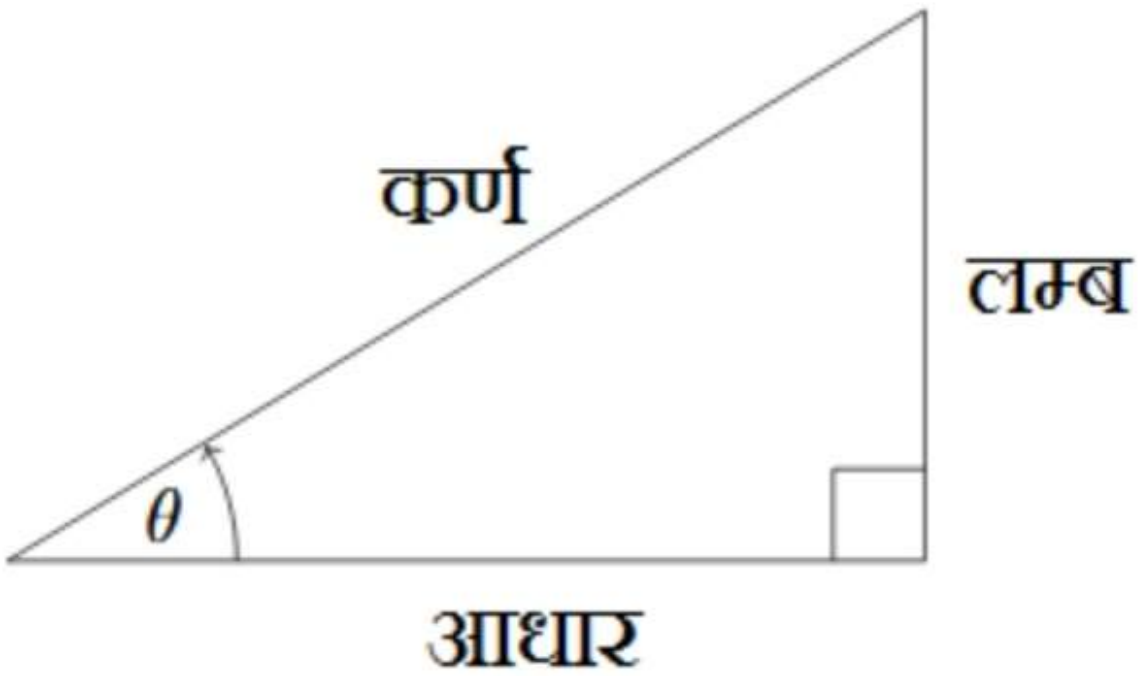
किसी भी समकोण त्रिभुज (Right angle Tiangle) के लिये सूत्र (formula)



$$\text{कर्ण}^2 = \text{लम्ब}^2 + \text{आधार}^2$$

त्रिकोणमिति के मूल सूत्र (Basic Identities of Trinomentry):

$$\text{Sin}\ \theta = \frac{\text{लम्ब}}{\text{कर्ण}}$$

$$\cos\theta = \frac{\text{आधार}}{\text{कर्ण}}$$

$$\tan\theta = \frac{\text{लम्ब}}{\text{आधार}}$$

$$\text{cosec}\ \theta = \frac{\text{कर्ण}}{\text{लम्ब}}$$

$$\sec\theta = \frac{\text{कर्ण}}{\text{आधार}}$$

$$\cot\theta = \frac{\text{आधार}}{\text{लम्ब}}$$

त्रिकोणमिति के सूत्र में आनुपातिक सम्बंध(Proportional Relationship in Trigonometry formula)

$\sin \theta = 1 / \operatorname{cosec} \theta$

$\operatorname{cosec} \theta = 1 / \sin \theta$

$\cos \theta = 1 / \sec \theta$

$\sec \theta = 1 / \cos \theta$

$$\sin \theta . \operatorname{cosec} \theta = 1$$

$$\cos \theta . \sec \theta = 1$$

$$\tan \theta . \cot \theta = 1$$

$$\tan \theta = \sin \theta / \cos \theta$$

$$\cot \theta = \cos \theta / \sin \theta$$

$$\tan \theta = 1 / \cot \theta$$

$$\cot \theta = 1 / \tan \theta$$

पायथागॉरियन सूत्र (Pythagorean Identity Formula)

