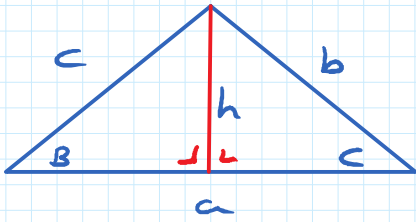


Sine Rule

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



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

$$c \sin B = h$$

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

$$b \sin C = h$$

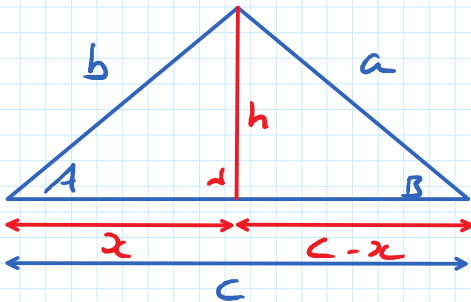
$$\frac{c \sin B}{b \cancel{c}} = \frac{b \sin C}{b \cancel{c}}$$

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

Similarly \rightarrow

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

Cosine Rule.



$$b^2 = h^2 + x^2$$

$$b^2 - x^2 = h^2$$

$$a^2 = h^2 + (c-x)^2$$

$$a^2 - (c-x)^2 = h^2$$

$$a^2 - (c-x)^2 = b^2 - x^2$$

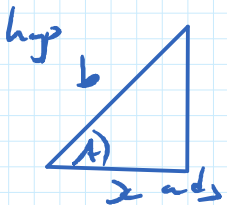
$$a^2 - (c^2 - 2cx + x^2) = b^2 - x^2$$

$$a^2 - c^2 + 2cx - \cancel{x^2} = b^2 - \cancel{x^2}$$

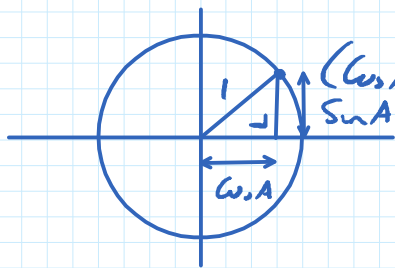
$$a^2 = b^2 + c^2 - 2cx$$

$$\cos A = \frac{x}{b} \Rightarrow x = b \cos A$$

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



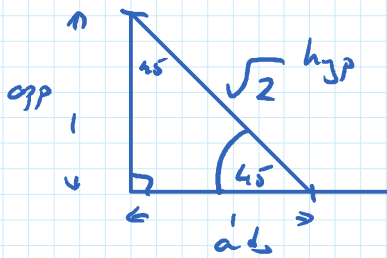
$$\sin^2 A + \cos^2 A = 1$$



$$(\sin A)^2 + (\cos A)^2 = 1$$

$$\sin^2 A + \cos^2 A = 1$$

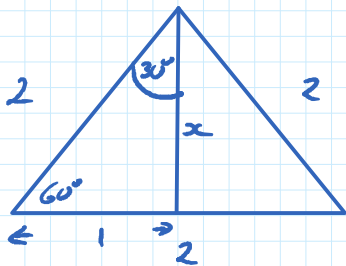
$$\underline{\sin} \quad | \quad \underline{\cos} \quad | \quad \underline{\tan} \quad \quad 45 \quad | \quad 30 \quad | \quad 60$$



$$\sin 45 = \frac{1}{\sqrt{2}}$$

$$\cos 45 = \frac{1}{\sqrt{2}}$$

$$\tan 45 = 1$$



$$x^2 + 1 = 4$$

$$x^2 = 3$$

$$x = \sqrt{3}$$

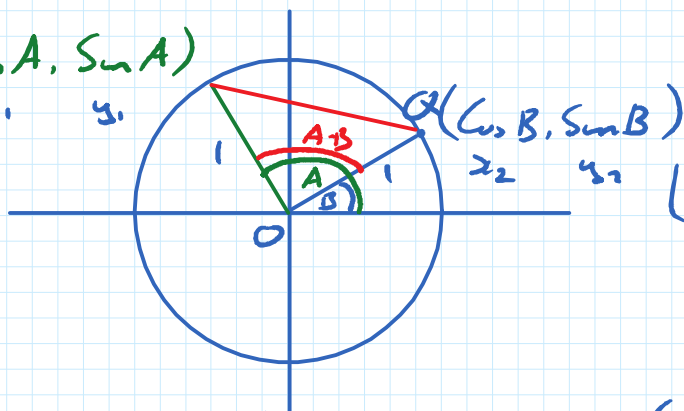
$$\sin 60 = \frac{\sqrt{3}}{2} \quad \sin 30 = \frac{1}{2}$$

