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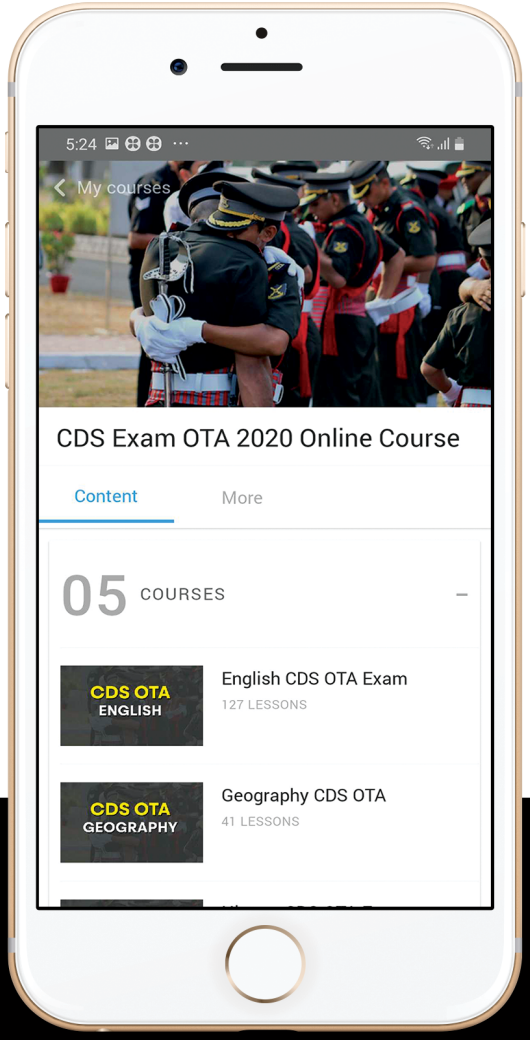

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21 MOST IMPORTANT IDENTITIES AND FORMULAS IN TRIGONOMETRY

Trigonometry is one of the most important topics of Mathematics and when it comes to trigonometry, then many students feel difficulty in learning all the formulas of trigonometry. So, one thing is very important to realize here and that is: “Focus on learning the basic identities and basic formulas”. All other formulas can be deduced with the help of these. Now the question arises what these Basic Identities of Trigonometry and Basic Formulas are? So, here is a step-by-step explanation for all such questions.

Now to get started let us start with noting the difference between Trigonometric identities and Trigonometric Ratios.

- **Trigonometric Identities** are some formulas that involve the trigonometric functions. These trigonometry identities are true for all values of the variables.
- **Trigonometric Ratio** is known for the relationship between the measurement of the angles and the length of the side of the right triangle.

Now let us start with the basic formulas of trigonometry and see the basic relationships on which the whole concept is based on.

We have six trigonometric ratios: sine, cosine, tangent, secant, cosecant and cotangent known as sin, cos, tan, sec, cosec and cot respectively. These all are measured by taking the ratios of sides of a right-triangles. Here is the list of each ratio in term of angle ‘x’:

Sin x	$\frac{Perpendicular}{Hypotenuse}$
Cos x	$\frac{Base}{Hypotenuse}$

Tan x	$\frac{\boldsymbol{Perpendicular}}{\boldsymbol{Base}}$
Sec x (reciprocal of cos x)	$\frac{\boldsymbol{Hypotenuse}}{\boldsymbol{Base}}$
Cosec x (reciprocal of sin x)	$\frac{\boldsymbol{Hypotenuse}}{\boldsymbol{Perpendicular}}$
Cot x (reciprocal of tan x)	$\frac{\boldsymbol{Base}}{\boldsymbol{Perpendicular}}$

Trigonometric Identities:

After knowing these angles, first thing which one should know are the Trigonometric Identities. They will be used most of the time.

- $sin^2x + cos^2x = 1$
- $tan^2x + 1 = sec^2x$
- $cot^2x + 1 = cosec^2x$

Allied Angles:

Two angles are said to be allied when their sum or difference is either zero or a multiple of 90°.

The angles like -θ, $90° \pm \theta$. Let's discuss the important allied angles only. The following conversion in sign is due to change in quadrant.

