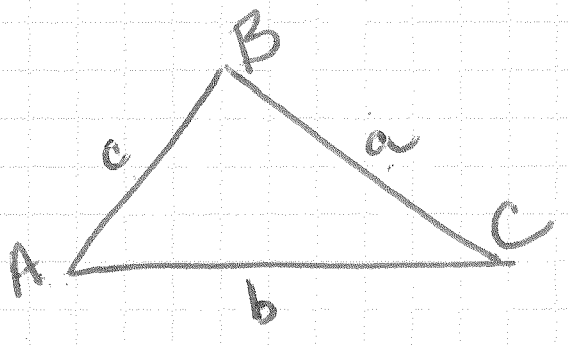
Law of Sines

Solving Oblique* Triangles

* non-right triangle

Law of Sines (Proportion)

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$ (reciprocal is OK)

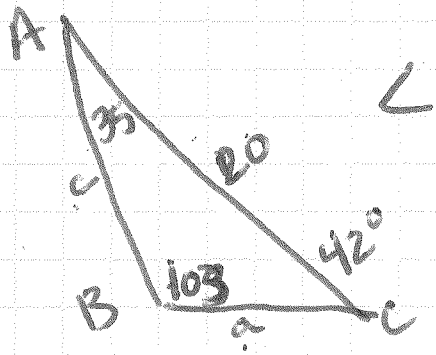


ABC → angles

abc → opposite sides

LoS works for ASA, AAS, SSA ↑ ambiguous Δ

Ex 1: Solve ΔABC



$\angle C = 180° - (35° + 103°) = 42°$

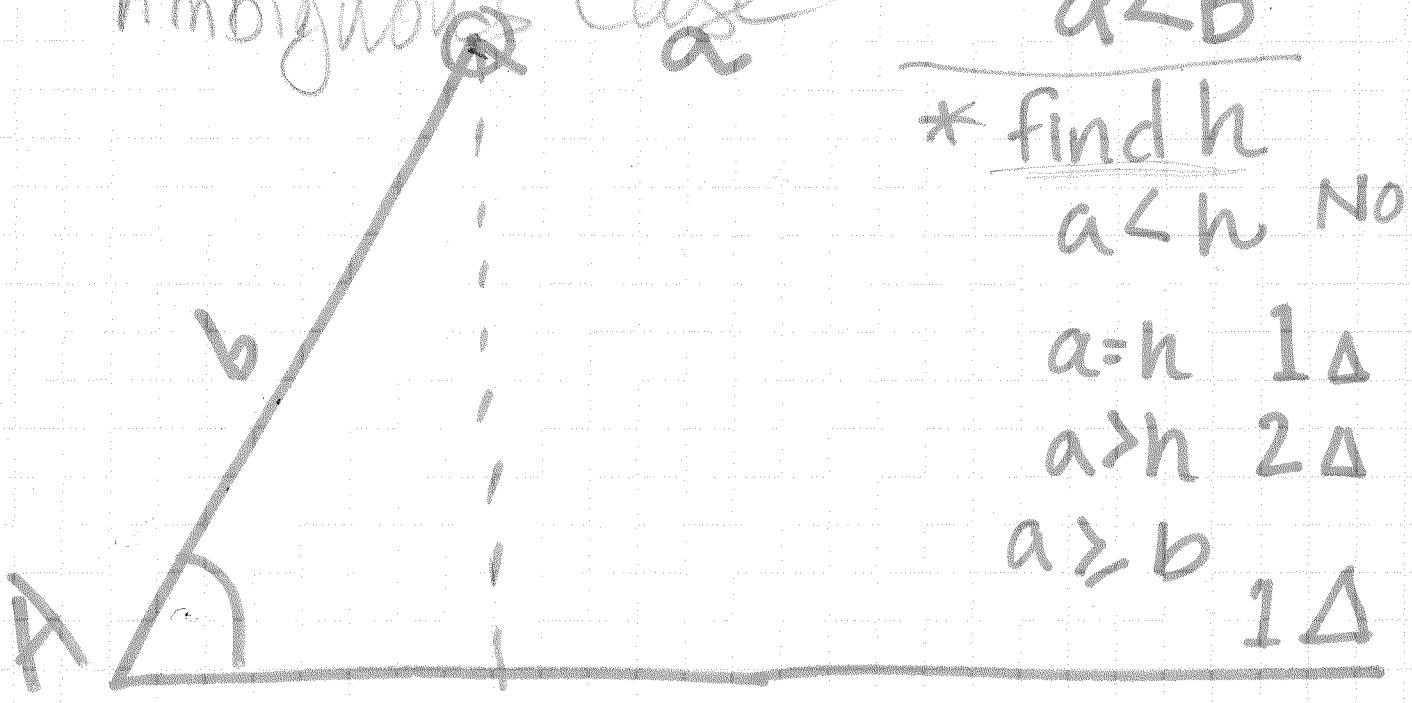
$$\frac{a}{\sin 35} = \frac{20}{\sin 103°}$$

