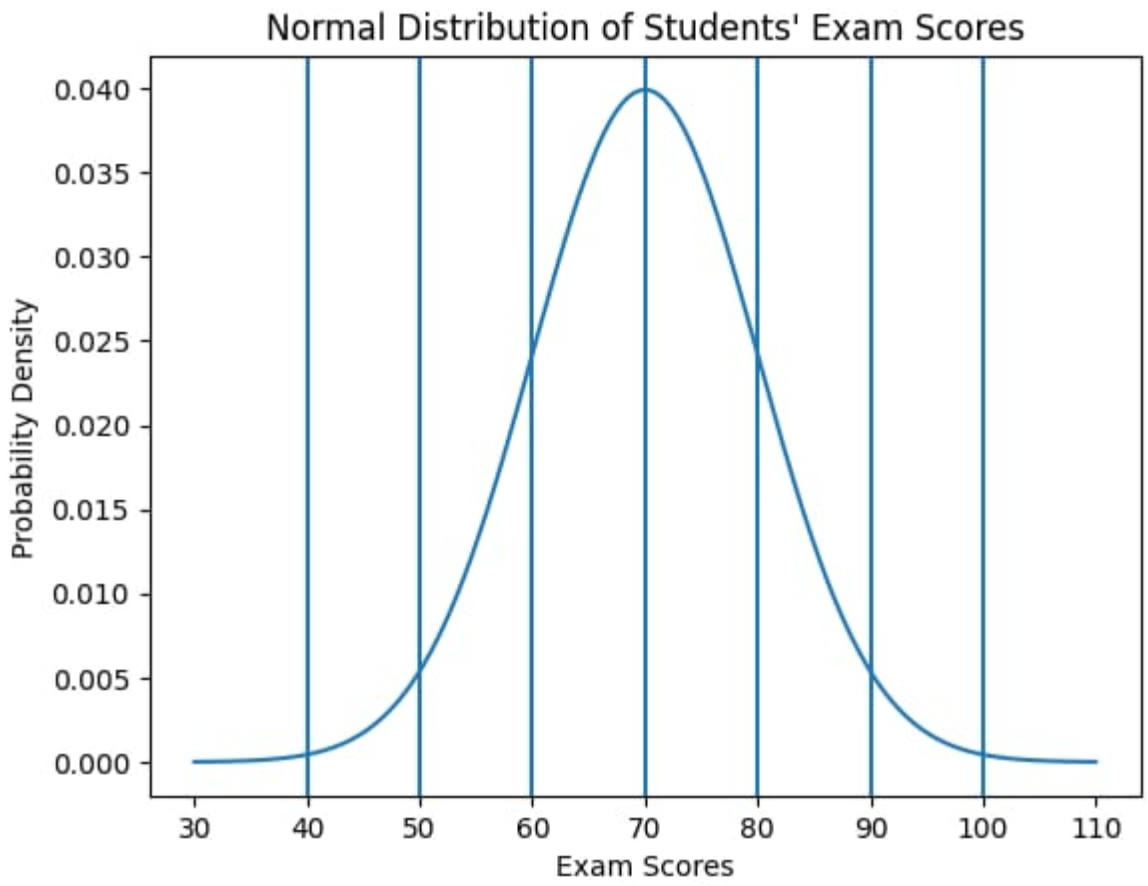
INDIVIDUAL TASK 2

Take one Domain and draw the graph (Normal distribution) (Empirical rule)



Domain: Students' Exam Scores (Normal Distribution)

In this example:

Mean (μ) = 70

Standard Deviation (σ) = 10

Empirical Rule (68–95–99.7 Rule)

For a normal distribution:

68% of data lies between μ ± 1σ → 60 to 80

95% of data lies between μ ± 2σ → 50 to 90

99.7% of data lies between μ ± 3σ → 40 to 100

The graph shows a bell-shaped curve (normal distribution) where:

Most students score near the average (70).

Fewer students score very low or very high.

Data is symmetrically distributed around the mean.

This demonstrates the Empirical Rule, which helps understand how data is spread in a normal distribution.

Explanation: Normal Distribution & Empirical Rule :

Domain: Students' Exam Scores

Imagine we are analyzing students' exam scores.

The average (mean, μ) score = 70

The standard deviation (σ) = 10

When the data follows a normal distribution, it forms a bell-shaped curve:

Most students score near the average.

Fewer students score very low or very high.

The graph is symmetric around the mean.

What the Graph Shows

The center of the curve (highest point) is 70, which is the mean.

As we move away from 70:

The height of the curve decreases.

This means fewer students get extremely high or extremely low scores.

Empirical Rule (68–95–99.7 Rule)

This rule explains how data is spread in a normal distribution.

1️⃣ 68% Rule (μ ± 1σ)

68% of students score between:

70 − 10 = 60

70 + 10 = 80

Most students score between 60 and 80.

