Range - Difference bet^n max obs & min obs

Quartile deviation - Measures which expresses the spread of observations in terms of distance between the values of selected observation

First Quartile $= Q_1 = L + \frac{\frac{N}{4} - c.f}{f} * h$

where L is lower limit of first quartile class.

Second quartile (Q_2) is median of data

third quartile (Q_3), $Q_3 = L + \frac{\frac{3N}{4} - c.f}{f} * h$

where L is lower limit of q. third quartile class

Quartile Deviation - $\frac{Q_3 - Q_1}{2}$

Inter quartile range - $Q_3 - Q_1$

coefficient of Quartile Deviation = $\frac{Q_3 - Q_1}{Q_3 + Q_1}$

Mean Deviation - $\frac{|Di|}{N}$ where N is total number of observations and $Di = X - A$, A is central measure (Mean or Median or Mode)

If $f_i, i = 1, 2, \ldots n$ is frequency distribution

then Mean deviation $= \frac{\Sigma f_i |x_i - A|}{N} = \frac{\Sigma f_i |Di|}{N}$

where $N = \Sigma f_i$

Standard Deviation

- Raw data $\sigma = \sqrt{\frac{\Sigma (x_i)^2}{N} - \left(\frac{\Sigma x_i}{N}\right)^2}$ where N is total no. of obs.
- Discrete or Continuous data : $\sigma = \sqrt{\frac{\Sigma f_i (x_i)^2}{N} - \left(\frac{\Sigma f_i x_i}{N}\right)^2}$ where N is total frequency
- Discrete or continuous data : $\sigma = \left(\sqrt{\frac{\Sigma f_i (d_i)^2}{N} - \left(\frac{\Sigma f_i d_i}{N}\right)^2}\right) * h$ where N is total frequency and $d_i = \frac{x_i - A}{h}$

coefficient of variation $\frac{\sigma}{\bar{x}} * 100\ \%$

Q1 Calculate (i) Range (ii) Quartile Deviations (iii) Coefficient of Quartile Deviation (iv) Mean Deviation from Mean (v) Standard Deviation (vi) Coefficient of variation

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No. of Student	6	5	8	15	7	6	3

(i) Range $= 70 - 0 = 70$

Marks	Mid Value (x)	No. of students (f)	$d = \frac{x-35}{10}$	fd	fd^2	$\lvert x-\bar{x}\rvert = \lvert x-33.41\rvert$	$f\lvert x-\bar{x}\rvert$	c.f
		6	-3	-18	54	28.4	170.4	6
0-10	5							
		5	-2	-10	20	18.4	92	11
10-20	15							
		8	-1	-8	8	8.4	67.2	19
20-30	25							
		15	0	0	0	1.6	24	34
30-40	35							
		7	1	7	7	11.6	81.2	41
40-50	45							
		6	2	12	24	21.6	129.6	47
50-60	55							
		3	3	9	27	31.6	94.8	50
60-70	65							
		$N = \Sigma f = 50$		$\Sigma fd = -8$	$\Sigma fd^2 = 140$		$\Sigma f\lvert x-\bar{x}\rvert = 659.2$	

$\frac{N}{4} = \frac{50}{4} = 12.75$

$Q_1 = L + \frac{\frac{N}{4} - c.f}{f} \times h$

c.f is just greater than 12.75

$= 20 + \frac{12.75 - 11}{8} \times 10 = 22.19$

$\frac{3N}{4} = \frac{3 \times 50}{4} = 37.25$

$Q_3 = L + \frac{\frac{3N}{4} - c.f}{f} \times h$

c.f is just greater than 37.25 i.e

$Q_3 = 40 + \frac{37.25 - 34}{7} \times 10 = 44.64$

Quartile Deviation $= \frac{Q_3 - Q_1}{2} = \frac{44.64 - 22.19}{2} = 11.23$

Coefficient of Quartile Deviation $= \frac{Q_3 - Q_1}{Q_3 + Q_1} = \frac{44.64 - 22.19}{44.64 + 22.19} = 0.336$

