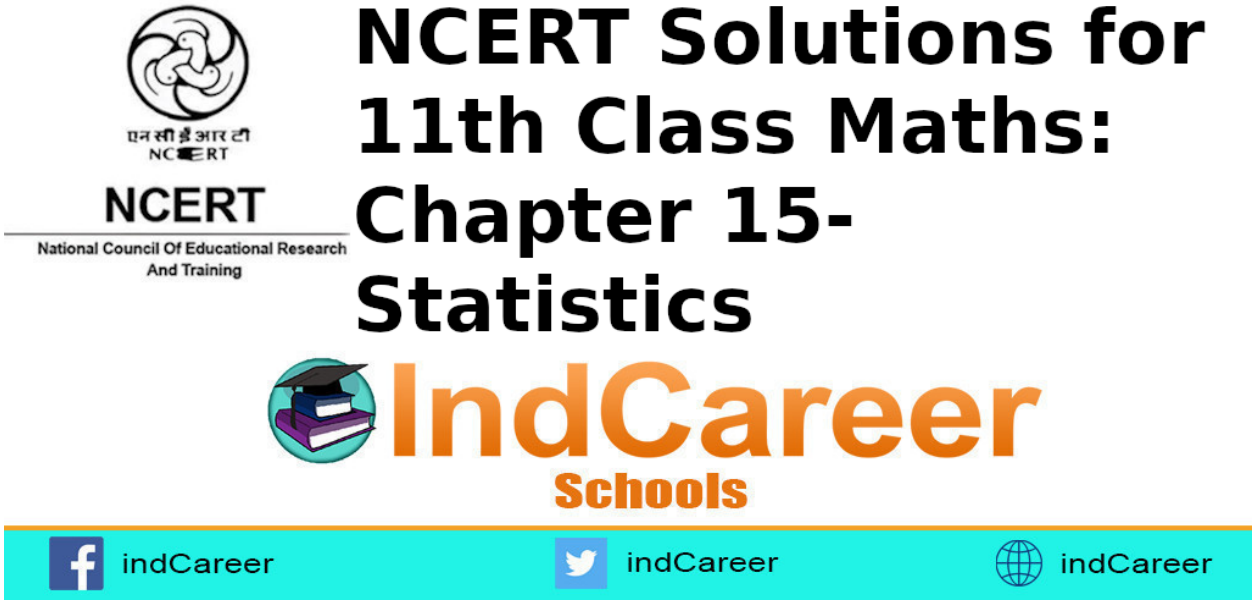

NCERT Solutions for 11th Class Maths: Chapter 15-Statistics

Class 11: Maths Chapter 15 solutions. Complete Class 11 Maths Chapter 15 Notes.

NCERT Solutions for 11th Class Maths: Chapter 15-Statistics

NCERT 11th Maths Chapter 15, class 11 Maths Chapter 15 solutions

Exercise 15.1

Find the mean deviation about the mean for the data in Exercises 1 and 2.

Question 1.

4, 7, 8, 9, 10, 12, 13, 17

Solution:

Mean of the given data is

$$\bar{x} = \frac{4+7+8+9+10+12+13+17}{8} = \frac{80}{8} = 10$$

x_i	$\lvert x_i - 10 \rvert$
4	6
7	3
8	2
9	1
10	0
12	2
13	3
17	7
Total	24

$$\therefore \quad \text{M.D. about mean} = \frac{1}{n}\sum_{i=1}^{n} \lvert x_i - \bar{x} \rvert = \frac{1}{8} \times 24 = 3$$

Question 2.

38, 70, 48, 40, 42, 55, 63, 46, 54, 44

Solution:

Mean of the given data is

$$\bar{x}=\frac{38+70+48+40+42+55+63+46+54+44}{10}$$

$$=\frac{500}{10}=50$$

x_i	$\lvert x_i-50\rvert$
38	12
70	20
48	2
40	10
42	8
55	5
63	13
46	4
54	4
44	6
Total	84

$$\therefore \quad \text{M.D. about mean}=\frac{1}{n}\sum_{i=1}^{n}\lvert x_i-\bar{x}\rvert=\frac{1}{10}\times 84=8.4$$

Question 3.