2️⃣ 95% Rule (μ ± 2σ)

95% of students score between:

70 − 20 = 50

70 + 20 = 90

Almost all students score between 50 and 90.

3️⃣ 99.7% Rule (μ ± 3σ)

99.7% of students score between:

70 − 30 = 40

70 + 30 = 100

Nearly every student scores between 40 and 100.

Why It Is Important :

Helps understand data distribution.

Shows how spread out the data is.

Used in statistics, machine learning, and quality control.

Helps identify outliers (values outside 3σ).

Final Understanding :

In a normal distribution:

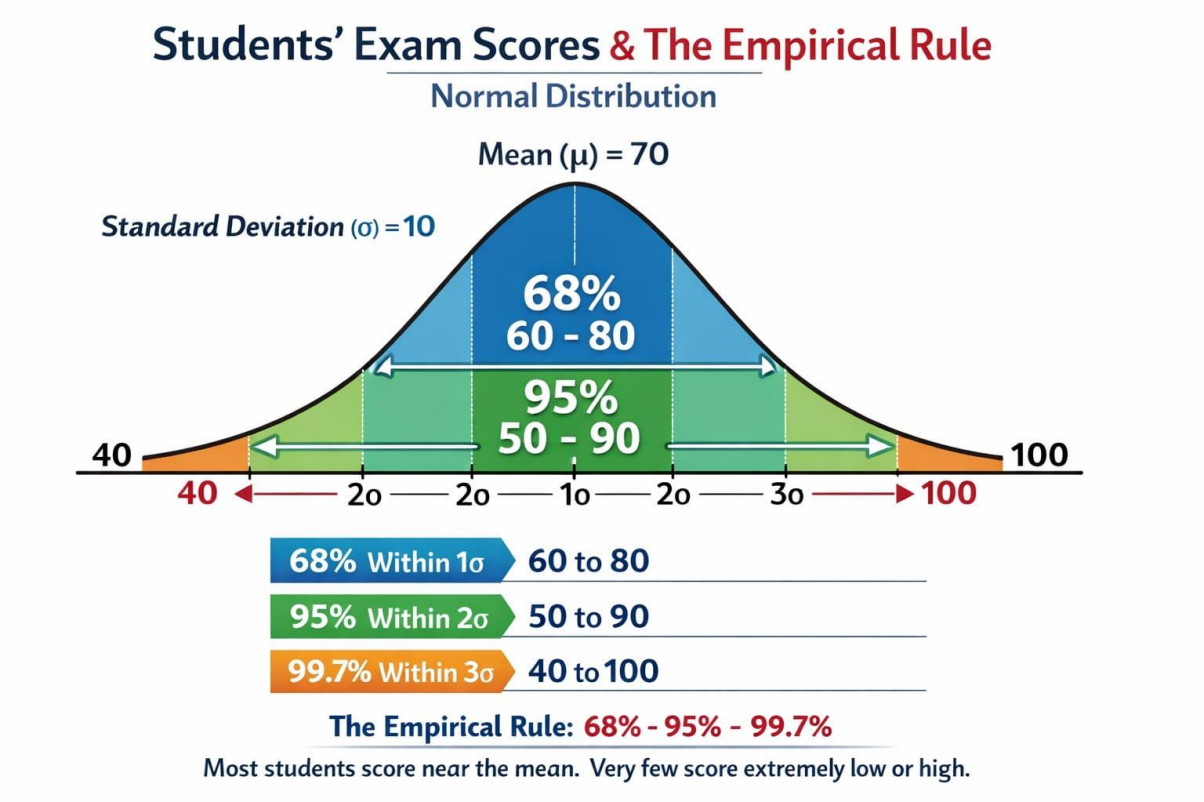
1 Data is centered around the mean.

2 Most values are close to the average.

Very extreme values are rare.

The Empirical Rule helps quickly estimate data spread.

This is why the normal distribution is very important in statistics and real-world data analysis.



What is Normal Distribution?

A normal distribution is a continuous probability distribution that:

Is bell-shaped

Is symmetric around the mean

Has mean = median = mode

Has tails that extend infinitely but never touch the axis

It is also called a Gaussian distribution.

2 Important Properties of Normal Distribution

✓ Symmetry

Left side = Right side

Equal probability on both sides of the mean.

✓ Mean, Median, Mode are Equal

All are located at the center (70 in our example).

✓ Total Area = 1

The total probability under the curve equals 1 (or 100%).

✓ Continuous Data

Used for continuous variables like height, weight, marks, temperature.

3️⃣ Understanding Standard Deviation (σ)

Standard deviation tells us:

How spread out the data is.

Small σ → Data is tightly packed.

Large σ → Data is widely spread.

In our example:

σ = 10 means most students' scores vary by about 10 marks from the average.

4️⃣ Empirical Rule (68–95–99.7 Rule)

This rule applies only to normal distributions.

