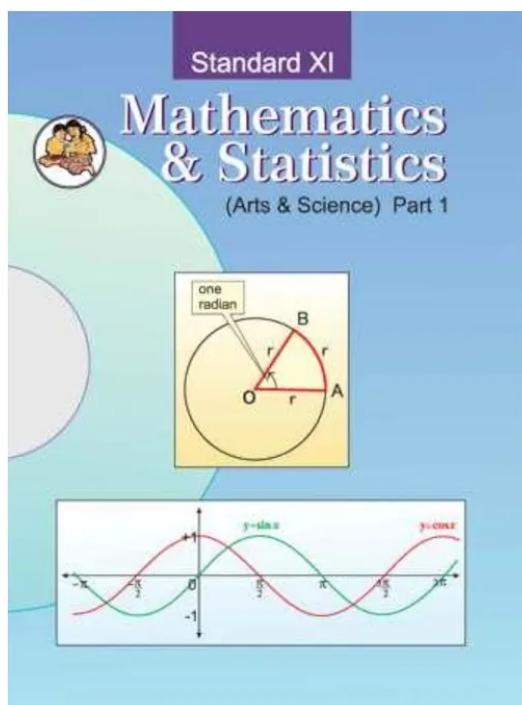


Maharashtra Board Solutions Class 11-Arts & Science Maths (Part 1): Chapter 8- Measures of Dispersion

Class 11 - Chapter 8 Measures of Dispersion



For any clarifications or questions you can write to info@indcareer.com

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Maharashtra Board Solutions Class 11-Arts & Science Maths (Part 1): Chapter 8- Measures of Dispersion

Class 11: Maths Chapter 8 solutions. Complete Class 11 Maths Chapter 8 Notes.

Maharashtra Board Solutions Class 11-Arts & Science Maths (Part 1): Chapter 8- Measures of Dispersion

Maharashtra Board 11th Maths Chapter 8, Class 11 Maths Chapter 8 solutions

Ex 8.1

Question 1.

Find a range of the following data:

19, 27, 15, 21, 33, 45, 7, 12, 20, 26

Solution:

Here, largest value (L) = 45, smallest value (S) = 7

$\therefore \text{Range} = L - S = 45 - 7 = 38$

Question 2.

Find range of the following data:

575, 609, 335, 280, 729, 544, 852, 427, 967, 250

Solution:

Here, largest value (L) = 967, smallest value (S) = 250

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$$\therefore \text{Range} = L - S = 967 - 250 = 717$$

Question 3.

The following data gives a number of typing mistakes done by Radha during a week. Find the range of the data.

Day	Mon-day	Tues-day	Wedn-esday	Thurs-day	Fri-day	Satur-day
No. of mis-takes	15	20	21	12	17	10

Solution:

Here, largest value (L) = 21, smallest value (S) = 10

$$\therefore \text{Range} = L - S = 21 - 10 = 11$$

Question 4.

The following results were obtained by rolling a die 25 times. Find the range of the data.

Score	1	2	3	4	5	6
Frequency	4	6	2	7	3	3

Solution:

Here, largest value (L) = 6, smallest value (S) = 1

$$\therefore \text{Range} = L - S = 6 - 1 = 5$$

Question 5.

Find range for the following data:

Classes	62-64	64-66	66-68	68-70	70-72
Frequency	5	3	4	5	3

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Solution:

Here, upper limit of the highest class (L) = 72

lower limit of the lowest class (S) = 62

$$\therefore \text{Range} = L - S = 72 - 62 = 10$$

Ex 8.2**Question 1.**

Find variance and S.D. for the following set of numbers.

7, 11, 2, 4, 9, 6, 3, 7, 11, 2, 5, 8, 3, 6, 8, 8, 2, 6

Solution:

Given data:

7, 11, 2, 4, 9, 6, 3, 7, 11, 2, 5, 8, 3, 6, 8, 8, 2, 6

The tabulated form of the above data is

x_i	f_i
2	3
3	2
4	1
5	1
6	3
7	2
8	3
9	1
11	2

Calculation of variance and S.D.

