**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

Σ of xi = 6+7+5+7+7+8+7+6+9+7+4+10+6+8+8+9+5+6+4+8 = 6.85

20

**The Mean of the given data is 6.85**

1. **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**

1. **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)

1. **Standard Deviation:**

**SD = √∑(x-)2**

**n**

**Where :**

SD = Standard Deviation

https://lh3.googleusercontent.com/2HoE3bnlU1bMTeEjZuCn0Ep2od-gVpwj3hd9ndMQ0CbdtGScytqmxbvQyHsH-65UoB2CVcA-1-avlcUHh3nM4_ZPq7eS6TyIHFXJv4d5peHaGb6vL8Qql9Dx487LlSZV8sPVcTSU = each value in the data set

https://lh6.googleusercontent.com/spMH8lBlE0tvB3VH5UG6G-U3P9TU1wpO90oCXBR49EeTCx4s2JN21JmHiGnZMfKBgpC6-tXnpW4AfWjB_lUGBrCsj1QlJObjCKgy8uj3YSgZvCEPNTYldiMZ29IfPGZAAnGi9EWW = Mean is the data set

n = number of values in the data set

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| |  | | --- | | https://lh3.googleusercontent.com/2HoE3bnlU1bMTeEjZuCn0Ep2od-gVpwj3hd9ndMQ0CbdtGScytqmxbvQyHsH-65UoB2CVcA-1-avlcUHh3nM4_ZPq7eS6TyIHFXJv4d5peHaGb6vL8Qql9Dx487LlSZV8sPVcTSU | | |  | | --- | | https://lh6.googleusercontent.com/spMH8lBlE0tvB3VH5UG6G-U3P9TU1wpO90oCXBR49EeTCx4s2JN21JmHiGnZMfKBgpC6-tXnpW4AfWjB_lUGBrCsj1QlJObjCKgy8uj3YSgZvCEPNTYldiMZ29IfPGZAAnGi9EWW | | |  | | --- | | https://lh6.googleusercontent.com/spMH8lBlE0tvB3VH5UG6G-U3P9TU1wpO90oCXBR49EeTCx4s2JN21JmHiGnZMfKBgpC6-tXnpW4AfWjB_lUGBrCsj1QlJObjCKgy8uj3YSgZvCEPNTYldiMZ29IfPGZAAnGi9EWWhttps://lh3.googleusercontent.com/2HoE3bnlU1bMTeEjZuCn0Ep2od-gVpwj3hd9ndMQ0CbdtGScytqmxbvQyHsH-65UoB2CVcA-1-avlcUHh3nM4_ZPq7eS6TyIHFXJv4d5peHaGb6vL8Qql9Dx487LlSZV8sPVcTSU**-** | | Image result for standard deviation formula   |  | | --- | |  | |
| 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 |
|  |  | Image result for standard deviation formula | 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**

1. **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

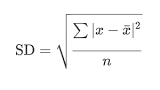
|  |  |  |
| --- | --- | --- |
| Sl. No. | https://lh3.googleusercontent.com/2HoE3bnlU1bMTeEjZuCn0Ep2od-gVpwj3hd9ndMQ0CbdtGScytqmxbvQyHsH-65UoB2CVcA-1-avlcUHh3nM4_ZPq7eS6TyIHFXJv4d5peHaGb6vL8Qql9Dx487LlSZV8sPVcTSU   |  | | --- | |  | |
| 1 | 28 |
| 2 | 40 |
| 3 | 68 |
| 4 | 70 |
| 5 | 75 |
| 6 | 75 |
| 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 |

1. **Mode:**

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

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

1. **Standard Deviation:**

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**Where :**

SD = Standard Deviation

https://lh3.googleusercontent.com/2HoE3bnlU1bMTeEjZuCn0Ep2od-gVpwj3hd9ndMQ0CbdtGScytqmxbvQyHsH-65UoB2CVcA-1-avlcUHh3nM4_ZPq7eS6TyIHFXJv4d5peHaGb6vL8Qql9Dx487LlSZV8sPVcTSU = each value in the data set

https://lh6.googleusercontent.com/spMH8lBlE0tvB3VH5UG6G-U3P9TU1wpO90oCXBR49EeTCx4s2JN21JmHiGnZMfKBgpC6-tXnpW4AfWjB_lUGBrCsj1QlJObjCKgy8uj3YSgZvCEPNTYldiMZ29IfPGZAAnGi9EWW = Mean is the data set

n = number of values in the data set

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl. No.** | https://lh3.googleusercontent.com/2HoE3bnlU1bMTeEjZuCn0Ep2od-gVpwj3hd9ndMQ0CbdtGScytqmxbvQyHsH-65UoB2CVcA-1-avlcUHh3nM4_ZPq7eS6TyIHFXJv4d5peHaGb6vL8Qql9Dx487LlSZV8sPVcTSU   |  | | --- | |  | | https://lh6.googleusercontent.com/spMH8lBlE0tvB3VH5UG6G-U3P9TU1wpO90oCXBR49EeTCx4s2JN21JmHiGnZMfKBgpC6-tXnpW4AfWjB_lUGBrCsj1QlJObjCKgy8uj3YSgZvCEPNTYldiMZ29IfPGZAAnGi9EWW   |  | | --- | |  | | https://lh3.googleusercontent.com/2HoE3bnlU1bMTeEjZuCn0Ep2od-gVpwj3hd9ndMQ0CbdtGScytqmxbvQyHsH-65UoB2CVcA-1-avlcUHh3nM4_ZPq7eS6TyIHFXJv4d5peHaGb6vL8Qql9Dx487LlSZV8sPVcTSUhttps://lh6.googleusercontent.com/spMH8lBlE0tvB3VH5UG6G-U3P9TU1wpO90oCXBR49EeTCx4s2JN21JmHiGnZMfKBgpC6-tXnpW4AfWjB_lUGBrCsj1QlJObjCKgy8uj3YSgZvCEPNTYldiMZ29IfPGZAAnGi9EWW   |  | | --- | | - | | Image result for standard deviation formula   |  | | --- | |  | |
| 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 |
|  |  |  | Image result for standard deviation formula   |  | | --- | |  | | 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 asNo. 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- | x | x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 |