FORMULA SHEET

CH-1 Ratio, Proportion, Logs & Indices

1) $\frac{a}{b}$ → Antecedent
   b → Consequent.
2) Fourth Proportion → a, b, c → $\frac{bc}{a}$
3) Third Proportion → a, b → = $\frac{b^2}{a}$
4) Mean Proportion → a, b → = $\sqrt{a \times b}$
5) Inverendo → $\frac{a}{b} \cdot \frac{b}{a} = \frac{d}{c}$
6) Alternendo → $\frac{a}{c} = \frac{b}{d}$
7) Componendo → $\frac{a+b}{b} = \frac{c+d}{d}$
8) Dividendo → $\frac{a-b}{b} = \frac{c-d}{d}$

$\frac{a}{b} = \frac{c}{d}$.

9) Comp. & Dividendo $\frac{a+b}{a-b} = \frac{c+d}{c-d}$
10) Addendo $\frac{a+c}{b+d}$.
11) Subtrahendo $\frac{a-c}{b-d}$

12) $a^m \times a^n \Rightarrow a^{m+n}$.
13) $\frac{a^m}{a^n} \Rightarrow a^{m-n}$.
14) $(a^m)^n \Rightarrow a^{m \times n}$.
15) $a^x = a^y \Rightarrow x = y$.
16) $x^a = y^a \Rightarrow x = y$
17) $a^0 = 1$
18) $(ab)^m = a^m \times b^m$
19) $\sqrt[m]{a} = a^{\frac{1}{m}}$.

20) $B^P = N \Rightarrow \log_B N = P$
21) $a^{\frac{1}{6}} = \sqrt{3} \Rightarrow a = (\sqrt{3})^6$
22) $\log(mn) \Rightarrow \log m + \log n$.
23) $\log \frac{m}{n} \Rightarrow \log m - \log n$
24) $\log m^n \Rightarrow n \log m$
25) $\log_a 1 \Rightarrow 0$ (with any Base)
26) $\log_a 10 \Rightarrow 1$ (with any Base)
27) $\log_b a \Rightarrow \frac{1}{\log_a b}$
28) $\log_b a \Rightarrow \frac{\log a}{\log b}$
29) $\log_{m^n} a^b \Rightarrow \frac{b}{n} \log_m a$
30) $\log_a a \Rightarrow 1$
31) $\log_b a \times \log_a b \Rightarrow 1$
32) $\log_b a \times \log_c b \Rightarrow \log_c a$
33) $\log_2 8 \Rightarrow ?$ 3 (दोनों को power करेंगे तो 8 आएगा)
34) $\log_2 n \Rightarrow 8$ (when Single log seems convert it into indices)
35) $\log \frac{ab}{cd} \Rightarrow \log a + \log b - \log c - \log d$

Calculation Tricks

① Trick No. ①

Variable $= (\text{Base})^{\frac{1}{3}} + (\text{Base})^{\frac{-1}{3}}$

→ $(\text{var.})^3 + 3(\text{var.}) \Rightarrow \text{Base} - \frac{1}{\text{Base}}$

→ $(\text{var.})^3 - 3(\text{var.}) \Rightarrow \text{Base} + \frac{1}{\text{Base}}$

② Trick No. ②

$\log_{2\sqrt{2}} 512$

- Press = Times "Till 512 comes."
- Press $2\sqrt{}$ × 2 "Then Add 1"
- Press =
- Press × → So Ans :- is 6

③ Trick No. ③

~~HOW TO FIND LOG OF ANY NO~~

$\log_7 343$

- Press 7 (Base)
- Press ×
- Press = (Till 343 come)
- Press 3 + 1 Ans :- 3.

④ Trick No. ④

If × Trick Fail Then We use This Trick

$\log_{0.1} 100$

- Press 0.1 (Base)
- Press ÷
- Press = (Till 100 come)
- Press Ans in − Ans → 2

HOW TO FIND LOG OF ANY NUMBER.