13, 17, 16, 14, 11, 13, 10, 16, 11, 18, 12, 17

Solution:

Arranging the data in ascending order, we have

10, 11, 11, 12, 13, 13, 14, 16, 16, 17, 17, 18

Here n = 12 (which is even)

So median is the average of 6th and 7th observations

$$\text{Median } (M) = \frac{46+49}{2} = \frac{95}{2} = 47.5$$

x_i	$\lvert x_i - 47.5 \rvert$
36	11.5
42	5.5
45	2.5
46	1.5
46	1.5
49	1.5
51	3.5
53	5.5
60	12.5
72	24.5
Total	70

$$\text{M.D. about median } = \frac{1}{n}\sum_{i=1}^{n} \lvert x_i - M \rvert$$

$$= \frac{1}{10} \times 70 = 7$$

Question 4.

36, 72, 46, 42, 60, 45, 53, 46, 51, 49

Solution:

Arranging the data in ascending order, we have 36, 42, 45, 46, 46, 49, 51, 53, 60, 72

Here n = 10 (which is even)

So median is the average of 5th and 6th observations

$$\text{Median } (M) = \frac{46+49}{2} = \frac{95}{2} = 47.5$$

x_i	$\lvert x_i - 47.5 \rvert$
36	11.5
42	5.5
45	2.5
46	1.5
46	1.5
49	1.5
51	3.5
53	5.5
60	12.5
72	24.5
Total	70

$$\text{M.D. about median} = \frac{1}{n}\sum_{i=1}^{n} \lvert x_i - M \rvert$$
$$= \frac{1}{10} \times 70 = 7$$

Find the mean deviation about the mean for the data in Exercises 5 and 6.

Question 5.

x_i	5	10	15	20	25
f_i	7	4	6	3	5

Solution:

x_i	f_i	$f_i x_i$	$\lvert x_i - 14 \rvert$	$f_i \lvert x_i - 14 \rvert$
5	7	35	9	63
10	4	40	4	16
15	6	90	1	6
20	3	60	6	18
25	5	125	11	55
	25	350		158

$$\text{Mean}(\bar{x}) = \frac{1}{N}\sum_{i=1}^{n} f_i x_i = \frac{1}{25} \times 350 = 14$$

$$\therefore \quad \text{Mean deviation about mean} = \frac{1}{N}\sum_{i=1}^{n} f_i \lvert x_i - \bar{x} \rvert$$

$$= \frac{1}{25} \times 158 = 6.32$$

Question 6.

x_i	10	30	50	70	90
f_i	4	24	28	16	8

Solution:

x_i	f_i	$f_i x_i$	$\lvert x_i - 50 \rvert$	$f_i \lvert x_i - 50 \rvert$
10	4	40	40	160
30	24	720	20	480
50	28	1400	0	0
70	16	1120	20	320
90	8	720	40	320
	80	4000		1280

$$\text{Mean}(\bar{x}) = \frac{1}{N}\sum_{i=1}^{n} f_i x_i = \frac{1}{80} \times 4000 = 50$$

$$\text{Mean deviation about mean} = \frac{1}{N}\sum_{i=1}^{n} f_i \lvert x_i - \bar{x} \rvert$$

$$= \frac{1}{80} \times 1280 = 16$$

Find the mean deviation about the median for the data in Exercises 7 and 8.

Question 7.

x_i	5	7	9	10	12	15
f_i	8	6	2	2	2	6

Solution:

x_i	f_i	$c.f.$	$\lvert x_i - 7 \rvert$	$f_i \lvert x_i - 7 \rvert$
5	8	8	2	16
7	6	14	0	0
9	2	16	2	4
10	2	18	3	6
12	2	20	5	10
15	6	26	8	48
	26			84

Here, $\frac{N}{2} = \frac{26}{2} = 13$

The $c.f.$ just greater than 13 is 14 and the corresponding value of x is 7.

So, Median $(M) = 7$

$$\therefore \quad \text{M.D. about median} = \frac{1}{N}\sum_{i=1}^{n} f_i \lvert x_i - M \rvert$$

$$= \frac{1}{26} \times 84 = 3.23$$

Question 8.

x_i	15	21	27	30	35
f_i	3	5	6	7	8

Solution:

x_i	f_i	$c.f.$	$\lvert x_i - 30 \rvert$	$f_i \lvert x_i - 30 \rvert$
15	3	3	15	45
21	5	8	9	45
27	6	14	3	18
30	7	21	0	0
35	8	29	5	40
	29			148

Here, $\frac{N}{2} = \frac{29}{2} = 14.5$

The $c.f.$ just greater than 14.5 is 21 and the corresponding value of x is 30.