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x_i	f_i	$f_i x_i$	x_i^2	$f_i x_i^2$
2	3	6	4	12
3	2	6	9	18
4	1	4	16	16
5	1	5	25	25
6	3	18	36	108
7	2	14	49	98
8	3	24	64	192
9	1	9	81	81
11	2	22	121	242
Total	$N = 18$	$\sum f_i x_i = 108$		$\sum f_i x_i^2 = 792$

$$\bar{x} = \frac{\sum f_i x_i}{N} = \frac{108}{18} = 6$$

$$\begin{aligned} \text{Var}(X) = \sigma_x^2 &= \frac{\sum f_i x_i^2}{N} - (\bar{x})^2 \\ &= \frac{792}{18} - (6)^2 = 44 - 36 = 8 \end{aligned}$$

$$\text{S. D.} = \sigma_x = \sqrt{\text{Var}(X)} = \sqrt{8} = 2.82$$

Question 2.

Find variance and S.D. for the following set of numbers.

65, 77, 81, 98, 100, 80, 129

Solution:

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x_i	$x_i - \bar{x}$	$(x_i - \bar{x})^2$
65	-25	625
77	-13	169
81	-9	81
98	8	64
100	10	100
80	-10	100
129	39	1521
$\sum x_i = 630$		$\sum (x_i - \bar{x})^2 = 2660$

Here, $n = 7$

$$\bar{x} = \frac{\sum x_i}{n} = \frac{630}{7} = 90$$

$$\text{Var}(X) = \sigma_x^2 = \frac{1}{n} \sum (x_i - \bar{x})^2 = \frac{2660}{7} = 380$$

$$\text{S. D.} = \sigma_x = \sqrt{\text{Var}(X)} = \sqrt{380} = 19.49$$

Question 3.

Compute variance and standard deviation for the following data:

X	2	4	6	8	10	12	14	16	18	20
F	8	10	10	7	6	4	3	4	2	6

Solution:

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x_i	f_i	$f_i x_i$	$f_i x_i^2$
2	8	16	32
4	10	40	160
6	10	60	360
8	7	56	448
10	6	60	600
12	4	48	576
14	3	42	588
16	4	64	1024
18	2	36	648
20	6	120	2400
	$N = 60$	$\Sigma f_i x_i = 542$	$\Sigma f_i x_i^2 = 6836$

$$\bar{x} = \frac{\Sigma f_i x_i}{N} = \frac{542}{60} = 9.03$$

$$\text{Var}(X) = \sigma_x^2 = \frac{\Sigma f_i x_i^2}{N} - (\bar{x})^2$$

$$= \frac{6836}{60} - (9.03)^2$$

$$= 113.93 - 81.54$$

$$= 32.39$$

$$\text{S.D.} = \sigma_x = \sqrt{\text{Var}(X)} = \sqrt{32.39} = 5.69$$

Question 4.

Compute the variance and S.D.

X	31	32	33	34	35	36	37
Frequency	15	12	10	8	9	10	6

Solution:

Let $u = x - Ah = x - 34$

Calculation of variance of u:

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x_i	f_i	$u_i = \frac{x_i - 34}{1}$	$f_i u_i$	$f_i u_i^2$
31	15	-3	-45	135
32	12	-2	-24	48
33	10	-1	-10	10
34	8	0	0	0
35	9	1	9	9
36	10	2	20	40
37	6	3	18	54
	$N = 70$		$\Sigma f_i u_i = -32$	$\Sigma f_i u_i^2 = 296$

$$\bar{u} = \frac{\Sigma f_i u_i}{N} = \frac{-32}{70} = -0.4571$$

$$\begin{aligned} \text{Var}(u) = \sigma_u^2 &= \frac{\Sigma f_i u_i^2}{N} - (\bar{u})^2 = \frac{296}{70} - (-0.4571)^2 \\ &= 4.2286 - 0.2089 \\ &= 4.0197 \end{aligned}$$

$$\text{Var}(X) = h^2 \text{Var}(u) = (1)^2 \times 4.0197 = 4.0197$$

$$\text{S.D.} = \sigma_x = \sqrt{\text{Var}(X)} = \sqrt{4.0197} = 2.005$$

Question 5.

