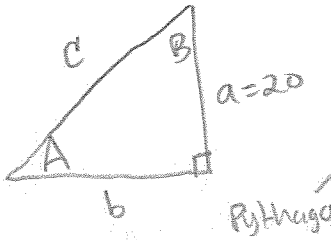
Homework 4 Solution MATH 1540 Spring 2020

§7.2 #7) $\cos\left(\frac{\pi}{3}\right) = \sin\left(\frac{\pi}{2} - \frac{\pi}{3}\right)$

$= \sin\left(\frac{3\pi}{6} - \frac{2\pi}{6}\right)$

$= \sin\left(\frac{\pi}{6}\right)$

#11) Given: $a=20$, $\sin(B)=\frac{1}{2}$



$\frac{1}{2} = \sin(B) = \frac{b}{c}$ (given, def)

$b^2+20^2=c^2$ (Pythagorean theorem) $\rightarrow$ $c=\sqrt{b^2+20^2}$

$\frac{1}{2} = \frac{b}{\sqrt{b^2+20^2}} \rightarrow \sqrt{b^2+20^2} = 2b$

square $\rightarrow$ $b^2+20^2=4b^2$

$20^2=3b^2$

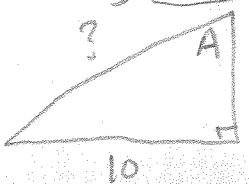
$b^2=\frac{20^2}{3}$

$b=+\sqrt{\frac{20^2}{3}} = \frac{20}{\sqrt{3}} \approx 11.5470$

$\frac{1}{2} = \frac{20/\sqrt{3}}{c}$

$\rightarrow \boxed{c = \frac{40}{\sqrt{3}} \approx 23.0940}$

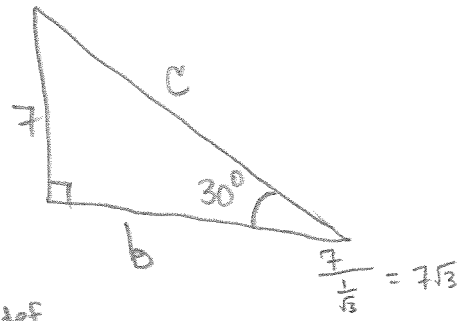
#17) $\boxed{\sin(A) = \frac{\text{opp } A}{\text{hyp}} = \frac{10}{\sqrt{116}}} \approx 0.9284$



$10^2+4^2=?^2 \rightarrow ? = \pm\sqrt{116}$

$\frac{10}{2\sqrt{29}} = \frac{5}{\sqrt{29}}$

#29) Given:



$\frac{7}{\frac{1}{\sqrt{3}}} = 7\sqrt{3}$

Find b

def: $\tan(30°) = \frac{7}{b} \rightarrow b = \frac{7}{\tan(30°)}$

≈ 12.12

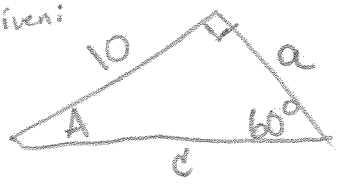
$\frac{7}{\frac{1}{2}} = 14$

Find c

def: $\sin(30°) = \frac{7}{c} \rightarrow c = \frac{7}{\sin(30°)}$

≈ 14

#30) Given:



$\frac{10}{\sqrt{3}}$

Find a

$\tan(60°) = \frac{10}{a} \rightarrow a = \frac{10}{\tan(60°)}$

≈ 5.774

$\frac{10}{\frac{\sqrt{3}}{2}} = \frac{20}{\sqrt{3}}$

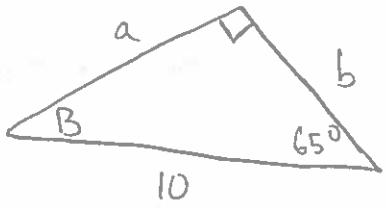
Find c

$\sin(60°) = \frac{10}{c} \rightarrow c = \frac{10}{\sin(60°)}$

≈ 11.55

§7.2 #34

Given:



Find a

$\sin(65^\circ) = \frac{a}{10}$

↓ mult by 10

$a = 10\sin(65^\circ)$

Find b

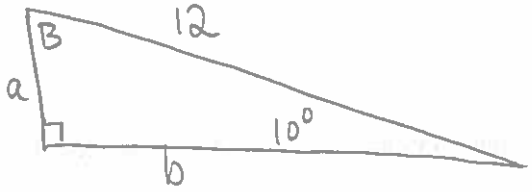
$\cos(65^\circ) = \frac{b}{10}$

↓ mult by 10

$b = 10\cos(65^\circ)$

#35

Given:



Find a

$\sin(10^\circ) = \frac{a}{12}$

↓ mult by 12

$a = 12\sin(10^\circ)$

Find b

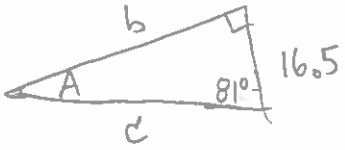
$\cos(10^\circ) = \frac{b}{12}$

↓ mult. by 12

$b = 12\cos(10^\circ)$

#36

Given:



