40 marks

STATISTICS

* Statistics is a branch of mathematics
* Statistics is not for individuals. ~~omitted~~
* Statistics is aggregate (Group) of facts.
* Statistics word is originated in 1749 by Gaott Eried Achenwall
* Statistics word is suggested by some words.
  - (i) Latin word → Status
  - (ii) Italian word → statista
  - (iii) German word → Statistik
  - (iv) French word → Statistique → French word ← Statistics

Defination :→

Statistics deals with collection classification analysis presentation and interpretation (Decision making) of numerical Data.

Defination → 2 Sense

① Singular sense → Data is defined in terms of collection classification presentative of data.

(ii) Plural sense

* Data is defined in terms of Quantitative and Qualitative data.

Measures of central tendency (Mact) :→ 1st order averages

A.M ⇒ 2 + 5 + 6 + 8 + 9 ...

G.M ⇒ 2 × 5 × 6 ...

H.M ⇒ $\frac{1}{2}$ $\frac{1}{5}$ $\frac{1}{7}$ ...

2 5 (6) 8 9

Median

→ MOCT measures central location of observation.

→ MOCT is also known as averages.

→ In this tendency there is a single value which can be regarded as representative value of data set (observations)

MOCT (Averages) are two types :→

- MOCT
  - Mathematical averages
    - A.M (Arithmetic mean) $\bar{x}$
    - G.M (Geometric mean) G
    - H.M (Harmonic mean) H
  - Positional Averages.
    - Median M
    - Mode Z

A.M for individuals series

① $\bar{x}$ = Sum of observations / number of observations

② $\bar{x} = \frac{\Sigma x}{n}$

③ $\bar{x} \Rightarrow \frac{1^{st} \text{ value} + \text{last value}}{2}$ (if difference is same)

④ Assumed mean method

$\bar{x} = A + \frac{\Sigma dx}{n}$

$\Sigma dx \rightarrow$ deviation

$\Sigma dx \Rightarrow \Sigma(x - A)$

$\Sigma dx \Rightarrow \Sigma(x - \bar{x}) = 0$

Question :→ $\frac{x}{2}$ $\frac{x}{3}$ $\frac{x}{4}$ $\frac{x}{5}$ A.M ⇒ 40 find x.

$$\frac{\frac{x}{2} + \frac{x}{3} + \frac{x}{4} + \frac{x}{5}}{4} \Rightarrow 40$$

$$\frac{x}{2} + \frac{x}{3} + \frac{x}{4} + \frac{x}{5} \Rightarrow 160$$

$$\frac{30x + 20x + 15x + 12x}{60} = 160$$

$$\frac{77x}{60} = 160$$

$$77x \Rightarrow 9600 \quad (160 \times 60)$$

$$x \Rightarrow \frac{9600}{77}$$

$$x \Rightarrow 124.6 \text{ Ans}$$

* A.M for descreate series :→

Q.

x	f	fx
x_1	f_1	
x_2	f_2	
x_3	f_3	
:	:	
x_n	f_n	
	N	

(x: variable, f: frequency)

$$\bar{x} \Rightarrow \frac{\Sigma fx}{fx}$$

or

$$\bar{x} = \frac{\Sigma fx}{N}$$

$$N = \Sigma f$$

Q.

x	f	fx
1	1	
2	2	
3	3	
4	4	
5	5	
:	:	
16	16	
	16	

$$\bar{x} \Rightarrow \frac{2n+1}{3}$$

$$\bar{x} \Rightarrow \frac{2 \times 16 + 1}{3}$$

$$\bar{x} \Rightarrow 32+1$$

$$\bar{x} \Rightarrow 11 \text{ Ans}$$

Q.

x	f	fx
2	2	4
4	3	12
8	3	24
16	2	32
	10	72

~~$\bar{x} \Rightarrow \frac{72}{40}$~~

$$\bar{x} \Rightarrow \frac{72}{10} \Rightarrow 7.2$$

* A.M for continuous series =>

Grouped frequency distribution

Exclusive classification

$$\bar{x} \Rightarrow \frac{\Sigma fx}{\Sigma f}$$

$\bar{x}$ => Mid value of class.

