

Introduction to Algebra

Solving a Quadratic Equation

$$2z^2 + 10z + 12$$

$$2(z^2 + 5z + 6)$$

$$2(z + 3)(z + 2)$$

$$4y^2 - 29y + 7$$

$$4y^2 - 28y - y + 7$$

$$4y(y - 7) - 1(y - 7)$$

$$(4y - 1)(y - 7)$$

ac
28

Word Problems

The Mitchell's are designing a garden. The garden will be in the shape of a rectangle and have an area of 270 square feet. The width of the garden is 3 feet less than the length. Find the length and width.

$$A = \text{length} \cdot \text{width}$$

$$270 = (x)(x-3)$$

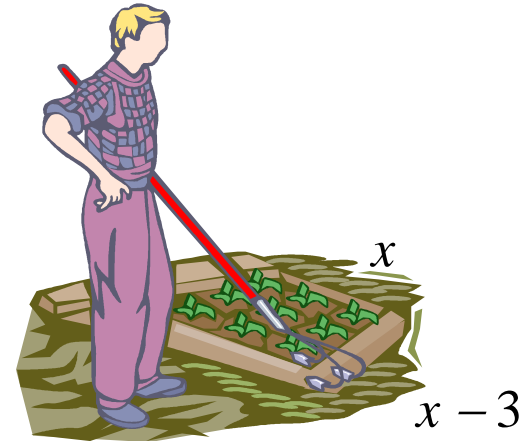
$$\begin{array}{r} 270 = x^2 - 3x \\ -270 \qquad \qquad -270 \\ \hline 0 = x^2 - 3x - 270 \end{array}$$

$$0 = x^2 - 3x - 270$$

$$0 = (x-18)(x+15)$$

$$\begin{array}{r} x-18=0 \\ +18 \quad +18 \\ \hline x=18 \end{array}$$

$$\begin{array}{r} x+15=0 \\ -15 \quad -15 \\ \hline x=-15 \end{array}$$



$$\begin{array}{l} x = 18 \text{ ft} \\ x-3 = 18-3 = 15 \text{ ft} \end{array}$$

A rectangular parking lot has a length that is 3 yards greater than the width. The area of the parking lot is 180 square yards. Find the length and the width.

$$A = \text{length} \cdot \text{width}$$

$$180 = (x+3)(x)$$

$$180 = x^2 + 3x - 180$$

$$\begin{array}{r} -180 \\ \hline 0 = x^2 + 3x - 180 \end{array}$$

$$0 = x^2 + 3x - 180$$

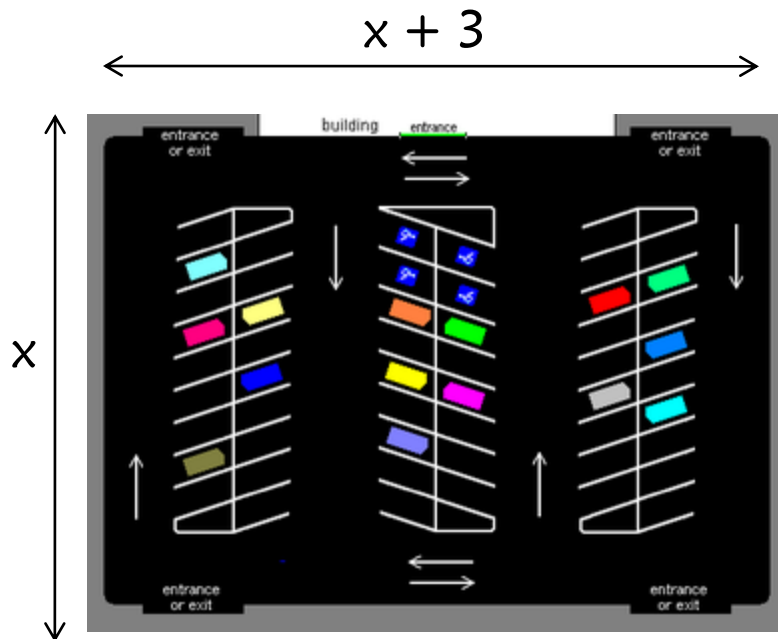
$$0 = (x+15)(x-12)$$

$$\begin{array}{r} x+15=0 \\ -15 \quad -15 \\ \hline x = -15 \end{array}$$

$$x = -15$$

$$\begin{array}{r} x-12=0 \\ +12 \quad +12 \\ \hline x=12 \end{array}$$

$$x=12$$



$$x = 12 \text{ yds}$$

$$x+3 = 12+3 = 15 \text{ yds}$$

The height of a triangular jib sail on a sailboat is 9ft more than the base. The triangle is 110 ft². Find the height.

