The Law of Sines
???Ambiguous Case???

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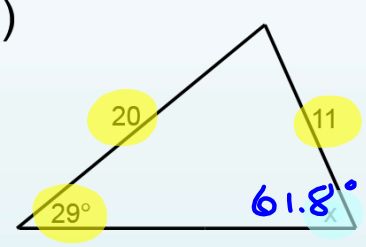
- SSS – Law of Cosines
- SAS – Law of Cosines
- AAS – Law of Sines
- ASA – Law of Sines

- Law of Sines Ambiguous Case … SSA

Use the Law of Sines to find x.

1)



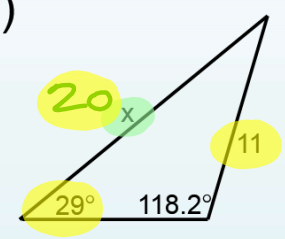
$$\frac{\sin X}{20} = \frac{\sin 29^\circ}{11}$$

$$\sin X = \frac{20 \sin 29^\circ}{11}$$

$$X = \sin^{-1}\left(\downarrow\right)$$

$X = 61.8^\circ$

2)

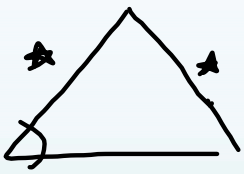


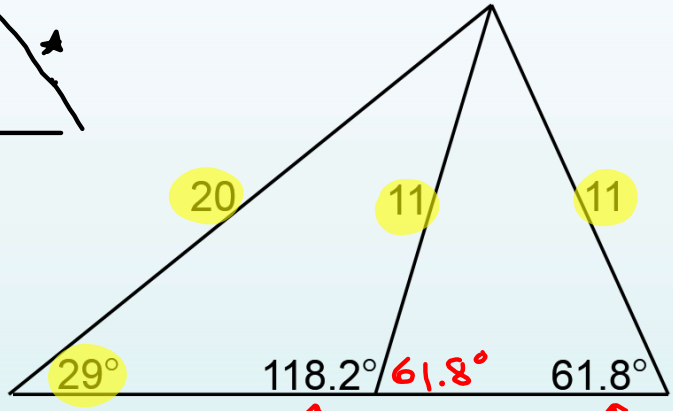
$$\frac{x}{\sin 118.2^\circ} = \frac{11}{\sin 29^\circ}$$

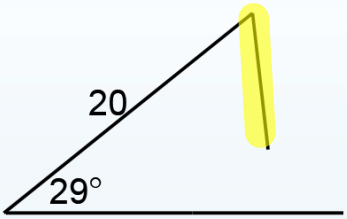
$$x = \frac{11 \sin 118.2^\circ}{\sin 29^\circ}$$

$x = 20$

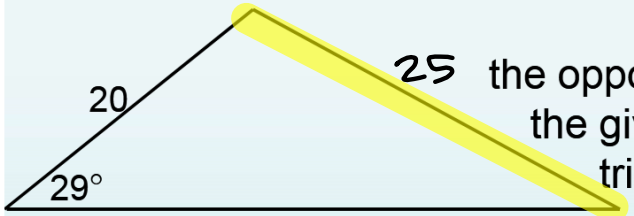
SSA



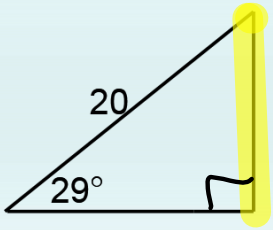




Sometimes …
the opposite side won't be long enough to create a triangle!



Other times …
the opposite side is longer than the given side, so only one triangle is possible!



Or…
the opposite side is just the right length to make a right triangle!

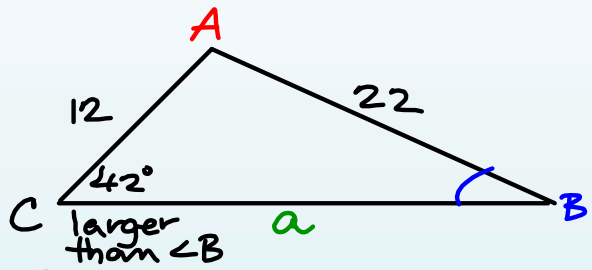
SSA

In general …

Given Angle	Compare Sides	# of solutions
Acute	Opposite > Other	1
Acute	Opposite < Other	0,1,2
Obtuse	Opposite > Other	1
Obtuse	Opposite < Other	0

Ex.1: Solve the triangle given
C = 42°, b = 12in and c = 22in.

SSA → opp > other → 1 △



① $\frac{\sin B}{12} = \frac{\sin 42°}{22}$

$\sin B = \frac{12 \sin 42°}{22}$

$B = 21.4°$

② $A = 180° - 42° - 21.4°$

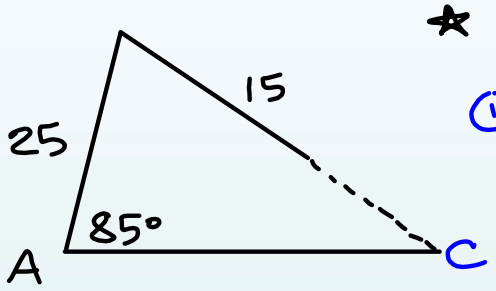
$A = 116.6°$

③ $\frac{a}{\sin 116.6°} = \frac{22}{\sin 42°}$

$a = \frac{22 \sin 116.6°}{\sin 42°} \longrightarrow a = 29.4$

Ex.2: Solve the triangle give
A = 85°, c = 25in and a = 15in.

★ SSA → opp < other ★



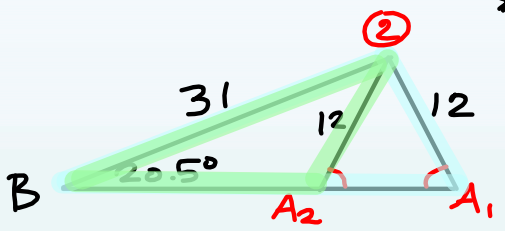
① $\frac{\sin C}{25} = \frac{\sin 85°}{15}$

$\sin C = \frac{25 \sin 85°}{15}$

$C =$ "ERROR"

NO TRIANGLE

Ex.3: Solve the triangle give
B = 20.5°, a = 31in and b =12in.



* SSA → opp < other ★
~~0, 1~~, 2 Solutions !

① $\frac{\sin A}{31} = \frac{\sin 20.5°}{12}$

$\sin A = \frac{31 \sin 20.5°}{12}$

$A_1 = 64.8°$

① $A_2 = 180° - 64.8°$

$A_2 = 115.2°$

② $C = 180° - 20.5° - 64.8°$

$C_1 = 94.7°$

② $C = 180° - 20.5° - 115.2°$

$C_2 = 44.3°$

③ $\frac{c}{\sin 94.7°} = \frac{12}{\sin 20.5°}$

$c_1 = \frac{12 \sin 94.7°}{\sin 20.5°} = 34.2$

③ $\frac{c}{\sin 44.3°} = \frac{12}{\sin 20.5°}$

$c = \frac{12 \sin 44.3°}{\sin 20.5°} = 23.9$