Following data gives ages of 100 students in a college. Calculate variance and S.D.

Age (In years)	16	17	18	19	20	21
No. of Students	20	7	11	17	30	15

Solution:

Let $u = x - Ah = x - 19$

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Age (in years) (x_i)	No. of Students (f_i)	$u_i = \frac{x_i - 19}{1}$	$f_i u_i$	$f_i u_i^2$
16	20	-3	-60	180
17	7	-2	-14	28
18	11	-1	-11	11
19	17	0	0	0
20	30	1	30	30
21	15	2	30	60
	$N = 100$		$\Sigma f_i u_i = -25$	$\Sigma f_i u_i^2 = 309$

$$\bar{u} = \frac{\Sigma f_i u_i}{N} = \frac{-25}{100} = -0.25$$

$$\begin{aligned} \text{Var}(u) &= \sigma_u^2 = \frac{\Sigma f_i u_i^2}{N} - (\bar{u})^2 = \frac{309}{100} - (-0.25)^2 \\ &= 3.09 - 0.0625 \\ &= 3.0275 \end{aligned}$$

$$\text{Var}(X) = h^2 \text{Var}(u) = (1)^2 (3.0275) = 3.0275$$

$$\text{S.D.} = \sigma_x = \sqrt{\text{Var}(X)} = \sqrt{3.0275} = 1.74$$

Question 6.

Find mean, variance and S.D. of the following data.

Class- es	10- 20	20- 30	30- 40	40- 50	50- 60	60- 70	70- 80	80- 90	90- 100
Freq.	7	14	6	13	9	15	11	10	15

Solution:

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Classes	Mid value (x_i)	f_i	$f_i x_i$	$f_i x_i^2$
10 – 20	15	7	105	1575
20 – 30	25	14	350	8750
30 – 40	35	6	210	7350
40 – 50	45	13	585	26325
50 – 60	55	9	495	27225
60 – 70	65	15	975	63375
70 – 80	75	11	825	61875
80 – 90	85	10	850	72250
90 – 100	95	15	1425	135375
		$N = 100$	$\Sigma f_i x_i = 5820$	$\Sigma f_i x_i^2 = 404100$

$$\bar{x} = \frac{\Sigma f_i x_i}{N} = \frac{5820}{100} = 58.2$$

$$\text{Var}(X) = \sigma_x^2 = \frac{\Sigma f_i x_i^2}{N} - (\bar{x})^2$$

$$= \frac{404100}{100} - (58.2)^2$$

$$= 4041 - 3387.24$$

$$= 653.76$$

$$\text{S.D.} = \sigma_x = \sqrt{\text{Var}(X)} = \sqrt{653.76} = 25.56$$

Alternate Method:

Let $u = x - Ah = x - 5510$

Calculation of variance of u :

Classes	Mid value (x_i)	f_i	$u_i = \frac{x_i - 55}{10}$	$f_i u_i$	$f_i u_i^2$
10 – 20	15	7	-4	-28	112
20 – 30	25	14	-3	-42	126
30 – 40	35	6	-2	-12	24
40 – 50	45	13	-1	-13	13
50 – 60	55	9	0	0	0
60 – 70	65	15	1	15	15
70 – 80	75	11	2	22	44
80 – 90	85	10	3	30	90
90 – 100	95	15	4	60	240
		$N = 100$		$\Sigma f_i u_i = 32$	$\Sigma f_i u_i^2 = 664$

$$\bar{u} = \frac{\Sigma f_i u_i}{N} = \frac{32}{100} = 0.32$$

$$\begin{aligned}\bar{x} &= \bar{u} \times h + A \\ &= 0.32 \times 10 + 55 \\ &= 58.2\end{aligned}$$