$\therefore$ Median $(M) = 30$

$$\text{M.D. about median} = \frac{1}{N}\sum_{i=1}^{n} f_i \lvert x_i - M \rvert$$

$$= \frac{1}{29} \times 148 = 5.1$$

Find the mean deviation about the mean for the data in Exercises 9 and 10.

Question 9.

Income per day	Number of persons
0 – 100	4
100 – 200	8
200 – 300	9
300 – 400	10
400 – 500	7
500 – 600	5
600 – 700	4
700 – 800	3

Solution:

Income per day	Mid values x_i	f_i	$f_i x_i$	$\lvert x_i - 358 \rvert$	$f_i \lvert x_i - 358 \rvert$
0 – 100	50	4	200	308	1232
100 – 200	150	8	1200	208	1664
200 – 300	250	9	2250	108	972
300 – 400	350	10	3500	8	80
400 – 500	450	7	3150	92	644
500 – 600	550	5	2750	192	960
600 – 700	650	4	2600	292	1168
700 – 800	750	3	2250	392	1176
		50	17900		7896

$$\text{Mean } (\bar{x}) = \frac{1}{N}\sum_{i=1}^{n} f_i x_i = \frac{1}{50} \times 17900 = 358$$

$$\text{Mean deviation about mean} = \frac{1}{N}\sum_{i=1}^{n} f_i \lvert x_i - \bar{x} \rvert = \frac{1}{50} \times 7896 = 157.92$$

Question 10.

Height (in cms)	Number of boys
95 – 105	9
105 – 115	13
115 – 125	26
125 – 135	30
135 – 145	12
145 – 155	10

Solution:

Height (in cms)	Mid values x_i	f_i	$f_i x_i$	$\lvert x_i - 125.3 \rvert$	$f_i \lvert x_i - 125.3 \rvert$
95 – 105	100	9	900	25.3	227.7
105 – 115	110	13	1430	15.3	198.9
115 – 125	120	26	3120	5.3	137.8
125 – 135	130	30	3900	4.7	141
135 – 145	140	12	1680	14.7	176.4
145 – 155	150	10	1500	24.7	247
		100	12530		1128.8

$$\text{Mean } (\bar{x}) = \frac{1}{N}\sum_{i=1}^{n} f_i x_i = \frac{1}{100} \times 12530 = 125.3$$

Mean deviation about mean

$$= \frac{1}{N}\sum_{i=1}^{n} f_i \lvert x_i - \bar{x} \rvert = \frac{1}{100} \times 1128.8 = 11.28$$

Question 11.

Find the mean deviation about median for the following data:

Marks	Number of girls
0 – 10	6
10 – 20	8
20 – 30	14
30 – 40	16
40 – 50	4
50 – 60	2

Solution:

Marks	Mid values x_i	f_i	$c.f.$	$\lvert x_i - 27.86 \rvert$	$f_i \lvert x_i - 27.86 \rvert$
0 – 10	5	6	6	22.86	137.16
10 – 20	15	8	14	12.86	102.88
20 – 30	25	14	28	2.86	40.04
30 – 40	35	16	44	7.14	114.24
40 – 50	45	4	48	17.14	68.56
50 – 60	55	2	50	27.14	54.28
		50			517.16

Here, $\frac{N}{2} = \frac{50}{2} = 25$

$\therefore$ Median class is $20 - 30$

$$\text{Median}(M) = 20 + \frac{25-14}{14} \times 10 = 20 + 7.86 = 27.86$$

$$\therefore \text{ M.D. about median } = \frac{1}{N}\sum_{i=1}^{n} f_i \lvert x_i - M \rvert$$

$$= \frac{1}{50} \times 517.16 = 10.34$$

Question 12.

Calculate the mean deviation about median age for the age distribution of 100 persons given below:

Age	Number
16 – 20	5
21 – 25	6
26 – 30	12

31 – 35	14
36 – 40	26
41 – 45	12
46 – 50	16
51 – 55	9

[Hint: Convert the given data into continuous frequency distribution by subtracting 0.5 from lower limit and adding 0.5 to the upper limit of each class interval]

Solution:

Age	Modified class	Mid values x_i	f_i	$c.f.$	$\lvert x_i - 38 \rvert$	$f_i \lvert x_i - 38 \rvert$
16 – 20	15.5 – 20.5	18	5	5	20	100
21 – 25	20.5 – 25.5	23	6	11	15	90
26 – 30	25.5 – 30.5	28	12	23	10	120
31 – 35	30.5 – 35.5	33	14	37	5	70
36 – 40	35.5 – 40.5	38	26	63	0	0
41 – 45	40.5 – 45.5	43	12	75	5	60
46 – 50	45.5 – 50.5	48	16	91	10	160
51 – 55	50.5 – 55.5	53	9	100	15	135
			100			735

$$\text{Here, } \frac{N}{2} = \frac{100}{2} = 50 \quad \therefore \text{ Median class is } 35.5 - 40.5$$

$$\text{Median } (M) = 35.5 + \frac{50 - 37}{26} \times 5 = 35.5 + 2.5 = 38$$

Mean deviation about median

$$= \frac{1}{N} \sum_{i=1}^{n} f_i \lvert x_i - M \rvert = \frac{735}{100} = 7.35$$

https://www.indcareer.com/schools/ncert-solutions-for-11th-class-maths-chapter-15-statistics/

Exercise 15.2

NCERT 11th Maths Chapter 15

Find the mean and variance for each of the data in Exercises 1 to 5.

Question 1.

6, 7, 10, 12, 13, 4, 8, 12

Solution:

Here x_i = 6, 7, 10, 12, 13, 4, 8, 12

$\therefore \Sigma x_i = 6 + 7 + 10 + 12 + 13 + 4 + 8 + 12 = 72$

n = 8

$$\therefore \text{ Mean } (\bar{x}) = \frac{72}{8} = 9$$

$$\text{Now, } \Sigma x_i^2 = (6)^2 + (7)^2 + (10)^2 + (12)^2 + (13)^2 + (4)^2 + (8)^2 + (12)^2$$

$$= 36 + 49 + 100 + 144 + 169 + 16 + 64 + 144$$

$$= 722$$

$$\therefore \text{ Variance } (\sigma^2) = \frac{n\sum x_i^2 - \left(\sum x_i\right)^2}{n^2}$$

$$= \frac{8 \times 722 - (72)^2}{(8)^2}$$

$$= \frac{5776 - 5184}{64} = \frac{592}{64} = 9.25$$

Question 2.

First n natural numbers

Solution:

Here x_i = 1, 2, 3, 4, …….n

$$\therefore \quad \Sigma x_i = 1 + 2 + 3 + 4 + \ldots + n = \frac{n(n+1)}{2}$$

$$\therefore \quad \text{Mean } (\bar{x}) = \frac{n(n+1)}{2n} = \frac{(n+1)}{2}$$

$$\Sigma x_i^2 = (1)^2 + (2)^2 + (3)^2 + (4)^2 + \ldots + n^2$$

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

$$\therefore \quad \text{Variance } (\sigma^2)$$

$$= \frac{n \times \frac{n(n+1)(2n+1)}{6} - \left[\frac{n(n+1)}{2}\right]^2}{n^2}$$

$$= \frac{(n+1)(2n+1)}{6} - \frac{(n+1)^2}{4}$$

$$= \frac{(n+1)}{2}\left(\frac{2n+1}{3} - \frac{(n+1)}{2}\right)$$

$$= \frac{(n+1)}{2}\left(\frac{4n+2-3n-3}{6}\right)$$

$$= \frac{(n+1)(n-1)}{12} = \frac{n^2-1}{12}$$

NCERT 11th Maths Chapter 15

Question 3.

First 10 multiples of 3

Solution:

Here x_i = 3, 6, 9, 12, 15, 18, 21, 27, 30,

Σx_i = 3 + 6 + 9 + 12 + 15 + 18 + 21 + 24 + 27 + 30 = 165

n = 10

https://www.indcareer.com/schools/ncert-solutions-for-11th-class-maths-chapter-15-statistics/

$$\therefore \quad \text{Mean } (\bar{x}) = \frac{165}{10} = 16.5$$

$$\Sigma x_i^2 = (3)^2 + (6)^2 + (9)^2 + (12)^2 + (15)^2 + (18)^2 + (21)^2 + (24)^2 + (27)^2 + (30)^2$$

$$= 9 + 36 + 81 + 144 + 225 + 324 + 441 + 576 + 729 + 900$$

$$= 3465$$

$$\therefore \quad \text{Variance } (\sigma^2) = \frac{n\Sigma x_i^2 - (\Sigma x_i)^2}{n^2}$$

$$= \frac{10 \times 3465 - (165)^2}{(10)^2}$$

$$= \frac{34650 - 27225}{100} = \frac{7425}{100} = 74.25$$

Question 4.

