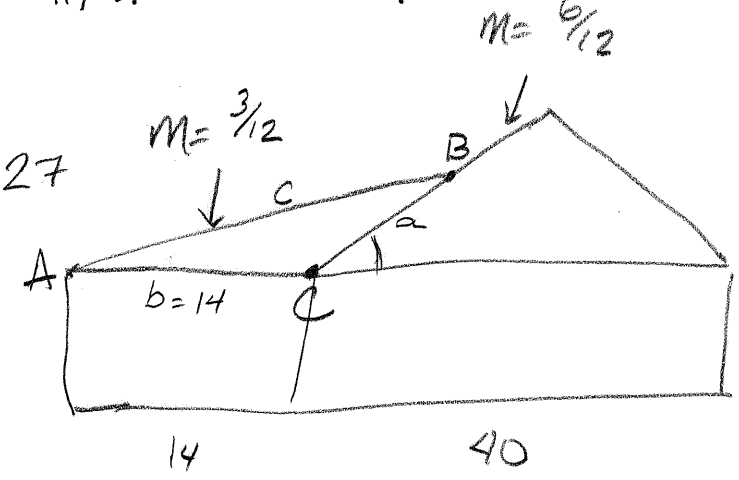
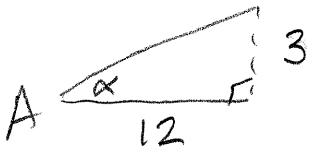
#27

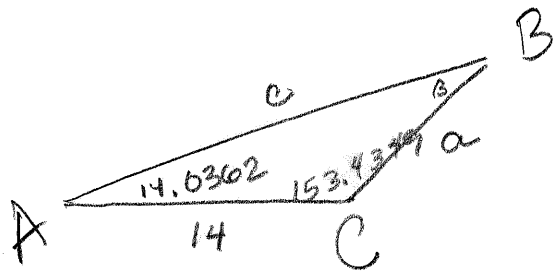


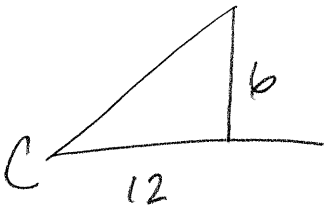


$\tan\alpha = \frac{3}{12}$

$\alpha = \tan^{-1}\left(\frac{3}{12}\right)$

14.0362





$\tan C = \frac{6}{12}$

$C = \tan^{-1}\left(\frac{6}{12}\right)$

$= 26.5651$

$\gamma = 180 - 26.5651$

$= 153.4349$

$\beta = 180 - (14.0362 + 153.4349)$

$= 12.5289$

$\frac{a}{\sin 14.0362} = \frac{14}{\sin 12.5289}$ (sin 14... / sin 14...)

$a = \frac{14 \sin 14.0362}{\sin 12.5289}$

$= 15.653$

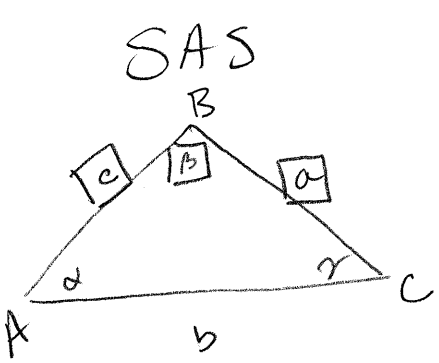
$\frac{c}{\sin 153.4349} = \frac{14}{\sin 12.5289}$ (sin 153... / sin 153...)

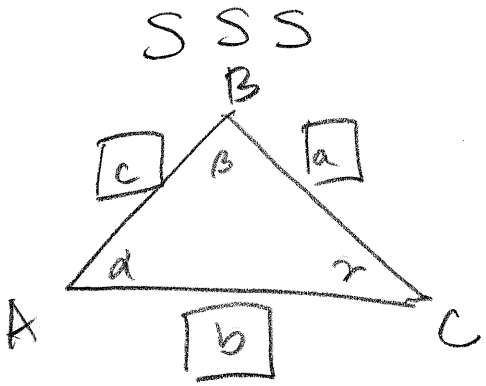
$C = \frac{14 \sin 153.4349}{\sin 12.5289}$

$= 28.8614$

$\overline{BC} = 15.7$ ft

$AB = 28.9$ ft





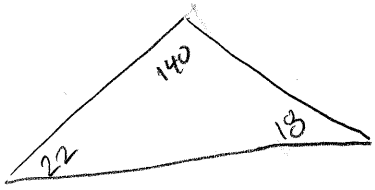
Law of Cosines

$$a^2 = b^2 + c^2 - 2bc\cos\alpha$$

$$b^2 = a^2 + c^2 - 2ac\cos\beta$$

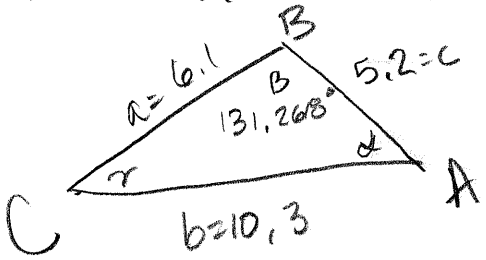
$$\boxed{c^2 = a^2 + b^2 - 2ab\cos\gamma}$$ ← Given