$$\begin{aligned}\text{Var}(u) &= \sigma_u^2 = \frac{\Sigma f_i u_i^2}{N} - (\bar{u})^2 \\ &= \frac{664}{100} - (0.32)^2 \\ &= 6.64 - 0.1024 \\ &= 6.5376\end{aligned}$$

$$\begin{aligned}\text{Var}(X) &= h^2 \text{Var}(u) \\ &= (10)^2 \times 6.5376 \\ &= 100 \times 6.5376 \\ &= 653.76\end{aligned}$$

$$\text{S.D.} = \sigma_x = \sqrt{\text{Var}(X)} = \sqrt{653.76} = 25.56$$

Question 7.

Find the variance and S.D. of the following frequency distribution which gives the distribution of 200 plants according to their height.

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Height (in cm)	14-18	19-23	24-28	29-33	34-38	39-43	44-48
No. of plants	5	18	44	70	36	22	5

Solution:

Since data is not continuous, we have to make it continuous.

Let $u = x - Ah = x - 31$

Calculation of variance of u :

Height (in cm) C. I.	Mid value (x_i)	No. of plants (f_i)	$u_i = \frac{x_i - 31}{5}$	$f_i u_i$	$f_i u_i^2$
13.5 – 18.5	16	5	-3	-15	45
18.5 – 23.5	21	18	-2	-36	72
23.5 – 28.5	26	44	-1	-44	44
28.5 – 33.5	31	70	0	0	0
33.5 – 38.5	36	36	1	36	36
38.5 – 43.5	41	22	2	44	88
43.5 – 48.5	46	5	3	15	45
		N = 200		$\Sigma f_i u_i = 0$	$\Sigma f_i u_i^2 = 330$

$$\bar{u} = \frac{\Sigma f_i u_i}{N} = \frac{0}{200} = 0$$

$$\begin{aligned} \text{Var}(u) &= \sigma_u^2 = \frac{\Sigma f_i u_i^2}{N} - (\bar{u})^2 \\ &= \frac{330}{200} - 0^2 \\ &= 1.65 \end{aligned}$$

$$\text{Var}(X) = h^2 \text{Var}(u) = (5)^2 \times 1.65 = 25 \times 1.65 = 41.25$$

$$\text{S.D.} = \sigma_x = \sqrt{\text{Var}(X)} = \sqrt{41.25} = 6.42$$

Question 8.

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The mean of 5 observations is 4.8 and the variance is 6.56. If three of the five observations are 1, 3, and 8, find the other two observations.

Solution:

$$\bar{x} = 4.8, \text{Var}(X) = 6.56, n = 5, x_1 = 1, x_2 = 3, x_3 = 8 \dots\dots(\text{given})$$

Let the remaining two observations be x_4 and x_5 .

$$\bar{x} = \frac{\sum x_i}{n}$$

$$\therefore \sum x_i = n\bar{x} = 5 \times 4.8 = 24$$

$$\text{Var}(X) = \frac{\sum x_i^2}{n} - (\bar{x})^2$$

$$\therefore 6.56 = \frac{\sum x_i^2}{5} - (4.8)^2$$

$$\begin{aligned}\therefore \sum x_i^2 &= 5[6.56 + (4.8)^2] \\ &= 5 \times 29.6 = 148\end{aligned}$$

$$\text{Now, } \sum x_i = 1 + 3 + 8 + x_4 + x_5$$

$$\therefore 24 = 12 + x_4 + x_5$$

$$\therefore x_4 + x_5 = 12$$

$$\therefore x_5 = 12 - x_4 \quad \dots\dots (i)$$

$$\sum x_i^2 = 1^2 + 3^2 + 8^2 + x_4^2 + x_5^2$$

$$\therefore 148 = 1 + 9 + 64 + x_4^2 + (12 - x_4)^2 \quad \dots\dots [\text{From (i)}]$$