x	f	X	fx
8-16	2	12	24
16-24	3	20	60
24-32	4	28	112
32-40	2	36	72
40-48	5	44	220
	16		488

$$\bar{x} \Rightarrow \frac{\Sigma fx}{\Sigma f}$$

$$\bar{x} \Rightarrow \frac{488}{16}$$

$$\bar{x} \Rightarrow 30.5 \text{ Ans}$$

Q. Combined A.M

Average of 5 pencil is 30 Rs.
Average of 10 copy is 40 Rs.
Average of total quantity

I n_1, n_2
II x_1, x_2

$5 \rightarrow 30 \Rightarrow 150$
$10 \rightarrow 40 \Rightarrow 400$

$$\bar{x} \Rightarrow \frac{n_1 \bar{x}_1 + n_2 \bar{x}_2}{n_1 + n_2}$$

$$\bar{x} \Rightarrow \frac{5 \times 30 + 10 \times 40}{5+10} \Rightarrow \frac{150 + 400}{15}$$

$\bar{x} \Rightarrow 36.66$. Ans

Avg. of 5 Quantity in 100 Rs.
Avg. of next 5 is 80 Rs.
Avg. of next 5 is 50 Rs.
Avg. of all.

~~$\bar{x} \Rightarrow n_1 x$~~

$5 \rightarrow 100 \Rightarrow 500$
$5 \rightarrow 80 \Rightarrow 400$
$5 \rightarrow 50 \Rightarrow 250$
1150

$\Rightarrow \frac{1150}{15}$

$\Rightarrow 76.66$. Ans

Avg. of 20 students is 400
Avg. of 12 of them is 200
Avg. of remaing students

$20 \rightarrow 400 \Rightarrow 8000$
$12 \rightarrow 200 \Rightarrow 2400$
5600

$\Rightarrow \frac{5600}{8}$

$\Rightarrow 700$ Ans

Average of 30 students is 100
4 student joined the class.
Average increased by 5 find avg. of joined students

$34 \rightarrow 105 \Rightarrow 3570$
$30 \rightarrow 100 \Rightarrow 3000$
570

$\Rightarrow \frac{570}{4}$

$\Rightarrow 142.5$ Ans

Q. 50 students avg. 5850

But mistake two values are wrongly taken as 4500 and 5400 instead of 7800 and 8000 find correct mean.

$50 \rightarrow 5850 \Rightarrow 292500$

-4500

-5400

$+7800$

$+8000$

298400

$\Rightarrow \frac{298400}{50}$

$\Rightarrow 5968$ Ans

$y \Rightarrow a + bx \rightarrow$ slope

Intercept ↙ ↘ Change of scale

Change of origin.

Change of origin → add · sub + each.

