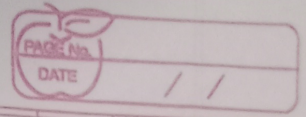


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Tutorial - 9



Q.1) The following table shows the monthly salaries (in dollars) of employees in a company:

Salary Range (\$)	2000-2999	3000-3999	4000-4999	5000-5999	6000-6999
Frequency	10	15	20	12	8

Find the coefficient of range for the given data.

⇒ Now, L = Upper limit of the highest class (Last class) = 6999

S = Lower limit of the lowest class (First class) = 2000

Then, Range = $L - S = 6999 - 2000 = 4999$

$$\therefore \text{Coefficient of Range} = \frac{L - S}{L + S} = \frac{4999}{6999 + 2000} = \frac{4999}{8999} = 0.5555$$

Thus, the Coefficient of Range for the given data is 0.5555

Q.2. The following table represents the weights (in kg) of students in a school:

Weight Range (kg)	30-39	40-49	50-59	60-69	70-79
Frequency	7	12	18	10	5

⇒ Now, L = Upper limit of the highest class (Last class) = 79

S = Lower limit of the lowest class (First class) = 30

Then, Range = $L - S = 79 - 30 = 49$

$$\therefore \text{Coefficient of Range} = \frac{L - S}{L + S} = \frac{49}{79 + 30} = \frac{49}{109} = 0.4495$$

Thus, the Coefficient of Range for the given data is 0.4495

Q.3. Calculate the mean deviation about the mean of the following: 12, 6, 7, 3, 15, 10, 18, 5.

⇒ ^(P) Mean = $\bar{X} = \frac{12 + 6 + 7 + 3 + 15 + 10 + 18 + 5}{8} = \frac{76}{8} = 9.5$

(ii) Deviation from the mean = $|f_i - \bar{X}|$

$$|12 - 9.5| = 2.5$$

$$|6 - 9.5| = 3.5$$

$$|7 - 9.5| = 2.5$$

$$|3 - 9.5| = 6.5$$

$$|15 - 9.5| = 5.5$$

$$|10 - 9.5| = 0.5$$

$$|18 - 9.5| = 8.5$$

$$|5 - 9.5| = 4.5$$

$$(iii) \text{ Mean Deviation} = \frac{2.5 + 3.5 + 2.5 + 6.5 + 5.5 + 0.5 + 8.5 + 4.5}{8}$$

$$= \frac{34.0}{8} = 4.25$$

\therefore Mean deviation about the mean is 4.25

Q.4) Find the mean deviation from mean of the following observation:

x_i	3	4	5	6	7	8
f_i	4	9	10	8	6	3

\Rightarrow

x_i	f_i	$f_i x_i$	$ d_i = x_i - \bar{x} $	$f_i d_i $
3	4	12	2.3	9.2
4	9	36	1.3	11.7
5	10	50	0.3	3
6	8	48	0.7	5.6
7	6	42	1.7	10.2
8	3	24	2.7	8.1
	$\Sigma f_i = 40$	$\Sigma f_i x_i = 212$		$\Sigma f_i d_i = 47.8$

$$(i) \text{ Mean } (\bar{X}) = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{212}{40} = 5.3$$

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$$(i) \text{ Mean deviation from mean} = \frac{\sum f_i |x_i - \bar{x}|}{\sum f_i} = \frac{\sum f_i d_i}{N}$$

$$= \frac{47.8}{40} = 1.195$$

∴ The mean deviation from mean is 1.195.

