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Important Trigonometric Formulas

Textbook of Algebra and Trigonometry for Class XI
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- $\sin^2\theta+\cos^2\theta=1$
- $1+\tan^2\theta=\sec^2\theta$
- $1+\cot^2\theta=\csc^2\theta$
- $\sin(-\theta)=-\sin\theta$
- $\cos(-\theta)=\cos\theta$
- $\tan(-\theta)=-\tan\theta$

- $\sin(\alpha+\beta)=\sin\alpha\cos\beta+\cos\alpha\sin\beta$
- $\sin(\alpha-\beta)=\sin\alpha\cos\beta-\cos\alpha\sin\beta$
- $\cos(\alpha+\beta)=\cos\alpha\cos\beta-\sin\alpha\sin\beta$
- $\cos(\alpha-\beta)=\cos\alpha\cos\beta+\sin\alpha\sin\beta$
- $\tan(\alpha+\beta)=\dfrac{\tan\alpha+\tan\beta}{1-\tan\alpha\tan\beta}$
- $\tan(\alpha-\beta)=\dfrac{\tan\alpha-\tan\beta}{1+\tan\alpha\tan\beta}$

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

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

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

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

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

- $\sin\theta+\sin\phi=2\sin\dfrac{\theta+\phi}{2}\cos\dfrac{\theta-\phi}{2}$
- $\sin\theta-\sin\phi=2\cos\dfrac{\theta+\phi}{2}\sin\dfrac{\theta-\phi}{2}$
- $\cos\theta+\cos\phi=2\cos\dfrac{\theta+\phi}{2}\cos\dfrac{\theta-\phi}{2}$
- $\cos\theta-\cos\phi=-2\sin\dfrac{\theta+\phi}{2}\sin\dfrac{\theta-\phi}{2}$

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

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

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 $n\cdot\dfrac{\pi}{2}\pm\theta$ 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. $\sin 667^\circ = \sin(7(90)+37)$

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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