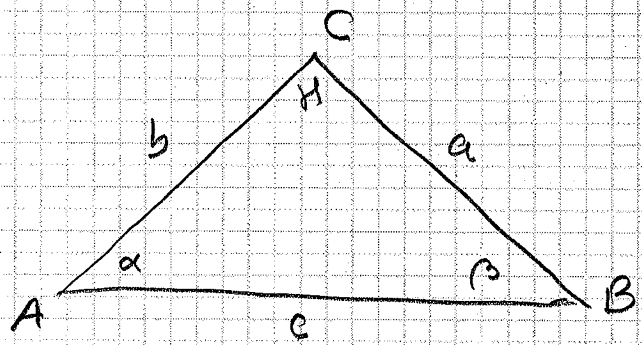
THE LAW OF COSINES



$$\boxed{c^2 = a^2 + b^2 - 2ab\cdot\cancel{\cos\gamma}}$$

$$b^2 = a^2 + c^2 - 2a\cdot c\cdot\cos\beta$$

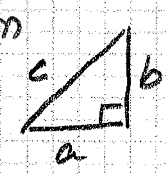
$$a^2 = b^2 + c^2 - 2bc\cdot\cos\alpha$$

If $\gamma = 90^\circ$

$\cos 90^\circ = 0$

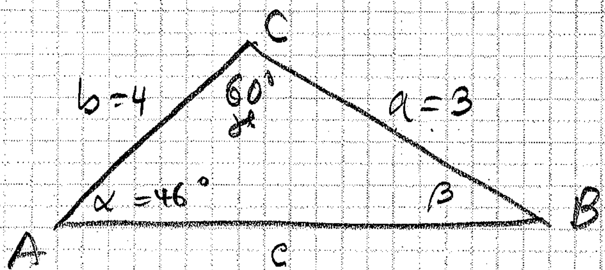
Pythagorean theorem

$$c^2 = a^2 + b^2$$



Ex: $a = 3 \quad b = 4 \quad \gamma = 60^\circ$

SAS

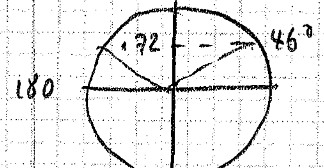


$$c^2 = 9 + 16 - 2*3*4*\cos 60^\circ = 13 \Rightarrow c = \sqrt{13}$$

$$\frac{\sin\alpha}{3} = \frac{\sin 60^\circ}{\sqrt{13}} \Longrightarrow \sin\alpha = \frac{3\times\sin 60^\circ}{\sqrt{13}} \approx .72 \Rightarrow$$

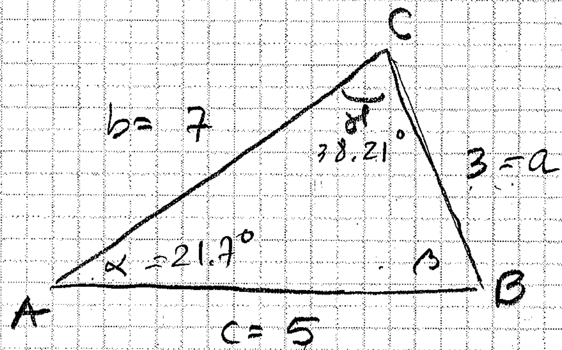
$$\Rightarrow \alpha = \sin^{-1}(.72) \approx 46^\circ$$

$\cancel{180 - 46 = 134^\circ}$



$$\beta = 180^\circ - 46^\circ - 60^\circ = 74^\circ$$

Ex:



$$25 = 9+49-2*3*7*\cos\gamma \Rightarrow 25 = 58 - 42*\cos\gamma \Rightarrow$$

$$\Rightarrow 42\cos\gamma = 58-25 \Rightarrow 42\cos\gamma = 33 \Rightarrow \cos\gamma = \frac{33}{42} \Rightarrow$$

$$\Rightarrow \gamma = \cos^{-1}\left(\frac{33}{42}\right) \approx 38.21^\circ$$

$$\frac{\sin\alpha}{3} = \frac{\sin 38.21^\circ}{5} \Rightarrow \sin\alpha = \frac{3\times\sin 38.21^\circ}{5} \approx .37 \Rightarrow$$

$$\Rightarrow \alpha = \sin^{-1}(.37) \approx 21.7^\circ$$

$$\beta = 180^\circ - 21.7^\circ - 38.21 \approx 120.09$$