$$A = \frac{1}{2}bh$$

$$2(110) = \frac{1}{2}(x)(x+9) \cdot 2$$

$$220 = x(x+9)$$

$$220 = x^2 + 9x$$

$$\begin{array}{r} 220 = x^2 + 9x \\ -220 \\ \hline 0 = x^2 + 9x - 220 \end{array}$$

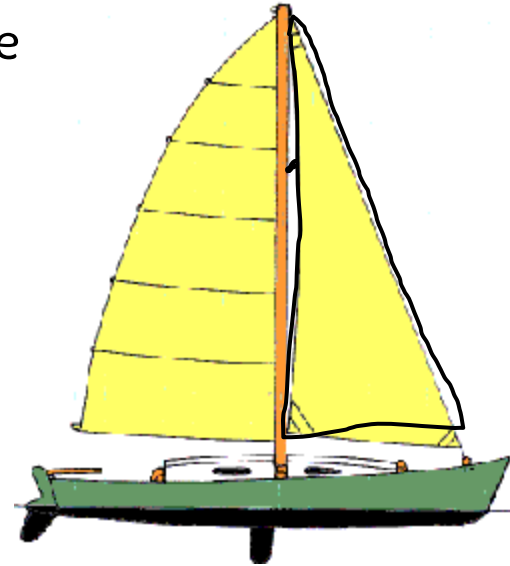
$$0 = (x + 20)(x - 11)$$

$$\begin{array}{r} x + 20 = 0 \\ -20 -20 \\ \hline x = -20 \end{array}$$

$$\begin{array}{r} x - 11 = 0 \\ +11 +11 \\ \hline x = 11 \end{array}$$

$$x = 11 \text{ ft}$$

$$x + 9 = 20 \text{ ft}$$

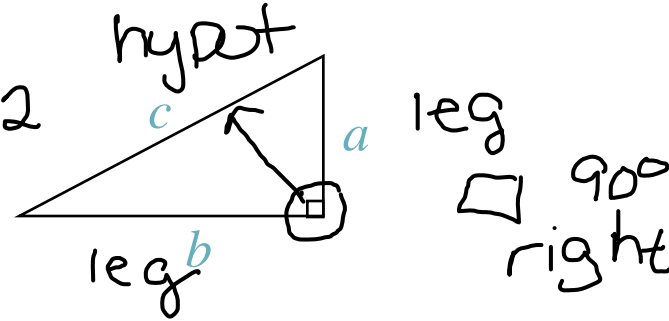


The Pythagorean Theorem

In any right triangle, if a and b are the lengths of the legs and c is the length of the hypotenuse, then

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

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



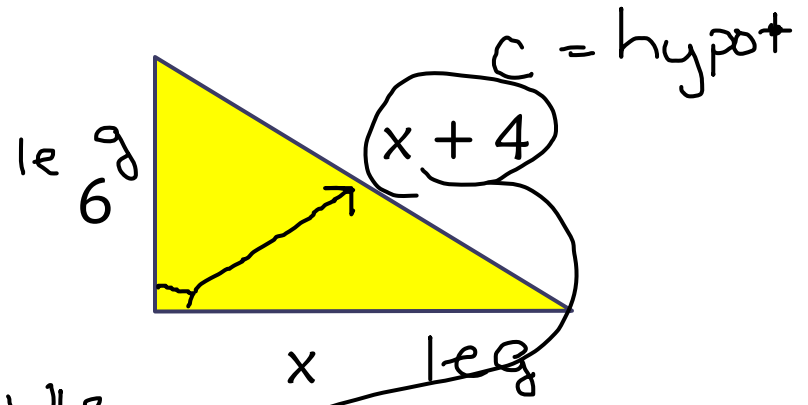
Memorize!

Find the length of each side of the right triangle.