→ Press "No."
→ Press "$\sqrt{}$ 19 Times"
→ Press "− 1"

→ Press "× 227695"
→ Press "="

Eg: log 10
→ Press 10
→ Press $\sqrt{}$ 19 Times
→ Press − 1
→ Press × 227695 → Ans 1

CH-7 Sets, Relation & Function

① No. of Subset $= 2^n$

② No. of Proper Subset $= 2^n - 1$

③ $(A \cup B)' = A' \cap B'$
④ $(A \cap B)' = A' \cup B'$
} De-Morgan's Law

⑤ $(A')' = A$

⑥ $n(A \cup B) = n(A) + n(B) - n(A \cap B)$
or
$n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(C \cap A) + n(A \cap B \cap C)$

⑦ $n(A \cup B)' = n(U) - n(A \cup B)$

⑧ "And" ⇒ ∩ & "Or" ⇒ ∪

⑨ Equivalent Set ⇒ Cardinal no. is same
& Equal Set ⇒ Every element of "A" is a element of "B".

⑩ Power Set ⇒ Set of All Subsets

⑪ Cartesian Product :- Eg: $A = \{1,2\}$, $B = \{3,4\}$

$A \times B = \{1,2\} \times \{3,4\}$
$= \{(1,3), (1,4), (2,3), (2,4)\}$

(Basic Formula)

① $(a+b)^2 = a^2 + 2ab + b^2$
② $(a-b)^2 = a^2 - 2ab + b^2$
③ $(a+b)^3 = a^3 + b^3 + 3a^2b + 3ab^2$
④ $(a-b)^3 = a^3 - b^3 - 3a^2b + 3ab^2$
⑤ $(a^3+b^3) = (a+b)(a^2 - ab + b^2)$
⑥ $(a^3-b^3) = (a-b)(a^2 + ab + b^2)$
⑦ $a^3 + b^3 + c^3 - 3abc = (a+b+c)(a^2 + b^2 + c^2 - ab - bc - ca)$

if $(a+b+c) = 0$
$\therefore a^3 + b^3 + c^3 - 3abc = 0$
$a^3 + b^3 + c^3 = 3abc$

⑧ Sum of 1st n natural Nos.
$1 + 2 + 3 + \dots + n = \frac{n(n+1)}{2}$

⑨ Mean of 1st n Natural no. $= \frac{n+1}{2}$

⑩ Sum of Sq. of 1 n N No. $\Rightarrow \frac{n(n+1)(2n+1)}{6}$

⑪ —11— Cube —11— $\Rightarrow \left(\frac{n(n+1)}{2}\right)^2$

(12) $B \subset A$ (13) $A \Delta B = (A-B) \cup (B-A)$

B ↓ Subset, A ↓ Superset. Symmetric Difference

Every equal set is equivalent set, but each equivalent set is not a equal set.

Every set is a subset of itself

Empty set is a subset of every set.

Collection of all subsets is called Power set.

(14) $n(A-B) = n(A) - n(A \cap B)$

(15) $n(B-A) = n(B) - n(A \cap B)$

(16) $n(A \cup B)' = n(U) - n(A \cup B)$

Equilateral $\Delta \subset$ Right Isoceles $\Delta \subset$ Isoceles $\subset$ Scalen Δ

$gof(n) = g(f(n))$

Every universal relation is Reflexive

Every identity relation is reflexive but it converse is not true.

(17) Types of Relations

(i) Symmetric Rel^n → $(a,b) \in R$ & $(b,a) \in R$.

(ii) Transitive Rel^n → $(a,b) \in R$ & $(b,c) \in R$ ∴ ⇒ $(a,c) \in R$.

(iii) Equivalence Rel^n → If a R is Symmetric, Reflexive, & Transitive then it is equivalence.

Is equal to = equivalence

Is parallel to = equivalence

CH-14 Measures of Central Tendency and Distribution

Five Basic Measures of Central Tendency

(1) Arithmatic Mean :- $\bar{x} = \frac{\text{Sum of observation}}{\text{No. of observation}} = \frac{x_1 + x_2 \cdots x_n}{n}$.

