WHAT IS A MNEMONIC?

A Mnemonic is an easy learning trick to memorise something complex.

Mnemonics help you to remember concepts for a long time.

During your exam, these Mnemonics will prove very useful to recollect concepts quickly and easily.

This is one more cognitive learning tool that fulfils our aim of 'Making Learning Simple' for you.

Each unit is picked from your syllabus. A concept is identified from it and relevant Mnemonics are developed for it by the "Oswaal Editorial Board".

Descriptions are also provided for each Mnemonic for clarity.

M. N. E. M. O. N. I. C.

Making a Nice and Easy, Memorable, Optical 'N' Illustrative representation of Concepts

MATHEMATICS

Chapter - 1
Sets, Relations and Functions

Sets And Representations (a)

Today's **S**cenario, **E**qually **T**alented **S**ingers **F**ind **I**nfinite **N**ew **S**ongs **T**o **S**ing.

Today's **S**cenario, **E**qually talented
- Types
- Sets
- Equivalent
- Equal

Singers **F**ind **I**nfinite
- Singleton
- Finite
- Infinite

New **S**ongs to sing.
- Null
- Sets

Interpretation :

Types of **S**ets :

1. **E**mpty or **N**ull **S**et - A set which has no element.
2. **F**inite **S**et - A **s**et having **f**inite **n**umber of **e**lements.
3. **I**nfinite **S**et - A set having infinite number of elements.
4. **E**quivalent **S**et - Two finite sets A and B are said to be equivalent if n(A)=n(B).
5. **E**qual **S**et - Two sets A and B are equal if every element of A is in B.
6. **S**ingleton **S**et - A sets having one element is called singleton set.

Sets And Representations (b)

Laws of **A**lgebra of **S**tatements :

Iacd and **I**cai are friends

Interpretation :

1. **I**dempotent **L**aw -
   (i) $(A\wedge A) \Leftrightarrow A$
   (ii) $(A\vee A) \Leftrightarrow A$
2. **A**ssociative **L**aw -
   (i) $(A\wedge B) \wedge C \Leftrightarrow A\wedge(B\wedge C)$
   (ii) $(A\vee B) \vee C \Leftrightarrow A\vee(B\vee C)$
3. **C**ommutative **L**aw -
   (i) $A\vee B \Leftrightarrow B\vee A$
   (ii) $A\wedge B \Leftrightarrow B\wedge A$
4. **D**istributive **L**aw -
   (i) $A\vee(B\wedge C)\Leftrightarrow (A\vee B)\wedge(A\vee C)$
   (ii) $A\wedge(B\vee C)\Leftrightarrow (A\wedge B)\vee(A\wedge C)$
5. **I**dentity **L**aws -
   (i) $A\vee T \Leftrightarrow A$
   (ii) $A\wedge F \Leftrightarrow F$
   (iii) $A\vee T \Leftrightarrow T$
   (iv) $A\vee F \Leftrightarrow A$
6. **C**omplement **L**aws -
   (i) $A\vee(\sim A) \Leftrightarrow T$
   (ii) $A\wedge(\sim A) \Leftrightarrow F$
   (iii) $\sim T \Leftrightarrow F$
   (iv) $\sim F \Leftrightarrow T$
7. **A**bsorption **L**aw -
   (i) $A\vee(A\wedge B)\Leftrightarrow A$
   (ii) $A\wedge(A\vee B)\Leftrightarrow A$
   (iii) $\sim(A\wedge B)\Leftrightarrow (-A)\vee(-B)$
8. **I**nvolution **L**aw -
   (i) $\sim(\sim A) \Leftrightarrow A$

