

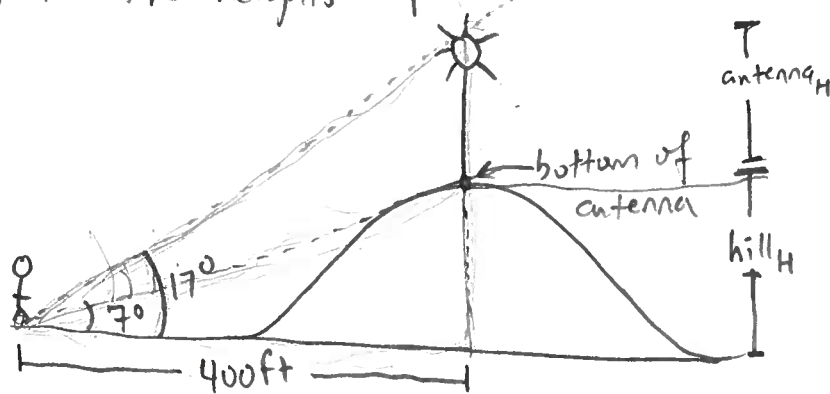
Ex: You approach a hill at top of which there is an antenna.

Your horizontal distance from bottom of antenna is 400ft.

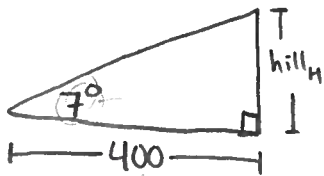
Angle of elevation to bottom of antenna is 7° and angle of elevation to top of antenna is 17° .
What is the heights of the hill and the antenna?

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Solu:

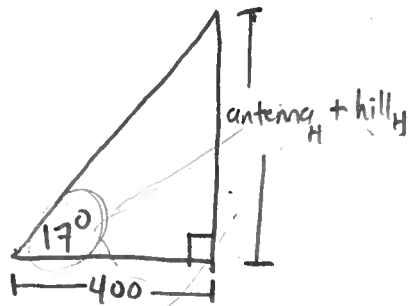


↓ extract Δ 's



$$\tan 7^\circ = \frac{\text{hill}_H}{400}$$

$$\text{hill}_H = 400 \tan(7^\circ) \approx 49.11 \text{ ft}$$



$$\tan(17^\circ) = \frac{\text{antenna}_H + \text{hill}_H}{400}$$

$$\text{antenna}_H + \text{hill}_H = 400 \tan(17^\circ)$$

$$\text{antenna}_H = (\text{antenna}_H + \text{hill}_H) - \text{hill}_H = 400 \tan(17^\circ) - 400 \tan(7^\circ) \approx 73.18 \text{ ft}$$

Goal: to solve non-right Δ 's

fundamental property of inverse:

$$f(f^{-1}(x)) = x$$

outputs $f^{-1}(f(x)) = x$
numbers

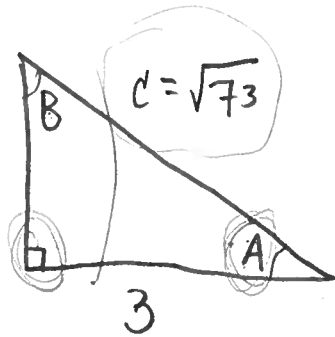
Need: inverse trig functions

trig function	<u>inputs</u> angles
inverse trig functions	numbers

angle

trig	inverse
sin	sin⁻¹ arcsin
cos	arccos
tan	arctan

Ex: $c^2 = 8^2 + 9$
 $c^2 = 73$
 $c = \pm\sqrt{73}$



$$\cos(B) = \frac{8}{\sqrt{73}}$$

$$B = \arccos\left(\frac{8}{\sqrt{73}}\right) \approx 20.56^\circ$$

$$\sin(A) = \frac{8}{\sqrt{73}}$$

Solve for A

⇓ plug both sides into arcsin

$$\arcsin(\sin(A)) = \arcsin\left(\frac{8}{\sqrt{73}}\right)$$

$$A = \arcsin\left(\frac{8}{\sqrt{73}}\right) \approx 69.44^\circ$$

$$\tan(A) = \frac{8}{3}$$

⇓ plug into arctan

$$\arctan(\tan(A)) = \arctan\left(\frac{8}{3}\right)$$

$$A = \arctan\left(\frac{8}{3}\right) \approx 69.44^\circ$$

FACT: sum of angles in a flat triangle is 180°

⇓

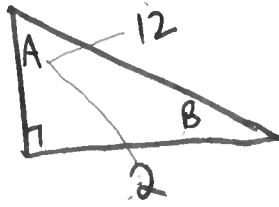
$$\Rightarrow B + A + 90^\circ = 180^\circ$$

$$B + 69.44^\circ = 90^\circ$$

$$B = 90 - 69.44^\circ = 20.56^\circ$$

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Ex: Find angles in



Find A

$$\sin(A) = \frac{2}{12} = \frac{1}{6}$$

$$A = \arcsin\left(\frac{1}{6}\right) \approx 9.59^\circ$$

Find B

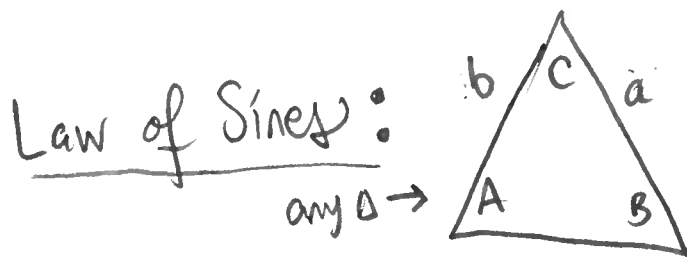
$$90^\circ + 9.59^\circ + B = 180^\circ$$

$$B = 180^\circ - 90^\circ - 9.59^\circ$$

$$= 80.41^\circ$$

Let's finish Δ -trig - we need to be able to solve any type of Δ

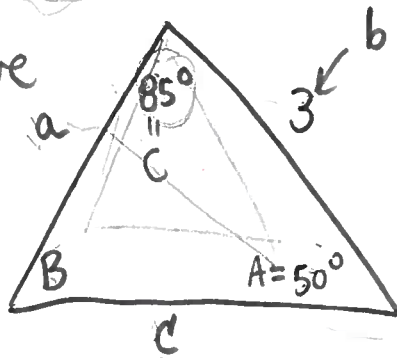
(4)



$$\frac{\sin(A)}{a} = \frac{\sin(B)}{b} = \frac{\sin(C)}{c}$$

Ex: Solve

find all missing sides + angles



Soln: Find B

$$85^\circ + 50^\circ + B = 180^\circ$$

$$B = 180^\circ - 85^\circ - 50^\circ = 45^\circ$$

Find a

$$\text{number} \rightarrow \frac{\sin(50^\circ)}{a} = \frac{\sin(45^\circ)}{3} \leftarrow \text{number}$$

Reciprocal:

$$\frac{a}{\sin(50^\circ)} = \frac{3}{\sin(45^\circ)} \xrightarrow{\text{mult by } \sin(50^\circ)} a = \frac{3\sin(50^\circ)}{\sin(45^\circ)}$$

≈ 3.25

Find c

$$\frac{\sin(45^\circ)}{3} = \frac{\sin(85^\circ)}{c} \rightarrow c = \frac{3\sin(85^\circ)}{\sin(45^\circ)} \approx 4.23$$