

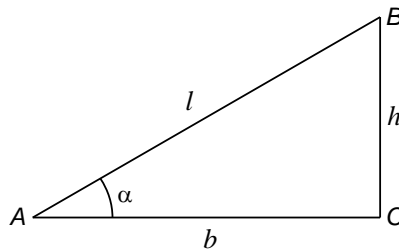
### Answer on Question#38772 - Math - Trigonometry

#### Question.

Length of ramp is 20 ft. find height and base.

#### Solution

A ramp is a flat supporting surface tilted at an angle, with one end higher than the other. The inclined plane's geometry is based on a right triangle. The horizontal leg length is called base, the vertical leg length is called height. (See the figure below.)



The length of ramp is given, i. e.  $l = 20$ . Let  $b$  and  $h$  denote the base and the height, respectively. To determine the length  $b$  of the base, we can use the cosine function.

$$\cos \alpha = \frac{b}{l}$$

Multiplying by  $l$  and substituting 20 for  $l$  we obtain

$$b = l \cos \alpha = 20 \cos \alpha.$$

We use the sine function to find the height

$$\sin \alpha = \frac{h}{l}$$

In a similar manner as above we obtain

$$h = l \sin \alpha = 20 \sin \alpha.$$

Because the angle  $\alpha$  is not given, one can see that the solution of the problem is not unique. If we take  $\alpha = 30^\circ$ , then we get

$$b = l \cos 30^\circ = 20 \cos 30^\circ = 20 \cdot 0,8660 = 17,32 \text{ ft,}$$

$$h = l \sin 30^\circ = 20 \sin 30^\circ = 20 \cdot 0,5 = 10 \text{ ft.}$$

But if we take  $\alpha = 45^\circ$ , then we obtain

$$b = l \cos 45^\circ = 20 \cos 45^\circ = 20 \cdot 0,7071 = 14,142 \text{ ft,}$$

$$h = l \sin 45^\circ = 20 \sin 45^\circ = 20 \cdot 0,7071 = 14,142 \text{ ft.}$$

That is in the last case the height and base are equal.

#### Answers:

$$b = l \cos \alpha, h = l \sin \alpha$$