Chapter - 2
Complex Numbers and Quadratic Equations

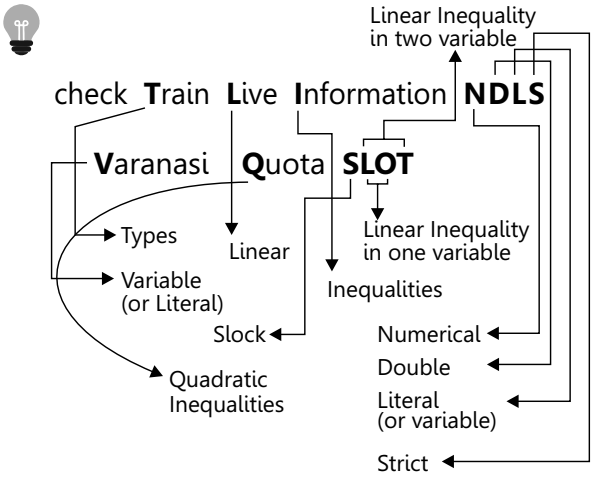
Iodine **E**quipment **S**hows **R**esult **N**egative **O**ne

Square Root

(iota) $i = \sqrt{-1}$

Interpretation: Complex numbers are expressed in the form of a+ib where 'i' is an imaginary number called 'iota' and the value of iota is $\sqrt{-1}$

Types of Linear Inequalities



Interpretation :

1. Numerical Inequality - $3<5$, $8>4$
2. Literal or Variable Inequalities - $x<5$, $y>8$
3. Double Inequality- $5<x<9$, $3<y<10$

4. Strict Inequality- $x<9$, $5<10$
5. Slack Inequality- $x\geq 7$, $y\leq 9$
6. linear Inequality in One Variable- $x<9$, $y>12$
7. linear Inequality in Two Variable- $5x+7y<12$
8. Quadratic Inequality- $x^2+5x\leq 10$

Chapter - 3
Matrices and Determinants

Identity Matrix-

$$A = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \quad a_{ij} = 0 \text{ when } i \neq j, \quad a_{ij} = 1 \text{ when } i = j$$

Zero Matrix-

$$A = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

Singular Matrix

A square matrix is said to be singular matrix if determinant of matrix denoted by $|A|$ is zero otherwise it is non zero matrix

Inverse Of a Matrix

Determinant

"a **D**etermined **A**rtist Can become a **S**inger, if he is **O**ptimistic. (Zero)

"a **D**etermined **A**rtist Can **N**ever be **S**inger if he is **N**ot **O**ptimistic

Non Singular

if $|A| = O$, then A is Singular Otherwise, A is non-Singular

≠0 (Zero)

"If **D**etermined **A**rtist is **N**ot **O**ptimistic then **ADJ**ust **B**elow **I**nternational **M**usicians"

Adjoint By Inverse Determinant Matrix

"A is non-singular *i.e.* $|A| \neq 0$ then $A^{-1} = \frac{1}{|A|} \cdot (\text{adj } A)$

Interpretation :
Singular & Non Singular Matrix -

if $|A| = 0$, then A is singular. Otherwise A is non-singular

Inverse of a Matrix -

Inverse of a Matrix exists if A is non- singular *i.e* $|A| \# 0$, and is given by

$$A^{-1} = \frac{1}{|A|} \text{adj } A$$

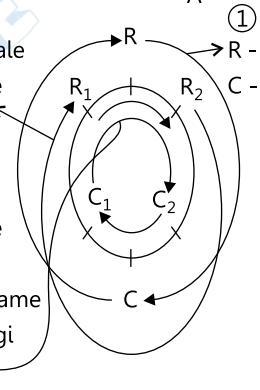
Properties Of |A|

Possible Clockwise **D**irections of

Properties (of Distance) Determinant

Action

A



② Route 1 wale Route 2 Se Jaye and Route 2 Wale Route 1 Se Jaye to distance Same **N**ahi rahegi (–ve)

① R - Society wale C - Society me Shift hojaye and C Society Wale R me Shift ho jaye, Distance Same hi Rahegi

③ Circle 1 Wale Circle 2 Se Jaye and Circle 2 Wale Circle 1 Se to Distance same **N**ahi rahegi (–ve)

④ Distance = 0 if $R_1=R_2$ (Route 1=Route 2) $|A| = 0$ if $R_1=R_2$

⑤ Distance = 0 if $C_1=C_2$ (Circle 1=Circle 2)

Interpretation :
Properties of |A| -

(i) |A| remains unchanged, if the rows and columns of A are interchanged i.e. |A| = |A'|

(ii) If any two rows (or columns) of A are interchanged, then the sign of |A| changes.