Change of scale → $x \div$

Q. A.M ⇒ 10 each data added by 6 New A.M

$\bar{x} \Rightarrow 10 + 6$

$\bar{x} \Rightarrow 16$ Ans

Q. A.M − 5 each data x by 4 then ÷ 10 New A.M

$\bar{x} \Rightarrow \frac{5 \times 4}{10} \Rightarrow \frac{20}{10}$

$\bar{x} \Rightarrow 2$ Ans

Q. A.M ⇒ $\bar{x}$ each data ÷ by 10 then increased by α

$\frac{\bar{x}}{10}$

$\frac{\bar{x}}{10} + \alpha \Rightarrow \frac{\bar{x} + 10\alpha}{10}$

Q. $y \Rightarrow 2+5x$ x mean is 8 y mean?

$\bar{y} \Rightarrow 2+5x$

$\bar{y} \Rightarrow 2+5\times 8$

$\bar{y} \Rightarrow 42$ Ans

Q. $2x+3y-7 \Rightarrow 0$ x A.M is 1 y. A.M

$2(1)+3y-7 \Rightarrow 0$

$2+3y-7 \Rightarrow 0$

$3y-5 \Rightarrow 0$

$3y \Rightarrow 5$

$\bar{y} \Rightarrow \frac{5}{3}$

Q. x. Am is 50 find A.M of $\frac{3x-100}{5}$

$\bar{y} = \frac{3x-100}{5}$

$\bar{y} \Rightarrow \frac{150-100}{5}$

$\bar{y} \Rightarrow \frac{50}{5}$

$\bar{y} \Rightarrow 10$

Q. x Mean is b find mean of $\frac{x-b}{a}$

$\frac{x-b}{a} \Rightarrow \frac{b-b}{a} \Rightarrow \frac{0}{a} \Rightarrow 0$ Ans

→ A.M is the mathematical Averages.
→ A.M is based on all observations.
→ A.M can be + or − or 0
→ For equal observation K, K, K, K → A.M ⇒ K
→ A.M is the best measure of central tedency.
→ A.M is rigidly defined everywhere.
→ A.M is stable measure of C.T
→ A.M cannot be determined graphically.
→ A.M is highly effected by presence of extreme observations.

→ Change of orgian ✓
→ Change of scale ✓
→ Liner Equation Property

$$y = a + b * x$$

$$\boxed{\bar{y} \Rightarrow a + b \cdot \bar{x}}$$

Median

Q. 6, 16, 10, 50, 40, 90, 15 find median?

n = 7 (odd)

6, 10, 15, 16, 40, 50, 90

M ⇒ 16

(Middle value of numbers).

Q. 9, 50, 40, 30, 100, 11, 17, 44 find median?

n ⇒ 8 (even) ⇒ $\frac{I + II}{2}$

9, 11, 17, 30, 40, 44, 50, 100

$M \Rightarrow \frac{30 + 40}{2}$

M ⇒ 35 Ans

Q. $a-8 \quad a+4 \quad a+\frac{1}{2} \quad a \quad a-1 \quad a+3 \quad a-\frac{1}{2}$ find median?

$a-8 \quad a-1 \quad a-\frac{1}{2} \quad a \quad a+\frac{1}{2} \quad a+3 \quad a+4$

$M \Rightarrow a$ Ans

Q. $a+\frac{1}{2}, a-1, a+4, a+\frac{3}{2}, a+7, a-5, a, a+6, a+2, a-3$

find median ?

