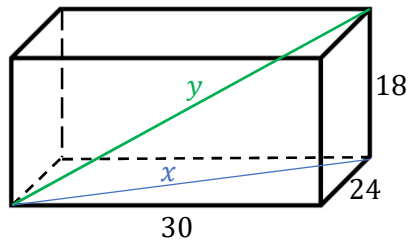
Lesson 9.4 – Story Problems

1) What is the longest stick that will fit inside a 24-by-30-by-18-inch box?



$30^2 + 24^2 = x^2$

$900 + 576 = x^2$

$1476 = x^2$

$x^2 + 18^2 = y^2$

$1476 + 324 = y^2$

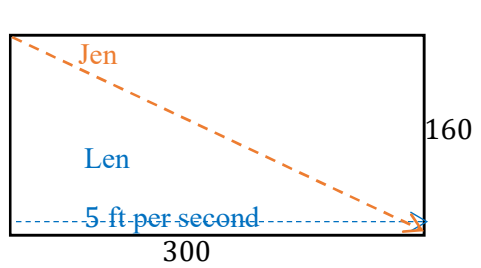
$1800 = y^2$

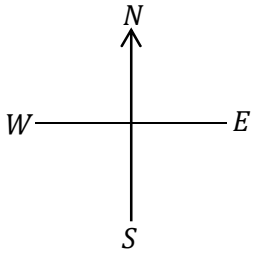
$\sqrt{1800} = y$

$42.4 = y$

The longest stick that will fit in the box is 42.4 inches long.

2) The Clementina High School Marching Band is practicing on the school football field. The field is 300 feet long from west to east and 160 feet wide from north to south. Len starts at the southwest corner and marches at a rate of 5 feet per second toward the southeast corner. At the same time, Jen begins marching diagonally from the northwest corner toward the southeast corner. If they want to meet at the corner at the same instant, how fast does Jen need to march?





$\frac{300}{5} = 60$ It takes Len 60 seconds to get from the southwest corner to the southeast corner.

Now, let's find the distance Jen needs to travel:

$300^2 + 160^2 = J^2$

$90000 + 25600 = J^2$

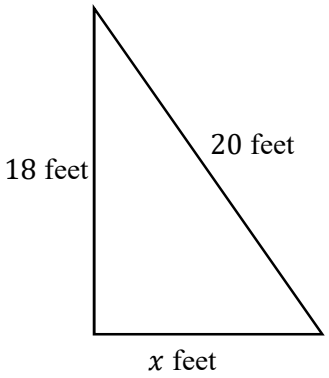
$115600 = J^2$

$340 = J$

$\frac{340}{60} = 5\frac{2}{3}$ ft/sec

Jen will need to march at $5\frac{2}{3}$ feet per second to arrive at the southeast corner at the same time as Len.

3) A 20 ft ladder reaches a window 18 ft high. How far is the foot of the ladder from the base of the building? How far must the foot of the ladder be moved to lower the top of the ladder by 2 ft?



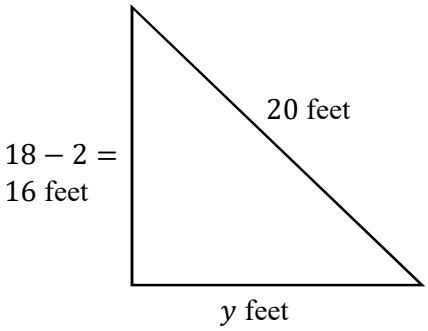
$18^2 + x^2 = 20^2$

$324 + x^2 = 400$

$x^2 = 76$

$x = \sqrt{76}$

$x \approx 8.72$ feet



$16^2 + y^2 = 20^2$

$256 + y^2 = 400$

$y^2 = 144$

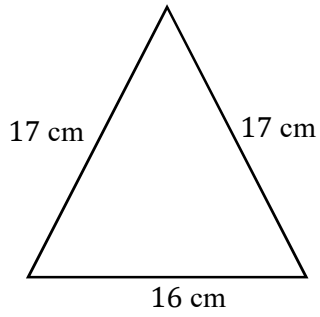
$y = \sqrt{144}$

$y = 12$ feet

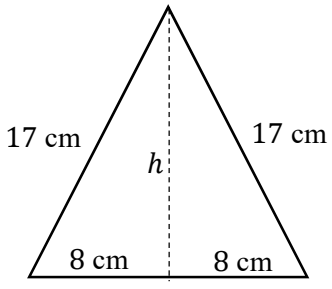
$12 - 8.72 = 3.28$

The foot of the ladder needs to be moved 3.28 feet out to lower the top of the ladder 2 feet.

4) Find the area of an isosceles triangle with base measuring 16 cm and legs measuring 17 cm.



In order to find the area of this triangle, we need to know the height.



$h^2 + 8^2 = 17^2$

$h^2 + 64 = 289$

$h^2 = 225$

$h = \sqrt{225}$

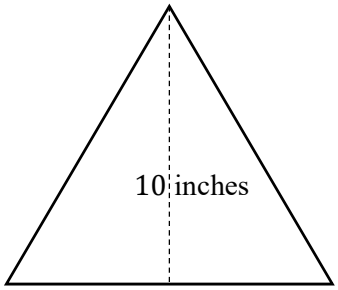
$h = 15$ cm

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

$A = \frac{1}{2}(16)(15)$

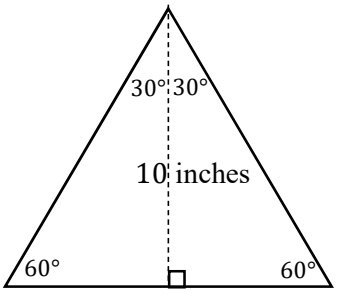
$A = 120$ cm^2

5) Find the length of each side of an equilateral triangle whose median measures 10 inches.



We know that equilateral triangles are also equiangular and all angles are 60°.

We also know that the median will bisect the vertex angle.



If we use our special triangle conjectures, we know that the long leg of the $30° - 60° - 90°$ triangle is 10 inches.

The short leg will be $\frac{10}{\sqrt{3}} \approx 5.77$. The hypotenuse will be $5.77 \cdot 2 = 11.55$.

Each side has length 11.55 inches.