(iii) If any two rows (or Columns) of A are identical then |A| = a

Chapter - 5
Principle of Mathematical Induction

San **F**rancis **P**rincipal **OM** **I**nvited **P**arents

SFPOMIP

Principle of Mathematical Induction (B)

Provided **T**est **P**aper of **1**st **T**erm

PTP(1)T

Principle of Mathematical Induction (C)

Also **T**est **P**aper of **K**th **T**erm

ATP(K)T

Principle of Mathematical Induction (D)

Then **T**est **P**aper of (**K+1)th** **T**erm

TPTP(K+1)T

Principle of Mathematical Induction (E)

Hence **P**aper of **nth** is **T**rustworthy **F**or **A**ll **N**ecessary **N**umbers

HP(n)TFANN

Principle of Mathematical Induction (F)

SFPOMIP-Steps for Principle of Mathematical Induction Proof

Interpretation :
Step1: Let P(n) be a result or statement formulated in terms of n in a given equation.

Principle of Mathematical Induction (G)

PTP(1)T-Prove that P(1) is true.

Interpretation :
Step2: Prove that P(1) is true.

Principle of Mathematical Induction (H)

ATP(K)T-Assume that P(K) is true.

Interpretation :
Step3: Assume that P(k) is true.

Principle of Mathematical Induction (I)

TPTP(K+1)T-prove that P(k+1) is true.

Interpretation :
Step4: Using step 3, prove that P(k+1) is true.

Principle of Mathematical Induction (J)

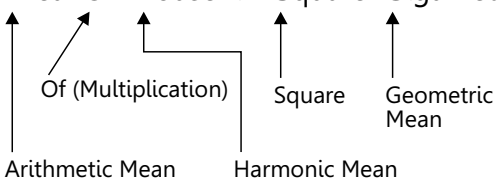
HP(n)TFANN - Hence, by the principle of mathematical induction, P(n) is true for all natural numbers n

Interpretation :
Step5: Thus, P(1) is true and P(k+1) is true whenever P(k) is true. Hence, by the principle of mathematical induction, P(n) is true for all natural numbers n.

Chapter - 7
Sequence and Series

Relationship between **A**M, **G**M and **H**M

Area **O**f **H**ouse in **S**quare **G**igameter



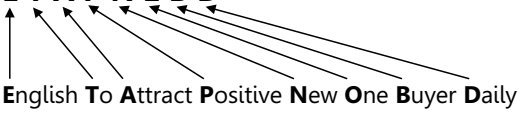
Arithmetic Progression (AP)

(a) Nth Term of Arithmetic Progression -

N O A P

Nokia **O**ffers **A**dditional **P**rogrammers in

E T A P N 1 B D



English **T**o **A**ttract **P**ositive **N**ew **O**ne **B**uyer **D**aily

Nth Term of AP = $a + (n - 1)d$

Chapter - 8
Limits Continuity and Differentiability

L' Hospital's Rule for Evaluating Limits

Numerator fights with **D**enominator, both are **C**ritical $\left(\frac{0}{0}, \frac{\infty}{\infty}\right)$, **L**ao **H**ospital, **B**ulao **D**r.

Differentiate

$$\lim_{x\to a}\frac{f(x)}{g(x)} = \lim_{x\to a}\frac{f'(x)}{g'(x)}$$

L' Hospital'S Rule

Interpretation :

if $\lim_{x\to a}\frac{f(x)}{g(x)}$ takes $\frac{0}{0}$ or $\frac{\infty}{\infty}$ form

then $\lim_{x\to a}\frac{f(x)}{g(x)} = \lim_{x\to a}\frac{f'(x)}{g'(x)}$

where $f'(x) = \frac{df(x)}{dx}$ and $g'(x) = \frac{dg(x)}{dx}$

Sandwich Theorem for Evaluating Limits

Likhil always uses **S**amesize **(L)** **M**iddle bread to make **T**hree layer Sandwich

(Three functions f(x), g(x) & h(x)