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

$\sec^2 \theta = \tan^2 \theta + 1$

$\text{cosec}^2 \theta = 1 + \cot^2 \theta$

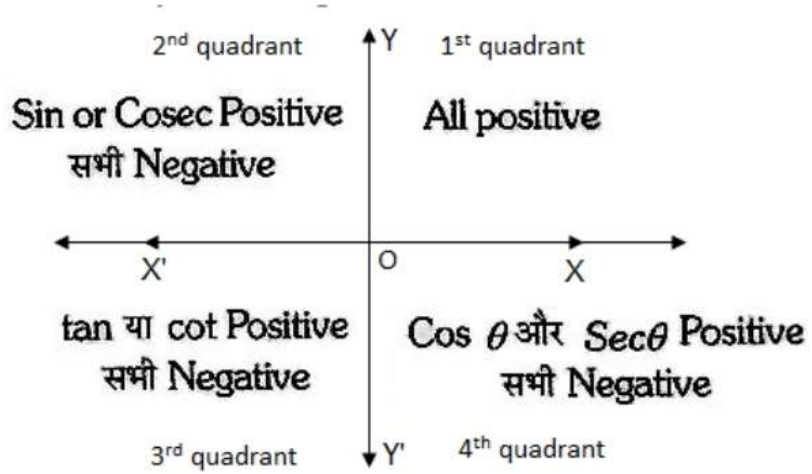
त्रिकोणमिति कोणों के महत्त्वपूर्ण मान (Important Values of Trigonometric Angle)

Main Table

	0°	30°	45°	60°	90°
$\sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan\theta$	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	$\pm\infty$

	0	$30^0 = \frac{\pi}{6}$	$45^0 = \frac{\pi}{4}$	$60^0 = \frac{\pi}{3}$	$90^0 = \frac{\pi}{2}$
sin	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	undefined
csc	undefined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1
sec	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	undefined
cot	undefined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0

त्रिकोणमिति के कोण और माप (Trigonometric Angle and Measurements)



1st $\frac{\text{(0 से 90° का Nature)}}{0 \to \theta \to 90}$

$\sin\theta$ — Increase (बढ़ेगा)

$\sin 68° > \sin 63°$

$\sin 71° > \sin 54°$

Positive

$\cos\theta$	—	Decrease
$\tan\theta$	—	Increase
$\cot\theta$	—	Decrease
$\sec\theta$	—	Increase
$\text{cosec}\,\theta$	—	Decrease

