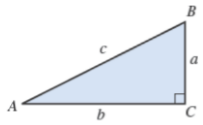
11/20/2020
Chapter 13



Angles are often indicated with capital letters: A, B, C
A is equivalent to the angle BAC
(angles are often indicated with Greek letters: α, β, γ)

Sides are indicated with lower case letters: a, b, c

Side (a) is opposite angle A
Side (c) is usually the longest side (in a right triangle, this is the hypotenuse)

Pythagorean theorem: $a^2 + b^2 = c^2$

Sides that are adjacent to angles: we never mean the hypotenuse

Trigonometric functions/ratios

Sine: $\sin A = \frac{opp}{hyp} = \frac{a}{c}$

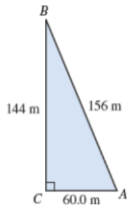
Cosine: $\cos A = \frac{adj}{hyp} = \frac{b}{c}$

Tangent: $\tan A = \frac{opp}{adj} = \frac{a}{b}$

Cotangent: $\cot A = \frac{adj}{opp} = \frac{b}{a}$

Secant: $\sec A = \frac{hyp}{adj} = \frac{c}{b}$

Cosecant: $\csc A = \frac{hyp}{opp} = \frac{c}{a}$



$$\sin A = \frac{144}{156} = 0.92307 \ldots$$

$$\cos A = \frac{60}{156} = 0.3846 \ldots$$

$$\tan A = \frac{144}{60} = 2.4$$

Sine and cosine are always smaller than 1, always between 0 and 1.
Tangent can be anything (positive)

$$\sin B = \frac{60}{156} = 0.3846 \ldots$$

$$\cos B = \frac{144}{156} = 0.92307 \ldots$$

$$\tan B = \frac{60}{144} = 0.416666 \ldots$$

If A and B are complementary, then $\sin A = \cos B$, and $\sin B = \cos A$, and $\tan A = \cot B = \frac{1}{\tan B}$

Sine of small angles is small (close to 0), but the cosine of small angles is large (close to 1).

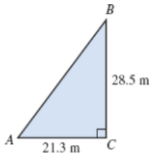
The tangent is equal for 1 when the angle is 45-degrees. Smaller than 1 when the angle is small, and bigger than 1 when the angle is larger than 45-degrees (goes to infinity when you get closer to 90-degrees).

Inverse trig functions take the ratio and convert the ratio into an angle.

$$\sin A = 0.92307 \ldots.$$
$$A = 67.4°$$

$$\cos B = 0.92307 \ldots$$
$$B = 22.6°$$

Once you find the value of one angle, then use the property of complementary angles to find the second angle or use another inverse trig function.



It's a right triangle, and the length of two sides.

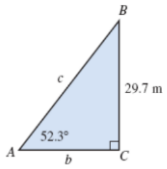
Find: length of the missing side.

$$c = \sqrt{28.5^2 + 21.3^2} = \sqrt{1265.94}$$
$$c = 35.58m$$

Find the missing angles.

$$\tan A = \frac{28.5}{21.3} = 1.338\ldots$$
$$\tan^{-1} 1.338\ldots = 52.3°$$
$$A = 53.2°$$

$$B = 90 - 53.2 = 36.8°$$



Two Angles: 1) right angle (right triangle), and 2) given second angle (A)
Length of one side: side opposite A: a

Missing angle B: $90 - 52.3 = 37.7°$

$$\sin 52.3° = \sin A = \frac{opp}{hyp} = \frac{29.7}{c}$$
$$\tan 52.3° = \tan A = \frac{opp}{adj} = \frac{29.7}{b}$$

$$\sin 52.3° = 0.79122\ldots = \frac{29.7}{c}$$

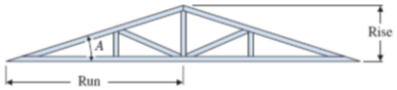
$$\frac{0.79122\ldots}{1} = \frac{29.7}{c}$$
$$c(0.79122\ldots) = 29.7$$
$$c = \frac{29.7}{0.79122\ldots}$$

$$c = 37.5\ m$$

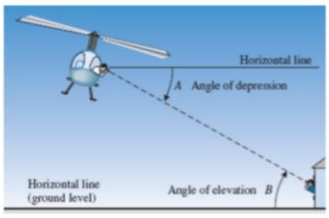
$$\tan 52.3° = 1.2938488\ldots = \frac{29.7}{b}$$
$$b = 23.0\ m$$

$$c = \sqrt{29.7^2 + 23^2} = \sqrt{1141.09} = 37.564\ldots$$

Whenever you are making calculations from other calculations, don't use the "rounded" values. Carry more decimal places than you need in the solution.

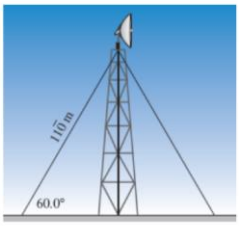


$$\tan A = \frac{opp}{adj} = \frac{rise}{run} = slope$$



Angle of depression vs. angle of elevation

= Alternate interior angles = they are equal



When doing applications (in this chapter), you are looking to frame the problem in terms of right triangles.

13.5 #18 hint