(a) Direct Method

$\bar{x} = \frac{\Sigma f_i x_i}{\Sigma f_i}$

(b) Shortcut Method

$\bar{x} = A + \frac{\Sigma f_i u_i}{\Sigma f_i}$ $[u_i = x_i - A]$, A = Assumed Mean.

(c) Step deviation Method

$\bar{x} = A + \frac{\Sigma f_i d_i}{\Sigma f_i} \times h/c$. $\left[d_i = \frac{x_i - A}{h}\right]$

* when all observations are constant (same) then Arithmatic mean is constant.
* Sum of deviation from mean is 0.
* combined mean = $\bar{x} = \frac{n_1 \bar{x}_1 + n_2 \bar{x}_2}{n_1 + n_2}$
* A.M. is least affected by the presence of extreme observations.
* A.M. is based on all observations
* Sum of square of deviation from mean is Minimum
* Mean of 1st n natural no. $= \frac{n+1}{2}$
* Mean of 1st n Odd no. $= n$
* Mean of 1st n Even no. $= n+1$

② **Median** :- central value of the given data.

when n = odd: $Me = \left(\frac{n+1}{2}\right)^{th}$

when n = even: $Me = \left(\frac{n}{2}\right)^{th} + \left(\frac{n+1}{2}\right)^{th}$

when continuous series: $Me = L + \frac{(n/2 - C)}{f} i$

Relation Between Mean, Median & Mode.

→ 3 Median = Mode + 2 Mean.

→ Mean - Mode = 3 [Mean - Median]

* Presence of extreme observation doesn't affect median.
* For a given set of observation the sum of absolute deviation is minimum when deviation is taken from Median i.e. $\Sigma|x_i - \text{Median}| = \text{Minimum}$

③ **Mode** :- Highest frequency number is called Mode.

Eg :- 1, 2, 2, 2, 3, 4, 6 , Mode = 2.

when series is continuous.

$$\text{Mode} = L + \frac{(f_m - f_1)}{(2f_m - f_1 - f_2)} \times i$$

L = Lower Limit
f_m = frequency of Modal class
i = width of the class
f_1 = Preceding ~~class~~ frequency
f_2 = Succeding frequency.

(4) Geometric Mean :-

Let $x_1, x_2, x_3 \dots x_n$.

GM → $(x_1 \times x_2 \times x_3 \dots \times x_n)^{1/n}$ Ans.

GM. when frequency is given

$$GM = [x_1^{f_1} \times x_2^{f_2} \times x_3^{f_3} \dots x_n^{f_n}]^{1/\Sigma f_i}$$

★ when all the observations are constant so GM. is also constant.

GM when percentage is given.

100%, 200% & 400%.

Find Average rate of return

GM. = $[100 \times 200 \times 400]^{1/3}$

= $[8000000]^{1/3}$

= 200.

(5) Harmonic Mean :-

Let $x_1, x_2, x_3 \dots x_n$ are non-zero observations

$$H.M. = \frac{n}{\frac{1}{x_1} + \frac{1}{x_2} + \frac{1}{x_3} \dots + \frac{1}{x_n}}$$

⇒ Incase of grouped frequency distribution

$$H.M. = \frac{\Sigma f_i}{\Sigma (f_i / x_i)}$$

★ when all the observation are constant then HM. is also constant.

★ combined H.M. = $\frac{n_1 + n_2}{\frac{n_1}{H_1} + \frac{n_2}{H_2}}$.

★ $G^2 = A \times H$.

★ $AM \geq GM \geq HM$

[AM > GM > HM] quantity unequal

[AM = GM = HM] quantity equal.

weighted Average :

1) weighted A.M. ⇒ $\frac{\Sigma W_i x_i}{\Sigma W_i}$

2) weighted H.M ⇒ $\frac{\Sigma W_i}{\Sigma (W_i / x_i)}$

Partition Values.

① Quartiles → $Q_1 = \left(\frac{n+1}{4}\right)^{th}$, $Q_2 = \left(2\left(\frac{n+1}{4}\right)\right)^{th}$.

② Deciles → $D_1 = \left(\frac{n+1}{10}\right)^{th}$, $D_2 = \left(2\left(\frac{n+1}{10}\right)\right)^{th}$.