Mean ~~Deviation~~ $\bar{x} = A + \frac{\Sigma fd}{N} = 35 + \frac{10 \times (-8)}{50} = 33.4$

Mean Deviation from mean $= \frac{1}{N} \Sigma f\lvert x - \bar{x}\rvert = \frac{659.2}{50} = 13.184$

$\sigma^2 = h^2 \left[\frac{1}{N}\Sigma fd^2 - \left(\frac{1}{N}\Sigma fd\right)^2\right] = 100\left[\frac{140}{50} - \left(\frac{-8}{50}\right)^2\right] = 100(2.8 - 0.0256) = 277.44$

SD $= \sqrt{277.44} = 16.66$

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Coefficient of variation $= \frac{\sigma}{\bar{x}} \times 100\% = 0.498$

$\frac{16.66}{33.4} \times 100\% = 49.88\%$

Range

Range is the difference between max observation and min observation

Problems

1. Find the range of 1100, 1150, 1080, 1120, 1200, 1160, 1400.

Range= 1400-1080=320

2. Find the range of the following data:

X	1	2	3	4	5	6	7	8	9	10	11	12
f	3	8	15	23	35	40	32	28	20	45	14	6

Range=12-1=11

3. Find the range of the following data:

Marks	0-10	10-30	30-60	60-100
No. of students	5	12	25	8

Range=100-0=100

Mean Deviation

- For raw data, Mean deviation $= \frac{|D_i|}{N}$ where N is the total number of observations and $D_i = X - A$, A is a central measure (Mean or Median or Mode)
- For discrete or continuous data, Mean deviation $= \frac{f_i|D_i|}{N}$ where N is the total frequency.

Problems

1. Calculate the mean deviation about median for the following data:

Income (Rs.)	1000	1500	800	2000	2500	1800
No. of persons	24	26	16	20	6	30

Mean Deviation

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Marks	0-10	10-30	30-60	60-100
No. of students	5	12	25	8

Standard Deviation

- Raw data: $\sigma = \sqrt{\frac{\sum(x_i)^2}{N} - (\frac{\sum x_i}{N})^2}$ where N is the total number of observations.
- Discrete or Continuous data: $\sigma = \sqrt{\frac{\sum f_i(x_i)^2}{N} - (\frac{\sum f_i x_i}{N})^2}$ where N is the total frequency.
- Discrete or Continuous data: $\sigma = (\sqrt{\frac{\sum f_i(d_i)^2}{N} - (\frac{\sum f_i d_i}{N})^2}) * h$ where N is the total frequency and $d_i = \frac{x_i - A}{h}$

Problems

1. Calculate standard deviation for the following data:

X	10	11	12	13	14
f	3	12	18	12	3

Problems

1. Goals scored by two teams in a foot ball season were as follows:

No. of goals scored	0	1	2	3	4	5
No. of matches (Team A)	15	10	7	5	3	2
No. of matches (Team B)	20	10	5	4	2	1

State which team is more consistent. ($C.V_A = 63.29\%, C.V_B = 92.57\%, A$ is more consistent.)

Problems

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State which team is more consistent. ($C.V_A = 63.29\%, C.V_B = 92.57\%, A$ is more consistent.)

2. Two brands of tyres are tested with the following results

Life (in '000 miles)	20-25	25-30	30-35	35-40	40-45
No. of tyres (Brand X)	1	22	64	10	3
No. of tyres (Brand Y)	0	24	76	0	0

(a) Which brand of tyres have greater average life?
(b) Compare the variability and state which brand of tyres would you use on your fleet of trucks?

$\bar{X} = 32.1, \sigma_X = 3.441, C.V_X = 10.72\%, \bar{Y} = 31.3, \sigma_Y = 2.136, C.V_Y = 6.824\%$, (a) X has greater average life (b) Y is more consistent