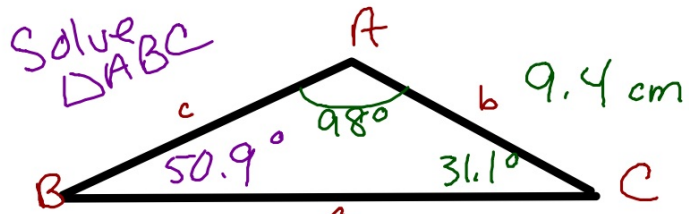
11.4 Law of Sines

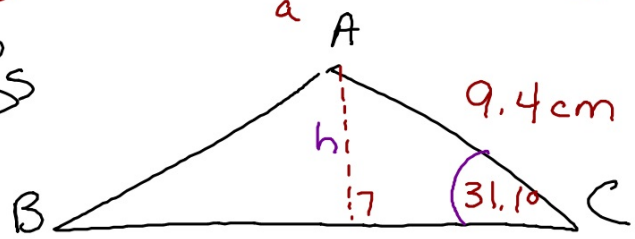
What do we do to find missing sides/angles in a non-right △?

Solve △ABC



To "solve" a triangle, find all sides and all angles

Idea: "split" into 2 right △s



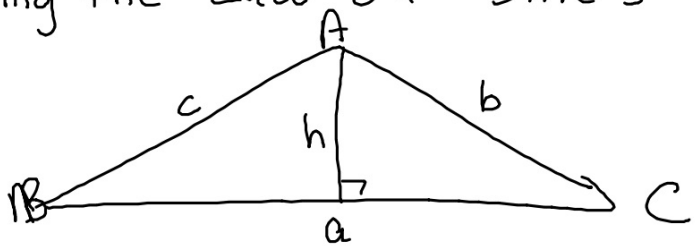
$A = \frac{1}{2}bh$

Drop a perpendicular from one angle to the opposite side

$\sin 31.1 = \frac{h}{9.4}$

$9.4 \sin 31.1 = h$

Deriving the Law of Sines



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

$h = c \sin B$ $h = b \sin C$

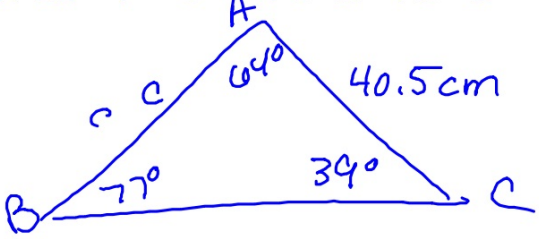
$$\frac{c \sin B}{b} = \frac{b \sin C}{b}$$

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

Law of Sines

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

Ex] Find the measure of c = _____



Sin Law

$$\frac{\sin 77^\circ}{40.5} = \frac{\sin 39}{c}$$

$$c \sin 77^\circ = 40.5 \sin(39)$$

$$c = \frac{40.5 \sin(39)}{\sin 77^\circ}$$

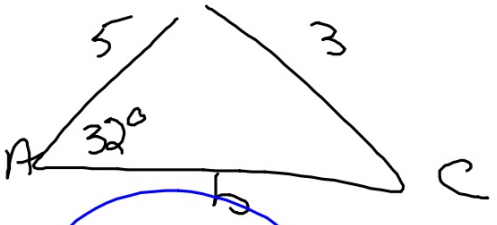
$$c \approx 26.2$$

When do I use the Law of Sines?

ASA

AAS

SSA



3 possibilities

1. one triangle
2. no triangle
3. two triangles

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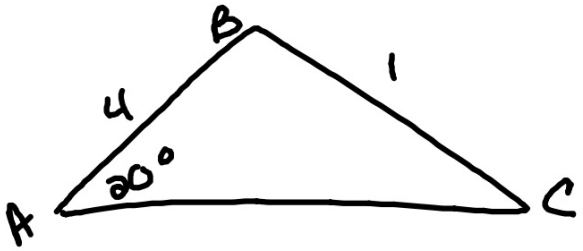
Ex No triangle



Find $\overline{AC}$

1st – find $m\angle C$

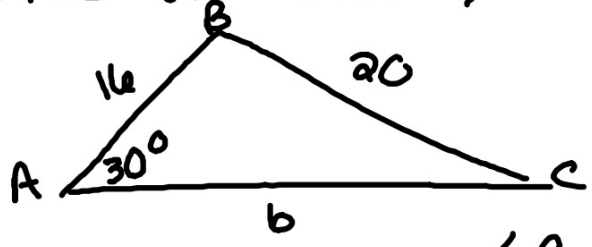
$$\frac{\sin 20}{1} = \frac{\sin C}{4}$$

$$\sin C = 4 \sin 20°$$

$$C = \sin^{-1}(4 \sin 20°)$$

ERROR

Ex) one (or two?) triangles



Solve the triangle (find all sides/angles)

1st - find angle C

$$\frac{\sin 30}{20} = \frac{\sin C}{16}$$

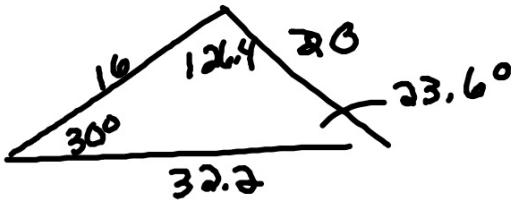
$$C = \sin^{-1}\left(\frac{16 \sin 30}{20}\right) \approx 23.6^\circ$$

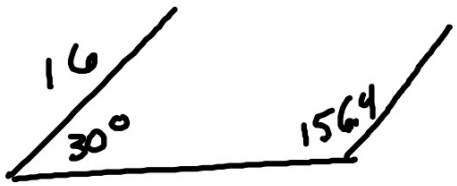
Find angle B

$$B = 180 - 30 - 23.6$$
$$= 126.4^\circ$$

Find side b

$$\frac{\sin 126.4}{b} = \frac{\sin 30}{20} \quad b =$$





look for the supplement of C and check to see it it is also a △

* Angle C has sin(C) in 2 places, 2 ∠s make it the same

find the supplement : $180 - 23.6° = 156.4°$

find ∠B $180 - 30 - 156.4 = -6.4°$

only 1 △

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