Proof: pg 281



longest side is <u>always</u> opposite the largest Angle

#3 $a = 6.1$, $b = 10.3$, $c = 5.2$ Solve the triangle



Find β first

$$(10.3)^2 = (6.1)^2 + (5.2)^2 - 2(6.1)(5.2)\cos\beta$$

$$106.09 = 37.21 + 27.04 - 63.44\cos\beta$$

$$106.09 = 64.25 - 63.44\cos\beta$$

$$-64.25 \quad -64.25$$

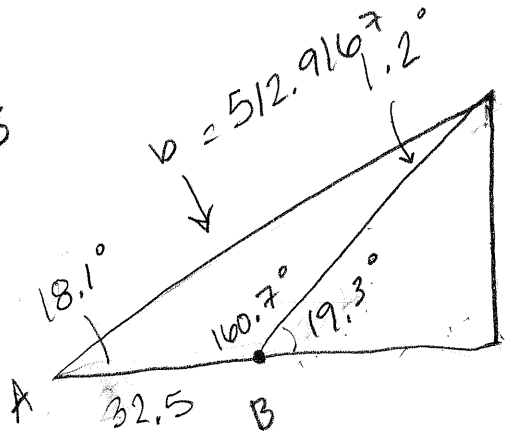
$$\frac{41.84}{-63.44} = \frac{-63.44\cos\beta}{-63.44}$$

$$-.6595 = \cos\beta$$

$$\beta = \cos^{-1}(-.6595)$$

$$= 131.2618$$

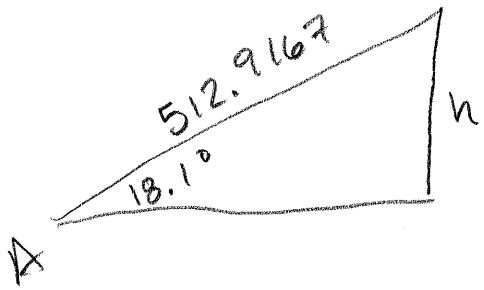
25



$$\frac{b}{\sin 160.7} = \frac{32.5}{\sin 1.2} \cdot \sin 160.7$$

$$b = \frac{32.5 \sin 160.7}{\sin 1.2}$$

$$b = 512.9167$$



$$\sin 18.1 = \frac{h}{512.9167} \cdot 512.9167$$

$$h = (\sin 18.1)\, 512.9167$$

$$= 159.3511$$

$$\boxed{159.4 \text{ ft}}$$

Law Sines

$$\frac{a}{\sin\alpha} = \frac{b}{\sin\beta} \quad \text{or} \quad \frac{\sin\alpha}{a} = \frac{\sin\beta}{b}$$

6.1. $\frac{\sin\alpha}{6.1} = \frac{\sin 131.26}{10.3}$ · 6.1

$131.26 + 26.44 + \gamma = 180$

$\gamma = 22.3$

$\sin\alpha =$

$\alpha = 26.44$

$\beta = 131.26$

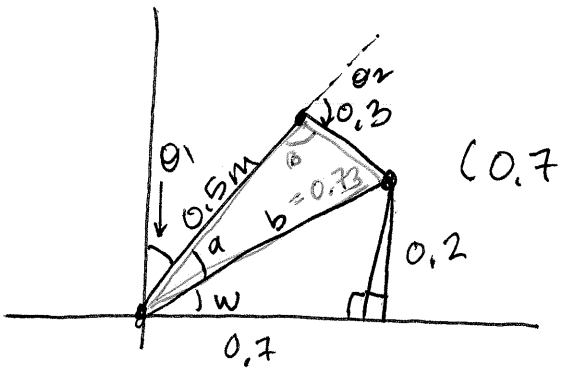
$\gamma = 22.3$

Triangle Inequality: the sum of two sides of a triangle must be longer than the 3rd side

↑

Check if only given 3 sides

Example 4



(0,7, 0,2)

$b^2 = 0,7^2 + 0,2^2$, $b = 0,73$

$\tan w = \frac{0,2}{0,7}$ $\quad w = 15,95°$

find β using Law of cosines

$\theta_2 = 180 - \beta$

$\alpha + w + \theta_1 = 90°$

find α using law of sines in Green triangle