Find b

$\tan(81^\circ) = \frac{b}{16.5}$

↓ multiply by 16.5

$b = 16.5\tan(81^\circ)$

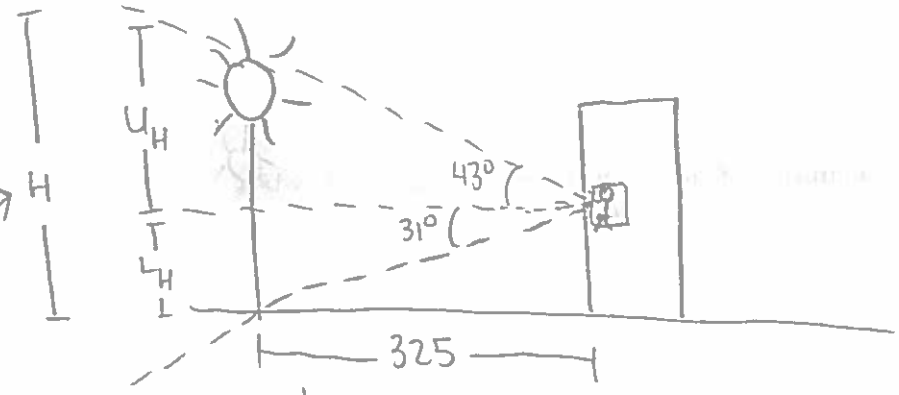
Find c

$\cos(81^\circ) = \frac{16.5}{c}$

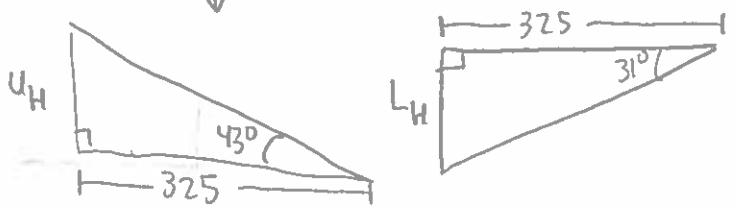
↓ reciprocal

$\frac{1}{\cos(81^\circ)} = \frac{c}{16.5}$ → mult. by 16.5 → $c = \frac{16.5}{\cos(81^\circ)}$

#47



"extract" the triangles



call the height of the tower H

split into U_H and L_H as drawn

We have from the diagram that $H = U_H + L_H$.

From the first Δ:

$$\tan(43^\circ) = \frac{U_H}{325}$$

$$U_H = 325\tan(43^\circ) \approx 303.1$$

From 2nd Δ;

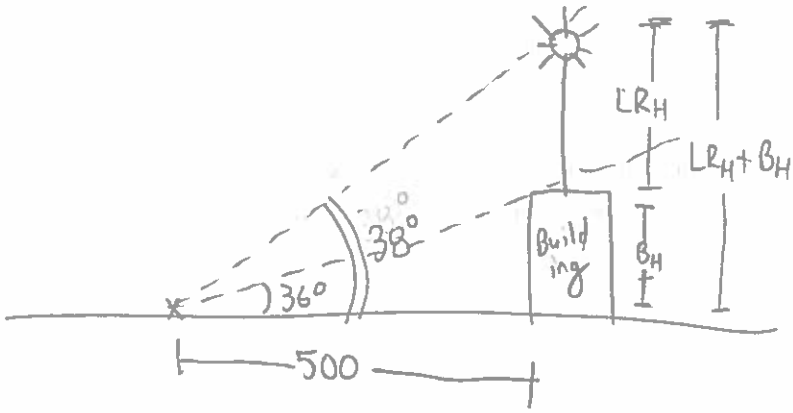
$$\tan(31^\circ) = \frac{L_H}{325}$$

$$L_H = 325\tan(31^\circ) \approx 195.3$$

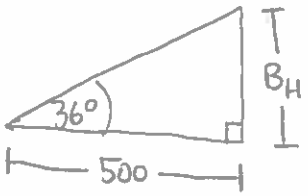
So the height of the antenna is

$$H = 303.1 + 195.3 = 498.4 \text{ ft}$$

#51)



"extract" the triangles

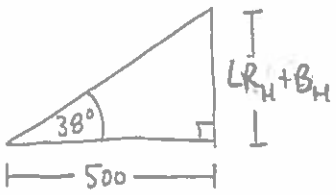


Find B_H

$$\tan(36°) = \frac{B_H}{500}$$

$$B_H = 500\tan(36°)$$

$$\approx 363.3$$



Find $L_H + B_H$

$$\tan(38°) = \frac{L_H + B_H}{500}$$

$$LR_H + B_H = 500\tan(38°)$$

$$\approx 390.6$$

To find the height of the lightning rod — labeled LR_H — we need to subtract the height of the building — labelled B_H — from the total height of both the building and the lightning rod — labeled $LR_H + B_H$:

$$LR_H = (LR_H + B_H) - B_H = 390.6 - 363.3 = 27.3 \text{ feet}$$