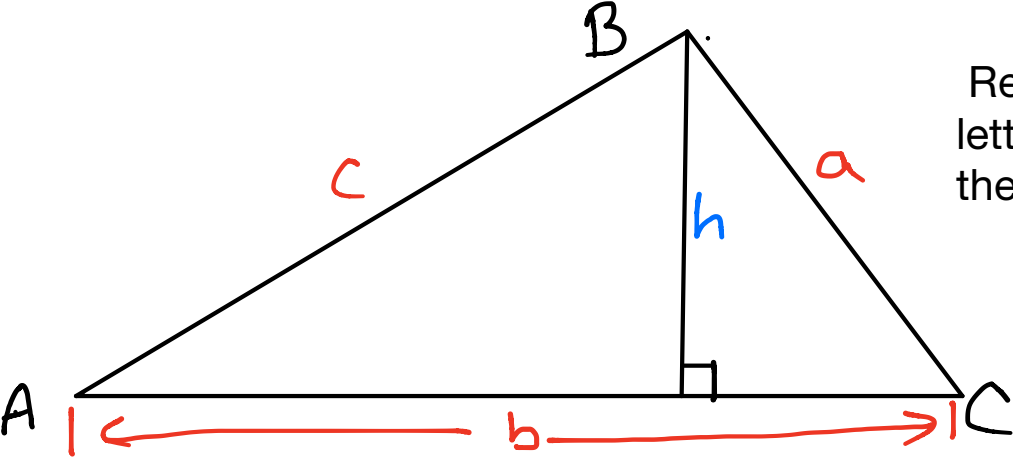


Recall that the lowercase letter side is always opposite the capital letter angle.



$$\sin(\angle A) = \frac{h}{c}$$

$$\sin(\angle C) = \frac{h}{a}$$

$$h = c \sin(\angle A)$$

$$h = a \sin(\angle C)$$

$$c \sin(\angle A) = a \sin(\angle C)$$

$$\frac{c \sin(\angle A)}{c} = \frac{a \sin(\angle C)}{c}$$

$$\sin(\angle A) = \frac{a \sin(\angle C)}{c}$$

$$\frac{\sin(\angle A)}{a} = \frac{a \sin(\angle C)}{ac}$$

$$\rightarrow \frac{\sin(\angle A)}{a} = \frac{\sin(\angle C)}{c} = \frac{\sin(\angle B)}{b}$$

by similar logic

equivalently,

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

* The Law of Sines

*On any triangle, the ratios of the sine of an angle and the length of its opposite side are always equal.

Recall identifying congruence

SSS
SAS

← Law of cosines

ASA
AAS

← Law of Sines

Recall SSA is not congruence statement

$$\frac{\sin(16)}{15} = \frac{\sin(79)}{a}$$

$$\frac{a \sin(16)}{\sin(16)} = \frac{15 \sin(79)}{\sin(16)}$$

$$a = \frac{15 \sin(79)}{\sin(16)} \approx 53.419$$

$$\frac{\sin(33)}{23} = \frac{\sin(\angle B)}{18}$$

$$\frac{18 \sin(33)}{23} = \frac{23 \sin(\angle B)}{23}$$

$$\frac{18 \sin(33)}{23} = \sin(\angle B)$$

$$\arcsin\left(\frac{18 \sin(33)}{23}\right) = m(\angle B)$$

$$25.229 \approx m(\angle B) \text{ between } (0, 90^\circ) \text{ QI}$$

b/c $\sin(x)$ is positive in QII also,

$$180 - \arcsin\left(\frac{18 \sin(33)}{23}\right) = m(\angle B)$$

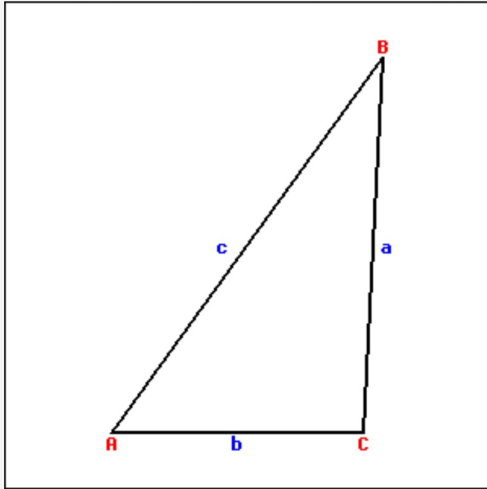
$$180 - 25.229 \approx m(\angle B)$$

$$154.771 \approx m(\angle B) \leftarrow \text{rejected}$$

$$\rightarrow 154.771 + (33) \approx 187^\circ > 180^\circ$$

↑
angle we know

(1 point) CUNY/CityTech/CollegeAlgebra_Trig/LawOfSines/geometric-ASA.pg



Finish solving the triangle:

$\angle A = 54^\circ$

$a = \square$

$\angle B = 33^\circ$

$b = \square$

$\angle C = \square$ degrees

$c = 13$

$$\frac{\sin(\angle C)}{c} = \frac{\sin(\angle B)}{b}$$

$$\frac{\sin(93)}{13} = \frac{\sin(33)}{b}$$

$$b = \frac{13 \sin(33)}{\sin(93)} \approx 6.898$$

$$m(\angle C) = 180 - (54 + 33)$$

$$= 93^\circ$$

$$\frac{\sin(\angle C)}{c} = \frac{\sin(\angle A)}{a}$$

$$\frac{\sin(93)}{13} = \frac{\sin(54)}{a}$$

$$a \sin(93) = 13 \sin(54)$$

$$a = \frac{13 \sin(54)}{\sin(93)}$$

$$a \approx 10.532$$