$a-5, a-3, a-1, a, a+\frac{1}{2}, a+\frac{3}{2}, a+2, a+4, a+6, a+7$

$$M \Rightarrow \frac{a+\frac{1}{2}+a+\frac{3}{2}}{2}$$

$$M \Rightarrow \frac{2a+2}{2} \quad \frac{2(a+1)}{2}$$

$M \Rightarrow a+1$ Ans

Q. 10 12 14 $x+2$ $x+4$ 40 50 60

median $\Rightarrow$ 30

find x

$$M \Rightarrow \frac{x+2+x+4}{2}$$

$$30 \Rightarrow \frac{2x+6}{2}$$

$2x+6 \Rightarrow 30 \times 2$

$2x \Rightarrow 60-6$

$x \Rightarrow \frac{54}{2}$

$x \Rightarrow 27$

$x+2 \Rightarrow 27+2 \Rightarrow 29$

$x+4 \Rightarrow 27+4 \Rightarrow 31$

Q. $\frac{x}{4}$ $\frac{x}{2}$ $\frac{x}{5}$ $\frac{x}{3}$ Median $\Rightarrow$ 40 find x.

$\frac{x}{5}$ $\frac{x}{4}$ $\frac{x}{3}$ $\frac{x}{2}$

$$40 \Rightarrow \frac{\frac{x}{4} + \frac{x}{3}}{2}$$

$$2 \times 40 \Rightarrow \frac{3x + 4x}{12}$$

$$3x + 4x \Rightarrow 80 \times 12$$

$$7x \Rightarrow 960$$

$$x \Rightarrow \frac{960}{7}$$

$$x \Rightarrow 137.142 \text{ Ans}$$

Q. In a class of 11 students 3 all failed Marks of passed candidates all.

90, 84, 33, 56, 61, 99, 80, 74 had median of class

A, B, C, 33, 56, 61, 74, 80, 84, 90, 99

M $\Rightarrow$ 61 Ans

★ Median for discreate series $M \Rightarrow \frac{N+1}{2}$ value

N $\Rightarrow$ ∑f

Search in c.f

c.f $\Rightarrow$ Cumulative frequency

x	f	c.f
5	3	3
15	4	7
40	5	12
60	7	19
90	9	28
92	8	36
	N=36	

$M \Rightarrow \frac{n+1}{2}$

$M \Rightarrow \frac{36+1}{2}$

$M \Rightarrow 18.5$

$M \Rightarrow 60$ Ans

Q. $\frac{3}{\frac{1}{3}+\frac{1}{6}+\frac{1}{12}}$

use calculator trick.

1 ÷ 3 M+
1 ÷ 6 M+
1 ÷ 12 M+
MRC
÷ 3
÷ = 5.14 Ans

Q. $\frac{4}{\frac{1}{6}+\frac{1}{8}+\frac{1}{12}+\frac{1}{36}}$

1 ÷ 6 M+
1 ÷ 8 M+
1 ÷ 12 M+
1 ÷ 36 M+
MRC
÷ 4
÷ = 9.93 Ans

Q. $\frac{10}{\frac{2}{2}+\frac{3}{4}+\frac{3}{8}+\frac{2}{16}}$

2 ÷ 2 M+
3 ÷ 4 M+
3 ÷ 8 M+
2 ÷ 16 M+
MRC
÷ 10 ÷ = 4.44 Ans

Q. $\frac{140}{\sqrt{351 \times 352}}$

351 × 352
= √ ÷ 140 ÷ =

=) 0.39

* Median for continuous series $\frac{N}{2}$ search in c.f median class.

$$M \Rightarrow l_1 + \frac{\frac{N}{2} - C}{f} \times i$$

$l_i \Rightarrow$ Lower class limit

$N \Rightarrow$ Σf

$C \Rightarrow$ c.f. of pre median class.

$f \Rightarrow$ frequency of median class.

$c \Rightarrow$ Class length UCB - LCB

x	f	c.f
8-16	3	3
16-24	4	7
24-32	5	12
32-40	7	19
40-48	9	28
48-56	8	36
	36	

$$M \Rightarrow l_i + \frac{\frac{N}{2} - C}{f} \times i$$

$$M \Rightarrow 32 + \frac{18-12}{7} \times 8$$

$$M \Rightarrow 32 + 6.85$$

$$M \Rightarrow 38.85 \text{ Ans.}$$

Q. Median of x is 2, $3x + 2y - 10 = 0$ y median.

$$6 + 2y - 10 = 0$$

$$2y = 4$$

$$y_M = 2$$

Q. x median is 3 median of $3x - 4$

$$y = 3x - 4$$

$$y \Rightarrow 3 \times 3 - 4$$

$$y \Rightarrow 5 \text{ Ans}$$

Q. $M \Rightarrow 20$ each data x by 4 New

$\Rightarrow 20 \times 4$

$\Rightarrow 80$ Ans

i) Median is a Positional average of central tendency.

ii) Median is not based on all observations.

iii) Median is based on central 50% value of observation

iv) For equal observation. K K K K, $\boxed{M = K}$

v) Median is + or − or 0

vi) Median can be determined graphically using ogive curve

vii) Median is not affected by presence of extreme values.

viii) Median is appropriate for open end classification.

Change of origin ⟵

Change of scale ⟵

Liner equation property ⟵

$y = a + bx$ $\quad (y_M \Rightarrow a + b x_M)$

$y \Rightarrow 2 + 3x$ $\qquad$ x median is 4

$y_M \Rightarrow 2 + 3 \times 4$

$y_M \Rightarrow 2 + 12$

$y_M \Rightarrow$ 14 Ans

Mode

Z => Highest frequency observation.

