

ASSIGNMENT QUESTION-3

3.If $\mu = 55$, $\sigma_1 = 4$, $\sigma_2 = 10$, $\sigma_3 = 15$, In this which is better?

We are given:

- Mean (μ) = 55
- Standard deviations:
 - $\sigma_1 = 4$
 - $\sigma_2 = 10$
 - $\sigma_3 = 15$

We need to determine **which case is better**.

1. Understanding the Mean ($\mu = 55$)

The mean represents the average value of the dataset.

In all three cases, the mean is the same (55).

This means the central value or midpoint of the data is identical for all situations.
So, comparison depends only on the standard deviation.

2. Understanding Standard Deviation

Standard deviation (σ) measures:

- How much the data values spread out from the mean.
- How scattered or consistent the data is.

Small Standard Deviation

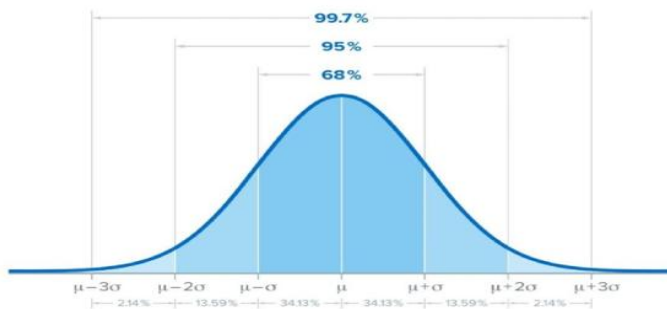
- Data points are close to the mean
- Less variation
- More consistency
- More reliability

Large Standard Deviation

- Data points are far from the mean
- More spread
- Less consistency
- Less stability

Applying to Given Values

| Standard Deviation | Spread of Data | Interpretation |
|--------------------|-------------------|--------------------|
| $\sigma = 4$ | Very small spread | Highly consistent |
| $\sigma = 10$ | Moderate spread | Moderate variation |
| $\sigma = 15$ | Large spread | Highly scattered |



Graphical Interpretation (Conceptually)

If you draw a normal distribution curve:

- For $\sigma = 4 \rightarrow$ Curve is narrow and tall \rightarrow Data tightly clustered around 55
- For $\sigma = 10 \rightarrow$ Curve is wider
- For $\sigma = 15 \rightarrow$ Curve is very wide and flat \rightarrow Data widely spread

The narrower the curve, the more precise and stable the data.

Which Is Better?

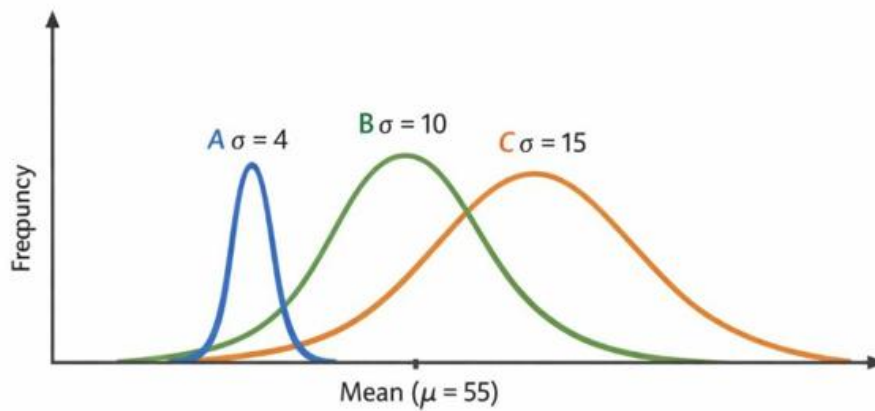
Since the mean is the same (55), we compare only dispersion.

$\sigma = 4$ is better because:

- It has the smallest variation
- Data values are closer to the mean
- It shows higher consistency and reliability

$\sigma = 15$ is the worst because it has the highest variation.

Comparison of Normal Distribution with Same Mean



Final Conclusion

From the given data, the mean value is constant at $\mu = 55$, which indicates that the central tendency of all three datasets is the same. Therefore, the comparison depends only on the standard deviation, which measures the degree of dispersion or spread of the data around the mean.

Among the given standard deviations ($\sigma = 4$, $\sigma = 10$, and $\sigma = 15$), $\sigma = 4$ has the smallest value. A smaller standard deviation indicates that the data points are closely clustered around the mean, showing less variation and greater consistency. This makes the dataset more stable, reliable, and predictable.

In contrast, $\sigma = 10$ shows moderate dispersion, and $\sigma = 15$ shows the highest dispersion, meaning the data values are widely spread from the mean and less consistent.

Therefore, the dataset with $\sigma = 4$ is considered better because it provides minimum variability and maximum uniformity around the mean value of 55.