



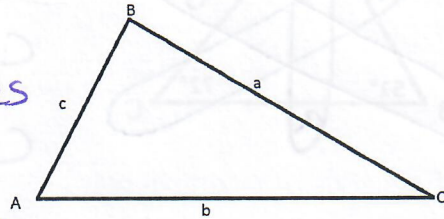
Lesson #3.2 – Proving and Applying the Sine Law

The **Sine Law** states:

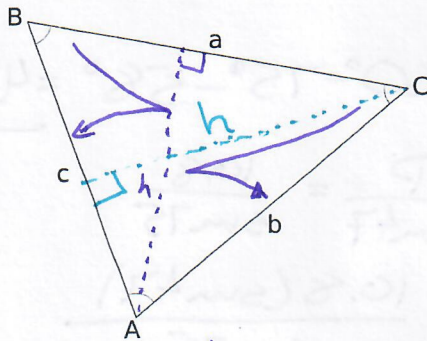
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \quad \left. \begin{array}{l} \text{use when} \\ \text{finding sides} \end{array} \right\}$$

or

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c} \quad \left. \begin{array}{l} \text{use when} \\ \text{finding Angles} \end{array} \right\}$$



**Proof:**



$$\sin B = \frac{h}{a} \quad \sin C = \frac{h}{b}$$

$$a \sin B = h \quad b \sin C = h$$

$$\therefore a \sin B = b \sin C$$

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

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

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

$$b \sin A = h \quad a \sin B = h$$

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

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

**\*To use the Sine Law, you need either:**

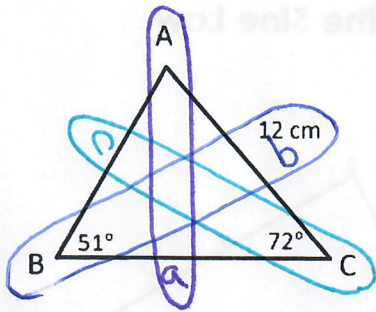
- Two (2) angles and one (1) side
- Two (2) sides and one (1) contained angle.



FOUNDATIONS OF MATH 11  
Chapter 3 – Acute Triangle Trigonometry



Example 1: Solve for all unknown sides.



Find c:

$$\frac{c}{\sin 72} = \frac{12}{\sin 51}$$

$$c = \frac{12 \sin 72}{\sin 51}$$

$$c = \frac{11.4 \text{ cm}}{0.777}$$

$$c = \underline{\underline{14.7 \text{ cm}}}$$

Find a:

$$\angle A = 180^\circ - 72^\circ - 51^\circ = 57^\circ$$

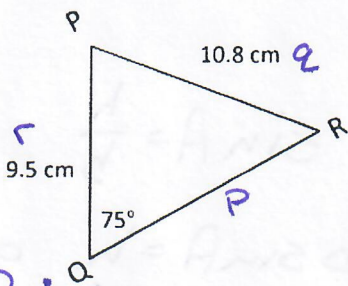
$$\frac{a}{\sin 57} = \frac{12}{\sin 51}$$

$$a = \frac{12 \sin 57}{\sin 51}$$

$$a = \frac{10.06}{0.777}$$

$$a = \underline{\underline{12.95 \approx 13 \text{ cm}}}$$

Example 2: Solve for the unknown side and angles.



Find P:  $180^\circ - 75^\circ - 58^\circ = 47^\circ$

find p:

$$\frac{p}{\sin 47} = \frac{10.8}{\sin 75}$$

$$p = \frac{10.8 (\sin 47)}{\sin 75}$$

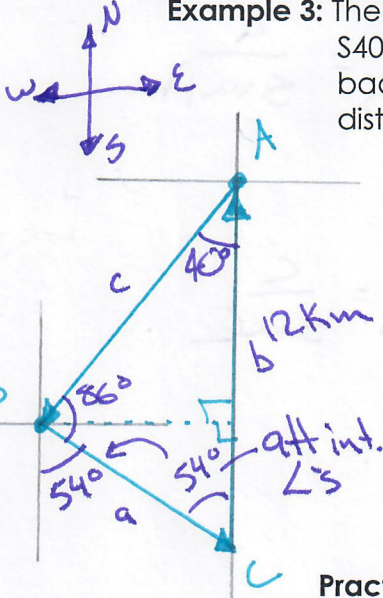
$$p = \frac{7.9}{0.966} = \underline{\underline{8.2 \text{ cm}}}$$

find R:

$$\frac{\sin R}{9.5} = \frac{\sin 75}{10.8}$$

$$\sin R = \frac{9.5 \sin 75}{10.8} \Rightarrow R = \sin^{-1}(0.849) = \underline{\underline{58.2^\circ}}$$

Example 3: The course for a boat race starts at point A, and heads in a direction S40°W to point B, then in a direction S54°E to point C and finally north back to point A. The distance from A to C is 12 km. What is the total distance of the boat race?



Find B:  $180^\circ - 54^\circ - 40^\circ = 86^\circ$

Find a:

$$\frac{a}{\sin 40} = \frac{12}{\sin 86}$$

$$a = \frac{12 \sin 40}{\sin 86}$$

$$a = \underline{\underline{7.73 \text{ km}}}$$

find c:

$$\frac{c}{\sin 54} = \frac{12}{\sin 86}$$

$$c = 9.73 \text{ km}$$

Total Distance

$$= A + B + C$$

$$= 7.73 + 12 + 9.73$$

$$= \underline{\underline{29.5 \text{ km}}}$$

Practice Questions: Page 124, #'s 1, 2, 3ace, 4, 7-10, 12\*, 17\*