ASSIGNMENT QUESTION - 3

If µ= 55, σ_{4a}= 4, $\sigma_{4\beta}$=10, σ_4=c 15, In this which is better

Overview of the Problem

In statistics, data analysis helps us understand the behavior and characteristics of different datasets. Two important measures used in this process are mean and standard deviation. The mean represents the central or average value of a dataset, while standard deviation indicates how much the values differ from this average.

In many practical situations, different datasets may have the same mean value but different levels of variation. In such cases, standard deviation plays a major role in determining which dataset is more reliable and consistent.

In this assignment, three datasets with the same mean but different standard deviations are compared to identify the better dataset.

Given Data:

- Mean (µ) = 55

- Standard Deviation of Dataset A (σ_a) = 4

- Standard Deviation of Dataset B (σ_β) = 10

- Standard Deviation of Dataset C (σ_c) = 15

The main objective is to analyze these values and determine which dataset shows better consistency.

Understanding Mean and Standard Deviation

Mean (µ)

The mean is the average value of all observations in a dataset. It represents the central value around which data points are distributed.

In this case:

- All three datasets have the same mean value (55).

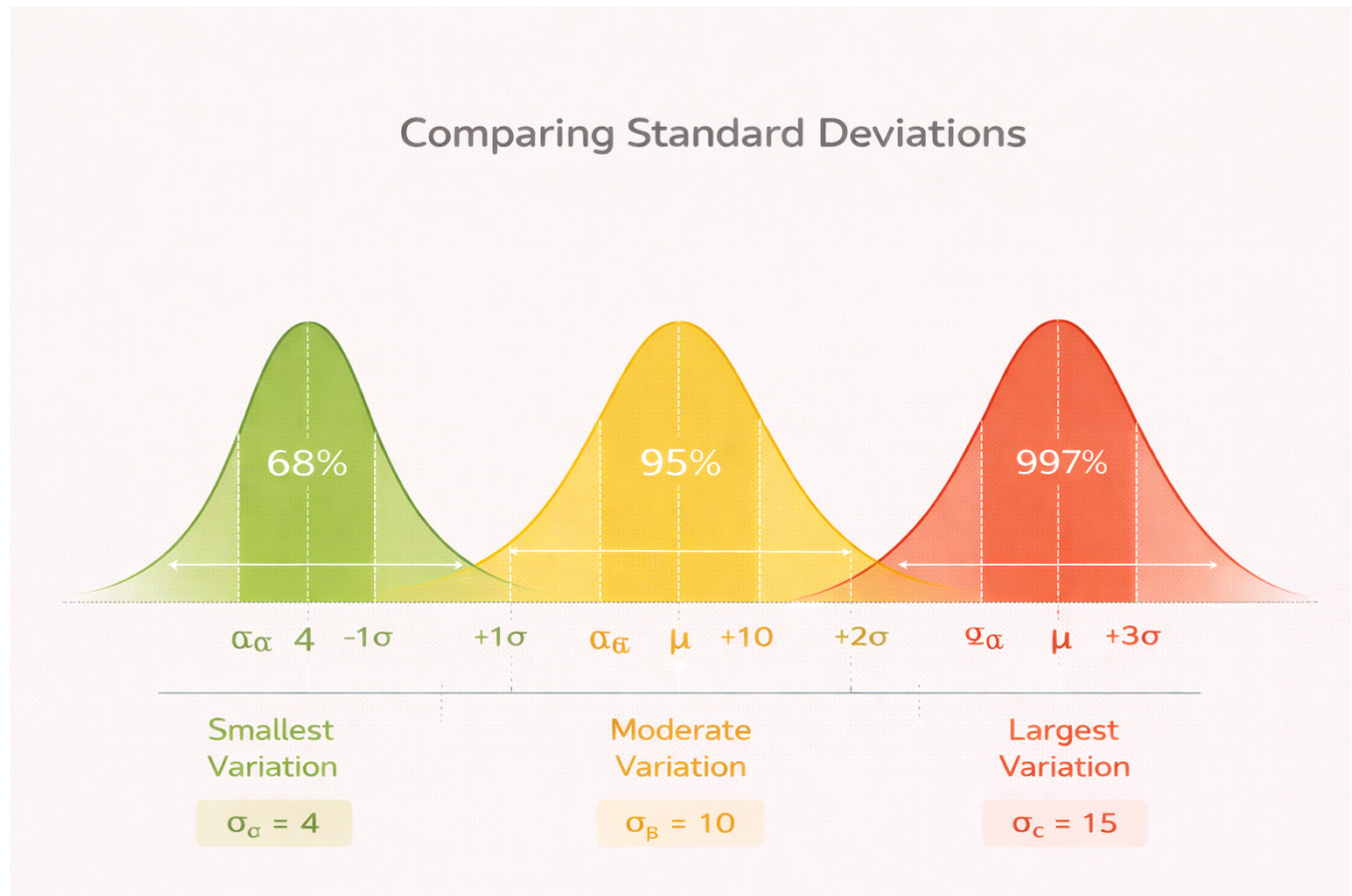- This means the average performance or central value is equal for all datasets.

Standard Deviation (σ)

Standard deviation measures the spread or dispersion of data values from the mean.

Key Points

- **Small standard deviation** → data values are close to the mean → more consistency.

- **Large standard deviation** → data values are widely spread → less consistency.

Therefore, when comparing datasets with the same mean, the dataset with the smallest standard deviation is considered better because it shows greater reliability and stability.

Comparison of Given Standard Deviations

Case 1: $\sigma_a = 4$

- Very small variation from the mean.

- Data values are closely concentrated around 55.

- Indicates high consistency and reliability.

Range Using Empirical Rule ($\mu \pm \sigma$)

$55 \pm 4 = 51$ to 59

Most values lie in a narrow range.

Case 2: $\sigma_\beta = 10$

- Moderate variation from the mean.
- Data values are more spread out compared to σ_a.
- Less consistent than the first dataset.

Range

$55 \pm 10 = 45$ to 65

Case 3: $\sigma_c = 15$

- Large variation from the mean.
- Data values are widely spread.
- Indicates low consistency and higher uncertainty.

Range

$55 \pm 15 = 40$ to 70

Determining the Better Dataset

Since all datasets have the same mean (55), the comparison depends on consistency and variation.

Dataset	Standard Deviation	Interpretation
σ_a	4	Highest consistency (Best)
σ_β	10	Moderate consistency
σ_c	15	Lowest consistency

The dataset with $\sigma_a = 4$ is better because it has the smallest standard deviation and shows minimum variation from the mean.

Importance of Smaller Standard Deviation

A smaller standard deviation is preferred because:

- It indicates stable and reliable data.

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- Values are close to the average.

- Predictability is higher.

- Error or uncertainty is minimal.

This concept is widely used in quality control, performance analysis, and statistical decision-making.

Final Remarks (Conclusion)

In this assignment, three datasets with the same mean value of 55 were compared using their standard deviations. Although their average values are equal, their variability differs significantly.

Dataset A has the smallest standard deviation (4), which indicates that its values are closely grouped around the mean. This makes it the most stable and reliable dataset. Dataset B shows moderate variation, while Dataset C shows maximum dispersion.

From the above analysis, it is clear that Dataset A is the best among the three. When the mean remains constant, lower standard deviation becomes the deciding factor. Therefore, $\sigma_a = 4$ represents the most dependable dataset.

Understanding standard deviation helps in selecting reliable data and supports better decision-making in statistical analysis.