$$\therefore x_4^2 + x_4^2 - 24x_4 + 144 + 74 = 148$$

$$\therefore 2x_4^2 - 24x_4 + 70 = 0$$

$$\therefore x_4^2 - 12x_4 + 35 = 0$$

$$\therefore x_4^2 - 7x_4 - 5x_4 + 35 = 0$$

$$\therefore x_4(x_4 - 7) - 5(x_4 - 7) = 0$$

$$\therefore (x_4 - 7)(x_4 - 5) = 0$$

$$\therefore x_4 = 7 \text{ or } x_4 = 5$$

From (i), we get

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$$x_5 = 5 \text{ or } x_5 = 7$$

∴ The two numbers are 5 and 7.

Ex 8.3

Question 1.

The means of two samples of sizes 60 and 120 respectively are 35.4 and 30.9 and the standard deviations are 4 and 5. Obtain the standard deviation of the sample of size 180 obtained by combining the two samples.

Solution:

$$\text{Let } n_1 = 60, n_2 = 120, \bar{x}_1 = 35.4, \bar{x}_2 = 30.9, \sigma_1 = 4, \sigma_2 = 5$$

$$\text{Combined mean } (\bar{x}_c) = \frac{n_1 \bar{x}_1 + n_2 \bar{x}_2}{n_1 + n_2} = \frac{60 \times 35.4 + 120 \times 30.9}{60 + 120} = \frac{2124 + 3708}{180} = \frac{5832}{180} = 32.4$$

$$\text{Now, } d_1 = \bar{x}_1 - \bar{x}_c = 35.4 - 32.4 = 3$$

$$d_2 = \bar{x}_2 - \bar{x}_c = 30.9 - 32.4 = -1.5$$

$$\therefore \text{ Combined standard deviation } (\sigma_c) = \sqrt{\frac{n_1 (\sigma_1^2 + d_1^2) + n_2 (\sigma_2^2 + d_2^2)}{n_1 + n_2}} = \sqrt{\frac{60 (4^2 + 3^2) + 120 [5^2 + (-1.5)^2]}{60 + 120}}$$

$$= \sqrt{\frac{60 (16 + 9) + 120 (25 + 2.25)}{180}}$$

$$= \sqrt{\frac{60 (25) + 120 (27.25)}{180}}$$

$$= \sqrt{\frac{1500 + 3270}{180}}$$

$$= \sqrt{\frac{4770}{180}} = \sqrt{26.5} = 5.15$$

Question 2.

For certain data, the following information is available.

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	X	Y
Mean	13	17
S. D.	3	2
Size	20	30

Obtain the combined standard deviation.

Solution:

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Here, $\bar{x} = 13$, $\bar{y} = 17$, $\sigma_x = 3$, $\sigma_y = 2$, $n_x = 20$, $n_y = 30$

$$\begin{aligned}\text{Combined mean } (\bar{x}_c) &= \frac{n_x \bar{x} + n_y \bar{y}}{n_x + n_y} = \frac{20(13) + 30(17)}{20 + 30} \\ &= \frac{260 + 510}{50} \\ &= \frac{770}{50} = 15.4\end{aligned}$$

$$\text{Now, } d_x = \bar{x} - \bar{x}_c = 13 - 15.4 = -2.4$$

$$d_y = \bar{y} - \bar{x}_c = 17 - 15.4 = 1.6$$

$$\therefore \text{ Combined standard deviation } (\sigma_c) = \sqrt{\frac{n_x(\sigma_x^2 + d_x^2) + n_y(\sigma_y^2 + d_y^2)}{n_x + n_y}}$$

$$\begin{aligned}&= \sqrt{\frac{20[3^2 + (-2.4)^2] + 30(2^2 + 1.6^2)}{20 + 30}} \\ &= \sqrt{\frac{20(9 + 5.76) + 30(4 + 2.56)}{50}} \\ &= \sqrt{\frac{20(14.76) + 30(6.56)}{50}} \\ &= \sqrt{\frac{295.2 + 196.8}{50}} \\ &= \sqrt{\frac{492}{50}} = \sqrt{9.84} = 3.14\end{aligned}$$

Question 3.