If $f(x) \le g(x) \le h(x)$ and

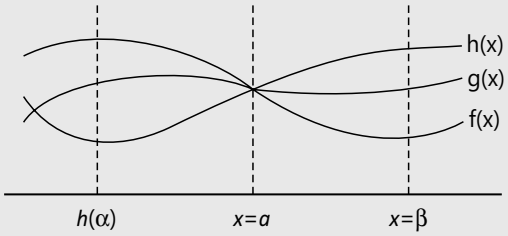
$\lim_{x\to a} f(x) = L = \lim_{x\to a} h(x) = L$ Then $\lim_{x\to a} g(x) = L$

Interpretation :

If $f(x) \le g(x) \le h(x)\ \forall\ x \in (\alpha, \beta) - \{a\}$

and $\lim_{x\to a} f(x) = L = \lim_{x\to a} h(x)$ then $\lim_{x\to a} g(x) = L$

where $a \in (\alpha, \beta)$



Mean Value Theorem & Rolle's Theorem

differentiable

on open interval

Film **a b c d** **MO**vie **V**s **T**heater **RO**le,

function → f (a, b)→R

Mean

Value

Theorem

Continuous → an closed interval [a,b]

Rolle's Theorem

O shows f'(c)=0 in Rolle's Theorem

∃ **S**ome **C**haracter **O**f **A**mitabh **B**achchan

∃ Some C (a, b)

Interpretation :

Mean Value Theorem -

if f: [a,b] → R Continuous on [a,b] and differential on (a,b) , then ∃ some c in (a,b) such that-

$$f'(c) = \frac{f(b) - f(a)}{b - a}$$

Rolle's Theorem -

If f: [a,b]→ R continuous on [a,b] and differentiable on [a,b] and f(a) = f(b) then ∃ some c in (a,b) s.t. f'(c) =0

Chapter - 9
Integral Calculus

SeCond FundAmental Theorem of Definite Integration

f c c F a d F b F a

Continuous, Closed anti derivative

You can also remember

fcc is small **f**ashionable **C**lothes

Counter **F**or **a**dorable **d**resses

at **Fb**b **Fa**shion

Closed anti Continuous derivative

F(b) – F(a)

Interpretation :

Let f be a continuous function defined on a closed interval [a,b] and F be an anti derivative of f. Then $\int_a^b f(x)\,dx = [F(x)]_a^b = F(b) - F(a)$,

where a and b are called limit of Integration.

Chapter - 10
Differential Equations

Linear Differential Equations

F O L D E - D Y B D X - P Y Q

Family **O**f **Lil**adhar **D**ixit **E**njoying

Daily **Y**oga **B**y **D**r. **X**avier at

Purana **Y**og **Q**ila

First Order Linear Differential Equation

$\frac{dy}{dx} + P_y = Q$

SOLDE-YIF-EIQ-IFC

Son **O**f **L**iladhar **D**ixit **E**klavya (SOLDE)

& **WIF**e (Y I F) **E**xploring **I**ndian **Q**illa

for **I**nternational **F**itness **C**ertificate

Integration

y. IF = Q. I F + C

S — Solution D — Differential

O — Of E — Equation

L — Linear

Interpretation :

Differential equation is of the form $\frac{dy}{dx} + py = Q$,

where P and Q are constants or the function of 'x' is called a first order linear differential equations. Its solution is given as

Y.IF = ∫Q.IF + C

Homogeneous Differential Equation

Hojayega **G**eneous **D**imag **E**kdum

Hoshiyar First Floor Wale X, Y (f(x,y)

Ground Floor Wale X, Y (g(x,y),

apni Same Degree ke saath

Forn aao Shree Yoga Vashist Xpert ke pass

Homogeneous Differential Equations

Homogeneous functions

f(x,y)

g(x,y) of Same Degree

For

Solution Substitute Y = Vx

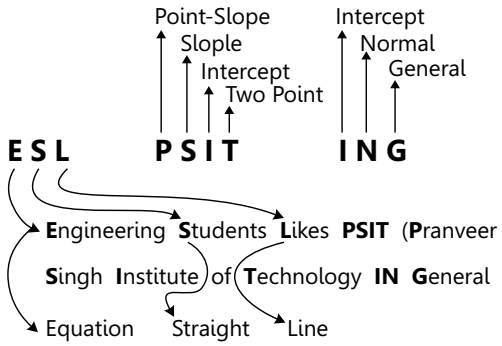
Interpretation :