Q. 5, 7, 17, 19, 51, 17, 51, 17

Z => 17 & Unimodal data set.

Q. 6, 11, 50, 50, 11, 11, 9, 19, 50, 55

Z => 11 and 50 Bimodal data set.

(2 more multimodal data set).

Discreate series.

x	f
4	5
50	15
60	11
16	15
9	6
21	9

Z => 50 and 16
Bimodal

x	f
5	3
15	17
11	6
9	9
19	15

Z => 15
Unimodal

Skewed

5	20
7	50
8	50
10	80
7	

Symmetrical distribution
(In which mean, mode, median are equal are called symmetrical distribution.)

(In which mean, mode, median, are not equal are called skewed distribution.).

* Mode for Continuous series

Highest frequency => Modal class.

$$Z = l_i + \frac{f_i - f_0}{2f_i - f_0 - f_2} \times l$$

l_i => Lower class limit.

F_i => Frequency of modal class.

F_0 => Frequency of pre modal class

F_2 => Frequency of past modal class.

i => Class length.

x	f	x	f	
0-20	5	0-30	12	F_0
20-30	7	30-60	17	F_1
30-60	17	60-90	8	F_2
60-80	6			
80-90	2			

$$Z \Rightarrow l_i + \frac{F_1 - F_0}{2F_1 - F_0 - F_2} \times i$$

$$Z \Rightarrow 30 + \frac{17-12}{2\times17-12-8} \times 30$$

$$Z \Rightarrow 30 + \frac{150}{14}$$

$$Z \Rightarrow 40.71 \text{ Ans}$$

Mode is a positional measur of central Tedency

Mode is not based on all observations.

Mode can be determined graphically using Histogram curve

Mode is fashionable measure of C.T -> scale of wooken clothes

Mode is not uniquely defined everywhere

1K, 1K, K, K. mode = 1K

Mode can be + or − or 0

Change of origin ←

Change of scale ←

Liner equation ←

Relation between mean, median, mode

$\bar{x} = M = Z$ Symmetrical Distribution $\gamma = 0$

$\bar{x} \neq M \neq Z$ Skewed Distribution $\gamma > 0$ $\gamma < 0$

$\bar{x} < M < Z$ Negative skewed

$\bar{x} > M > Z$ Positive skewed.

Mean − mode = 3 (mean − median.

$\bar{x} - Z = 3(\bar{x} - M)$

$\bar{x} - Z = 3\bar{x} - 3M$

$3M - Z = 2\bar{x}$

$Z = 3M - 2\bar{x}$

Q. $\bar{x} = 25$
$M = 25$
$Z = 25$
Symmetrical method

Q. $\bar{x} \Rightarrow 40$
$M \Rightarrow 20$
$Z \Rightarrow 10$
Positive skewed

Q. mean = 32.40
median = 44.60
find mode

$Z = 3M - 2\bar{x}$
$Z \Rightarrow 3 \times 44.60 - 2 \times 32.40$
$Z \Rightarrow 133.8 - 64.8$
$Z \Rightarrow 69$ Ans

Q. Mean − mode = 10
Mean − mode = 20 median?

$\bar{x} - Z = 10$
$\bar{x} + Z = 20$
$2\bar{x} = 30$
$\bar{x} = 15$

$15 - Z = 10$
$Z \Rightarrow 5$
$Z \Rightarrow 3M - 2\bar{x}$
$5 \Rightarrow 3M - 30$
$3M \Rightarrow 35$
$M \Rightarrow \frac{35}{3}$
$M \Rightarrow 11.66.$ Ans.

