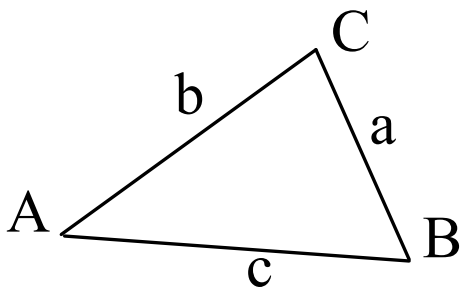
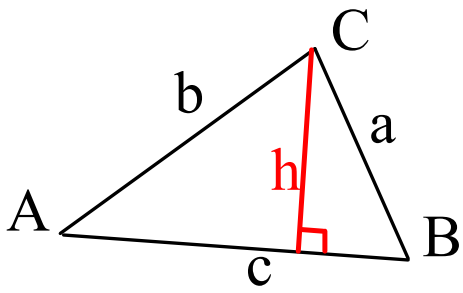
Law of Sines



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

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

derived from using right triangles



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

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

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

$$\frac{\sin A}{a} = \frac{\cancel{a}\sin B}{\cancel{a}\, b}$$

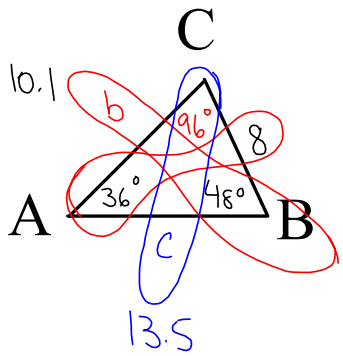
$$\frac{\sin A}{a} = \frac{\sin B}{b}$$

☆ Law of sines works when you have AAS, ASA, and SSA patterns

How do you know how to label the sides?

smallest side matches up with the smallest angle

Solve ΔABC given that $a = 8, \angle B = 48^o, \angle A = 36^o$



$\cancel{\sin 48^\circ}$

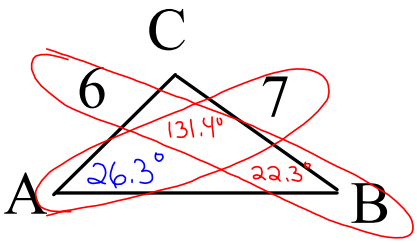
$$\frac{b}{\cancel{\sin 48^\circ}} = \frac{8 \sin 48^\circ}{\sin 36^\circ}$$

$b = 10.1$

$$\frac{c}{\sin 96^\circ} = \frac{8}{\sin 36^\circ}$$

$c = 13.5$

Solve Δ ABC given that a = 7, b = 6 ,$\angle$ A = 26.3°



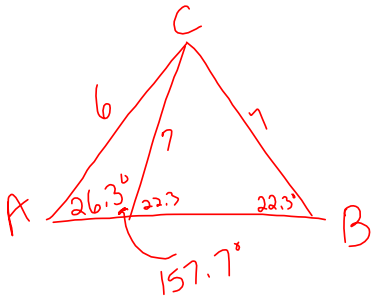
$$\frac{\sin B}{6} = \frac{\sin 26.3^\circ}{7}$$

$$\sin B = \frac{6(\sin 26.3^\circ)}{7}$$

$$\sin B = .379$$

$$\sin^{-1}(.379) = \angle B$$

$$\angle B = 22.3^\circ$$



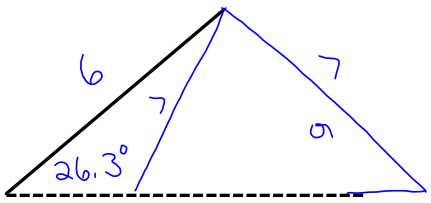
$$\frac{c}{\sin 131.4^\circ} = \frac{7}{\sin 26.3^\circ}$$

$$c = \frac{7 \sin 131.4^\circ}{\sin 26.3^\circ}$$

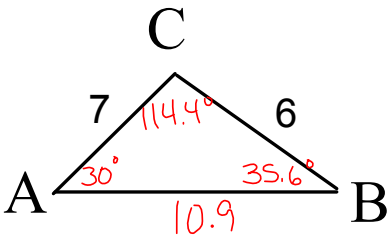
$$c = 11.8$$

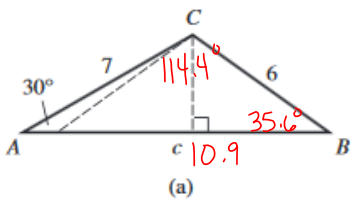
SSA Pattern could have 0, 1, or 2 solutions