Differential equation can be expressed in the form $\frac{dy}{dx} = f(x, y)$ or $\frac{dx}{dy} = g(x, y)$

where f(x,y) and g(x,y) are homogeneous functions of sum is called a homogeneous Differential equation. These equations can be solved by substituting y=vx so that dependent variable y is changed to another variable v, where v is some unknown function.

Chapter - 11
Coordinate Geometry

Equation of **S**traight **L**ine in Various forms :



Interpretation :

(1) Point Slope form :- $y-y_1 = m(x-x_1)$

(2) Slope intercept form :- $y = mx+c$

(3) Two point form :- $y - y_1 = \dfrac{y_2 - y_1}{x_2 - x_1}(x - x_1)$

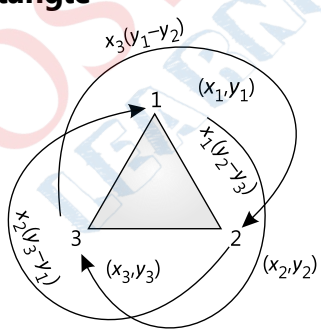
(4) Intercept form:- $\dfrac{x}{a} + \dfrac{y}{b} = 1$

(5) Normal / Perpendicular form :-

$x \cos \alpha + y \sin \alpha = P$

(6) General Form :- $ax + bx + c = 0$

Area of Triangle



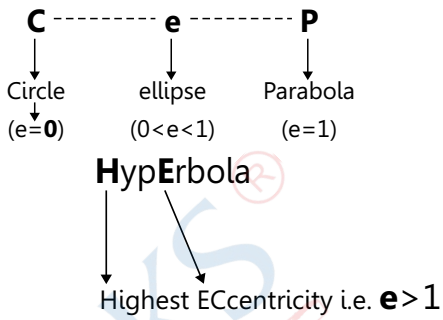
Ar**E**a **O**f **T**riangle

Area Equal to (one) 1/2 (two)

Area $= \frac{1}{2}[x_1(y_2-y_3)+x_2(y_3-y_1)+x_3(y_1-y_3)]$

Eccentricity of conic Sections

English alphabet **C**ounting **S**equence



Interpretation :

Eccentricity of Conic Sections-

(a) If e=1, the conic is called parabola.

(b) If 0<e<1, the conic is called ellipse.

(c) If e>1, the conic is called hyperbola.

(d) If e=0, the conic is called circle.

Chapter - 12
Three Dimensional Geometry

Direction Cosines

Dance **C**horeographer **P**refer **D**ieting

Direction Cosines Positive Direction

1 glass **L** e **M** o **N** juice

$l^2 + m^2 + n^2 = 1$

Direction Ratios

Director Remo a **P**rofessional **D**ancer

Direction Ratios Proportional Direction

Choreographer created

Cosines

3 **L**ifetime **M**ovies with **N**ew faces **a b c**

$l = \dfrac{a}{\sqrt{a^2+b^2+c^2}}, m = \dfrac{b}{\sqrt{a^2+b^2+c^2}}, n = \dfrac{c}{\sqrt{a^2+b^2+c^2}}$

Interpretation :

Direction cosines of a line are the cosines of the angles made by the line with the positive directions of the co. ordinate axes. If l , m, n are the D. cs of a line, then $l^2+m^2+n^2=1$

Chapter - 13
Vector Algebra

Types Of Vectors (A)

Teachers of **V**arious **N**ew **C**olleges **U**sing

Types, Vectors, Negative, Collinear, Unit

Zoom **C**onferencing during **E**pidemic

Zero, Coinitial, Equal

Interpretation :

Types of Vectors-

1. Zero Vector - Initial and terminal points coincide

2. Unit Vector - Magnitude is unity

3. Coinitial Vectors - Same initial points

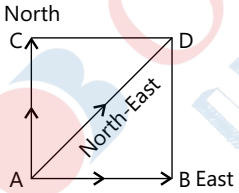
4. Collinear vectors - Parallel to the same Line

5. Equal Vectors - Same magnitude and direction

6. Negative of a vector- Same magnitude, opp. direction

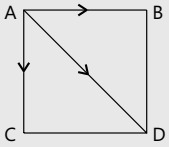
Properties Of Vectors(B)

"Neither choose East nor choose north, always choose North-East and save your time".



