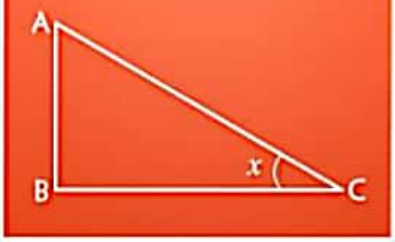
TRIGONOMETRIC IDENTITIES

Part I

1 Quotient Identities



$$\tan x = \frac{\sin x}{\cos x}$$

$$\cot x = \frac{\cos x}{\sin x}$$

$$\sec x = \frac{1}{\cos x}$$

$$\operatorname{cosec} x = \frac{1}{\sin x}$$

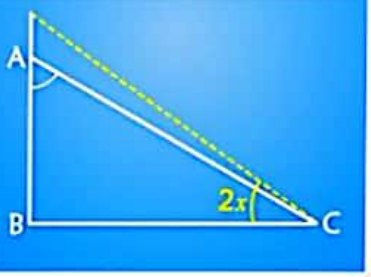
2 Pythagorean Identities

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

$$\sec^2 x - \tan^2 x = 1$$

$$\operatorname{cosec}^2 x - \cot^2 x = 1$$

3 Double Angle Identities



$$\sin 2x = 2 \sin x \cos x$$

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

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

$$\cos 2x = 1 - 2\sin^2 x$$

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

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

4 Half Angle Identities

$$\sin \frac{x}{2} = \pm\sqrt{\frac{1 - \cos x}{2}}$$

$$\cos \frac{x}{2} = \pm\sqrt{\frac{1 + \cos x}{2}}$$

$$\tan \frac{x}{2} = \pm\sqrt{\frac{1 - \cos x}{1 + \cos x}}$$

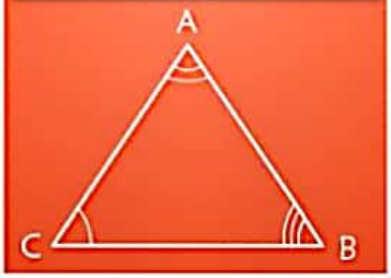
$$\tan \frac{x}{2} = \frac{1 - \cos x}{\sin x}$$

$$\tan \frac{x}{2} = \frac{\sin x}{1 + \cos x}$$

TRIGONOMETRIC IDENTITIES

Part II

5 Angle Sum & Difference Identities



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

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$$

$$\cot(A \pm B) = \frac{\cot A \cdot \cot B \mp 1}{\cot B \pm \cot A}$$

6 Sum Identities

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

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

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

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

7 Product Identities

$$2\sin A \cos B = \left[\sin(A+B) + \sin(A-B)\right]$$

$$2\cos A \sin B = \left[\sin(A+B) - \sin(A-B)\right]$$

$$2\cos A \cos B = \left[\cos(A-B) + \cos(A+B)\right]$$

$$2\sin A \sin B = \left[\cos(A-B) - \cos(A+B)\right]$$

8 Summation of Trigonometric Series

$$\sin A + \sin(A+B) + \sin(A+2B) + \ldots + \sin(A+(n-1)B) = \frac{\sin nB/2}{\sin B/2}.\sin\left(A + \frac{(n-1)}{2}B\right)$$

$$\cos A + \cos(A+B) + \cos(A+2B) + \ldots + \cos(A+(n-1)B) = \frac{\sin nB/2}{\sin B/2}.\cos\left(A + \frac{(n-1)}{2}B\right)$$