③ Percentiles → $P_1 = \left(\frac{n+1}{100}\right)^{th}$, $P_2 = \left(2\left(\frac{n+1}{100}\right)\right)^{th}$.

* Q_2, D_5 and P_{50} are Medians.

Dispersion.

Absolute Measure of Dispersion	Relative Measure of Dispersion
① Range. Range = Largest − Smallest = L − S	① Coefficient of Range = $\frac{L-S}{L+S} \times 100$
② Mean Deviation $\frac{\Sigma \lvert x_i - \bar{x} \rvert}{n}$ ⇒ $\frac{\Sigma f_i (x_i - \bar{x})}{\Sigma f_i}$	② Coefficient of Mean Deviation = $\frac{\text{Mean Deviation about Mean}}{\text{Median}} \times 100$
③ Quartile Deviation / Semi-Interquartile Range (SIQR) = $\frac{Q_3 - Q_1}{2}$; S.I.Q.R. = $Q_3 - Q_1$	③ Coefficient of Quartile Deviation = $\frac{Q_3 - Q_1}{Q_3 + Q_1} \times 100$
④ Standard Deviation $\sigma = \sqrt{\frac{\Sigma (x_i - \bar{x})^2}{n}}$; $\sigma = \sqrt{\frac{\Sigma f_i (x_i - \bar{x})^2}{n}}$	④ Coefficient of variation S.D. = $\frac{S.D.}{\text{Mean}} = \frac{\sigma}{\bar{x}}$

⑤ Variance

$$\sigma^2 = \frac{\Sigma f_i (x_i - \bar{x})^2}{\Sigma f_i}$$

⑤ Coefficient of Variance

$$= \frac{\sigma}{\bar{x}} \times 100$$

CH-6 Sequence and Series

$$a_n = a + (n-1)d \qquad a_n = l - (n-1)d$$

★ n^{th} Term of an A.P. is always Linear in n and its common difference is coefficient of n.

If $m \cdot a_m = n \cdot a_n$, Then $a(m+n) = 0$

★ Sum of the term equidistant from "beginning" and "end" is always equal to Sum of 1st & last Term

Ex:- 5, 10, 15 ..... 90, 95, 100

$(5+100) = 105$

★ ① $p^{th} \longrightarrow q$, $q^{th} \longrightarrow p$, Then n^{th} Term $= (p+q-n)$

② $x^{th} \longrightarrow y$, $y^{th} \longrightarrow x$, Then n^{th} Term $= (x+y-n)$

★ $m^{th} \longrightarrow \frac{1}{n}$ & $n^{th} \longrightarrow \frac{1}{m}$, Then $(mn)^{th} = 1$.

★ Sum of n terms of an A.P.

$$S_n = \frac{n}{2}[2a + (n-1)d]$$

or

$$= \frac{n}{2}[a+l]$$

★ Sum of n terms of an G.P.

$$S_n = a\frac{(r^n - 1)}{r-1}, \quad r > 1$$

$$= a\frac{(1 - r^n)}{1-r} \quad r < 1$$

★ Sum of n terms of an A.P. is always quadratic in n & its C.D. is 2 the coefficient of n^2 i.e. $an^2 + bn$.

★ Insertion of A.M.

$d = \frac{b-a}{n+1}$, n = no. of mean

★ Insertion of G.M.

$r = \left(\frac{b}{a}\right)^{\frac{1}{n+1}}$

★ For what value of n $\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$ is the A.M. of a & b

Ans:- $n = 0$

★ If $S_n = n^2 p$ & $S_m = m^2 p$.

then $S_p = p^2 \cdot p = p^3$

★ n^{th} term or general term or last term.

$a_n = a + (n-1)d$

★ G.P. from end. $= l\left(\frac{1}{r}\right)^{n-1}$

★ If a, b, c are in A.P. $= 2b = a + c$

★ If a, b, c are in G.P. $= b^2 = ac$

★ Important point.