Harmonic Mean.

$$H.M \Rightarrow \frac{n}{\frac{1}{x_1} + \frac{1}{x_2} + \frac{1}{x_3} \cdots \frac{1}{x_n}}$$

Q. 5, 10, 15, 20, 25 H.M?

Ans $H.M \Rightarrow \frac{5}{\frac{1}{5} + \frac{1}{10} + \frac{1}{15} + \frac{1}{20} + \frac{1}{25}}$

$\Rightarrow$ 10.94 Ans

Q. 4, −5, −6, 2

H.M. cannot be determined.

Q. 4, 5, 0, 6

$H.M \Rightarrow \frac{4}{\frac{1}{4} + \frac{1}{5} + \frac{1}{0} + \frac{1}{6}}$ H.M. cannot be determined.

★ H.M for discreate series.

x	f
x_1	f_1
x_2	f_2
x_3	f_3
⋮	⋮
x_n	f_n

$$H.M \Rightarrow \frac{N}{\frac{f_1}{x_1} + \frac{f_2}{x_2} + \frac{f_3}{x_3} \cdots \frac{f_n}{x_n}}$$

$$H.M \Rightarrow \frac{10}{\frac{2}{2} + \frac{3}{4} + \frac{3}{8} + \frac{2}{16}}$$

H.M $\Rightarrow$ 4.44 Ans

→ H.M is a mathematical average.
→ H.M is based on all observation.
→ H.M is always positive
→ If any observations is negative or 0. H.M cannot be determined
→ For equal observation K, K, K ⇒ K → H.M ⇒ K.
→ H.M is reciprocal of average of reciprocal of observation.
→ Change of origin ✗
→ Change of scale ✗
→ Linear equation property ✗.
→ H.M is used to calculate average speed.

Geometric mean

$G.M \Rightarrow (x_1 \times x_2 \times x_3 \ldots x_n)^{\frac{1}{n}}$

Q. 4 9

$G.M \Rightarrow (4 \times 9)^{\frac{1}{2}}$

$36^{\frac{1}{2}}$

$G.M \Rightarrow 6.$

G.M
6 ✓
7
5
5

Q. 6 8 12 36

$G.M \Rightarrow (6 \times 8 \times 12 \times 36)^{\frac{1}{4}}$

$\Rightarrow (20736)^{\frac{1}{4}}$

$\Rightarrow 12^{\frac{1}{4}}$

$G.M \Rightarrow 12$

G.M
10
12 ✓
14
11

Q. 3 6 12

$(3 \times 6 \times 12)^{\frac{1}{3}}$

$(216)^{\frac{1}{3}}$

$(6)^3$

$G.M \Rightarrow 6$

G.M
5
6 ✓
7
8

Q. 2 4 8 16 32 64 find G.M.

$G.M \Rightarrow (2 \times 4 \times 8 \times 16 \times 32 \times 64)^{\frac{1}{6}}$

$\Rightarrow (2 \times 2^2 \times 2^3 \times 2^4 \times 2^5 \times 2^6)^{\frac{1}{6}}$