Q.5) Find the mean deviation from mean of the following distribution:

Weight	10-15	15-20	20-25	25-30	30-35	35-40	40-45
No. of items	7	12	16	25	19	15	6

⇒ Weight (in gms) Class Interval (C.I)	$x_i = \frac{(L_1 + L_2)}{2}$	f_i (No. of items)	$f_i x_i$	$ d_i = x_i - \bar{x} $	$f_i d_i $
10-15	12.5	7	87.5	15.3	107.1
15-20	17.5	12	210	10.3	123.6
20-25	22.5	16	360	5.3	84.8
25-30	27.5	25	687.5	0.3	7.5
30-35	32.5	19	617.5	4.7	89.3
35-40	37.5	15	562.5	9.7	145.5
40-45	42.5	6	255	14.7	88.2
		$\sum f_i = 100$	$\sum f_i x_i = 2780$		$\sum f_i d_i = 646$

$$(i) \text{ Mean} = \bar{x} = \frac{\sum f_i x_i}{\sum f_i} = \frac{2780}{100} = 27.8$$

$$(ii) \text{ Mean deviation from mean} = \frac{\sum f_i |x_i - \bar{x}|}{\sum f_i} = \frac{\sum f_i |d_i|}{N}$$

$$= \frac{646}{100} = 6.46$$

∴ The mean deviation from mean is 6.46.

Q.6. Find the mean deviation from mean of the following data:

Weight of wood logs (in kg)	10-20	20-30	30-40	40-50	50-60	60-70
No. of logs	4	6	10	18	9	3

Weight of wood logs (in kg) Class Interval	$x_i = \frac{l_1 + l_2}{2}$	f_i (No. of logs)	$f_i x_i$	$d_i = x_i - \bar{x} $	$f_i d_i$
10-20	15	4	60	26.2	104.8
20-30	25	6	150	16.2	97.2
30-40	35	10	350	6.2	62
40-50	45	18	810	3.8	68.4
50-60	55	9	495	13.8	124.2
60-70	65	3	195	23.8	71.4
		$\Sigma f_i = 50$	$\Sigma f_i x_i = 2060$		$\Sigma f_i d_i = 528$

$$(i) \text{ Mean} = \bar{x} = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{2060}{50} = 41.2$$

$$(ii) \text{ Mean deviation from mean} = \frac{\Sigma f_i |x_i - \bar{x}|}{\Sigma f_i} = \frac{\Sigma f_i d_i}{N}$$

$$= \frac{528}{50} = 10.56$$

\therefore The mean deviation from mean is 10.56.

Q.7. The weights of a sample of crates containing books from the book store are (in kgs): 103, 97, 101, 106, 103. Find mean deviation from mean of the data.

⇒ (i) Mean = $\bar{x} = \frac{103+97+101+106+103}{5} = \frac{510}{5} = 102$

(ii) Deviation from the mean = $|f_i - \bar{x}|$

- $|103 - 102| = 1$
- $|97 - 102| = 5$
- $|101 - 102| = 1$
- $|106 - 102| = 4$
- $|103 - 102| = 1$

(iii) Mean Deviation = $\frac{1+5+1+4+1}{5} = \frac{12}{5} = 2.4$

∴ Mean deviation from mean is 2.4

Q.8. The crushing strengths of 45 cement concrete blocks is recorded as :

Crushing strength in kg/cm ²	145-155	155-165	165-175	175-185	185-195	195-205
No. of blocks	6	7	9	14	4	5

Find standard deviation.

⇒

Crushing strength in kg/cm ² (C.I)	$x_i = \frac{L_1 + L_2}{2}$	f_i	$f_i x_i$	$f_i x_i^2$
145-155	150	6	900	135000
155-165	160	7	1120	179200
165-175	170	9	1530	260100
175-185	180	14	2520	463600
185-195	190	4	760	144400
195-205	200	5	1000	200000
		$\Sigma f_i = 45$	$\Sigma f_i x_i = 7830$	$\Sigma f_i x_i^2 = 1372300$

(i) Mean = $\bar{x} = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{7830}{45} = 174$

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$$\begin{aligned}
 \text{(i) S.D} = \sigma &= \sqrt{\frac{\sum (f_i x_i)^2}{\sum f_i} - (\bar{x})^2} \\
 &= \sqrt{\frac{1372300}{783045} - (174)^2} \\
 &= 14.8174
 \end{aligned}$$

∴ The standard deviation is 14.8174.

