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★ Netzwerk Academy :-

★ MATHEMATICS STATICS :-

Measure of Central Tendency :- (~~केन्द्रीय प्रवृत्ति~~)

* The Central Tendancy is stated as the statical measure that represents the single value of the entire distribution of a dataset.

* Through the single value from the dataset it reflects the center of the data distribution.

* The Central Tendency of the dataset can be found out using the three important measures namely mean, median and mode.

→ The mean, median, and mode are techniques that are often used in machine learning.

* Mean :- The average value.

* Median :- The mid point value.

* Mode :- The most Common value.

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Ex.

mean- 9, 3, 1, 8, 3, 6

$$\text{mean} = \frac{9+3+1+8+3+6}{6} = \frac{30}{6} = 5$$

median- first of all we have to arrange it in either ascending order or descending order.

if even value → median = 1, 3, 3, 6, 8, 9 | n = 6 even

$$= \frac{3+6}{2} = 4.5$$

if odd value → 1, 3, 6, 8, 9 | n = 5 odd

median = 6

formula :-

if n = even

$$\frac{\left(\frac{n}{2}\right)^{th} + \left(\frac{n}{2}+1\right)^{th}}{2}$$

Ex. 1, 3, 3, 6, 8, 9 n = 6

$$\frac{\left(\frac{6}{2}\right)^{th} + \left(\frac{6}{2}+1\right)^{th}}{2} = \frac{3+6}{}$$

$\frac{3+6}{2} = 4.5$ median

if n = odd

Ex. 1, 3, 6, 8, 9 n = 5

$\left(\frac{n+1}{2}\right)^{th}$ term

$\left(\frac{5+1}{2}\right)^{th} = 3^{rd}$ term = 6

Mode :- 9, 3, 1, 8, 3, 6

So mode = 3
because 3 is occur maximum time in the data set.

~~Example~~ :-

★ mean :- The mean value is the average value.

- To Calculate the mean, find the sum of all values, and divide the sum by the number of values :-

Ex. $\frac{78+77+99+86+87+88+111+86+103+87+94+85+86}{13} = 89.7$

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★ **Median**:- The median value is the value in the middle, after you have sorted all the values.

→ 77, 78, 85, 86, 86, 86, 87, 87, 88, 94, 99, 103, 111

↳ you have to arrange in either ascending or descending order.

$n = 13$ (odd)

$\left(\frac{n+1}{2}\right)^{th}$ term $\quad \left(\frac{13+1}{2}\right) = 7^{th}$ term

7^{th} term $= 87$ Ans

formula:-

n is odd

$$\text{median} = \left(\frac{n+1}{2}\right)^{th} \text{ observation}$$

n is even

$$\text{median} = \frac{\left(\frac{n}{2}\right)^{th} + \left(\frac{n}{2}+1\right)^{th}}{2} \text{ observation}$$

★ **Mode**:- The mode value is the value that appears the most number of times.

Ex. 99, 86, 87, 88, 111, 86, 103, 87, 94, 78, 77, 85, 86, = 86

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★ What is standard Deviation:

→ standard deviation is a number that describes how spread out the values are.

→ A low standard deviation means that most of the numbers are close to the mean (average) value.

→ A high standard deviation means that values are spread out over a wider range.

→ Example: This time we have register the speed of 7 cars:

- Speed - [86, 87, 88, 86, 87, 85, 86]

The standard deviation = 0.9 (low value)

Meaning that most of the values are within the range of 0.9 from the mean value, ~~with~~ which is 86.4.

Example: Let us do the same with a selection of numbers with wider range.

Speed = [32, 111, 138, 28, 59, 77, 97]

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The standard deviation is = 37.85 (high value)

- meaning that most of the values are within the range of 37.85 from the mean value, which is 77.4
- As you can see, a higher standard deviation indicates that the values are spread out over a wider range.

★ **Variance** :- Variance is another number that indicates how spread out the value are.

$$\text{Variance} = (\text{Standard deviation})^2$$

$$\text{Standard deviation} = \sqrt{\text{Variance}}$$

$$(SD)\ \sigma = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2}$$

sigma

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

Where
n = Total number of Data points
$\bar{x}$ = mean value
x_i = each Data point

N- Population Data
μ - Population Mean

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* How to Calculate the Variance:

① find the mean:

② for each value: find the difference from the mean:

③ for each Diff: find the square value:

④ The variance is the average number of these squred differences.