Interpretation :

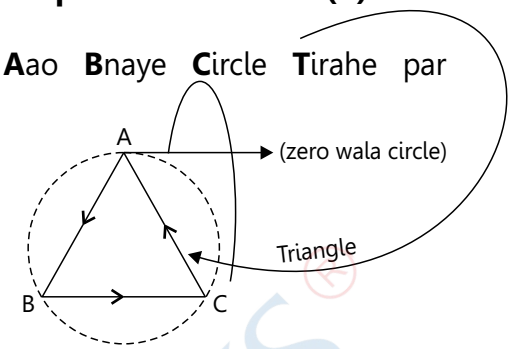
The vector sum of two coinitial vectors is given by the diagonal of the parallelogram whose adjacent sides are given vectors.



$\vec{AB} + \vec{AC} = \vec{AD}$

Properties Of Vectors(C)

Aao **B**naye **C**ircle **T**irahe par



Interpretation:

The vector sum of the three sides of a triangle taken in order is $\vec{O}$ i.e

$\vec{AB} + \vec{BC} + \vec{CA} = \vec{O}$

Chapter - 14
Statistics & Probability

Mutually Exclusive Events

MEE-Mutual **E**nemies **E**verywhere

Morning **E**vening **E**veryday **C**annot **O**ccur

Mutually, Exclusive, Events, cannot, occur

Sametime

simultaneously

Interpretation :

Events A & B are called mutually exclusive events if occurrence of any one of them excludes occurrence of other event, i.e. they cannot occur simultaneously.

eg: A die is thrown. Event A=All even outcomes & events B=All odd outcomes. then, A & B are mutually exclusive events, they cannot occur simultaneously

Poisson Distribution

DPD – Directions for **P**ure **D**ishes

Distribution–Poisson Distribution

Perfect **R**estaurant **E**stablished

near **L**ajpat **N**agar **I**n **N**CR **P**rovides

Rich **Q**uality **N**aan **R**ice

Equal

$$P(r) = \lim_{n\to\infty} {}^{n}C_r p^r q^{(n-r)}$$

Here **L**emo**N** **Q**uinoa **I**s **C**ostliest **P**ure **D**ish

Here $\lambda = nq$ is called Poisson Distribution

Normal Distribution

DND — Do **N**ot **D**isturb

Distribution Normal Distribution

Parking **x** **E**ntry **T**icket is **O**ne rs.

Per **S**ingle **R**oot for **2** **P**ersons and

Entry **P**oint is **M**id **H**alf **Z**one **2.**

Power Minus ½

$$p(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}z^2}$$

Here **Z**one **E**ntry for **EXMS**

(Electronic Exam Management System)

in **R**ajasthan for **N**ational **P**rofessional

Qualification

Here

Minus Meu Sigma Root

$$Z = \frac{x-\mu}{\sigma}, \quad \sigma = \sqrt{npq}$$

Variance and standard deviation for ungrouped data-

(a) Standard deviation for ungrouped data-

Subject me **D**istinction **U**n **G**roups ki

(Standard) (Deviation) (Ungrouped data)

Rhti, jo "**A**dd kre **X**tra **M**ehnont

(Root) ('Σ' sign) (minus)

X **B**ar **D**ouble **P**ower ke saath"

Distinction wale **N**umber ke Saath".