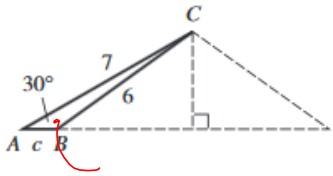
http://www.geogebra.org/m/33502



Given Δ ABC, a =6, b = 7 and angle A = 30
Solve the triangle.







$$\frac{\sin B}{7} = \frac{\sin 30^\circ}{6}$$

$$\sin B = 7\,\frac{\sin 30^\circ}{6}$$

$$\sin B = .583$$

$$\angle B = 35.6^\circ$$

$$\frac{c}{\sin 114.4^\circ} = \frac{6}{\sin 30^\circ}$$

$$c = 10.9$$

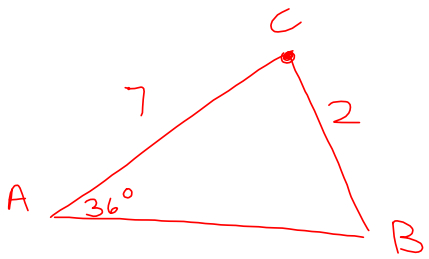
$$\angle B = 144.4^\circ$$

$$\angle C = 5.6^\circ$$

$$\frac{c}{\sin 5.6^\circ} = \frac{6}{\sin 30^\circ}$$

$$c = 1.2$$

Given Δ ABC, a =2, b = 7 and angle A = 36°



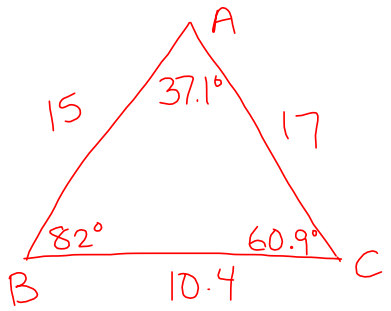
$$\frac{\sin B}{7} = \frac{\sin 36^\circ}{2}$$

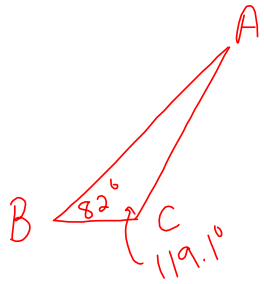
$$\sin B = \frac{7 \sin 36^\circ}{2}$$

$$\sin B = 2.05$$

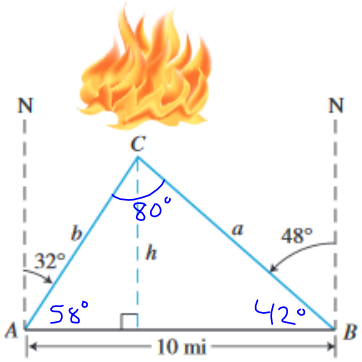
$$\sin^{-1}(2.05) = \angle B$$

Given Δ ABC, b =17, c = 15 and angle B = 82°





In the law of sines if you are given a choice, try to solve for the smallest angle you can first



Forest Ranger Johnson at ranger station A sights a fire in the direction 32° east of north. Ranger Thorpe at ranger station B, 10 miles due east of A sights the same fire on a line 48° west of north. Find the distance from each ranger station to the fire.

$$\frac{10}{\sin 80^\circ} = \frac{b}{\sin 42^\circ}$$

$b = 6.8\text{mi}$

$$\frac{10}{\sin 80^\circ} = \frac{a}{\sin 58^\circ}$$

$a = 8.6\text{mi}$

Section 5.5

Pg. 484 QR 1- 6

Ex: 5-11 odd, 27-35 odd, 37-40, 45, 49-51