# ASSIGNMENT (Question -2)

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

## Introduction

In statistics, the normal distribution is an important concept used to describe how data values are distributed around an average. It is commonly known as the bell-shaped curve because of its symmetric shape. In a normal distribution, most of the values are concentrated near the mean, while fewer values appear at the extreme ends.

The empirical rule, also called the 68–95–99.7 rule, explains how observations are spread within a normal distribution. It describes the percentage of data that lies within one, two, and three standard deviations from the mean.

Normal distribution is widely used in domains such as education, psychology, healthcare, finance, and research. In this assignment, the selected domain is IQ score distribution, and the empirical rule is used to understand how intelligence scores are distributed in a population.

## Domain Selection: IQ Score Distribution

IQ (Intelligence Quotient) scores are one of the most common real-world examples of normal distribution. When IQ tests are conducted on a large population, most individuals score around the average value, while very high and very low scores are less common.

Why IQ Scores Follow Normal Distribution

- IQ tests are standardized using statistical methods.
- Most individuals have average intelligence levels.
- Extremely high or low IQ scores are rare.
- The distribution is symmetric around the average score.

Because of these characteristics, IQ data forms a bell-shaped curve when represented graphically.

Understanding Normal Distribution

A normal distribution is defined by two important parameters:

1. **Mean (μ)**

The mean represents the average value of the dataset. In IQ score distribution, the standard mean is:

$\mu = 100$

This means the average IQ score of the population is 100. The mean lies at the center of the bell curve.

2. **Standard Deviation (σ)**

Standard deviation measures how much the values deviate from the mean. For IQ scores, the standard deviation is:

$\sigma = 15$

This means most IQ scores vary by about 15 points above or below the mean.

• Small standard deviation → values are close to the mean.
• Large standard deviation → values are more spread out.

**Characteristics of Normal Distribution**

• Bell-shaped symmetric curve
• Mean, median, and mode are equal
• Data is evenly distributed on both sides
• Probability decreases as values move away from the mean

## Empirical Rule (68–95–99.7 Rule)

The empirical rule explains how IQ scores are distributed around the mean.

1. **68% Rule (Within One Standard Deviation)**

Approximately 68% of individuals fall within one standard deviation from the mean.

$\mu \pm 1\sigma$
$100 \pm 15$
Range: 85 to 115

This means about 68% of people have IQ scores between 85 and 115. These individuals are considered to have average intelligence.

2. **95% Rule (Within Two Standard Deviations)**

About 95% of individuals fall within two standard deviations from the mean.

$\mu \pm 2\sigma$
$100 \pm 30$
Range: 70 to 130

This range includes almost the entire population except those with very low or very high IQ scores.