Calculate the coefficient of variation of marks secured by a student in the exam, where the marks are:

85, 91, 96, 88, 98, 82

Solution:

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x_i	$x_i - \bar{x}$	$(x_i - \bar{x})^2$
85	-5	25
91	1	1
96	6	36
88	-2	4
98	8	64
82	-8	64
$\Sigma x_i = 540$		$\Sigma (x_i - \bar{x})^2 = 194$

Here, $n = 6$, $\bar{x} = \frac{\Sigma x_i}{n} = \frac{540}{6} = 90$

$\text{Var}(X) = \sigma_x^2 = \frac{1}{n} \Sigma (x_i - \bar{x})^2 = \frac{194}{6} = 32.33$

S.D. $= \sigma_x = \sqrt{\text{Var}(X)}$
 $= \sqrt{32.33}$
 $= 5.69$

Now, C.V. $= 100 \times \frac{\sigma_x}{\bar{x}}$
 $= 100 \times \frac{5.69}{90} = 6.32\%$

Question 4.

Find the coefficient of variation of a sample that has a mean equal to 25 and a standard deviation of 5.

Solution:

Given, $\bar{x} = 25$, $\sigma_x = 5$

C.V. $= 100 \times \frac{\sigma_x}{\bar{x}}$
 $= 100 \times \frac{5}{25} = 20\%$

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Question 5.

A group of 65 students of class XI has their average height as 150.4 cm with a coefficient of variance of 2.5%. What is the standard deviation of their heights?

Solution:

Given, $n = 65$, $\bar{x} = 150.4$, C.V. = 2.5%

$$\text{C.V.} = 100 \times \frac{\sigma_x}{\bar{x}}$$

$$\therefore 2.5 = 100 \times \frac{\sigma_x}{150.4}$$

$$\therefore \frac{2.5 \times 150.4}{100} = \sigma_x$$

$$\therefore \sigma_x = 3.76$$

$\therefore$ The standard deviation of students' height is 3.76 cm.

Question 6.

Two workers on the same job show the following results:

	Worker P	Worker Q
Mean time for completing the job (hours)	33	21
Standard Deviation (hours)	9	7

(i) Regarding the time required to complete the job, which worker is more consistent?

(ii) Which worker seems to be faster in completing the job?

Solution:

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Here, $\bar{p} = 33$, $\bar{q} = 21$, $\sigma_p = 9$, $\sigma_q = 7$

$$\text{C.V. (P)} = 100 \times \frac{\sigma_p}{\bar{p}} = 100 \times \frac{9}{33} = 27.27\%$$

$$\text{C.V. (Q)} = 100 \times \frac{\sigma_q}{\bar{q}} = 100 \times \frac{7}{21} = 33.33\%$$

(i) Since $\text{C.V. (P)} < \text{C.V. (Q)}$, Worker P is more consistent regarding the time required to complete the job. (ii) Since $\bar{p} > \bar{q}$,

i.e., the expected time for completing the job is less for worker Q.

$\therefore$ Worker Q seems to be faster in completing the job.

Question 7.

A company has two departments with 42 and 60 employees respectively. Their average weekly wages are ₹ 750 and ₹ 400. The standard deviations are 8 and 10 respectively.

(i) Which department has a larger bill?

(ii) Which department has larger variability in wages?

Solution:

Let $n_1 = 42$, $n_2 = 60$, $\bar{x}_1 = 750$, $\bar{x}_2 = 400$, $\sigma_1 = 8$, $\sigma_2 = 10$

$$\text{C.V. (1)} = 100 \times \frac{\sigma_1}{\bar{x}_1} = 100 \times \frac{8}{750} = 1.07\%$$

$$\text{C.V. (2)} = 100 \times \frac{\sigma_2}{\bar{x}_2} = 100 \times \frac{10}{400} = 2.5\%$$

(i) Since $\bar{x}_1 > \bar{x}_2$,

i.e., average weekly wages are more for the first department.