Trigonometric ratios of $(-\theta)$:

- sin (-θ)= -sinθ
- cos (-θ)= cosθ

- tan (-θ)= -tanθ

Trigonometric ratios of (90° − θ):

- sin (90°-θ)= cosθ
- cos (90°-θ)= sinθ
- tan (90°-θ)= cotθ

Trigonometric ratios of (90° + θ):

- sin (90° + θ)= cosθ
- cos (90° + θ)= -sinθ
- tan (90° + θ)= -cotθ

Trigonometric ratios of (180° − θ):

- sin (180° − θ)= sinθ
- cos (180° − θ)= −cosθ
- tan (180° − θ)= −tanθ

Trigonometric ratios of (180° + θ):

- sin (180° + θ)= −sinθ
- cos (180° + θ)= −cosθ
- tan (180° + θ)= tanθ

Trigonometric Ratios of Sum and Difference of Two Angles:

- sin(A+B) = sinA.cosB + cosA.sinB
- sin(A-B) = sinA.cosB-cosA.sinB
- cos(A+B) = cosA.cosB - sinA.sinB
- cos(A-B) = cosA.cosB+ sinA.sinB
- tan(A+B) = $\frac{tanA+tanB}{1-tanA.tanB}$
- tan(A-B) = $\frac{tanA-tanB}{1+tanA.tanB}$
- cot(A+B) = $\frac{cotA.cotB-1}{cotA+cotB}$
- cot(A-B) =$\frac{cotA.cotB+1}{cotB-cotA}$

Product of Sum and Difference of Angles:

- sin(A+B). sin (A-B) = $sin^2A - sin^2B = cos^2B - cos^2A$
- cos(A+B). cos (A-B) = $cos^2A - sin^2B$

Transformation of Product into Sum or Difference:

- $2\sin A.\cos B = \sin(A+B) + \sin(A-B)$
- $2\cos A.\sin B = \sin(A+B) - \sin(A-B)$
- $2\cos A.\cos B = \cos(A+B) + \cos(A-B)$
- $2\sin A.\sin B = \cos(A-B) - \cos(A+B)$

Transformation of Sum or Difference into Products:

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

If these formulas are at your tips, then trigonometry will not be any trouble for you. You will be able to derive many more formulas with the help of these.

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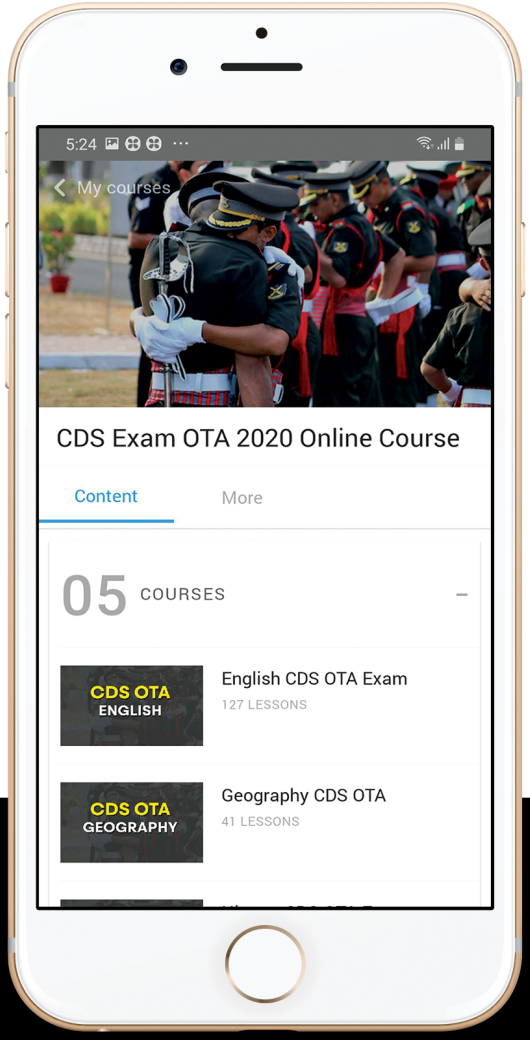

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