Session 11: Additional Exercise

The marks awarded for an assignment set for a Year 8 class of 20 students were as follows:

6 7 5 7 7 8 7 6 9 7 4 10 6 8 8 9 5 6 4 8

Calculate the mean, median, mode and standard deviation.

Solution:

1. Mean:

Mean = (Σ xi) / n

xi = Each value in the data set
n = Total number of values in the data set

$$\Sigma \text{ of } xi = \frac{6+7+5+7+7+8+7+6+9+7+4+10+6+8+8+9+5+6+4+8}{20} = 6.85$$

The Mean of the given data is 6.85

2. Median:

The **Median** is the "middle" of a sorted list of numbers

Slno	Data
1	4
2	4
3	5
4	5
5	6
6	6
7	6
8	6
9	7
10	7
11	7
12	7
13	7
14	8
15	8
16	8
17	8
18	9
19	9
20	10

Median of the given data set = Sum of middle values / 2

=(7 + 7) / 2 = 6.5

3. Mode:

Mode of the data is the most repeated value in the data set.

Hence, Mode of the given data set = 7 (most repeated value)

4. Standard Deviation:

$$SD = \sqrt{\frac{\sum(x-\bar{x})^2}{n}}$$

Where :

SD = Standard Deviation

x = each value in the data set

$\bar{x}$ = Mean is the data set

n = number of values in the data set

x	$\bar{x}$	$x - \bar{x}$	$\lvert x - \bar{x}\rvert^2$
4	6.85	2.85	8.1225
4	6.85	2.85	8.1225
5	6.85	1.85	3.4225
5	6.85	1.85	3.4225
6	6.85	0.85	0.7225
6	6.85	0.85	0.7225
6	6.85	0.85	0.7225
6	6.85	0.85	0.7225
7	6.85	-0.15	0.0225
7	6.85	-0.15	0.0225
7	6.85	-0.15	0.0225
7	6.85	-0.15	0.0225
7	6.85	-0.15	0.0225
8	6.85	-1.15	1.3225
8	6.85	-1.15	1.3225
8	6.85	-1.15	1.3225
8	6.85	-1.15	1.3225
9	6.85	-2.15	4.6225
9	6.85	-2.15	4.6225
10	6.85	-3.15	9.9225
		$\sum \lvert x - \bar{x}\rvert^2$	50.55

∴ Standard Deviation = 50.55 /20 = √2.5275 = 1.5898

Problem Statement 2 :

The number of calls from motorists per day for roadside service was recorded for a particular month:

28, 122, 217, 130, 120, 86, 80, 90, 140, 120, 70, 40, 145, 113, 90, 68, 174, 194, 170, 100, 75, 104, 97, 75, 123, 100, 75, 104, 97, 75, 123, 100, 89, 120, 109

Calculate the mean, median, mode and standard deviation

Solution:

1. Mean:

Mean = (Σ xi) / n

xi = Each value in the data set
n = Total number of values in the data set

∑xi = 3763

n = 35

∴ 3763 / 35 = 107. 51

2. Median:

{(n + 1) ÷ 2}th element

n = 35

∴ n+1 = 35+1 = 36
∴ {(n + 1) ÷ 2}th element = 36/ 2 = 18 = 100 from the below table

Sl. No.	
1	28
2	40
3	68
4	70
5	75
6	75
7	75
8	75
9	80

10	86
11	89
12	90
13	90
14	97
15	97
16	100
17	100
18	100
19	104
20	104
21	109
22	113
23	120
24	120
25	120
26	122
27	123
28	123
29	130
30	140
31	145
32	170
33	174
34	194
35	217

3. Mode:

Mode of the data is the most repeated value in the data set.

∴ Mode of the given data set = 75 (most repeated value)

4. Standard Deviation:

$$\mathrm{SD} = \sqrt{\frac{\sum |x - \bar{x}|^2}{n}}$$

Where :

SD = Standard Deviation

x = each value in the data set

$\bar{x}$ = Mean is the data set

n = number of values in the data set

Sl. No.	x	$\bar{x}$	$x - \bar{x}$	$\lvert x - \bar{x} \rvert^2$
1	28	100	-72	5184
2	40	100	-60	3600
3	68	100	-32	1024
4	70	100	-30	900
5	75	100	-25	625
6	75	100	-25	625
7	75	100	-25	625
8	75	100	-25	625
9	80	100	-20	400
10	86	100	-14	196
11	89	100	-11	121
12	90	100	-10	100
13	90	100	-10	100
14	97	100	-3	9
15	97	100	-3	9
16	100	100	0	0
17	100	100	0	0
18	100	100	0	0
19	104	100	4	16
20	104	100	4	16
21	109	100	9	81
22	113	100	13	169
23	120	100	20	400
24	120	100	20	400
25	120	100	20	400
26	122	100	22	484
27	123	100	23	529
28	123	100	23	529
29	130	100	30	900
30	140	100	40	1600
31	145	100	45	2025
32	170	100	70	4900
33	174	100	74	5476
34	194	100	94	8836
35	217	100	117	13689
			$\sum \lvert x - \bar{x} \rvert^2$	54593

∴ Standard Deviation = 54593 /35 = √1559.8 = 39.4943

Problem Statement 3:

The number of times I go to the gym in weekdays, are given below along with its associated probability:

x = 0, 1, 2, 3, 4, 5

f(x) = 0.09, 0.15, 0.40, 0.25, 0.10, 0.01

Calculate the mean no. of workouts in a week. Also evaluate the variance involved in it.

Solution:

Expected Mean of the Work outs:

Let us call x as No. of Work outs in a week

P(x) is given as - f(x) = 0.09, 0.15, 0.40, 0.25, 0.10, 0.01

Calculation of Expected mean number of workouts in a week = Weighted average of the workouts and the probability.

i.e., Expected mean of work outs (E) = E(x) :

x	Probability f(x)	Weighted sum of probability
0	0.09	0.00
1	0.15	0.15
2	0.40	0.80
3	0.25	0.75
4	0.10	0.40
5	0.01	0.05
Mean work out E(x)		**2.15**

Variance:

x	Probability f(x)	Weighted sum of probability	x-μ	$(x-\mu)2$	$(x-\mu)2 * p(x)$
0	0.09	0.00	-2.15	4.6225	0.416025
1	0.15	0.15	-1.15	1.3225	0.198375
2	0.40	0.80	-0.15	0.0225	0.009
3	0.25	0.75	0.85	0.7225	0.180625
4	0.10	0.40	1.85	3.4225	0.34225
5	0.01	0.05	2.85	8.1225	0.081225
Mean work out		2.15			1.2275
Variance value					1.10792599