* How to Calculate Standard deviation:

→ standard deviation = $\sqrt{\text{variance}}$

* Population & Sample:

→ Everything in the group that we want to learn about is called Population.

→ A part of the population is Sample.

→ Sample is representative of Population.

Ex.

	Population	Sample
→	All of the IT Companies	50 IT Companies
→	All of the stocks	30 stocks

→ The number of items in a sample is called Sample Size.

Population Mean (μ)

$$\mu = \frac{\sum_{i=1}^{N} x_i}{N}$$

Where

N = number of item in the population

Sample mean

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

n = number of item in the sample.

★ Find mean, median, mode and SD for each data set :

Q.1 7, 11, 16, 14, 11, 13, 19, 13, 13

- mean = $\frac{7+11+16+14+11+13+19+13+13}{9}$

mean = 13

- mode = 7, 11, 16, 14, 11, 13, 19, 13, 13

mode = 13 (13 occur most Times)

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ascending order

- Median = 7, 11, 11, 13, 13, 13, 14, 16, 19
  → Centre value

$n = 9$ (odd)

So

formula → $\left(\frac{n+1}{2}\right)^{th}$ term $= \left(\frac{9+1}{2}\right)^{th}$ term $= 5^{th}$ term

5^{th} term $= 13$

- Standard deviation:- So we calculate

mean = 13

$7 - 13 = -6$	$(-6)^2 = -36$	$+36$
$11 - 13 = -2$	$(-2)^2 = -4$	$+4$
$11 - 13 = -2$	$(-2)^2 = -4$	$+4$
$13 - 13 = 0$	$(0)^2 = 0$	0
$13 - 13 = 0$	$(0)^2 = 0$	0
$13 - 13 = 0$	$(0)^2 = 0$	0
$14 - 13 = 1$	$(1)^2 = 1$	$+1$
$16 - 13 = 3$	$(3)^2 = 9$	$+9$
$19 - 13 = 6$	$(6)^2 = 36$	$+36$

→ adding = 90

$\text{Variance} = \frac{90}{9} = 10$

$SD = \sqrt{\text{Variance}}$

So standard deviation $= \sqrt{10}$

$SD = 3.1622$

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Q.2. 16, 15, 16, 17, 19, 12, 14, 9

- mean = 14.75
- Mode = 16 (max times)
→ Median = n = 8 (even)

formula = $\frac{(\frac{n}{2})^{th} + (\frac{n}{2}+1)^{th}}{2}$ observation

$\frac{(\frac{8}{2})^{th} + (\frac{8}{2}+1)^{th}}{2} = \frac{4^{th}+5^{th}}{2}$

arrange 9, 12, 14, 15, 16, 16, 17, 19

$\frac{15+16}{2} = 15.5$ (median)

→ SD (σ) = $\sqrt{\frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2}$

$\frac{1}{8}(9-14.75)^2 = 4.13$

$\frac{1}{8}(12-14.75)^2 = 0.94$

$\frac{1}{8}(14-14.75)^2 = 0.070$

$\frac{1}{8}(15-14.75)^2 = 0.0078$

$\frac{1}{8}(16-14.75)^2 = 0.195$

$\frac{1}{8}(16-14.75)^2 = 0.195$

$\frac{1}{8}(17-14.75)^2 = 0.632$

$\frac{1}{8}(19-14.75)^2 = 2.257$

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- Sum of all the values = 8.4268 → Variance

$\sigma = \sqrt{8.4268}$

SD $\sigma = 2.90$

Q.3 27, 66, 24, 81, 50, 40, 74, 81, 97

mean = $\frac{540}{9} = 60$

~~median~~ = mode = 81

median = $n = 9$ (odd)

formula = $\left(\frac{n+1}{2}\right)^{th}$ obs. $= \frac{9+1}{2} = 5^{th}$ term

ascending 24, 27, 40, 50, 66, 74, 81, 81, 97

5^{th} term = 66 (median)

$$SD = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2}$$

$$\sqrt{\frac{1296 + 1089 + 400 + 100 + 36 + 196 + 441 + 441 + 1369}{9}}$$

$SD = \sqrt{596.44}$

$SD = 24.42$