x_i	6	10	14	18	24	28	30
f_i	2	4	7	12	8	4	3

Solution:

x_i	f_i	$f_i x_i$	$(x_i - 19)$	$(x_i - 19)^2$	$f_i(x_i - 19)^2$
6	2	12	−13	169	338
10	4	40	−9	81	324
14	7	98	−5	25	175
18	12	216	−1	1	12
24	8	192	5	25	200
28	4	112	9	81	324
30	3	90	11	121	363
	40	760			1736

$$\text{Mean } (\bar{x}) = \frac{1}{N}\sum_{i=1}^{n} f_i x_i = \frac{1}{40} \times 760 = 19$$

$$\text{Variance } (\sigma^2) = \frac{1}{N}\sum_{i=1}^{n} f_i (x_i - \bar{x})^2$$

$$= \frac{1}{40} \times 1736 = 43.4$$

Question 5.

x_i	92	93	97	98	102	104	109
f_i	3	2	3	2	6	3	3

Solution:

x_i	f_i	$f_i x_i$	$(x_i - 100)$	$(x_i - 100)^2$	$f_i(x_i - 100)^2$
92	3	276	–8	64	192
93	2	186	–7	49	98
97	3	291	–3	9	27
98	2	196	–2	4	8
102	6	612	2	4	24
104	3	312	4	16	48
109	3	327	9	81	243
	22	2200			640

$$\text{Mean } (\bar{x}) = \frac{1}{N}\sum_{i=1}^{n} f_i x_i = \frac{1}{22} \times 2200 = 100$$

$$\text{Variance } (\sigma^2) = \frac{1}{N}\sum_{i=1}^{n} f_i (x_i - \bar{x})^2$$

$$= \frac{1}{22} \times 640 = 29.09$$

Question 6.

Find the mean and standard deviation using short-cut method

x_i	60	61	62	63	64	65	66	67	68
f_i	2	1	12	29	25	12	10	4	5

Solution:

IndCareer

x_i	f_i	$u_i = x_i - 64$	$f_i u_i$	$f_i u_i^2$
60	2	–4	–8	32
61	1	–3	–3	9
62	12	–2	–24	48
63	29	–1	–29	29
64	25	0	0	0
65	12	1	12	12
66	10	2	20	40
67	4	3	12	36
68	5	4	20	80
	100		0	286

Let assumed mean $(A) = 64$

$$\text{Mean } (\bar{x}) = A + \frac{\Sigma f_i u_i}{N} = 64 + \frac{0}{100} = 64$$

$$\text{S.D. } (\sigma) = \frac{1}{N}\sqrt{N\Sigma f_i u_i^2 - (\Sigma f_i u_i)^2}$$

$$= \frac{1}{100}\sqrt{100 \times 286 - (0)^2}$$

$$= \frac{1}{100}\sqrt{28600} = \frac{1}{100} \times 169.1 = 1.69$$

Find the mean and variance for the following frequency distributions in Exercises 7 and 8.

NCERT 11th Maths Chapter 15

Question 7.

Classes	Frequencies
0 – 30	2
30 – 60	3
60 – 90	5
90 – 120	10
120 – 150	3
150 – 180	5
180 – 210	2

Solution:

Classes	Mid values x_i	f_i	$u_i = \frac{x_i - 105}{30}$	$f_i u_i$	$f_i u_i^2$
0 – 30	15	2	–3	–6	18
30 – 60	45	3	–2	–6	12
60 – 90	75	5	–1	–5	5
90 – 120	105	10	0	0	0
120 – 150	135	3	1	3	3
150 – 180	165	5	2	10	20
180 – 210	195	2	3	6	18
		30		2	76

Let assumed mean $(A) = 105$

$$\text{Mean } (\bar{x}) = A + \frac{\Sigma f_i u_i}{N} \times h = 105 + \frac{2}{30} \times 30 = 107$$

$$\text{Variance } (\sigma^2) = \frac{h^2}{N^2}[N\Sigma f_i u_i^2 - (\Sigma f_i u_i)^2]$$

$$= \frac{900}{900}[30 \times 76 - 4] = [2280 - 4] = 2276$$

Question 8.

