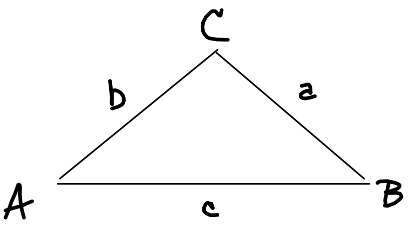
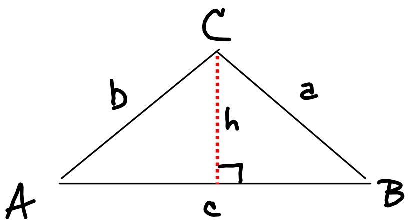
Section 3.1 - Law of Sines



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

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

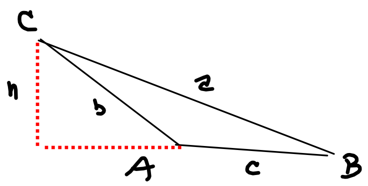


$$\sin A = \frac{h}{b} \quad \& \quad \sin B = \frac{h}{a}$$

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

$$\frac{\sin A}{a} = \frac{\sin B}{b} \quad \text{, etc.}$$

A is obtuse.



$$\sin A = \sin(\pi - A) = \frac{h}{b}$$

$$\sin B = \frac{h}{a} \quad \text{, etc.}$$

$$\sin(\pi - A)$$
$$= \sin\pi \cos(-A) + \sin(-A) \cdot \cos\pi$$
$$= 0 \cdot \sim - \sin(A) \cdot (-1)$$
$$= \sin(A)$$

3.1 #3

Use the Law of Sines to solve the triangle. Round your answers to two decimal places.

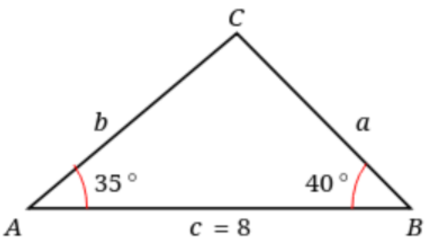
$C =$ 105° 105 °

$a =$ 4.75 4.75

$b =$ 5.32 5.32

$C = 180^\circ - B - A = 180^\circ - 35^\circ - 40^\circ = 180^\circ - 75^\circ = 105^\circ$

$\boxed{105.^\circ = C}$



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

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

$$\frac{a}{\sin 35^\circ} = \frac{8}{\sin 105^\circ} \longrightarrow$$

$$a = \frac{8 \sin 35^\circ}{\sin(105^\circ)} \approx 4.75048017759 \approx \boxed{4.75 \approx a}$$

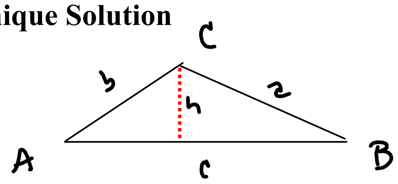
use this in calculations (Don't Round!)

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

$$b = \frac{c \sin B}{\sin C} = \frac{8 \sin(40^\circ)}{\sin(105^\circ)} \approx 5.32370161097 \approx \boxed{5.32 \approx b}$$

There are 3 possibilities

Unique Solution

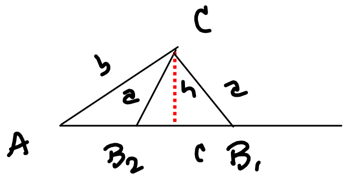


Need $a > h$ to have any sol'n.

$a > b \Rightarrow$ one solution!

$h < b < a$

Two Solutions



Need $a > h$ for a solution

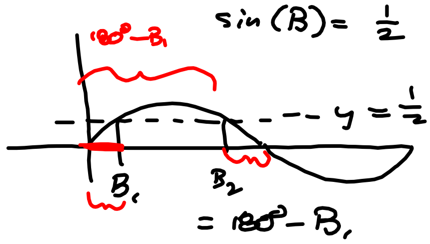
$a < b$ for 2 sol'ns

$h < a < b$

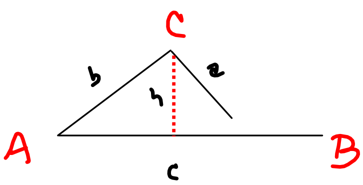
B_1 is $\sin^{-1}(\qquad)$ (Found with calculator).