① $9 + 99 + 999 + \ldots\ldots$

$\Rightarrow 10\left[\frac{(10^n - 1)}{9} - n\right]$

② $0.7 + 0.77 + 0.777 + \ldots\ldots$

$\Rightarrow \frac{0.7}{9}\left[10\left(\frac{10^n - 1}{9}\right) - n\right] \Rightarrow \frac{7}{81}\left[9n - 1 + 10^{-n}\right]$

③ $11 + 103 + 1005 + \ldots\ldots$

$(10+1) + (10^2+1) + (10^3+1) + \ldots\ldots$

$\Rightarrow \frac{10(10^n - 1)}{9} + n^2$.

★ Sum of an Infinite GP.

$S_\infty = a + ar + ar^2 + \dots \infty$

$S_\infty = \frac{a}{1-r}$

CH-13 Statistical Description of Data

Singular → Scientific Method → P Present, A Analyses, C Collect.

Plural → Data → Quantitative, Qualitative

Collection of Data

Quantitative (variable)
- Discrete (whole)
- Continuous (Decimal)

Qualitative (Attribute)
Eg: Nation, Color & Gender.

Collection of Data

- Observation Method → Most Accurate
- Mailed Questionnaire Method → Maximum Non-responsiveness & Widest Range
- Questionaires by Enumerator method + Sending someone with list of questions
- Interview Method.
  - Personal
  - Telephonic
  - Indirect

Classification of Data

- Chronological or Temporal or Time series Data
- Geographical or Spatial Series Data
- Qualitative (ordinal) Data
- Quantitative (Cardinal) Data

* Some Important Terms

① Range.
Range = L − S

② No. of class Interval.
$= \frac{\text{Range}}{\text{Length of class}}$

③ class Mark / Mid value / Mid Point
$= \frac{UCB + LCB}{2}$

④ Frequency Density.
$= \frac{\text{Frequency}}{\text{Width or class Length}}$

⑤ Relative Frequency.
$= \frac{\text{Frequency}}{\text{Total Frequency}}$

Sum of Relative Frequency is always 1.

⑥ Percentage Frequency.
$= \frac{\text{Frequency}}{\text{Total Frequency}}$.

Sum of % frequency is always 100.

⑦ class Boundary
Overlapping classification

⑧ Exclusive Series
upper limit not included.

⑨ Less than Ogive curve - (J-shaped)
S-Shaped.

⑩ Most Commonly used
Bell-Shaped.

⑪ Histogram
Compute → Mode.
Cannot Compute → S.D.

Classification is of 4 kinds.
Logarithm of variable is also known as Ratio Chart.

CH-18 INDEX NUMBERS

TESTS	Laspeyre's	Paasche's	Fisher's	Marshall E.W.	Simple (i.e. M of RR.)
Unit Test	✓	✓	✓	✓	X
Circular Test	X	X	X	X	✓
Time Reversal Test	X	X	✓	✓	✓
Factor Reversal Test	X	X	✓	X	X

Simple

Laspeyre
Metho
$= \frac{\Sigma P_1 Q}{\Sigma P_0 Q}$
Dick-B
B.Y. E

S
Sp
#
#
Link
→ Link
of

Index No. (P_{01})

BY ↓ → CY.

Simple / Unweighted

- **Simple Aggregative**
  $P_{01} = \frac{\Sigma P_1}{\Sigma P_0} \times 100$
- **Simple Average of Price Relatives**
  $= \frac{\Sigma \frac{P_1}{P_0} \times 100}{N}$

Weighted

- **Weighted Aggregative**
  5 Types.
- **Weighted Average of Relatives**
  (Laspeyres)

Laspeyres's Method
$= \frac{\Sigma P_1 Q_0}{\Sigma P_0 Q_0} \times 100$

Trick - BALA B.Y. & Laspeyres

Paasche's Method
$= \frac{\Sigma P_1 Q_1}{\Sigma P_0 Q_1} \times 100$

Trick - Paasche current Year

Dorbish & Bowley Method
$P_{01} = \frac{L + P}{2}$

$\Rightarrow \frac{\frac{\Sigma P_1 Q_0}{\Sigma P_0 Q_0} \times \frac{\Sigma P_1 Q_1}{\Sigma P_0 Q_1}}{2}$