Q.9. Find variance of the following :

Expenditure below	5	10	15	20	25
No. of Students	6	16	28	38	46

⇒

Expenditure below (x_i)	No. of students (f_i)	$f_i x_i$	$f_i x_i^2$
5	6	30	150
10	16	160	1600
15	28	420	6300
20	38	760	15200
25	46	1150	28750
	$\sum f_i = 134$	$\sum f_i x_i = 2520$	$52000 = \sum f_i x_i^2$

$$\text{(i) Mean} = \bar{x} = \frac{\sum f_i x_i}{\sum f_i} = 18.8060$$

$$\begin{aligned}
 \text{(ii) S.D} = \sigma &= \sqrt{\frac{\sum f_i x_i^2}{\sum f_i} - (\bar{x})^2} \\
 &= \sqrt{\frac{52000}{134} - (18.8060)^2} \\
 &= 5.8646
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii) Variance} &= \sigma^2 \\
 &= (5.8646)^2 \\
 &= 34.3935
 \end{aligned}$$

Q.10. The following table shows the chest measurement of 100 student. Calculate mean and standard deviation.

Chest in cm	68-74	75-81	82-88	89-95	96-102	103-109
No. of students	5	31	40	20	3	1

⇒ Chest in cm (C.I)	Continuous C.I	No. of students (fi)	$f_i x_i = \frac{(L_1 + L_2)}{2}$	$f_i x_i$	$f_i x_i^2$
68-74	67.5-74.5	5	71	355	25205
75-81	74.5-81.5	31	78	2418	188604
82-88	81.5-88.5	40	85	3400	289000
89-95	88.5-95.5	20	92	1840	169280
96-102	95.5-102.5	3	99	297	29403
103-109	102.5-109.5	1	106	106	11236
		$\Sigma f_i = 100$	Σ	$\Sigma f_i x_i = 8416$	$\Sigma f_i x_i^2 = 712728$

(i) Mean = $\bar{X} = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{8416}{100} = 84.16$

(ii) S.D = $\sigma = \sqrt{\frac{\Sigma f_i x_i^2}{\Sigma f_i} - (\bar{x})^2}$
 $= \sqrt{\frac{712728}{100} - (84.16)^2}$
 $= 6.6614$

∴ The mean and standard deviation is 84.16 and 6.6614 respectively.

Q.11. Find the standard deviation, variance and coefficient of variance for the following distribution:

C.I.	0-30	30-60	60-90	90-120	120-150	150-180
Frequency	9	17	43	82	81	44
						180-120
						24

⇒ C.I.	$x_i = \frac{(L_1 + L_2)}{2}$	Frequency (f _i)	f _i x _i	f _i x _i ²
0-30	15	9	135	2025
30-60	45	17	765	34425
60-90	75	43	3225	241875
90-120	105	82	8610	904050
120-150	135	81	10935	1476225
150-180	165	44	7260	1197900
180-210	195	24	4680	912600
		$\Sigma f_i = 300$	$\Sigma f_i x_i = 35610$	$\Sigma f_i x_i^2 = 356104769100$

(i) Mean = $\bar{X} = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{35610}{300} = 118.7$

(ii) S.D = $\sigma = \sqrt{\frac{\Sigma f_i x_i^2}{\Sigma f_i} - (\bar{X})^2}$
 $= \sqrt{\frac{4769100}{300} - (118.7)^2}$
 $= 42.5125$

(iii) Variance = σ^2
 $= (42.5125)^2$
 $= 1807.3126$

(iv) Co-efficient of Variance = $\frac{\sigma}{\bar{X}} \times 100$
 $= \frac{42.5125}{118.7} \times 100$
 $= \frac{4251.25}{118.7}$
 $= 35.8151 \%$

∴ The standard deviation, variance and co-efficient of Variance is 42.5125, 1807.3126, 35.8151% respectively.