$\Rightarrow (2^{21})^{\frac{1}{6}}$

$\Rightarrow 2^{\frac{21}{6}}$

$\Rightarrow 2^{\frac{7}{2}}$ Ans

Q. 8 24 40 find G.M.

$G.M \Rightarrow (8 \times 24 \times 40)^{\frac{1}{3}}$

$\Rightarrow (8 \times 8 \times 3 \times 8 \times 5)^{\frac{1}{3}}$

$\Rightarrow (8^3)^{\frac{1}{3}} \times (15)^{\frac{1}{3}}$

$\Rightarrow 8 \times \sqrt[3]{15}$

$\Rightarrow 8\sqrt[3]{15}$ Ans

G.M

$\sqrt{14}$

$\sqrt{15}$

$8\sqrt[3]{15}$ ✓

$7\sqrt[3]{15}$

Q. G.M for discrete series.

x	f
x_1	f_1
x_2	f_2
x_3	f_3
:	:
x_n	f_n
	N

$G.M \Rightarrow (x_1^{f_1} \times x_2^{f_2} \times x_3^{f_3})^{\frac{1}{N}}$

x	f
2	2
4	3
8	3
16	2
	10

$G.M \Rightarrow (2^2 \times 4^3 \times 8^3 \times 16^2)^{\frac{1}{10}}$

$\Rightarrow (2^2 \times (2^2)^3 \times (2^3)^3 \times (2^4)^2)^{\frac{1}{10}}$

$\Rightarrow (2^2 \times 2^6 \times 2^9 \times 2^8)^{\frac{1}{10}}$

$\Rightarrow (2^{25})^{\frac{1}{10}}$

$\Rightarrow 2^{\frac{25}{10}}$

$\Rightarrow 2^{\frac{5}{2}} \Rightarrow 2^2 \times \frac{1}{2^2}$

$\Rightarrow 4\sqrt{2}$ Ans

G.M.

$\sqrt{2}$

$4\sqrt{2}$ ✓

$5\sqrt{2}$

$3\sqrt{2}$

Q. Rate of Return (Bank)

100%, 200%, 400% average rate.

$G.M \Rightarrow (100 \times 200 \times 400)^{\frac{1}{3}}$

$\Rightarrow (8000000)^{\frac{1}{3}}$

$\Rightarrow 200^{\frac{1}{3}}$ Ans

→ G.M is a mathematical average
→ G.M is based on all observations.
→ If any observation is positive and negative both G.M cannot be determined.
→ For equal observation. K K K G.M ⇒ $\frac{1}{K}$

a b c G.M ⇒ K then $\frac{1}{a}$ $\frac{1}{b}$ $\frac{1}{c}$ GM ⇒ $\frac{1}{K}$

→ G.M of (x.y) = G.M of x × G.M of y

→ Change of origin ×
→ Change of scale ✓
→ Liner equation ×

→ G.M is difficult measure of central tendency.

Portion values

Median
50% | 50%
M
Two equal parts
M ⇒ $\frac{n+1}{2}$ values
Discreate
M ⇒ $\frac{N+2}{2}$ value
Search c.f

Quartiles
4 equal parts
25% | 25% | 25% | 25%
Q_1 Q_2 Q_3
Q_K ⇒ K $\left(\frac{n+1}{4}\right)$ value
Discreate
Q_K ⇒ K $\frac{(N+1)}{4}$ value
Search c.f

Deciles
10 parts
D_1 ⋯ D_5 ⋯ D_9
D ⇒ K $\left(\frac{n+1}{10}\right)$ value
Discreate
D_K ⇒ K $\left(\frac{N+1}{10}\right)$
Search c.f

Percentiles
100 parts
P_1 ⋯ P_{50} ⋯ P_{99}
P = K $\left(\frac{n+1}{100}\right)$ value
Discreate
P_K = K $\frac{(N+1)}{100}$
Search c.f

Q. 16 12 11 9 100 120 130 90 54 23

9 11 12 16 23 54 90 100 120 130

D_7

$Q_1 \Rightarrow 1\left(\frac{n+1}{4}\right)$ value

$D_7 \Rightarrow 7\left(\frac{n+1}{10}\right)$

$1\left(\frac{11}{4}\right) \Rightarrow 2.75$ value

$\Rightarrow \frac{7 \times 11}{10} \Rightarrow 7.7$ value

$2nd + .75(3rd - 2nd)$

$\Rightarrow 7th + .7(8th - 7th)$

$11 + .75$

$\Rightarrow 90 + .7(10)$

$\Rightarrow 11.75$ Ans

$\Rightarrow 90 + 7$

$\Rightarrow 97$ Ans.