$\therefore$ The first department has a larger bill.

(ii) Since $\text{C.V. (1)} < \text{C.V. (2)}$,

second department is less consistent.

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∴ The second department has larger variability in wages.

Question 8.

The following table gives the weights of the students of two classes. Calculate the coefficient of variation of the two distributions. Which series is more variable?

Weight (in kg)	Class A	Class B
30-40	22	13
40-50	16	10
50-60	12	17

Solution:

Let x denote the data of class A and y denote the data of class B.

Calculation of S.D. for class A:

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Weight (in kg) C.I.	Mid value (x_i)	f_i	$f_i x_i$	$f_i x_i^2$
30 – 40	35	22	770	26950
40 – 50	45	16	720	32400
50 – 60	55	12	660	36300
		$N = 50$	$\Sigma f_i x_i = 2150$	$\Sigma f_i x_i^2 = 95650$

$$\bar{x} = \frac{\Sigma f_i x_i}{N} = \frac{2150}{50} = 43$$

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

$$\sigma_x^2 = \frac{95650}{50} - (43)^2 = 1913 - 1849 = 64$$

$$\sigma_x = \sqrt{64} = 8$$

Calculation of S.D. for class B:

Weight (in kg) C.I.	Mid value (y_i)	f_i	$f_i y_i$	$f_i y_i^2$
30 – 40	35	13	455	15925
40 – 50	45	10	450	20250
50 – 60	55	17	935	51425
		$N = 40$	$\Sigma f_i y_i = 1840$	$\Sigma f_i y_i^2 = 87600$

$$\bar{y} = \frac{\Sigma f_i y_i}{N} = \frac{1840}{40} = 46$$

$$\sigma_y^2 = \frac{\Sigma f_i y_i^2}{N} - (\bar{y})^2$$

$$\therefore \sigma_y^2 = \frac{87600}{40} - (46)^2 = 2190 - 2116 = 74$$

$$\therefore \sigma_y = \sqrt{74} = 8.60$$

$$\text{Now, C.V. (X)} = 100 \times \frac{\sigma_x}{\bar{x}} = 100 \times \frac{8}{43} = 18.6\%$$

$$\text{C.V. (Y)} = 100 \times \frac{\sigma_y}{\bar{y}} = 100 \times \frac{8.60}{46} = 18.7\%$$

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Since $C.V. (Y) > C.V.(X)$,

$C.V. (B) > C.V. (A)$

$\therefore$ Series B is more variable.

Question 9.

Compute the coefficient of variation for team A and team B.

No. of goals	0	1	2	3	4
No. of matches played by team A	19	6	5	16	14
No. of matches played by team B	16	14	10	14	16

Which team is more consistent?

Solution:

Let f_1 denote no. of goals of team A and f_2 denote no. of goals of team B.

No. of goals (x_i)	f_{1i}	$f_{1i}x_i$	$f_{1i}x_i^2$
0	19	0	0
1	6	6	6
2	5	10	20
3	16	48	144
4	14	56	224
	$N_1 = 60$	$\Sigma f_{1i}x_i = 120$	$\Sigma f_{1i}x_i^2 = 394$

No. of goals (x_i)	f_{2i}	$f_{2i}x_i$	$f_{2i}x_i^2$
0	16	0	0
1	14	14	14
2	10	20	40
3	14	42	126
4	16	64	256
	$N_2 = 70$	$\Sigma f_{2i}x_i = 140$	$\Sigma f_{2i}x_i^2 = 436$

