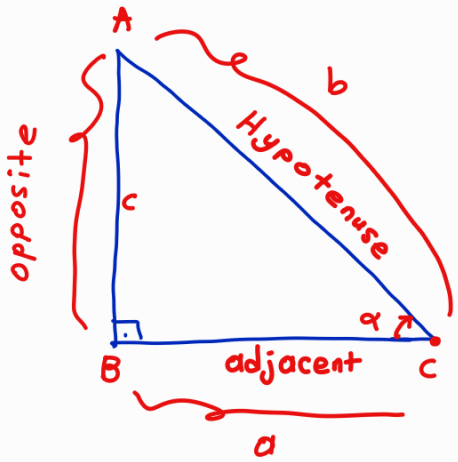
= Trigonometry Formulas =



$\sin\alpha = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{c}{b}$

$\cos\alpha = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{a}{b}$

$\tan\alpha = \frac{\text{opposite}}{\text{adjacent}} = \frac{c}{a}$

$\cot\alpha = \frac{\text{adjacent}}{\text{opposite}} = \frac{a}{c}$

- $\tan\alpha = \frac{\sin\alpha}{\cos\alpha}$
- $\cot\alpha = \frac{\cos\alpha}{\sin\alpha}$

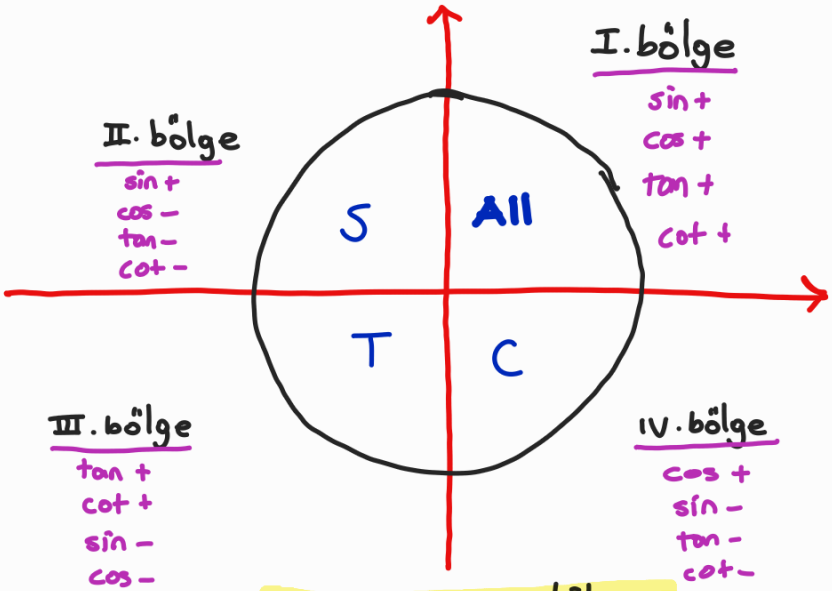
$\Rightarrow \sec\alpha = \frac{1}{\cos\alpha}$

$\Rightarrow \operatorname{cosec}\alpha = \frac{1}{\sin\alpha}$

★ $\tan x \cdot \cot x = 1$

$\sin^2\alpha + \cos^2\alpha = 1$ ★ important

Signs of Trigonometric Functions



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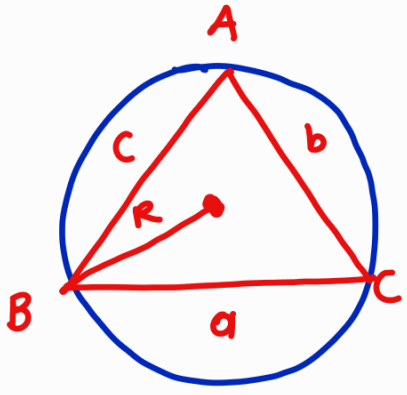
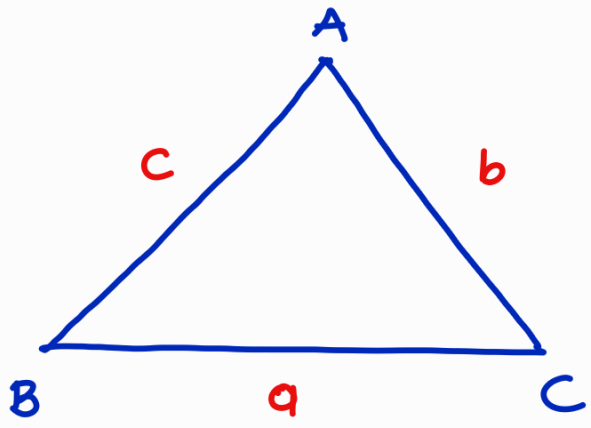
The Law of Sines



