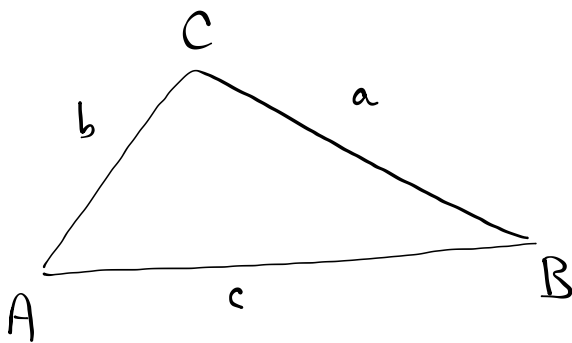


## Chapter 3 - Acute Triangle Trigonometry

### §3-1 Exploring Side-Angle Relationships in Acute Triangles



$$\angle A = 47^\circ$$

$$\angle B = 55^\circ$$

$$\angle C = 78^\circ$$

$$a = 9.5 \text{ cm}$$

$$b = 10.6 \text{ cm}$$

$$c = 13.0 \text{ cm}$$

$$\frac{a}{\sin A} = \frac{9.5}{\sin 47^\circ} = 13.0$$

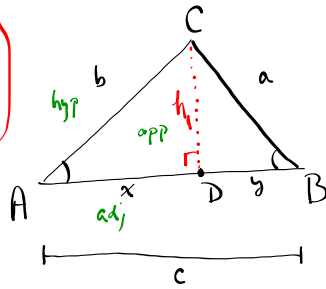
$$\frac{b}{\sin B} = \frac{10.6}{\sin 55^\circ} = 12.9$$

$$\frac{c}{\sin C} = \frac{13.0}{\sin 78^\circ} = 13.3$$

← These ratios appear to be about the same.

Consider any acute triangle:

Q3.2  
Proving +  
Applying the  
Law of  
Sines



SOH CAH TOA  
 $\sin \theta = \frac{\text{opp}}{\text{hyp}}$      $\cos \theta = \frac{\text{adj}}{\text{hyp}}$      $\tan \theta = \frac{\text{opp}}{\text{adj}}$

$$\sin A = \frac{\text{opp}}{\text{hyp}}$$

$$\sin B = \frac{\text{opp}}{\text{hyp}}$$

$$\sin A = \frac{h_1}{b}$$

$$\sin B = \frac{h_1}{a}$$

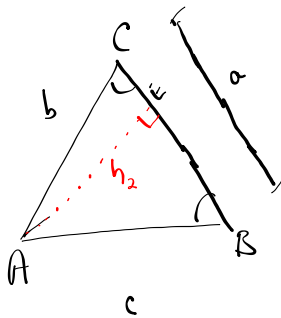
$$h_1 = b \sin A$$

$$h_1 = a \sin B$$

so  $b \sin A = a \sin B$

$$b = \frac{a \sin B}{\sin A}$$

$$\frac{b}{\sin B} = \frac{a}{\sin A}$$



$$\sin B = \frac{\text{opp}}{\text{hyp}}$$

$$\sin C = \frac{\text{opp}}{\text{hyp}}$$

$$\sin B = \frac{h_2}{c}$$

$$\sin C = \frac{h_2}{b}$$

$$h_2 = c \sin B$$

$$h_2 = b \sin C$$

finally:

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

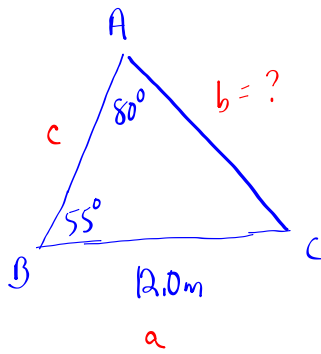
LAW OF SINES

$$c \sin B = b \sin C$$

$$c = \frac{b \sin C}{\sin B}$$

$$\frac{c}{\sin C} = \frac{b}{\sin B}$$

Example 1 (p120)



Law of Sines:

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

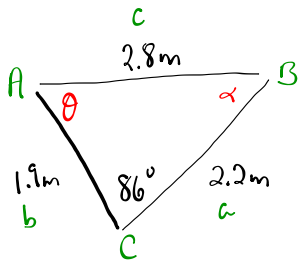
$$\frac{12.0m}{\sin 80^\circ} = \frac{b}{\sin 55^\circ}$$

$$b = \frac{(12.0m)(\sin 55^\circ)}{\sin 80^\circ}$$

$$b = 9.981465m$$

$$b = 10.0m$$

Example 2 (p121)



$\theta = 40^\circ ??$  ← find  $\theta$   
 $\alpha = 54^\circ ??$

Law of Sines:

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

$$\frac{a}{\sin A} = \frac{c}{\sin C}$$

$$\frac{2.2}{\sin \theta} = \frac{2.8}{\sin 86^\circ}$$

$$2.8 \sin \theta = 2.2 \sin 86^\circ$$

$$\sin \theta = \frac{2.2 \sin 86^\circ}{2.8}$$

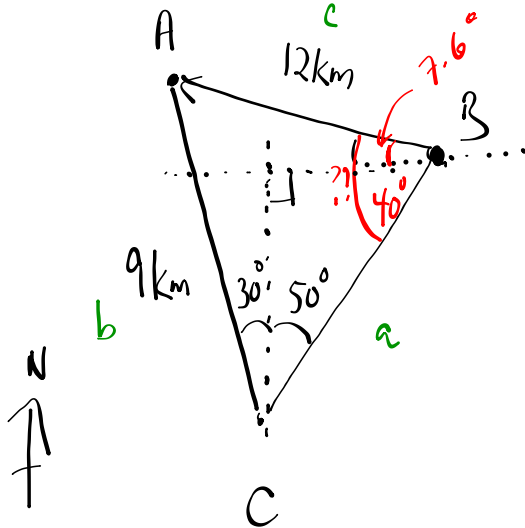
$$\sin \theta = 0.7838\dots$$

$$\theta = \sin^{-1}(0.7838\dots)$$

$$\theta = 51.6^\circ$$

Toby thought that  $\theta = 40^\circ$ . He was incorrect. It is

$51.6^\circ$  and  $\alpha = 94^\circ - 51.6^\circ$   
 $\theta$   $\alpha = 42.4^\circ$

Example 3 (p122)

The boat must head  
W  $7.6^\circ$  N

TO DO

- ① Read over summary (p124)
- ② CYU (p124)

Law of Sines:

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

$$\frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{9}{\sin B} = \frac{12}{\sin 80^\circ}$$

$$12(\sin B) = 9(\sin 80^\circ)$$

$$\sin B = \frac{9(\sin 80^\circ)}{12}$$

$$\sin B = 0.7386 \dots$$

$$B = \sin^{-1}(0.7386 \dots)$$

$$B = 47.6^\circ$$