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$$\bar{x}_1 = \frac{\sum f_{1i} x_i}{N_1} = \frac{120}{60} = 2$$

$$\sigma_{x_1}^2 = \frac{1}{N_1} \sum f_{1i} x_i^2 - (\bar{x}_1)^2 = \frac{394}{60} - 2^2 = 6.5666 - 4 = 2.5666$$

$$\sigma_{x_1} = \sqrt{2.5666} = 1.60$$

$$\text{C.V. of team A} = 100 \times \frac{\sigma_{x_1}}{\bar{x}_1} = 100 \times \frac{1.60}{2} = 80\%$$

$$\bar{x}_2 = \frac{\sum f_{2i} x_i}{N_2} = \frac{140}{70} = 2$$

$$\sigma_{x_2}^2 = \frac{1}{N_2} \sum f_{2i} x_i^2 - (\bar{x}_2)^2 = \frac{436}{70} - 2^2 = 6.2285 - 4 = 2.2285$$

$$\sigma_{x_2} = \sqrt{2.2285} = 1.49$$

$$\text{C.V. of team B} = 100 \times \frac{\sigma_{x_2}}{\bar{x}_2} = 100 \times \frac{1.49}{2} = 74.5\%$$

Since C.V. of team A > C.V. of team B,

Team B is more consistent.

Question 10.

Given below is the information about marks obtained in Mathematics and Statistics by 100 students in a class. Which subject shows the highest variability in marks?

	Mathematics	Statistics
Mean	20	25
S.D.	2	3

Solution:

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Here, $\bar{x}_m = 20$, $\bar{x}_s = 25$, $\sigma_m = 2$, $\sigma_s = 3$

$$\begin{aligned}\text{C.V. (M)} &= 100 \times \frac{\sigma_m}{\bar{x}_m} \\ &= 100 \times \frac{2}{20} = 10\%\end{aligned}$$

$$\text{C.V. (S)} = 100 \times \frac{\sigma_s}{\bar{x}_s} = 100 \times \frac{3}{25} = 12\%$$

Since C.V. (S) > C.V. (M),

The subject statistics show higher variability in marks.



Maharashtra Board Solutions

Class 11 Arts & Science Maths

(Part 1)

- Chapter 1- Angle and its Measurement
- Chapter 2- Trigonometry – I
- Chapter 3- Trigonometry – II
- Chapter 4- Determinants and Matrices
- Chapter 5- Straight Line
- Chapter 6- Circle
- Chapter 7- Conic Sections
- Chapter 8- Measures of Dispersion
- Chapter 9- Probability

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About About Maharashtra State Board (MSBSHSE)

The Maharashtra State Board of Secondary and Higher Secondary Education or MSBSHSE (Marathi: महाराष्ट्र राज्य माध्यमिक आणि उच्च माध्यमिक शिक्षण मंडळ), is an **autonomous and statutory body established in 1965**. The board was amended in the year 1977 under the provisions of the Maharashtra Act No. 41 of 1965.

The Maharashtra State Board of Secondary & Higher Secondary Education (MSBSHSE), Pune is an independent body of the Maharashtra Government. There are more than 1.4 million students that appear in the examination every year. The Maha State Board conducts the board examination twice a year. This board conducts the examination for SSC and HSC.

The Maharashtra government established the Maharashtra State Bureau of Textbook Production and Curriculum Research, also commonly referred to as Ebalbharati, in 1967 to take up the responsibility of providing quality textbooks to students from all classes studying under the Maharashtra State Board. MSBHSE prepares and updates the curriculum to provide holistic development for students. It is designed to tackle the difficulty in understanding the concepts with simple language with simple illustrations. Every year around 10 lakh students are enrolled in schools that are affiliated with the Maharashtra State Board.

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FAQs

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As of now, the MSCERT and Balbharti are responsible for the syllabus and textbooks of Classes 1 to 8, while Classes 9 and 10 are under the Maharashtra State Board of Secondary and Higher Secondary Education (MSBSHSE).

How many state boards are there in Maharashtra?

The Maharashtra State Board of Secondary & Higher Secondary Education, conducts the HSC and SSC Examinations in the state of Maharashtra through its nine Divisional Boards located at Pune, Mumbai, Aurangabad, Nasik, Kolhapur, Amravati, Latur, Nagpur and Ratnagiri.

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