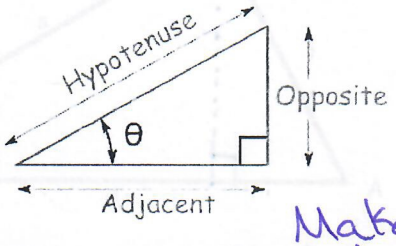
Lesson #3.1 – Exploring Side–Angle Relationships of Triangles

Recall from previous years, you learned how to solve for sides and angles in a right triangle using.

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

SOH CAH TOA

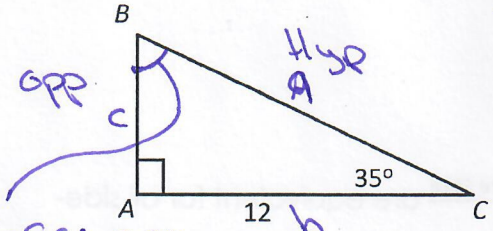


Make sure calculator is in Degree Mode "DEG"

Sine	Cosine	Tangent
$\sin\theta = \frac{Opposite}{Hypotenuse}$	$\cos\theta = \frac{Adjacent}{Hypotenuse}$	$\tan\theta = \frac{Opposite}{Adjacent}$

A triangle with all angles less than 90° is called an **Acute triangle**. These trigonometric functions (SOH CAH TOA) as well as Pythagoras only work with acute triangles.

Example 1: Find the missing sides of the triangle.



Opp, Hyp, Adj

$180° - 90° - 35° = 55°$

$\tan C = \frac{c}{b}$

$\tan 35 = \frac{c}{12}$

$C = 12\tan 35$

$C = 8.4$

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

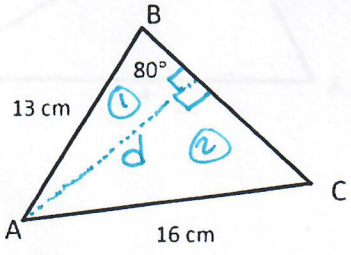
$hyp = 12^2 + 8.4^2$

$a^2 = 144 + 70.6$

$a = \sqrt{214.6}$

$a = 14.7$

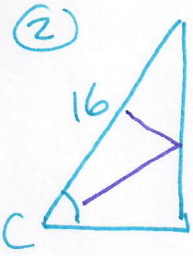
Example 2: Solve for ∠A ⇒ Divide into 2 right triangles



$\sin 80 = \frac{d}{13}$

$d = 13\sin 80$

$d = 12.8\text{cm}$

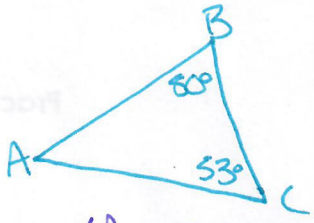


$\sin C = \frac{12.8}{16}$

$\sin C = 0.8$

$C = \sin^{-1}(0.8)$

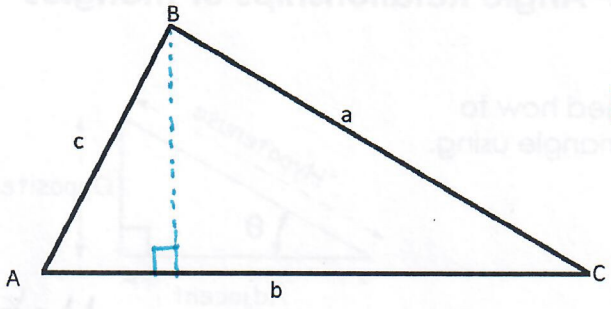
$C = 53°$

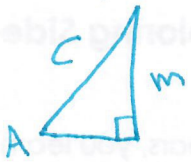


$\angle A = 180° - 80° - 53°$

$= 47°$

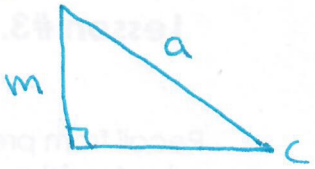
Example 3: Find two equivalent expressions that represent the height of ΔABC





$\sin A = \frac{m}{c}$

$c \sin A = m$ ①



$\sin C = \frac{m}{a}$

$a \sin C = m$ ②

set ① = m = ②

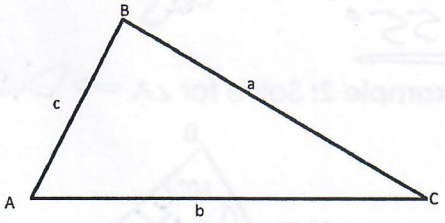
$c \sin A = a \sin C$

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

This result shows that the ratios of $\frac{Length\ of\ Opposite\ Side}{\sin(angle)}$ are equivalent for all side-angle pairs in an acute triangle.

The **Sine Law**:

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



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Practice Questions: Page 117, #'s 1-5