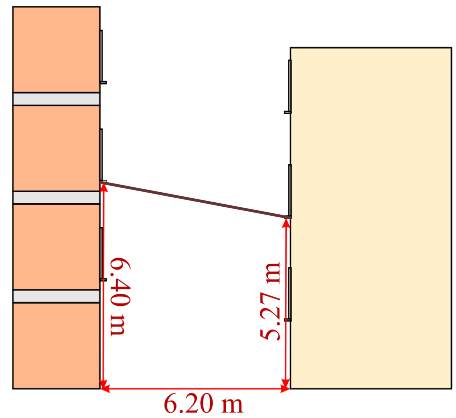
Note: computer screen sizes refer to the length of the screen's *diagonal*. For example, a 15-inch screen means that the diagonal is 15 inches, not the width nor the height.

3. A park is in the shape of a rectangle and measures 48 m by 30 m. How much longer is it to walk from A to B along the diagonal of the park than to walk along the edges of the park?

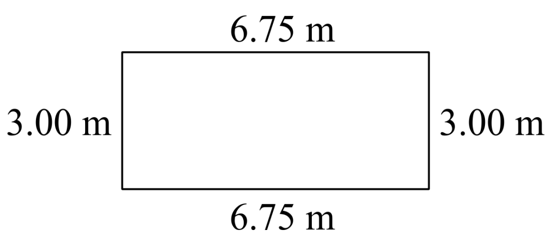


4. The area of a square is 100 m^2. How long is the diagonal of the square?

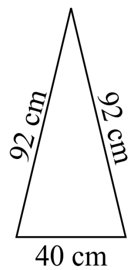
5. A clothesline is suspended between two apartment buildings. Calculate its length, assuming it is straight and doesn't sag any.



6. Construction workers have made a rectangular mold out of wood, and they are getting ready to pour cement into it. How could they make sure that the mold is indeed a rectangle and not a parallelogram? After all, in a parallelogram the opposite sides are equal, so simply measuring the opposite sides does not guarantee that a shape is a rectangle.

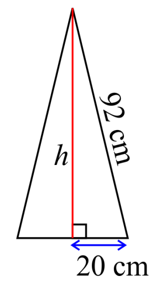


Example 2. Find the area of this isosceles triangle.



Solution: To calculate the area of any triangle, we need to know its altitude. When we draw the altitude, we get a right triangle:

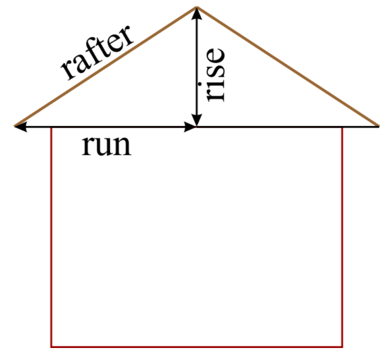
The next step is to apply the Pythagorean Theorem to solve for the altitude h, and after that calculate the actual area.



7. Calculate the area of the isosceles triangle in the example above to the nearest ten square centimeters.

8. Calculate the area of an equilateral triangle with 24-cm sides to the nearest square centimeter. Don't forget to draw a sketch.

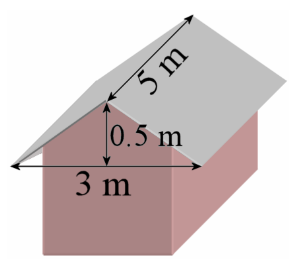
9. Calculate the length of the rafter in feet and inches, if...



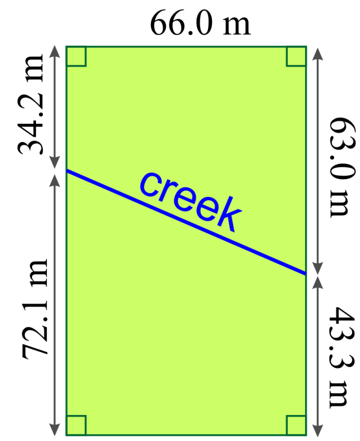
a. ...the run is 12 ft and the rise is 3 ft

b. ...the run is 12 ft and the rise is 5 ft 3 in.

10. Find the surface area of this roof to the nearest tenth of a square meter.



11. A creek runs through a piece of land in a straight line.



a. Find the length of the creek. Give your answer to the same accuracy as the dimensions in the picture.

b. The creek splits the plot into two parts. Calculate the areas of the two parts to the nearest ten square meters.

Puzzle Corner

The roof of a little kiosk is in the shape of a square pyramid. Each bottom edge measures 3.5 m, and the other edges measure 2.2 m. Calculate the surface area of this roof to the nearest tenth of a square meter.