$$\cos 60 = \frac{1}{2} \quad \cos 30 = \frac{\sqrt{3}}{2}$$

$$\tan 60 = \sqrt{3} \quad \tan 30 = \frac{1}{\sqrt{3}}$$

$$\cos(A-B) = \cos A \cos B + \sin A \sin B.$$

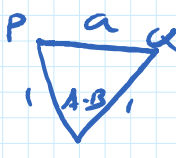
$$P(\cos A, \sin A)$$



$$|PQ|^2 = \text{distance}^2 = \text{cosine rule}$$

$$|PQ|^2 = (\cos A - \cos B)^2 + (\sin A - \sin B)^2$$

$$= \cos^2 A - 2\cos A \cos B + \cos^2 B + \sin^2 A - 2\sin A \sin B + \sin^2 B$$

$$= 2 - 2(\cos A \cos B + \sin A \sin B)$$


$$|PQ|^2 = 1 + 1 - 2(1)(1)\cos(A-B)$$

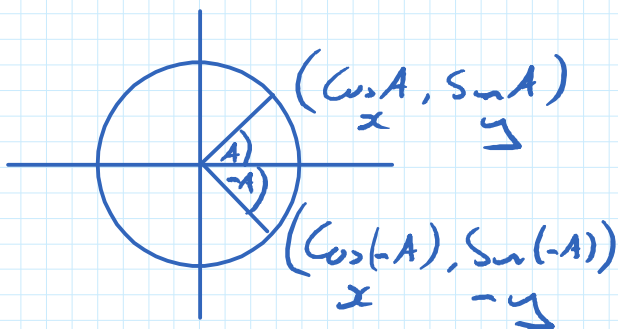
$$= 2 - 2\cos(A-B)$$

$$\cancel{2} - \cancel{2}\cos(A-B) = \cancel{2} - \cancel{2}(\cos A \cos B + \sin A \sin B)$$

$$\cos(A-B) = \cos A \cos B + \sin A \sin B$$

$$\cos(-A) = \cos A$$

$$\sin(-A) = -\sin A$$

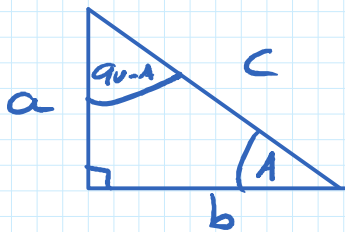


$$\cos(-A) = \cos A$$

$$\sin(-A) = -\sin A$$

$$\cos(90-A) = \sin A$$

$$\sin(90-A) = \cos A$$



$$\sin A = \frac{a}{c}$$

$$\cos A = \frac{b}{c}$$

$$\sin(90-A) = \frac{b}{c}$$

$$\cos(90-A) = \frac{a}{c}$$

$$\cos(A+B) = \cos A \cos B - \sin A \sin B$$

$$\cos(A-B) = \cos A \cos B + \sin A \sin B$$

Replace B with $-B$ NB

$$\cos(A-(-B)) = \cos A \cos(-B) + \sin A \sin(-B)$$

$$\cos(A+B) = \cos A \cos B - \sin A \sin B.$$

$$\cos 2A = \cos^2 A - \sin^2 A$$

$$\cos(A+B) = \cos A \cos B - \sin A \sin B$$

Replace B with A

$$\begin{aligned}\cos 2A &= \cos A \cos A - \sin A \sin A \\ &= \cos^2 A - \sin^2 A.\end{aligned}$$

$$\sin(A+B) = \sin A \cos B + \cos A \sin B$$

$$\cos(90-A) = \sin A \quad \sin(90-A) = \cos A$$

$$\cos(A-B) = \cos A \cos B + \sin A \sin B$$

Replace A with $90-A$

$$\cos(90-A-B) = \cos(90-A) \cos B + \sin(90-A) \sin B$$

$$\sin(A+B) = \sin A \cos B + \cos A \sin B$$

$$\cos(90-A-B) = \cos(90-(A+B)) = \sin(A+B)$$

$$\cos(90-0) = \sin 0$$

$$\sin(A-B) = \sin A \cos B - \cos A \sin B$$

$$\sin(A+B) = \sin A \cos B + \cos A \sin B$$

Replace B with $-B$

$$\begin{aligned}\sin(A-B) &= \sin A \cos(-B) + \cos A \sin(-B) \\ &= \sin A \cos B - \cos A \sin B.\end{aligned}$$

$$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$\frac{\sin(A+B)}{\cos(A+B)} = \frac{\sin A \cos B + \cos A \sin B}{\cos A \cos B - \sin A \sin B}$$

$$\frac{\frac{\cancel{\sin A} \cancel{\cos B} + \cancel{\cos A} \cancel{\sin B}}{\cancel{\cos A} \cancel{\cos B} - \cancel{\sin A} \cancel{\sin B}}}{\frac{\cancel{\cos A} \cancel{\cos B} - \cancel{\sin A} \cancel{\sin B}}{\cancel{\cos A} \cancel{\cos B} - \cancel{\sin A} \cancel{\sin B}}} = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$