$(90° \pm \theta)$ Change हो जाएगा

$(270° \pm \theta)$ Change हो जाएगा

बदलेगा

$\sin \to \cos$

$\cos \to \sin$

$\tan \to \cot$

$\cot \to \tan$

$\sec \to \text{cosec}$

$\text{cosec} \to \sec$

$\sin(90^\circ - \theta) = \cos\theta$

$\cos(90^\circ - \theta) = \sin\theta$

$\tan(90^\circ - \theta) = \cot\theta$

$\operatorname{cosec}(90^\circ - \theta) = \sec\theta$

$\sec(90^\circ - \theta) = \operatorname{cosec}\theta$

$\cot(90^\circ - \theta) = \tan\theta$

$\sin(90^\circ + \theta) = \cos\theta$

$\cos(90^\circ + \theta) = -\sin\theta$

$\tan(90^\circ + \theta) = -\cot\theta$

$\operatorname{cosec}(90^\circ + \theta) = \sec\theta$

$\sec(90^\circ + \theta) = -\operatorname{cosec}\theta$

$\cot(90^\circ + \theta) = -\tan\theta$

$\sin(180^\circ - \theta) = \sin\theta$

$\cos(180^\circ - \theta) = -\cos\theta$

$\tan(180^\circ - \theta) = -\tan\theta$

$\operatorname{cosec}(180^\circ - \theta) = \operatorname{cosec}\theta$

$\sec(180^\circ - \theta) = -\sec\theta$

$\cot(180^\circ - \theta) = -\cot\theta$

$\sin(180^\circ + \theta) = -\sin\theta$

$\cos(180^\circ + \theta) = -\cos\theta$

$\tan(180^\circ + \theta) = \tan\theta$

$\operatorname{cosec}(180^\circ + \theta) = -\operatorname{cosec}\theta$

$\sec(180^\circ + \theta) = -\sec\theta$

$\cot(180^\circ + \theta) = \cot\theta$

$\sin(360° - \theta) = -\sin\theta$

$\cos(360° - \theta) = \cos\theta$

$\tan(360° - \theta) = -\tan\theta$

$\operatorname{cosec}(360° - \theta) = -\operatorname{cosec}\theta$

$\sec(360° - \theta) = \sec\theta$

$\cot(360° - \theta) = -\cot\theta$

$\sin(360° + \theta) = \sin\theta$

$\cos(360° + \theta) = \cos\theta$

$\tan(360° + \theta) = \tan\theta$

$\operatorname{cosec}(360° + \theta) = \operatorname{cosec}\theta$

$\sec(360° + \theta) = \sec\theta$

$\cot(360° + \theta) = \cot\theta$

मिश्र कोण (Compound Angle) :

Sum and Difference Formula

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

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

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

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

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

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

Double Angle Formula

$$\sin(2A) = 2\sin A \cos A$$
$$\cos(2A) = \cos^2 A - \sin^2 A$$
$$\cos(2A) = 2\cos^2 A - 1 = 1 - 2\sin^2 A$$
$$\tan(2A) = \frac{2\tan A}{1 - \tan^2 A}$$

Half Angle Formula

$$\sin(\frac{A}{2}) = \pm\sqrt{\frac{1-\cos(A)}{2}}$$
$$\cos(\frac{A}{2}) = \pm\sqrt{\frac{1+\cos(A)}{2}}$$
$$\tan(\frac{A}{2}) = \frac{1-\cos A}{\sin A} = \frac{\sin A}{1+\cos A}$$

Product to Sum

$$\cos A \cos B = \frac{1}{2}(\cos(A+B) + \cos(A-B))$$
$$\sin A \sin B = \frac{1}{2}(\cos(A-B) - \cos(A+B))$$
$$\sin A \cos B = \frac{1}{2}(\sin(A+B) + \sin(A-B))$$

Sum to Product

$$\sin A \pm \sin B = 2\sin(\frac{A \pm B}{2})\cos(\frac{A \mp B}{2})$$

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

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

Area of a Triangle

$$\begin{aligned}\text{Area} &= \frac{1}{2}ab\sin C = \frac{1}{2}bc\sin A \\ &= \frac{1}{2}ac\sin B = \sqrt{s(s-a)(s-b)(s-c)}\end{aligned}$$

where $s = \frac{a+b+c}{2}$

Law of Sines

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

Law of Cosines

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

$$\cos B = \frac{a^2 + c^2 - b^2}{2ac}$$

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

Sin 3A =3 Sin A - 4 Sin^3 A

Cos 3 A= 4 Cos^3 A - 3 Cos A

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

$$\cot 3\text{A} = \frac{\cot^3 \text{A} - 3\cot \text{A}}{3\cot^2 \text{A} - 1}$$

$$sin15 = sin(45 - 30) = sin45.cos30 - sin30.cos45 = \frac{\sqrt{2}}{2}.\frac{\sqrt{3}}{2} - \frac{1}{2}.\frac{\sqrt{2}}{2} = \frac{\sqrt{6} - \sqrt{2}}{4}$$

$$sin15 = cos\,75 = \frac{\sqrt{6} - \sqrt{2}}{4}$$

$$sin75 = sin(30 + 45) = sin30.cos45 + sin45.cos30 = \frac{1}{2}.\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}.\frac{\sqrt{3}}{2} = \frac{\sqrt{2} + \sqrt{6}}{4}$$

$$sin75 = cos\,15 = \frac{\sqrt{2} + \sqrt{6}}{4}$$

$$\tan 15^\circ = \frac{\sin 15^\circ}{\cos 15^\circ} = \frac{\frac{\sqrt{3}-1}{2\sqrt{2}}}{\frac{\sqrt{3}+1}{2\sqrt{2}}} = 2 - \sqrt{3}$$

$$\tan 15^\circ = 2 - \sqrt{3}$$

$$\tan 75^\circ = 2 + \sqrt{3}$$