$$S.D.(\sigma) = \sqrt{\frac{1}{n}\Sigma(x_i - \bar{x})^2}$$

Divided by

"Mere Naam me mera Sign-S se sigma

Variance for ungrouped data

"**V**edic **F**undamentals **U**nder **G**raduates

(Variance) (for) (Ungrouped data)

lagaao **S**quare me **D**istinction

(Square) (Standard) (Deviation)

number Paao"

Variance = (Standard deviation)^2

Interpretation :

Standard deviation of ungrouped data :

S.D. of ungrouped data is the square root of squared deviation from the mean of data. It is denoted by the symbol " 6 "

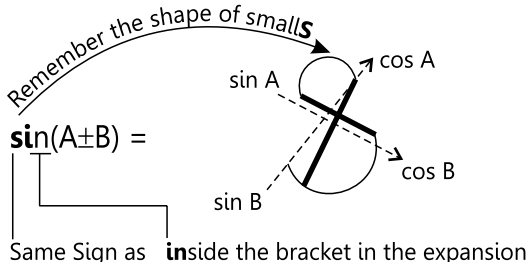
Variance for ungrouped data :

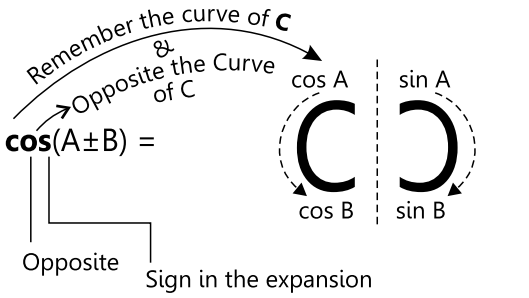
Variance for ungrouped data is defined as the square of S.D. It is denoted by " 6^2"

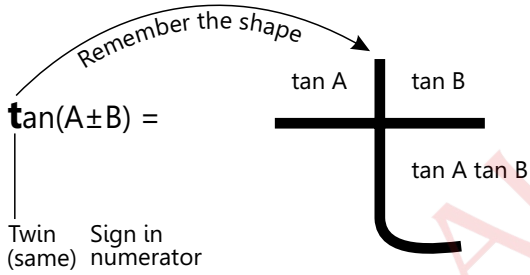
Chapter - 15
Sum and Difference of two Angles

Shape **A**nd **D**esign **O**f **T**hree **A**lphabets

Sum and Difference of two Angles



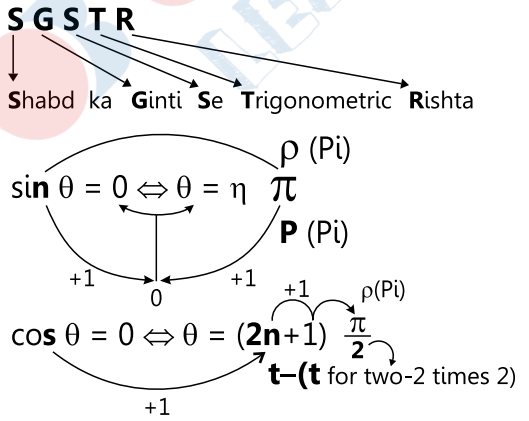


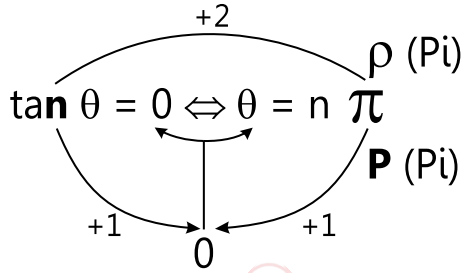


Interpretation :

* sin (A ± B) = sin A cos B ± cos A sin B
* cos (A ± B) = cos A cos B ∓ sin A sin B
* $\tan(A \pm B) = \dfrac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$

Standard General Solution of Trigonometric Ratios





Interpretation :

The solution consisting of all possible solutions of a trigonometric equation is called its general solution.

* $\sin\theta = 0 \Leftrightarrow \theta = n\pi$
* $\cos\theta = 0 \Leftrightarrow \theta = (2n+1)\frac{p}{2}$
* $\tan\theta = 0 \Leftrightarrow \theta = n\pi$

Chapter - 16
Mathematical Reasoning

Algebra of statements -