Classes	Frequencies
0 – 10	5
10 – 20	8
20 – 30	15
30 – 40	16
40 – 50	6

Solution:

https://www.indcareer.com/schools/ncert-solutions-for-11th-class-maths-chapter-15-statistics/

Classes	Mid values x_i	f_i	$u_i = \frac{x_i - 25}{10}$	$f_i u_i$	$f_i u_i^2$
0 – 10	5	5	–2	–10	20
10 – 20	15	8	–1	–8	8
20 – 30	25	15	0	0	0
30 – 40	35	16	1	16	16
40 – 50	45	6	2	12	24
		50		10	68

Let assumed mean $(A) = 25$

$$\text{Mean } (\bar{x}) = A + \frac{\Sigma f_i u_i}{N} \times h = 25 + \frac{10}{50} \times 10$$

$$= 25 + 2 = 27$$

$$\text{Variance}(\sigma^2) = \frac{h^2}{N^2}[N\Sigma f_i u_i^2 - (\Sigma f_i u_i)^2]$$

$$= \frac{(10)^2}{(50)^2}[50 \times 68 - (10)^2] = \frac{100}{2500}[3400 - 100]$$

$$= \frac{1}{25} \times 3300 = 132$$

NCERT 11th Maths Chapter 15

Question 9.

Find the mean, variance and standard deviation using short-cut method.

Height in cms	No. of children
70 – 75	3
75 – 80	4
80 – 85	7
85 – 90	7
90 – 95	15
95 – 100	9
100 – 105	6
105 – 110	6
110 – 115	3

Solution:

Height in cms	Mid values x_i	f_i	$u_i = \frac{x_i - 92.5}{5}$	$f_i u_i$	$f_i u_i^2$
70 – 75	72.5	3	–4	–12	48
75 – 80	77.5	4	–3	–12	36
80 – 85	82.5	7	–2	–14	28
85 – 90	87.5	7	–1	–7	7
90 – 95	92.5	15	0	0	0
95 – 100	97.5	9	1	9	9
100 – 105	102.5	6	2	12	24
105 – 110	107.5	6	3	18	54
110 – 115	112.5	3	4	12	48
		60		6	254

Let assumed mean $(A) = 92.5$

$$\text{Mean } (\bar{x}) = A + \frac{\Sigma f_i u_i}{N} \times h = 92.5 + \frac{6}{60} \times 5$$

$$= 92.5 + 0.5 = 93$$

$$\text{Variance}(\sigma^2) = \frac{h^2}{N^2}[N\Sigma f_i u_i^2 - (\Sigma f_i u_i)^2]$$

$$= \frac{(5)^2}{(60)^2}[60 \times 254 - (6)^2]$$

$$= \frac{25}{3600} \times 15204 = 105.58$$

$$\text{Standard deviation } (\sigma) = \sqrt{105.58} = 10.27$$

NCERT 11th Maths Chapter 15

Question 10.

The diameters of circles (in mm) drawn in a design are given below:

Diameters	No. of circles
33 – 36	15
37 – 40	17
41 – 44	21
45 – 48	22
49 – 52	25

Calculate the standard deviation and mean diameter of the circles.

[Hint: First make the data continuous by making the classes as 32.5 – 36.5, 36.5 – 40.5, 40.5 – 44.5, 44.5 – 48.5, 48.5 – 52.5 and then proceed.]

Solution:

Diameters	Modified Classes	Mid values x_i	f_i	$u_i = \frac{x_i - 42.5}{4}$	$f_i u_i$	$f_i u_i^2$
33 – 36	32.5 – 36.5	34.5	15	–2	–30	60
37 – 40	36.5 – 40.5	38.5	17	–1	–17	17
41 – 44	40.5 – 44.5	42.5	21	0	0	0
45 – 48	44.5 – 48.5	46.5	22	1	22	22
49 – 52	48.5 – 52.5	50.5	25	2	50	100
			100		25	199

Let assumed mean $(A) = 42.5$

$$\text{Mean } (\bar{x}) = A + \frac{\Sigma f_i u_i}{N} \times h = 42.5 + \frac{25}{100} \times 4$$

$$= 42.5 + 1 = 43.5$$

$$\text{Standard deviation}(\sigma) = \frac{h}{N}\sqrt{N\Sigma f_i u_i^2 - (\Sigma f_i u_i)^2}$$

$$= \frac{4}{100}\sqrt{100 \times 199 - (25)^2} = \frac{1}{25}\sqrt{19275}$$

$$= \frac{1}{25} \times 138.83 = 5.55$$

Exercise 15.3

Question 1.

From the data given below state which group is more variable, A or B?