Fisher's Ideal Method
$P_{01} = \sqrt{L \times P}$

$\Rightarrow \sqrt{\frac{\Sigma P_1 Q_0}{\Sigma P_0 Q_0} \times \frac{\Sigma P_1 Q_1}{\Sigma P_0 Q_1}}$

Marshall Edge-Worth Method
$\frac{\Sigma P_1 (Q_0 + Q_1)}{\Sigma P_0 (Q_0 + Q_1)} \times 100$

In Time Reversal Test $P_{01} \times P_{10} = 1$.

Splicing :- Two index No. having different bases Combined into Single Series.

Deflated Value = $\frac{\text{Current Year}}{\text{Price Index of C.Y.}}$ OR. Current Value ↓ $P_1 Q_1$ $\times \frac{\text{BY Price}}{\text{CY Price}}$

Chain Index No. = $\frac{\text{Link Relative of Current Year} \times \text{Chain Index of P.Y.}}{100}$

→ Link Relative of C.Y. $\Rightarrow \frac{\text{CY Price}}{\text{PY Price}} \times 100$.

★ Remember LR & CI of 1st Year Assume 100.

How To Read???

→ P_{01}
P_1 on 0.
→ P_{10}
P_0 on 1.

CH - 2 EQUATIONS

#How to form a quadratic equation

$x^2 - (\text{Sum of the Root})x + (\text{Product of Root}) = 0$

where, Sum $\Rightarrow \alpha + \beta = -\frac{b}{a}$

Product $\Rightarrow \alpha \cdot \beta = \frac{c}{a}$.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Nature of the roots.

$b^2 - 4ac$.

- $b^2 - 4ac = 0$ → Roots are Real & Equal
- $b^2 - 4ac < 0$ → Roots are Imaginary
- $b^2 - 4ac > 0$ → Roots are distinct unequal or real
  - $b^2 - 4ac$ = P.S. (Rational No.)
  - $b^2 - 4ac \neq$ P.S. (Irrational No.)

In Conjugate pair if one root is $\sqrt{2} + 3$ then the other root is $-\sqrt{2} + 3$

Trick for roots like

$3 + \sqrt{7}$

$x^2 - 2 \times 3 \times x + (3)^2 - 7$

$= x^2 - 6x + 2 = 0$

Trick:- x^2 - double of 1 no. x + (Sq. of 1 no. − 2 no.)

CH-3 LINEAR INEQUALITIES

① **Strict Inequality**
Less than $<$
greater than $>$

② **Slack Inequality**
Less than equals to $\leq$
greater than equals to $\geq$

Inequalities

Numerical
$2 < 3$

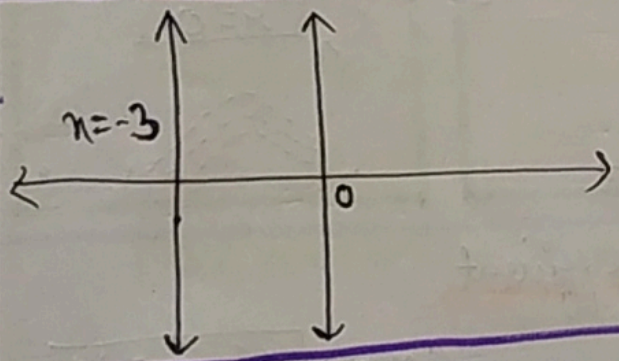
Variable
$2x < 4$.

