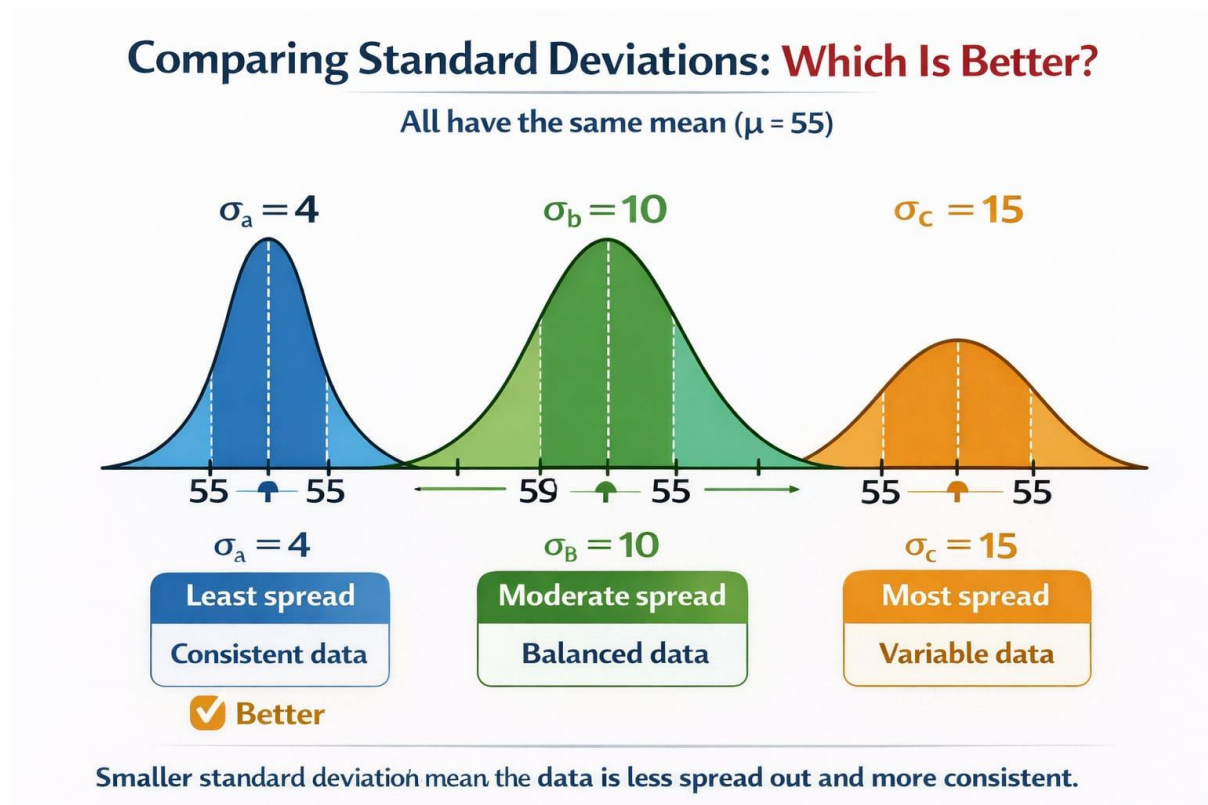


INDIVIDUAL TASK-3

If $\mu = 55$, $\sigma_a = 4$, $\sigma_b = 10$, $\sigma_c = 15$, In this which is better ?



You are given:

Mean (μ) = 55

$\sigma_a = 4$

$\sigma_b = 10$

$\sigma_c = 15$

All three distributions have the same mean (55) but different standard deviations.

What Does Standard Deviation Tell Us?

Standard deviation (σ) measures how spread out the data is around the mean.

Small $\sigma \rightarrow$ Data is close to the mean (more consistent).

Large $\sigma \rightarrow$ Data is widely spread (less consistent).

Explanation of Each Case

1 When $\sigma = 4$

Very small spread.

Most values are very close to 55.

Distribution is tall and narrow.

Data is more stable and consistent.

2 When $\sigma = 10$

Moderate spread.

Values are reasonably spread around 55.

Balanced variation.

3 When $\sigma = 15$

Large spread.

Values are far from the mean.

Distribution is wide and flat.

More variability and less consistency.

Which is Better?

If we want:

More consistency

Less variation

More reliability

Then:

✓ $\sigma = 4$ is better

Because smaller standard deviation means data points are closer to the mean.

Understanding the Situation :

All three distributions have the same mean (55), but different standard deviations.

Standard deviation (σ) tells us how spread out the data is:

Smaller $\sigma \rightarrow$ Data is tightly clustered around the mean.

Larger $\sigma \rightarrow$ Data is more spread out.

Comparison

1 $\sigma = 4$

Very small spread.

Data is closely packed around 55.

More consistency.

Curve is tall and narrow.

2 $\sigma = 10$

Moderate spread.

Data moderately dispersed.

Balanced variation.

Detailed Explanation ($\mu = 55$, $\sigma = 4, 10, 15$)

All three distributions have the same mean ($\mu = 55$).

This means the center of all three graphs is the same.

The only difference is the standard deviation (σ), which measures how spread out the data is.

1 When $\sigma = 4$ (Small Spread)

Data is very close to 55.

Curve is tall and narrow.

Most values lie near the mean.

Very little variation.

High consistency and reliability.

Example:

If these were exam scores, most students would score very close to 55 (between 51 and 59).

👉 This shows stable and controlled data.

2 When $\sigma = 10$ (Moderate Spread)

Data is moderately spread around 55.

Curve is wider than $\sigma = 4$.

More variation compared to $\sigma = 4$.

Balanced distribution.

Example:

Students' scores may range more widely (45 to 65 for $\pm 1\sigma$).

👉 This shows average variability.

3 When $\sigma = 15$ (Large Spread)

Data is widely spread.

Curve is short and very wide.

High variability.

Less consistency.

Example:

Students' scores could vary greatly (40 to 70 for $\pm 1\sigma$).

👉 This shows unstable or highly variable data.

Key Concept

Standard Deviation tells us about consistency:

Smaller $\sigma \rightarrow$ Less spread \rightarrow More consistent

Larger $\sigma \rightarrow$ More spread \rightarrow Less consistent

Which Is Better?

If the goal is:

Consistency

Reliability

Less variation

Stable performance

✅ $\sigma = 4$ is better

Because the data points are closer to the mean.

Important Note

"Better" depends on the situation:

In quality control → Smaller σ is better.

In research needing diversity → Larger σ may be acceptable.

In machine learning → Lower variance often means more stability.

Final Conclusion

Since all have the same mean (55):

$\sigma = 4$ → Most consistent (Best choice in most cases)

$\sigma = 10$ → Moderate variation

$\sigma = 15$ → Most variation

Therefore, $\sigma = 4$ is generally better because it shows less spread and more stability.

Conclusion :

When the mean ($\mu = 55$) is the same for all three cases, the difference depends on the standard deviation (σ).

$\sigma = 4$ → Least spread, more consistency, more stability

$\sigma = 10$ → Moderate spread

$\sigma = 15$ → High spread, more variability

Since smaller standard deviation means the data values are closer to the mean and more reliable,

✅ $\sigma = 4$ is generally the better option because it shows less variation and more consistency.