Marks	Group A	Group B
10 – 20	9	10
20 – 30	17	20
30 – 40	32	30
40 – 50	33	25
50 – 60	40	43
60 – 70	10	15
70 – 80	9	7

Solution:

For Group A :

IndCareer

Marks	Mid values x_i	f_i	$u_i = \frac{x_i - 45}{10}$	$f_i u_i$	$f_i u_i^2$
10 – 20	15	9	–3	–27	81
20 – 30	25	17	–2	–34	68
30 – 40	35	32	–1	–32	32
40 – 50	45	33	0	0	0
50 – 60	55	40	1	40	40
60 – 70	65	10	2	20	40
70 – 80	75	9	3	27	81
		150		–6	342

Let assumed mean $(A) = 45$

$$\text{Mean } (\bar{x}_1) = A + \frac{\Sigma f_i u_i}{N} \times h$$

$$= 45 - \frac{6}{150} \times 10 = 45 - 0.4 = 44.6$$

Standard deviation (σ_1)

$$= \frac{h}{N}\sqrt{N\Sigma f_i u_i^2 - (\Sigma f_i u_i)^2}$$

$$= \frac{10}{150}\sqrt{150 \times 342 - (-6)^2} = \frac{1}{15}\sqrt{51300 - 36}$$

$$= \frac{1}{15} \times 226.41 = 15.09$$

For Group B :

Marks	Mid values x_i	f_i	$u_i = \frac{x_i - 45}{10}$	$f_i u_i$	$f_i u_i^2$
10 – 20	15	10	–3	–30	90
20 – 30	25	20	–2	–40	80
30 – 40	35	30	–1	–30	30
40 – 50	45	25	0	0	0
50 – 60	55	43	1	43	43
60 – 70	65	15	2	30	60
70 – 80	75	7	3	21	63
		150		–6	366

$$\text{Mean } (\bar{x}_2) = A + \frac{\Sigma f_i u_i}{N} \times h = 45 - \frac{6}{150} \times 10$$

$$= 45 - 0.4 = 44.6$$

Standard deviation (σ_2)

$$= \frac{h}{N}\sqrt{N\Sigma f_i u_i^2 - (\Sigma f_i u_i)^2}$$

$$= \frac{10}{150}\sqrt{150 \times 366 - (-6)^2} = \frac{1}{15}\sqrt{54900 - 36}$$

$$= \frac{1}{15} \times 234.23 = 15.61$$

The group which have greater S.D. is more variable. Thus group B is more variable.

Question 2.

From the prices of shares X and Y below, find out which is more stable in value:

IndCareer

X	Y
35	108
54	107
52	105
53	105
56	106
58	107
52	104
50	103
51	104
49	101

Solution:

X	Y	$(X-\bar{X})$	$(Y-\bar{Y})$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$
35	108	−16	3	256	9
54	107	3	2	9	4
52	105	1	0	1	0
53	105	2	0	4	0
56	106	5	1	25	1
58	107	7	2	49	4
52	104	1	−1	1	1
50	103	−1	−2	1	4
51	104	0	−1	0	1
49	101	−2	−4	4	16
510	1050			350	40

$$\bar{X}=\frac{510}{10}=51, \bar{Y}=\frac{1050}{10}=105$$

$$\sigma_X=\sqrt{\frac{\Sigma(X-\bar{X})^2}{n}}=\sqrt{\frac{350}{10}}=5.92$$

$$\sigma_Y=\sqrt{\frac{\Sigma(Y-\bar{Y})^2}{n}}=\sqrt{\frac{40}{10}}=2$$

$$\text{C.V. of } X=\frac{\sigma_X}{\bar{X}}\times 100=\frac{5.92}{51}\times 100=11.60$$

$$\text{C.V. of } Y=\frac{\sigma_Y}{\bar{Y}}\times 100=\frac{2}{105}\times 100=1.9$$

$\because$ C.V. of Y < C.V. of X

Thus prices of share Y are more stable.

Question 3.

An analysis of monthly wages paid to workers in two firms A and B, belonging to the same industry, gives the following results:

	Firm A	Firm B
No. of wage earners	586	648
Mean of monthly wages	Rs. 5253	Rs. 5253
Variance of the distribution of wages	100	121

(i) Which firm A or B pays larger amount as monthly wages?

(ii) Which firm, AorB, shows greater variability in individual wages?

