

6-1 Law of Sines

Day 1

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

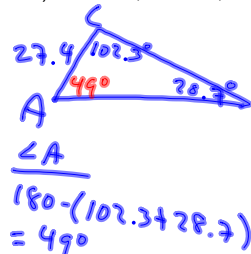
used for solving oblique triangles (no right angles)

Can be used if given:

1. 2 angles and any side (AAS and ASA)
2. 2 sides and the angle opposite one of them (SSA)

I. Solve the triangle.

Ex 1) $C = 102.3^\circ$, $B = 28.7^\circ$, $b = 27.4$ ft



$$\angle A = 180 - (102.3 + 28.7) = 49^\circ$$

$$\frac{c}{\sin 28.7} = \frac{27.4}{\sin 102.3}$$

$$c \sin 28.7 = 27.4 \sin 102.3$$

$$c = \frac{27.4 \sin 102.3}{\sin 28.7} \approx 55.75$$

$\angle A = 49^\circ$
 $c = 55.75$ ft
 $a = 43.06$ ft

$$\frac{a}{\sin 49} = \frac{27.4}{\sin 28.7}$$

$$a \sin 28.7 = 27.4 \sin 49$$

$$a = \frac{27.4 \sin 49}{\sin 28.7} \approx 43.06$$

Ex 2) $a = 22$ in, $b = 12$ in, and $A = 42^\circ$



$$\frac{12}{\sin 42} = \frac{22}{\sin B}$$

$$12 \sin B = 22 \sin 42$$

$$B = \sin^{-1}\left(\frac{12 \sin 42}{22}\right)$$

$$B = 21.41^\circ$$

$$\angle C = 180 - (42 + 21.41) = 116.59^\circ$$

$$\frac{c}{\sin 116.59} = \frac{12}{\sin 42}$$

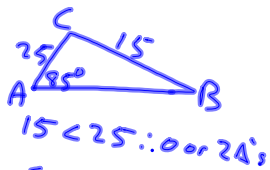
$$c \sin 42 = 12 \sin 116.59$$

$$c = \frac{12 \sin 116.59}{\sin 42} \approx 29.40$$

If the side opposite the angle given is larger than the other side, only 1 triangle exists. Otherwise, there is 0 or 2 triangles possible.

$B = 21.41^\circ$
 $C = 116.59^\circ$
 $c = 29.40$ in

Ex 3) $a = 15$, $b = 25$, $A = 85^\circ$



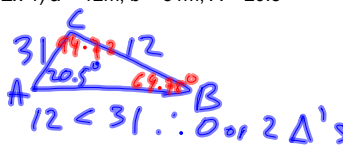
$$\frac{15}{\sin 85} = \frac{25}{\sin B}$$

$$15 \sin B = 25 \sin 85$$

error

no solutions

Ex 4) $a = 12\text{m}$, $b = 31\text{m}$, $A = 20.5^\circ$



$$\frac{\sin 20.5}{12} = \frac{\sin B}{31}$$

$$B = 64.78^\circ$$

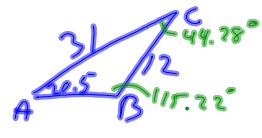
$$C = 180 - (20.5 + 64.78)$$

$$C = 94.72^\circ$$

$$\frac{c}{\sin 94.72} = \frac{12}{\sin 20.5}$$

$$c = 34.15\text{m}$$

$$\begin{aligned} c &= 34.15\text{m} \\ c &= 94.72^\circ \\ B &= 64.78^\circ \end{aligned}$$



$$\frac{\sin 20.5}{12} = \frac{\sin B}{31}$$

$$B = 115.22^\circ$$

$$C = 180 - (20.5 + 115.22)$$

$$C = 44.28^\circ$$

$$\frac{c}{\sin 44.28} = \frac{12}{\sin 20.5}$$

$$c = 23.92\text{m}$$

$$\begin{aligned} c &= 23.92\text{m} \\ c &= 44.28^\circ \\ B &= 115.22^\circ \end{aligned}$$