Q. 16, 25, 34, 11, 50, 44, 100, 90, 120, 130

P_{82}

11, 16, 25, 34, 44, 50, 90, 100, 120, 130

$P_{82} \Rightarrow 82\left(\frac{n+1}{100}\right)$ value

$\frac{82 \times 11}{100} \Rightarrow 9.02$ value

$9th + 0.02(10th - 9th)$

$\Rightarrow 120 + 0.2$

$120 + 0.02 \times 10$

$\Rightarrow 120.2$ Ans

$120 + 0.2$

Q.

x	f	n	cf	C.f
5	3	5	3	3
11	4	11	5	8
15	5	15	4	12
16	4	16	4	16
20	7	20	7	23
30	8	30	9	32
50	8	50	8	40

D_6

$D_6 = 6\left(\frac{N+1}{10}\right)$ value

$D_6 \Rightarrow 6\left(\frac{40+1}{10}\right)$

$D_6 \Rightarrow \frac{6 \times 41}{10}$

$D_6 \Rightarrow 24.6$

$D_6 \Rightarrow 30$

Combind A.M

$\frac{n_1}{\bar{x}_1}$ $\frac{n_2}{\bar{x}_2}$

$\bar{x}_T = \frac{n_1\bar{x}_1 + n_2\bar{x}_2}{n_1 + n_2}$

	B	G
	40	60
Avg.	50	30

$\bar{x}_T = \frac{40\times50 + 60\times30}{100}$

$\Rightarrow \frac{2000+1800}{100}$

$\Rightarrow$ 38 Ans

Combind G.M

n_1 n_2

a_1 a_2

Combind G.M $\Rightarrow (a_1^{n_1} \times a_2^{n_2})^{\frac{1}{n_1+n_2}}$

	B	G
	3	5
G.M	4	3

Combind $(4^3 \times 3^5)^{\frac{1}{8}}$

$\Rightarrow (64 \times 243)^{\frac{1}{8}}$

$\Rightarrow (15552)^{\frac{1}{8}}$

$\Rightarrow$ 3.34 Ans

Combind H.M

n_1 n_2

H_1 H_2

Combind H.M $\frac{n_1+n_2}{\frac{n_1}{H_1}+\frac{n_2}{H_2}}$

	B	G
	13	15
H.M	65	75

Combind $= \frac{28}{\frac{13}{65}+\frac{15}{75}}$

Combind $\Rightarrow$ 70.0 Ans

★ Relation between A.M G.M H.M

→ for unequal observation A.M > G.M > H.M

→ for equal observation A.M = G.M = H.M

→ Nothing is mentioned A.M ≥ G.M ≥ H.M

$G.M^2 = A.M \times H.M$

A.M = 15

H.M $\Rightarrow$ 15

G.M $\Rightarrow$ 15

A.M $\Rightarrow$ 64

H.M $\Rightarrow$ 16

G.M = ?

$G.M^2 \Rightarrow A.M \times H.M$

$G.M^2 \Rightarrow 16 \times 64$

$G.M \Rightarrow \sqrt{16\times64}$

$G.M \Rightarrow 4\times8$

$G.M \Rightarrow 32.$

Q Girl Boys. $\bar{x}_T = \frac{n_1 x_1 + n_2 x_2}{n_1 + n_2}$

n_1 n_2

Average 30(low) 80(high)

combind avg. $\Rightarrow$ 60 $\frac{60}{T} = \frac{n_1 \times 30 + n_2 \times 80}{n_1 + n_2}$

$60 n_1 + 60 n_2 = 30 n_1 + 80 n_2$

$30 n_1 = 20 n^2$

$B = A$ $n_1 n^2$

$3 = 2$ $2 : 3$

(B) (G)

Ratio निकालना है

5 A = 5 B = 3 C

15 = 18 = 30

3 : 6 : 10

Q. $1 + 2 + 3 + \cdots 65$

$n \frac{(n+1)}{2} \Rightarrow 65 \frac{(65+1)}{2}$

$\frac{65 \times 66}{2} = 2145$

Formula.

$1 + 2 + 3 + \cdots n = \frac{n(n+1)}{2}$

$1^2 + 2^2 + 3^2 + \cdots n^2 = \frac{n(n+1)(2n+1)}{6}$

$1^3 + 2^3 + 3^3 + \cdots n^3 = \frac{n^2 (n+1)^2}{4}$