Solution:

(i) Firm A :

Number of wage earners (n_1) = 586

Mean of monthly wages ($\overline{x1}$) = Rs.5253

∴ Total monthly wages = 5253 x 586

= Rs. 3078258

Firm B :

Number of wage earners (n_2) = 648

Mean of monthly wages ($\overline{x2}$) = Rs.5253

∴ Total monthly wages = 5253 x 648

= Rs. 3403944

Hence, Firm B pays larger amount as monthly wages.

(ii) Since both the firms have same mean of monthly wages, so the firm with greater variance will have more variability in individual wages. Thus firm B will have more variability in individual wages.

Question 4.

The following is the record of goals scored by team A in a football session:

No. of goals scored	0	1	2	3	4
No. of matches	1	9	7	5	3

For the team B, mean number of goals scored per match was 2 with a standard deviation 1.25 goals. Find which team may be considered more consistent?

Solution:

For team A:

x_i	f_i	$f_i x_i$	$f_i x_i^2$
0	1	0	0
1	9	9	9
2	7	14	28
3	5	15	45
4	3	12	48
	25	50	130

$$\text{Mean}(\bar{x}_A) = \frac{1}{N}\Sigma f_i x_i = \frac{1}{25} \times 50 = 2$$

$$\text{S.D.}(\sigma_A) = \sqrt{\frac{\Sigma f_i x_i^2}{N} - \left(\frac{\Sigma f_i x_i}{N}\right)^2}$$

$$= \sqrt{\frac{130}{25} - \left(\frac{50}{25}\right)^2} = \sqrt{5.2 - 4} = \sqrt{1.2} = 1.09$$

$$\therefore \quad \text{C.V. of team A} = \frac{1.09}{2} \times 100 = 54.5$$

$$\text{C.V. of team B} = \frac{1.25}{2} \times 100 = 62.5$$

Since C.V. of team A < C.V. of team B
Thus team A is more consistent.

Question 5.

The sum and sum of squares corresponding to length x (in cm) and weight y (in gm) of 50 plant products are given below:

$$\sum_{i=1}^{50} x_i = 212, \quad \sum_{i=1}^{50} x_i^2 = 902.8$$

$$\sum_{i=1}^{50} y_i = 261, \quad \sum_{i=1}^{50} y_i^2 = 1457.6$$

Which is more varying, the length or weight?

Solution:

We have, $\sum_{i=1}^{50} x_i = 212, \sum_{i=1}^{50} x_i^2 = 902.8$

Now, $\bar{x} = \frac{212}{50} = 4.24$

$$\sigma_x^2 = \frac{1}{50} \times 902.8 - \left(\frac{212}{50}\right)^2$$

$= 18.056 - 17.978 = 0.078$

$\sigma_x = \sqrt{0.078} = 0.28$

Also, $\sum_{i=1}^{50} y_i = 261, \sum_{i=1}^{50} y_i^2 = 1457.6$

$\bar{y} = \frac{261}{50} = 5.22$

$$\sigma_y^2 = \frac{1}{50} \times 1457.6 - \left(\frac{261}{50}\right)^2$$

$= 29.152 - 27.248 = 1.904$

$\therefore \quad \sigma_y = \sqrt{1.904} = 1.38$

C.V. of length $(x) = \frac{0.28}{4.24} \times 100 = 6.6$

C.V. of weight $(y) = \frac{1.38}{5.22} \times 100 = 26.4$

$\because$ C.V. of weight > C.V. of length

Thus weight have more variability than length.

Chapterwise NCERT Solutions for Class 11 Maths :

About NCERT

The National Council of Educational Research and Training is an autonomous organization of the Government of India which was established in 1961 as a literary, scientific, and charitable Society under the Societies Registration Act. The major objectives of NCERT and its constituent units are to: undertake, promote and coordinate research in areas related to school education; prepare and publish model textbooks, supplementary material, newsletters, journals and develop educational kits, multimedia digital materials, etc.

Organise pre-service and in-service training of teachers; develop and disseminate innovative educational techniques and practices;collaborate and network with state educational departments, universities, NGOs and other educational institutions; act as a clearing house for ideas and information in matters related to school education; and act as a nodal agency for achieving the goals of Universalisation of Elementary Education.

In addition to research, development, training, extension, publication and dissemination activities, NCERT is an implementation agency for bilateral cultural exchange programmes with other countries in the field of school education.Its headquarters are located at Sri Aurobindo Marg in New Delhi.

Visit the Official NCERT website to learn more.