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

leg² + leg² = hyp²

$$x^2 + 6^2 = (x + 4)^2$$



$$x^2 + 36 = (x + 4)(x + 4)$$

$$x^2 + 36 = x^2 + 4x + 4x + 16$$

$$x^2 + 36 = x^2 + 8x + 16$$

$$\begin{array}{r} x^2 + 36 \\ -x^2 \quad \quad \quad -16 \\ \hline 36 = 8x + 16 \\ -16 \quad \quad \quad -16 \\ \hline 20 = 8x \end{array}$$

$$\frac{20}{8} = \frac{8x}{8}$$

$$\frac{5}{2} = x$$

$$x = \frac{5}{2}$$

$$x + 4 = \frac{13}{2}$$

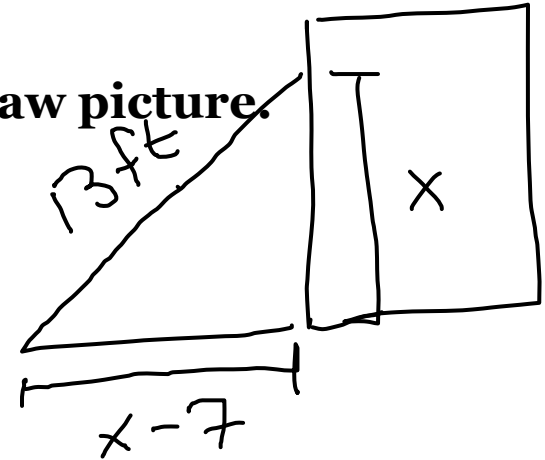
A 13-ft ladder is leaning against a house. The distance from the bottom of the ladder to the house is 7 ft less than the distance from the top of the ladder to the ground. How far is the bottom of the ladder from the house?

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

$$x^2 + (x-7)^2 = 13^2$$

$$\begin{aligned}
 x^2 + (x-7)(x-7) &= 169 \\
 x^2 + x^2 - 14x + 49 &= 169 \\
 2x^2 - 14x + 49 &= 169 \\
 \hline
 2x^2 - 14x - 120 &= 0 \\
 2(x^2 - 7x - 60) &= 0 \\
 2(x+5)(x-12) &= 0
 \end{aligned}$$

Draw picture.



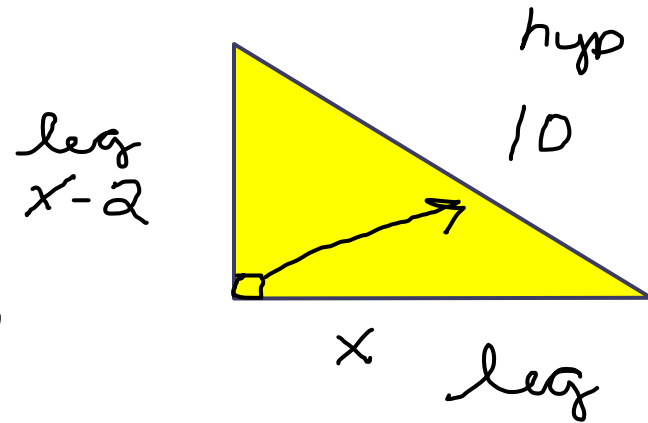
$$\begin{aligned}
 x+5 &= 0 \\
 \frac{-5}{-5} & \quad \frac{-5}{-5} \\
 \hline
 x &= -5
 \end{aligned}$$

$$\begin{aligned}
 x-12 &= 0 \\
 x-12 &= 0 \\
 +12 & \quad +12 \\
 \hline
 x &= 12
 \end{aligned}$$

$$\begin{aligned}
 x &= 12 \text{ ft} \\
 12 - 7 &= 5 \text{ ft}
 \end{aligned}$$

The shortest leg of a right triangle is 2 inches less than the length of the longest leg. If the hypotenuse measures 10 inches, find the length of all three sides.

Draw picture.



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

$$(x-2)^2 + x^2 = 10^2$$

$$(x-2)(x-2) + x^2 = 100$$

$$x^2 - 2x - 2x + 4 + x^2 = 100$$

$$2x^2 - 4x + 4 = 100$$

$$\begin{array}{r} 2x^2 - 4x + 4 = 100 \\ \underline{-100 \quad -100} \\ 2x^2 - 4x - 96 = 0 \\ 2(x^2 - 2x - 48) = 0 \\ 2(x-8)(x+6) = 0 \end{array}$$

$$\begin{array}{r} x - 8 = 0 \\ +8 \quad +8 \\ \hline x = 8 \end{array}$$

$$\begin{array}{r} x + 6 = 0 \\ -6 \quad -6 \\ \hline x = -6 \end{array}$$

$x = 8$ in
 $x - 2 = 8 - 2 = 6$ in

Wednesday:

Chapter 5 test

Hand out 'midterm' practice quiz