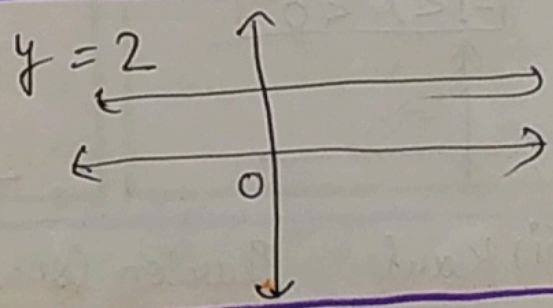
Inequalities

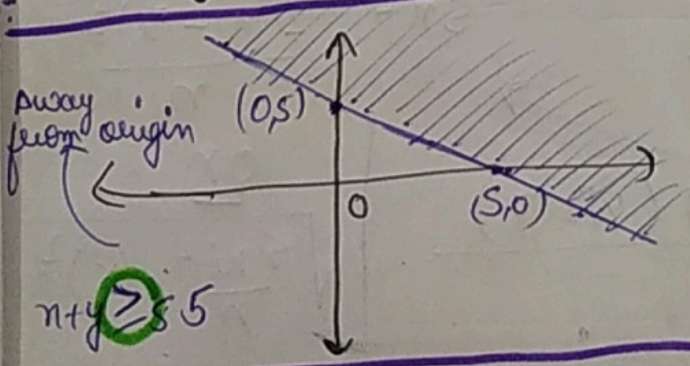
Single
$x < 3$

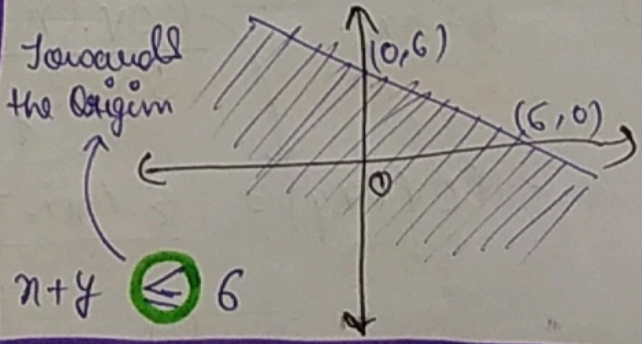
Double
$2 < x < 6$.

Graphs:→









$x \geq 0, y \geq 0$
↓
Shade only in I Quadrant.

$2 \leq 2 \boxed{+} 3\frac{x}{3} \leq 5$
↓
Important
(when we solve L.I. then [-ve] sign se last me deal करना है)