- 68% Rule (μ ± 1σ)

68% of students score between:

60 and 80

This is the majority of students.

- 95% Rule (μ ± 2σ)

95% of students score between:

50 and 90

Very few students score outside this range.

- 99.7% Rule (μ ± 3σ)

99.7% of students score between:

40 and 100

Almost all students fall here.

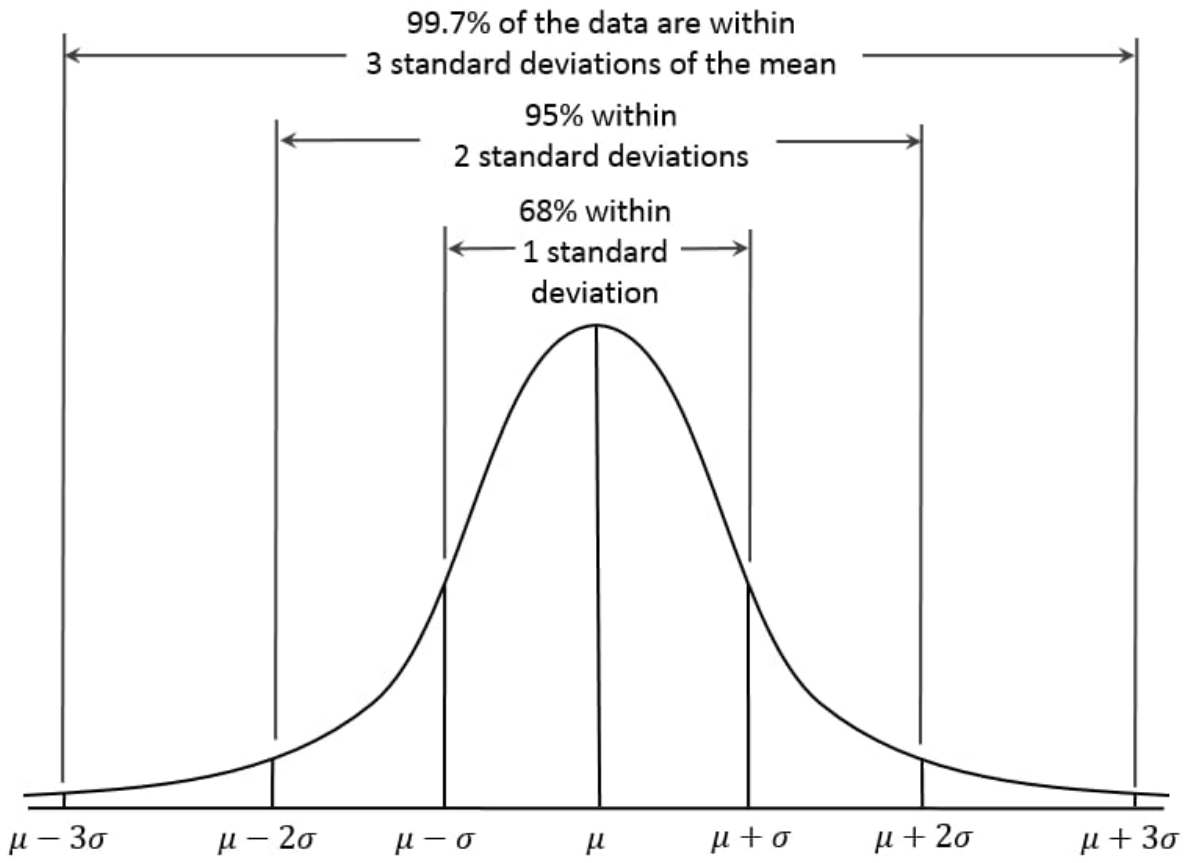
5️⃣ Interpretation of the Graph

Highest point = Mean (70)

Curve decreases gradually on both sides.

Extreme scores (very low or very high) are rare.

Distribution is smooth and continuous.



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Conclusion

The graph shows a bell-shaped curve (normal distribution) where:

Most students score near the average (70).

Fewer students score very low or very high.

Data is symmetrically distributed around the mean.

This demonstrates the Empirical Rule, which helps understand how data is spread in a normal distribution

CONCLUSION :

The normal distribution is a bell-shaped, symmetric distribution where most values lie near the mean and fewer values occur as we move away from the center.

Using the Empirical Rule (68–95–99.7 rule):

68% of data lies within 1 standard deviation ($\mu \pm 1\sigma$)

95% lies within 2 standard deviations ($\mu \pm 2\sigma$)

99.7% lies within 3 standard deviations ($\mu \pm 3\sigma$)

In the example of students' exam scores (Mean = 70, SD = 10), most students score close to 70, and very few score extremely low or extremely high.

Therefore, the normal distribution and empirical rule help us understand:

How data is spread

Where most values lie

How to identify unusual or extreme values

They are very important tools in statistics, data analysis, and machine learning.