B_2 is $180^\circ - B_1$

$\sin(B) = \frac{1}{2}$

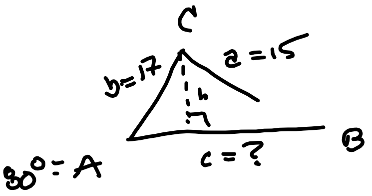


No Solution $h > a$



3.1 #6

$A = 80°, a = 15, b = 17$



$\frac{h}{17} = \sin A \longrightarrow \underline{h} = 17 \sin A$

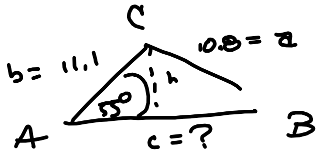
$= 17 \sin(80°) \approx 16.7417318012 \; \underline{>} \; 15 = \underline{a}$

$\longrightarrow$ $\boxed{\text{No Sol'n!}}$

2 Solutions

Use the Law of Sines to solve (if possible) the triangle. If two solutions exist, find both. Round your answers to two decimal places. (If a triangle is not possible, enter IMPOSSIBLE in each corresponding answer blank.)

$A = 55°$, $a = 10.8$, $b = 11.1$



$a < b \Rightarrow$ potential 2-sol'n sitch.

$\frac{h}{11.1} = \sin(55°) = \frac{h}{a}$

$\Rightarrow h = (\sin 55°)(11.1) \approx 9.09258769161 < 10.8 = a$

$h < a < b \Rightarrow$ 2 sol'ns

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

$\sin B = \frac{b \sin A}{a} = \frac{11.1 \sin 55°}{10.8} \approx 0.841906267741$

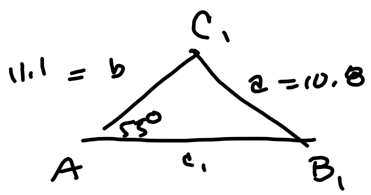
$\Rightarrow B = B_1 = \arcsin(\sin B) \approx 57.3419676248° \approx \boxed{57.34° \approx B_1}$

$C_1 = 180° - A - B \approx 180° - 55° - 57.3419676248°$

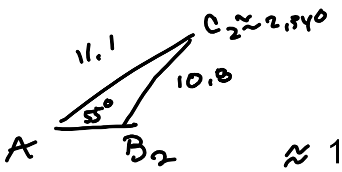
$\approx 67.6580323752 \approx \boxed{67.66° \approx C_1}$

$c = \frac{a \sin C}{\sin A} = \frac{10.8 \sin(67.6580323752°)}{\sin(55°)} \approx 12.1946353915$

$\approx \boxed{12.19 \approx c_1}$



2^{nd} Sol'n:



B is obtuse:

$B_2 = 180° - B_1 \approx 180° -$ 57.3419676248

$\approx$ 122.658032375° $\approx \boxed{122.66° \approx B_2}$

$\angle C_2 = 180° - A - B_2 \approx 180° - 55° -$ 122.658032375°

$\approx$ 2.341967625° $\approx \boxed{2.34° \approx C_2}$

$$\frac{c_2}{\sin C_2} = \frac{a}{\sin A} \longrightarrow c_2 = \frac{a \sin C_2}{\sin A} = \frac{10.8 \sin(2.341967625°)}{\sin(55°)}$$

$c_2 \approx$ 0.538761495486 So small, it looks like a sine!

$\approx \boxed{.54 \approx c_2}$

Case 1:

B = [ ] ✗ 57.34 °

(smaller B-value)

C = [ ] ✗ 67.66 °

c = [ ] ✗ 12.19

Case 2:

B = [ ] ✗ 122.66 °

(large value

C = [ ] ✗ 2.34 °

c = [ ] ✗ 0.54