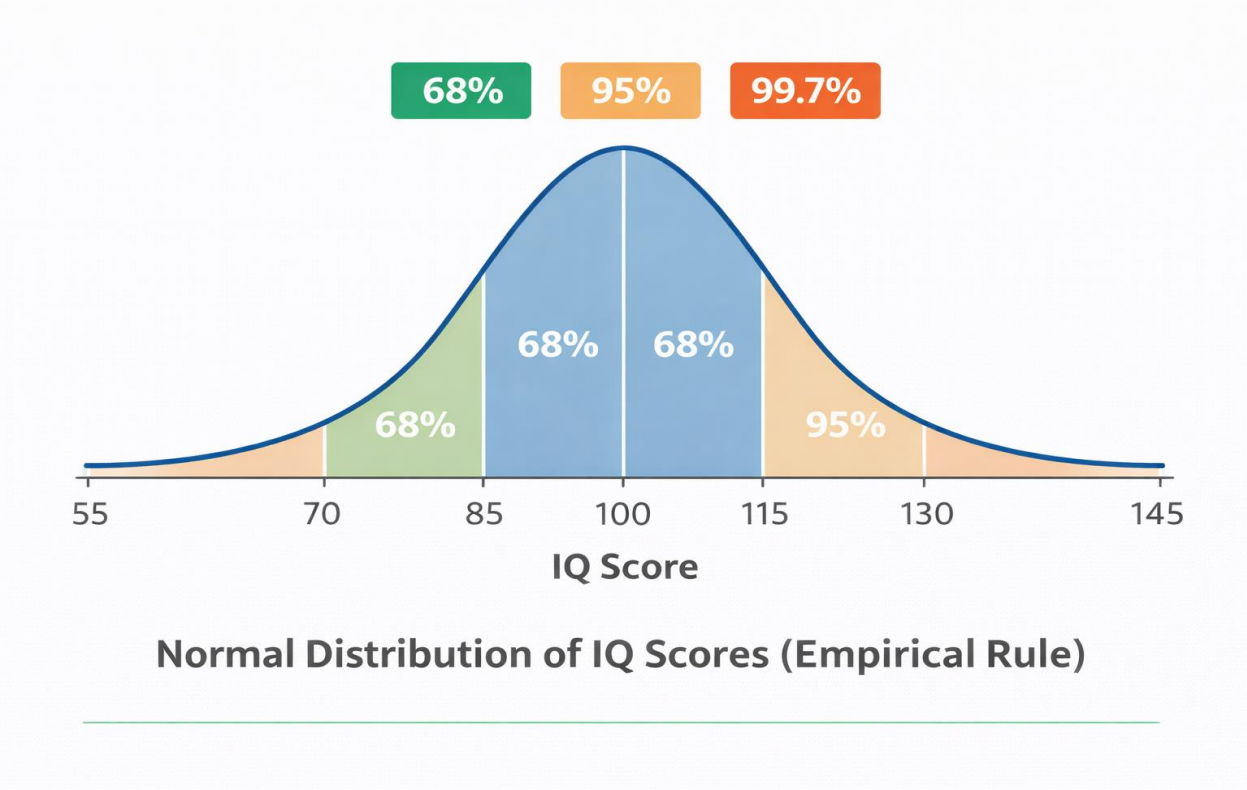
3. **99.7% Rule (Within Three Standard Deviations)**

Nearly 99.7% of individuals fall within three standard deviations from the mean.

$\mu \pm 3\sigma$
$100 \pm 45$
Range: 55 to 145

Only a very small percentage of people fall outside this range.

**Graph Representation of IQ Score Distribution**




The normal distribution graph of IQ scores is represented by a bell-shaped curve.

Components of the Graph

X-axis

Represents IQ score values ranging from low to high.

Y-axis

Represents frequency or number of individuals.

Mean ($\mu = 100$)
Located at the center of the curve.

Standard Deviations

Marked as:
- 85 and 115 ($\pm 1\sigma$)
- 70 and 130 ($\pm 2\sigma$)
- 55 and 145 ($\pm 3\sigma$)

The curve is symmetric on both sides of the mean.

**Interpretation of IQ Distribution**

Using the empirical rule, IQ scores can be classified as:

Below Average (Below 85)
- Smaller percentage of population
- Lower than average intelligence

Average (85 to 115)
- Majority of individuals
- Normal intelligence range

Above Average (Above 115)
- Smaller percentage
- Higher than average intelligence

Extremely High or Low (Beyond $\pm 3\sigma$)
- Very rare cases

This classification helps psychologists and researchers analyze intelligence patterns.

**Applications of Normal Distribution in Psychology and Education**

**Normal distribution of IQ scores is used in:**

1. Educational Assessment
   Helps identify gifted and special-needs students.
2. Psychological Evaluation
   Used in cognitive and behavioral studies.
3. Research Analysis
   Helps analyze intelligence trends in populations.
4. Recruitment and Selection
   Used in aptitude and ability testing.
5. Academic Planning
   Helps design suitable learning strategies.

**Advantages of Using Normal Distribution**

- Provides clear interpretation of data
- Helps in statistical prediction
- Useful in educational and psychological studies
- Easy to calculate probabilities

**Limitations of Normal Distribution**

- Not all real-world data follows perfect normal distribution
- Extreme values may slightly distort interpretation
- Assumes symmetry in data

Despite these limitations, it remains one of the most widely used statistical models.

**Conclusion**

The normal distribution provides an effective way to analyze IQ scores within a population. The bell-shaped curve shows that most individuals have IQ scores close to the average value of 100, while fewer individuals fall at the extreme ends.

The empirical rule explains that 68% of people fall within 85–115, 95% within 70–130, and 99.7% within 55–145. This statistical model helps in understanding intelligence patterns and making informed decisions in education and psychology.

Therefore, normal distribution and the empirical rule play a significant role in analyzing IQ score data and interpreting population characteristics.