Important Trigonometric Formulas

- $\sin^2 q + \cos^2 q = 1$
- $1+\tan^2 q = \sec^2 q$
- $1+\cot^2 q = \csc^2 q$
- $\sin(-q) = -\sin q$
- $\cos(-q) = \cos q$
- $\tan(-q) = -\tan q$

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- $\sin(a+b) = \sin a \cos b + \cos a \sin b$
- $\sin(a-b) = \sin a \cos b - \cos a \sin b$
- $\cos(a+b) = \cos a \cos b - \sin a \sin b$
- $\cos(a-b) = \cos a \cos b + \sin a \sin b$
- $\tan(a+b) = \dfrac{\tan a + \tan b}{1-\tan a \tan b}$
- $\tan(a-b) = \dfrac{\tan a - \tan b}{1+\tan a \tan b}$

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- $\sin 2q = 2\sin q \cos q$
- $\cos 2q = \cos^2 q - \sin^2 q$
- $\tan 2q = \dfrac{2\tan q}{1-\tan^2 q}$

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- $\sin^2 \dfrac{q}{2} = \dfrac{1-\cos q}{2}$
- $\cos^2 \dfrac{q}{2} = \dfrac{1+\cos q}{2}$
- $\tan^2 \dfrac{q}{2} = \dfrac{1-\cos q}{1+\cos q}$

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- $\sin 3q = 3\sin q - 4\sin^3 q$
- $\cos 3q = 4\cos^3 q - 3\cos q$
- $\tan 3q = \dfrac{3\tan q - \tan^3 q}{1-3\tan^2 q}$

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- $\sin 2q = \dfrac{2\tan q}{1+\tan^2 q}$
- $\cos 2q = \dfrac{1-\tan^2 q}{1+\tan^2 q}$

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- $\sin(a+b)+\sin(a-b) = 2\sin a \cos b$
- $\sin(a+b)-\sin(a-b) = 2\cos a \sin b$
- $\cos(a+b)+\cos(a-b) = 2\cos a \cos b$
- $\cos(a+b)-\cos(a-b) = -2\sin a \sin b$

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- $\sin q + \sin f = 2\sin\dfrac{q+f}{2}\cos\dfrac{q-f}{2}$
- $\sin q - \sin f = 2\cos\dfrac{q+f}{2}\sin\dfrac{q-f}{2}$
- $\cos q + \cos f = 2\cos\dfrac{q+f}{2}\cos\dfrac{q-f}{2}$
- $\cos q - \cos f = -2\sin\dfrac{q+f}{2}\sin\dfrac{q-f}{2}$

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- $\sin^{-1}A + \sin^{-1}B = \sin^{-1}\left(A\sqrt{1-B^2} + B\sqrt{1-A^2}\right)$
- $\sin^{-1}A - \sin^{-1}B = \sin^{-1}\left(A\sqrt{1-B^2} - B\sqrt{1-A^2}\right)$
- $\cos^{-1}A + \cos^{-1}B = \cos^{-1}\left(AB - \sqrt{(1-A^2)(1-B^2)}\right)$
- $\cos^{-1}A - \cos^{-1}B = \cos^{-1}\left(AB + \sqrt{(1-A^2)(1-B^2)}\right)$
- $\tan^{-1}A + \tan^{-1}B = \tan^{-1}\dfrac{A+B}{1-AB}$
- $\tan^{-1}A - \tan^{-1}B = \tan^{-1}\dfrac{A-B}{1+AB}$

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Three Steps to solve $\sin\left(n\cdot\dfrac{p}{2} \pm q\right)$

Step I: First check that *n* is even or odd

Step II: If *n* is even then the answer will be in *sin* and if the *n* is odd then *sin* will be converted to *cos* and vice virsa (i.e. *cos* will be converted to *sin*).

Step III: Now check in which quadrant $n\cdot\dfrac{p}{2} \pm q$ is lying if it is in *Ist* or *IInd* quadrant the answer will be positive as *sin* is positive in these quadrants and if it is in the *IIIrd* or *IVth* quadrant the answer will be negative.

e.g. $\sin 667^\circ = \sin\left(7(90)+37\right)$

Since n = 7 is odd so answer will be in *cos* and 667 is in *IVth* quadrant and *sin* is –ive in *IVth* quadrant therefore answer will be in negative. i.e $\sin 667^\circ = -\cos 37^\circ$

Similar technique is used for other trigonometric ratios. i.e $\tan \rightleftarrows \cot$ and $\sec \rightleftarrows \csc$.

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