1 Sum Of Two Angles

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

$$\cos(\alpha + \beta) = \cos\alpha \cdot \cos\beta - \sin\alpha \cdot \sin\beta$$

$$\tan(\alpha + \beta) = \frac{\tan\alpha + \tan\beta}{1 - \tan\alpha \cdot \tan\beta}$$

2 Difference Of Two Angles

$$\sin(\alpha - \beta) = \sin\alpha \cdot \cos\beta - \cos\alpha \cdot \sin\beta$$

$$\cos(\alpha - \beta) = \cos\alpha \cdot \cos\beta + \sin\alpha \cdot \sin\beta$$

$$\tan(\alpha - \beta) = \frac{\tan\alpha - \tan\beta}{1 + \tan\alpha \cdot \tan\beta}$$

3 Products To Sums

$$2\sin\alpha \cdot \cos\beta = \sin(\alpha + \beta) + \sin(\alpha - \beta)$$

$$2\cos\alpha \cdot \sin\beta = \sin(\alpha + \beta) - \sin(\alpha - \beta)$$

$$2\cos\alpha \cdot \cos\beta = \cos(\alpha + \beta) + \cos(\alpha - \beta)$$

$$2\sin\alpha \cdot \sin\beta = \cos(\alpha - \beta) - \cos(\alpha + \beta)$$

4 Products Of Sums Of Two Angles

$$\sin(\alpha + \beta) \cdot \sin(\alpha - \beta) = \sin^2\alpha - \sin^2\beta$$

$$\cos(\alpha + \beta) \cdot \cos(\alpha - \beta) = \cos^2\alpha - \sin^2\beta$$

$$\tan(\alpha + \beta) \cdot \tan(\alpha - \beta) = \frac{\tan^2\alpha - \tan^2\beta}{1 - \tan^2\alpha \cdot \tan^2\beta}$$

5 Sums or Differences to Products

$$\sin C + \sin D = 2\sin\left(\frac{C + D}{2}\right)\cos\left(\frac{C - D}{2}\right)$$

$$\sin C - \sin D = 2\cos\left(\frac{C + D}{2}\right)\sin\left(\frac{C - D}{2}\right)$$

$$\cos C + \cos D = 2\cos\left(\frac{C + D}{2}\right)\cos\left(\frac{C - D}{2}\right)$$

$$\cos C - \cos D = 2\sin\left(\frac{C + D}{2}\right)\sin\left(\frac{D - C}{2}\right)$$

6 Double Angles

$$\sin 2\theta = 2\sin\theta \cdot \cos\theta$$

$$= \frac{2\tan\theta}{1+\tan^2\theta}$$

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

$$= 1 - 2\sin^2\theta$$

$$= 2\cos^2\theta - 1$$

$$= \frac{1-\tan^2\theta}{1+\tan^2\theta}$$

$$\tan 2\theta = \frac{2\tan\theta}{1-\tan^2\theta}$$

$$\sin^2\theta = \frac{1-\cos 2\theta}{2}$$

$$\cos^2\theta = \frac{1+\cos 2\theta}{2}$$

7 Triple Angles

$$\sin 3\theta = 3\sin\theta - 4\sin^3\theta$$

$$\cos 3\theta = 4\cos^3\theta - 3\cos\theta$$

$$\tan 3\theta = \frac{3\tan\theta - \tan^3\theta}{1-3\tan^2\theta}$$

8 Miscellaneous

$$\sin\theta \cdot \sin(60-\theta) \cdot \sin(60+\theta) = \frac{\sin 3\theta}{4}$$

$$\cos\theta \cdot \cos(60-\theta) \cdot \cos(60+\theta) = \frac{\cos 3\theta}{4}$$

$$\cos^3\theta + \cos^3(120+\theta) + \cos^3(\theta-120) = \frac{3}{4} \cdot \cos 3\theta$$

$$\tan\theta \cdot \tan(60-\theta) \cdot \tan(60+\theta) = \tan 3\theta$$

9 Sum Of Three Angles

$$\sin(\alpha+\beta+\gamma) = \sin\alpha\cdot\cos\beta\cdot\cos\gamma + \sin\beta\cdot\cos\alpha\cdot\cos\gamma + \sin\gamma\cdot\cos\alpha\cdot\cos\beta - \sin\alpha\cdot\sin\beta\cdot\sin\gamma$$

$$\cos(\alpha+\beta+\gamma) = \cos\alpha\cdot\cos\beta\cdot\cos\gamma - \cos\alpha\cdot\sin\beta\cdot\sin\gamma - \cos\beta\cdot\sin\alpha\cdot\sin\gamma - \cos\gamma\cdot\sin\alpha\cdot\sin\beta$$

$$\tan(\alpha+\beta+\gamma) = \frac{\tan\alpha+\tan\beta+\tan\gamma-\tan\alpha\cdot\tan\beta\cdot\tan\gamma}{1-tan\alpha\cdot\tan\beta-tan\beta\cdot\tan\gamma-tan\alpha\cdot\tan\gamma}$$

10 AP, GP in Trigonometrical Ratios

$$\sin(A)+\sin(A+D)+\ldots+\sin(A+(n-1)D) = \frac{\sin(A+\frac{(n-1)D)}{2}\cdot\sin(\frac{nD}{2}))}{\sin(\frac{D}{2})}$$

$$\cos(A)+\cos(A+D)+\ldots+\cos(A+(n-1)D) = \frac{\cos(A+\frac{(n-1)D)}{2}\cdot\sin(\frac{nD}{2}))}{\sin(\frac{D}{2})}$$

$$\cos\theta\cdot\cos 2\theta\cdot\cos 2^2\theta\ldots\cos 2^{(n-1)}\theta = \frac{\sin(2^n\theta)}{2^n\sin\theta}$$

11 Trigonometrical Equations

11.1 Value is 0

$\sin\theta = 0, \theta = n\pi$

$\cos\theta = 0, \theta = (2n+1)\frac{\pi}{2}$

$\tan\theta = 0, \theta = n\pi$

11.2 Value is 1

$\sin\theta = 1, \theta = (4n+1)\frac{\pi}{2}$

$\cos\theta = 1, \theta = 2n\pi$

11.3 Value is -1

$\sin\theta = -1, \theta = (4n-1)\frac{\pi}{2}$

$\cos\theta = -1, \theta = (2n+1)\pi$

11.4 $\theta = \alpha$

$\sin\theta = \sin\alpha, \theta = n\pi + (-1)^n\alpha$

$\cos\theta = \cos\alpha, \theta = 2n\pi \pm \alpha$

$\tan\theta = \tan\alpha, \theta = n\pi + \alpha$

$\sin^2\theta = \sin^2\alpha, \cos^2\theta = \cos^2\alpha, \tan^2\theta = \tan^2\alpha, \theta = n\pi \pm \alpha$