$$a = \frac{20 \sin 35°}{\sin 103°} \quad 11.773 \text{ u}$$

$$\frac{c}{\sin 42°} = \frac{20}{\sin 103}$$

$$c = \frac{20 \sin 42°}{\sin 103°} \quad 13.735 \text{ u}$$

Ambiguous Case



$a < b$

* find h

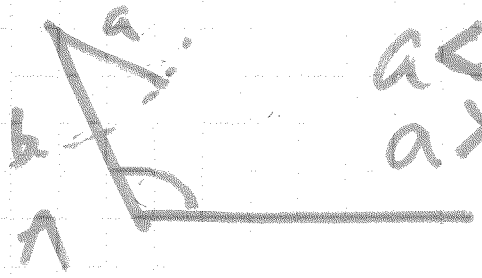
$a < h$ NOM

$a = h$ 1 Δ

$a > h$ 2 Δ

$a \geq b$ 1 Δ

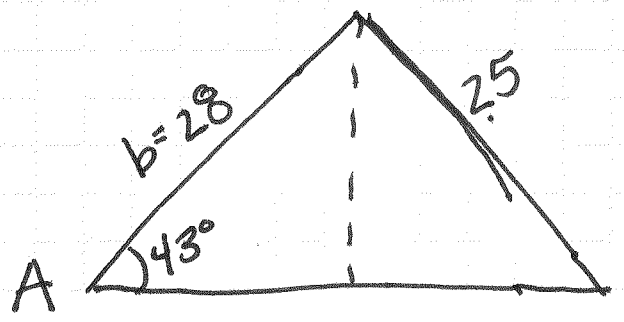
$\sin A = \frac{h}{b}$ $\quad b \sin A = h$



$a < b$ 0 Δ

$a > b$ 1 Δ

Ex find 2 Δ s $\angle A = 43°$ $a = 25$ $b = 28$

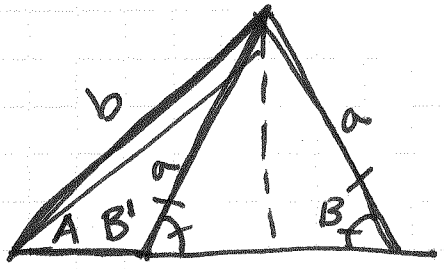


$25 < 28$ $25 > 19.096$

$h = 28 \sin 43° = 19.096$

2 Δ's

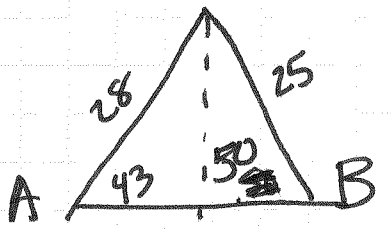
B acute B obtuse



Find the obtuse $\angle B$, ($\angle B'$)

Subtract acute $\angle B$ from 180°

$\angle B' = 180 - \angle B$

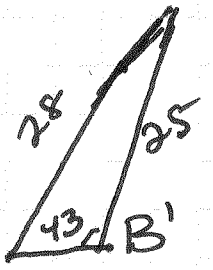


$\frac{\sin B'}{28} = \frac{\sin 43°}{25}$

$\sin^{-1}\left(\frac{28 \sin 43}{25}\right) = B$

$\angle C = 87°$ $50° = B$

find side C



$B' = 180 - 50 = 130°$

find $\angle C$, side c