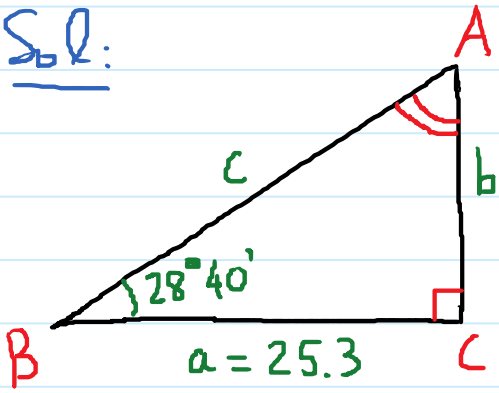
2.4. Solve Right Triangles

Wednesday, February 6, 2019 10:53 AM

E.g. Solve the right triangle ABC

Given $B = 28°40'$; $a = 25.3$

Sol:



Find $\angle A$, b, c

$$\angle A = 90° - 28°40'$$

$$= 89°60' - 28°40'$$

$$= \boxed{61°20'}$$

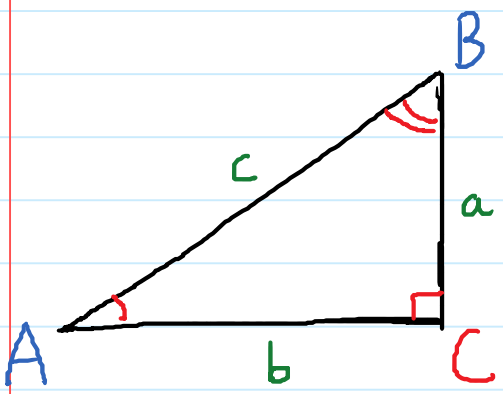
$$\tan B = \frac{b}{a} \longrightarrow b = a \cdot \tan B$$

$$b = 25.3 \cdot \tan\left(28° + \frac{40°}{60}\right) \simeq 13.832$$

$$\cos B = \frac{a}{c} \longrightarrow c = \frac{a}{\cos B} = \frac{25.3}{\cos\left(28° + \frac{40°}{60}\right)}$$

$$\boxed{c \simeq 28.834}$$

E.g. Given $a = 18.9$, $c = 46.3$



Find b, $\angle A$, $\angle B$

$$a^2 + b^2 = c^2$$

$$\rightarrow b = \sqrt{c^2 - a^2}$$

$$b = \sqrt{(46.3)^2 - (18.9)^2} \simeq 42.26677$$

$$\sin A = \frac{a}{c} = \frac{18.9}{46.3} \rightarrow A = \sin^{-1}\left(\frac{18.9}{46.3}\right)$$

$$A \simeq 24.09227^\circ$$

$$\cos B = \frac{a}{c} = \frac{18.9}{46.3} \rightarrow B = \cos^{-1}\left(\frac{18.9}{46.3}\right)$$

$$B \simeq 65.90773^\circ$$

E.g. $\dfrac{I_w}{I_a} = \dfrac{\sin A}{\sin W}$

Given: $I_a = 1.0003$; $I_w = 1.3$

$\angle A = 31.5^\circ$. Find $\angle W$

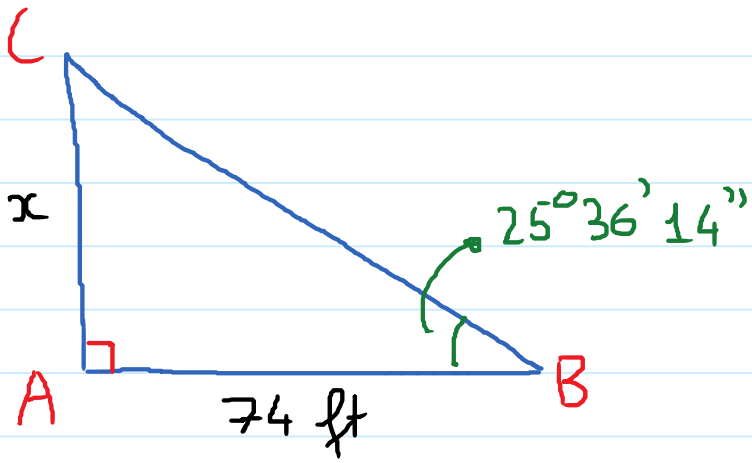
$$\frac{1.3}{1.0003} = \frac{\sin(31.5^\circ)}{\sin W}$$

$$\sin W = \frac{(1.0003)\cdot \sin(31.5^\circ)}{1.3}$$

$$W = \sin^{-1}\left(\frac{(1.0003)\cdot \sin(31.5^\circ)}{1.3}\right)$$

$$W \simeq 23.70593^\circ$$

E.g. (#12)



$$\tan B = \frac{x}{74} \rightarrow x = 74 \tan B$$

$$x = 74 \tan\left(25^\circ + \frac{36^\circ}{60} + \frac{14^\circ}{3600}\right) \simeq 35 \text{ ft}$$

#18: $\frac{c_1}{c_2} = \frac{\sin\theta_1}{\sin\theta_2}$

Given: $c_1 = 6 \cdot 10^8$; $c_2 = 4.66 \cdot 10^8$; $\theta_1 = 43^\circ$

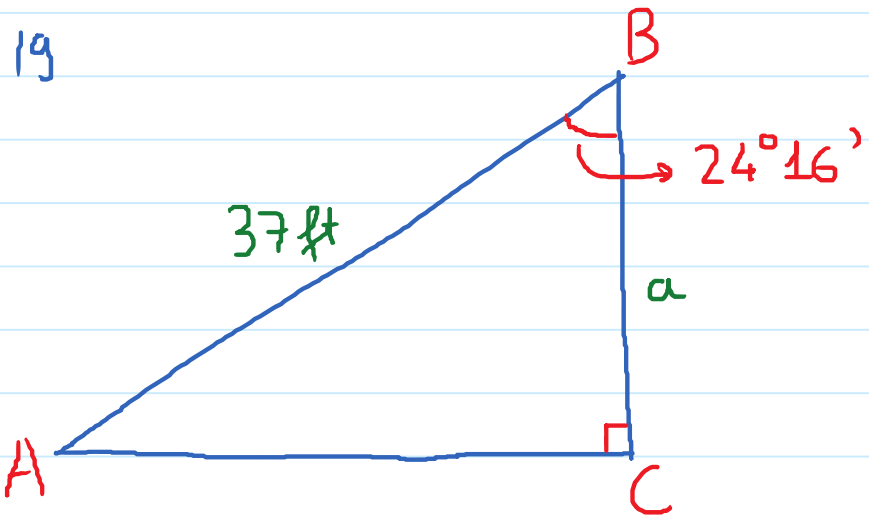
$$\frac{6 \cdot 10^8}{4.66 \cdot 10^8} = \frac{\sin(43^\circ)}{\sin(\theta_2)}$$

$$\frac{6}{4.66} = \frac{\sin(43^\circ)}{\sin\theta_2}$$

$$\sin\theta_2 = \frac{(4.66) \cdot \sin(43^\circ)}{6}$$

$$\theta_2 = \sin^{-1}\left(\frac{(4.66) \cdot \sin(43^\circ)}{6}\right) \simeq \boxed{32^\circ}$$

#19



$$\cos B = \frac{a}{37} \rightarrow a = 37 \cos\left(24^\circ + \frac{16^\circ}{60}\right) = \boxed{33.73 \text{ ft}}$$