Thm. $\sin(\alpha + \beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$
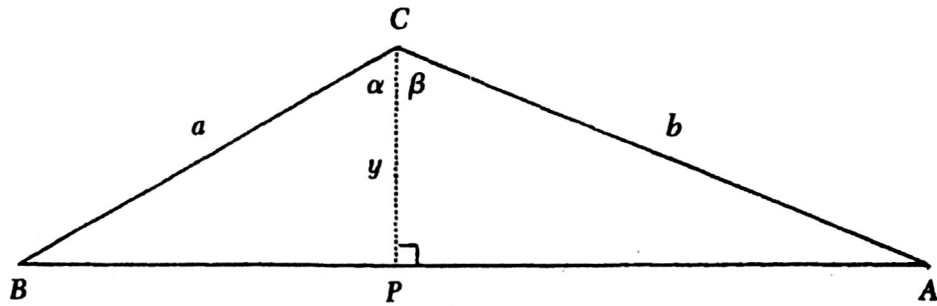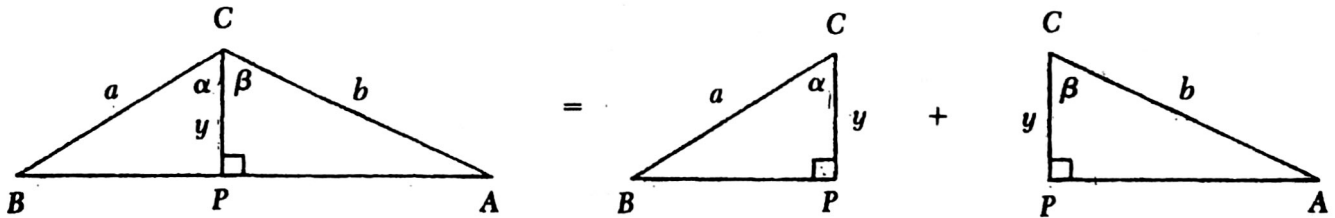
Proof.

$\text{Sin}(\alpha + \beta)$ for $\alpha + \beta < \pi$

$$y = a\cos\alpha = b\cos\beta$$

$$\tfrac{1}{2}ab\sin(\alpha + \beta) = \tfrac{1}{2}ay\sin\alpha + \tfrac{1}{2}by\sin\beta$$

$$= \tfrac{1}{2}ab\cos\beta\sin\alpha + \tfrac{1}{2}ba\cos\alpha\sin\beta$$

$$\therefore \sin(\alpha + \beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$$