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = 2R$$

Sine area Formula



$$A(ABC) = \frac{1}{2}.b.c.\sin\hat{A}$$

$$= \frac{1}{2}.a.b.\sin\hat{C}$$

$$= \frac{1}{2}.a.c.\sin\hat{B}$$

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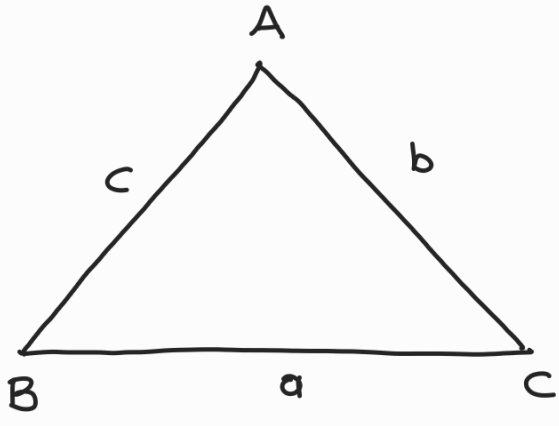
The Law of Cosines



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

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

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

Formulas sum and Difference identities:

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

- $\tan(a-b) = \dfrac{\tan a - \tan b}{1 + \tan a.\tan b}$
- $\cot(a+b) = \dfrac{\cot a.\cot b - 1}{\cot a + \cot b}$
- $\cot(a-b) = \dfrac{\cot a.\cot b - 1}{\cot a - \cot b}$

Formulas Involving Double Angle Identities:

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

Formulas Involving Sum to Product Identities:

- $\sin a + \sin b = 2\sin\left(\dfrac{a+b}{2}\right)\cdot\cos\left(\dfrac{a-b}{2}\right)$
- $\sin a - \sin b = 2\cdot\sin\left(\dfrac{a-b}{2}\right)\cdot\cos\left(\dfrac{a+b}{2}\right)$
- $\cos a + \cos b = 2\cos\left(\dfrac{a+b}{2}\right)\cdot\cos\left(\dfrac{a-b}{2}\right)$
- $\cos a - \cos b = 2\sin\left(\dfrac{a+b}{2}\right)\cdot\sin\left(\dfrac{a-b}{2}\right)$
- $\tan a + \tan b = \dfrac{\sin(a+b)}{\cos A\cdot\cos b}$
- $\tan a - \tan b = \dfrac{\sin(a-b)}{\cos a\cdot\cos b}$

Formulas Involving Product Identities:

- $\sin a\cdot\cos b = \dfrac{1}{2}\left[\sin(a+b)+\sin(a-b)\right]$
- $\cos a\cdot\cos b = \dfrac{1}{2}\left[\cos(a+b)+\cos(a-b)\right]$
- $\sin a\cdot\sin b = -\dfrac{1}{2}\left[\cos(a+b)-\cos(a-b)\right]$

Trigonometric Ratio Table:

Trigonometric Table

Degree	0^0	30^0	45^0	60^0	90^0	180^0	270^0	360^0
Radian	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π
sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1	0	-1	0
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0	-1	0	1
tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Not defined	0	Not defined	0
cosec	Not defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1	Not defined	-1	Not defined
sec	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	Not defined	-1	Not defined	1
cot	Not defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0	Not defined	0	Not defined

Single and double function:

$\sin(-x) = -\sin x$

$\tan(-x) = -\tan x$

$\cot(-x) = -\cot x$

} single func.

$\cos(-x) = \cos x$

↓ double func.