x के पास वाले

CH-17 CORRELATION AND REGRESSION

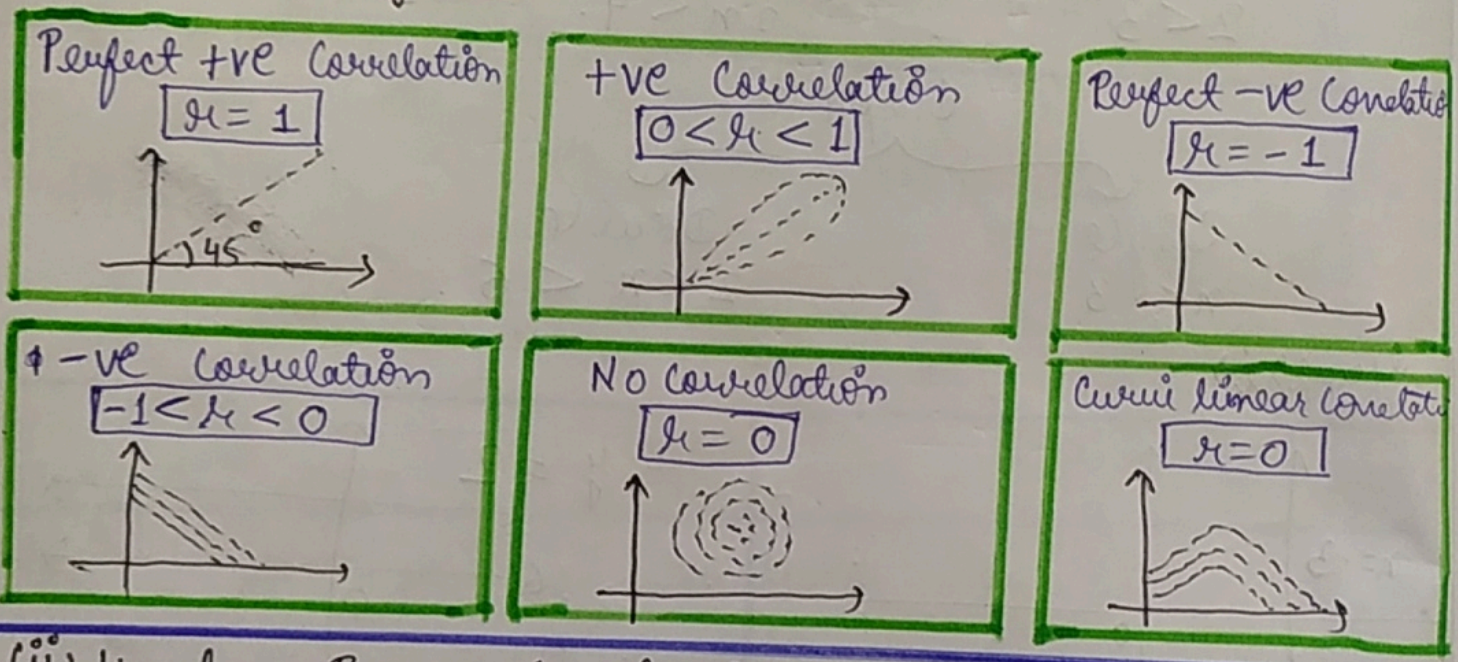
Types of Correlation

Positive
when two variables move in same direction
Ex: Profit ↑ Investment ↑

Negative
when two variables move in different direction -
Ex: Price ↑ Demand ↓

Measure of Correlation

(i) Scatter Diagram



(ii) Karl Pearson Correlation Coefficient

(1) $r = r_{xy} = \frac{Cov(x,y)}{S_x \cdot S_y}$

$S_x = \sqrt{\frac{\Sigma(x_i - \bar{x})^2}{n}}$ or $\sqrt{\frac{\Sigma x_i^2}{n} - (\bar{x})^2}$

$Cov(x,y) = \frac{\Sigma (x_i - \bar{x})(y_i - \bar{y})}{n}$

or

$Cov(x,y) = \frac{\Sigma x_i y_i}{n} - (\bar{x})(\bar{y})$

② $r = \frac{\Sigma(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\Sigma(x_i - \bar{x})^2}\sqrt{\Sigma(y_i - \bar{y})^2}}$ } - Word Problems.

IMPORTANT

OR:

$$= \frac{n\Sigma x_i y_i - \Sigma x_i \cdot \Sigma y_i}{\sqrt{n\Sigma x_i^2 - (\Sigma x_i)^2}\sqrt{n\Sigma y_i^2 - (\Sigma y_i)^2}}$$

③ Step Deviation Method

$dx_i = x_i - A$, $dy_i = y_i - A$

$$r = \frac{n\Sigma dx_i dy_i - \Sigma dx_i \cdot \Sigma dy_i}{\sqrt{n\Sigma dx_i^2 - (\Sigma dx_i)^2}\sqrt{n\Sigma dy_i^2 - (\Sigma dy_i)^2}}$$

In ②, $\Sigma(x_i - \bar{x})(y_i - \bar{y})$ = Sum of Product of deviation from x & y series from mean

and

$\Sigma(x_i - \bar{x})^2$ = Sum of Square of deviation from mean of x series

$\Sigma(y_i - \bar{y})^2$ = Sum of square of deviation from mean of y series.

(iii) Spearman's Rank Correlation Coefficient.

① $r_R = 1 - \frac{6\Sigma d_i^2}{n(n^2-1)}$

d_i = diff. in Rank

$\Sigma d_i = 0$

(2) $R_R = 1 - \dfrac{6\left[\Sigma d_i^2 + \frac{1}{12}\Sigma(d_i^2 - t_i)\right]}{n(n^2-1)}$

t_i = No. of times an item be repeated.

(iv) Coefficient of Congruent Deviation

$$R_C = \pm\sqrt{\frac{\pm(2C-m)}{m}}$$

$m \Rightarrow$ Total no. of deviations $= n-1$

$C \Rightarrow$ No. of pair of Congruent Deviations

or

No. of the signs in Deviation column.

GMP

If $C=0$ then Coeff. of Congruent Deviation is -1