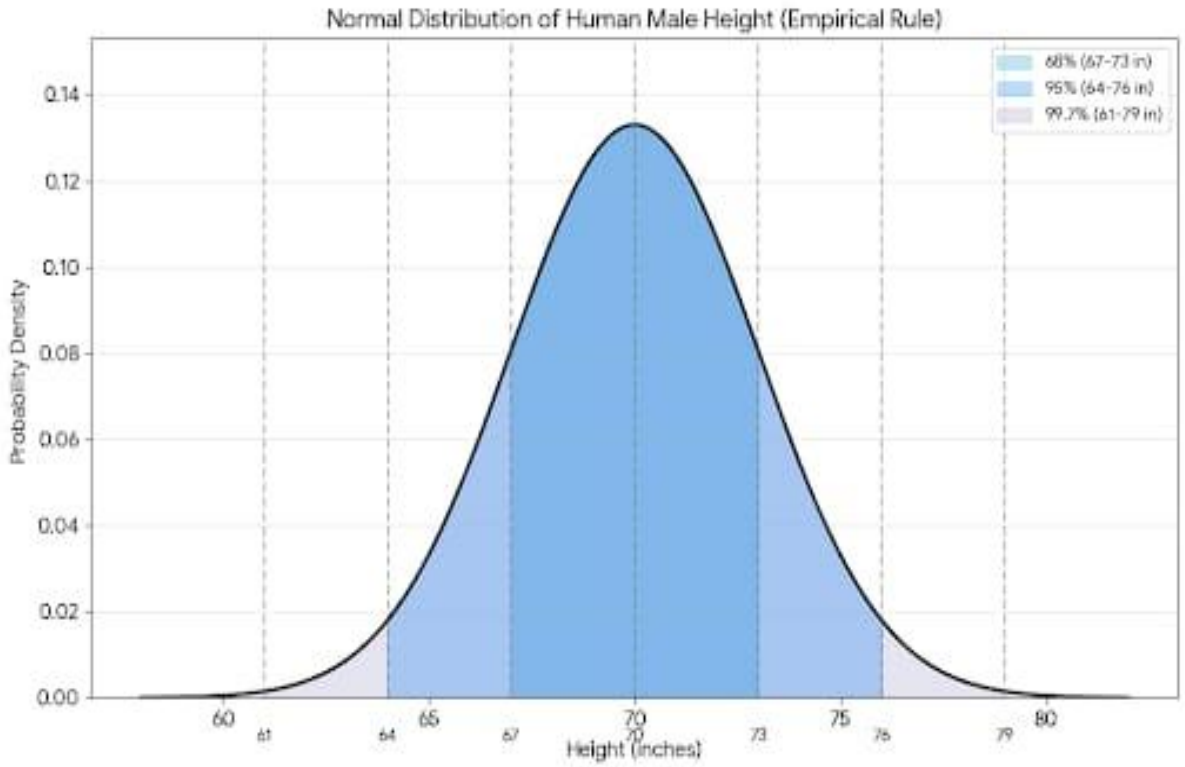
ASSIGNMENT-2

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

>A normal distribution is a type of continuous probability distribution that is symmetric around its mean, forming the classic "bell-shaped" curve. In the context of exam scores, most students score near the average, with fewer students achieving very high or very low scores.

>The Empirical Rule—also called the 68–95–99.7 rule—helps describe how data is spread in a normal distribution: approximately 68% of scores fall within one standard deviation of the mean, 95% fall within two standard deviations, and 99.7% fall within three standard deviations.

>For example, if the mean exam score is 70 with a standard deviation of 10, about 68% of students score between 60 and 80, 95% between 50 and 90, and nearly all students between 40 and 100. This rule provides a simple way to understand variability in data and to predict where most observations lie.



>This graph illustrates the normal distribution of human male heights using the Empirical Rule to show how heights are spread around the average.

> at the average height of 70 inches. The height values on the horizontal axis represent different male heights, while the vertical axis shows the probability density—how likely it is for a man to have a height near a specific value.

The darkest blue region in the center covers heights between 67 and 73 inches, representing about 68% of men whose heights fall within one standard deviation from the average.

2. The darkest blue region in the center covers heights between 67 and 73 inches, representing about 68% of men whose heights fall within one standard deviation from the average.

3.The medium blue area extends from 64 to 76 inches, covering about 95% of the population within two standard deviations.

4.The lightest blue on the edges spans from 61 to 79 inches, including 99.7% of men within three standard deviations of the mean.

1.Breaking Down The Percentages:-

>The Empirical Rule helps us understand how data is spread around the average (mean) in a normal distribution by using standard deviations as a measuring stick.

1.68% of data within one standard deviation:
This means that if you look just a little bit away from the average—say, one step (called a standard deviation) above and below the mean—you'll find about 68% of all the data points there. For example, most men's heights cluster close to the average height; roughly two-thirds fall within this narrow range.

2.95% of data within two standard deviations:
If you widen your view to two steps away from the average on both sides, you cover almost all the data—about 95%. This means that nearly everyone's height will be in this broader range, showing that extreme values are quite rare.

3.99.7% of data within three standard deviations:
Looking even further—three steps away—includes nearly every single data point, about 99.7%. Only a tiny fraction of the population falls outside this wide range, representing very unusual or extreme cases.

2.Symmetry and the Mean:-

A normal distribution is perfectly symmetrical around its mean (average) value. This means that the shape of the curve on the left side of the mean is a mirror image of the right side. Because of this symmetry:

- The mean, median, and mode all fall at the exact same point in the center of the curve.
- Equal proportions of data lie on either side of the mean — for example, 50% of the data is below the mean, and 50% is above it.
- This balance implies that deviations below and above the mean are equally likely and that the data does not skew to one side.

Asymptotic:- The term asymptotic describes how the tails of the normal distribution curve behave. Specifically, the curve approaches but never actually touches the horizontal axis (the x-axis) as it extends infinitely in both directions.

3.Why This Matters(Beyond Heights):-

The normal distribution and the Empirical Rule are important far beyond just measuring human heights.

They help us understand patterns in almost any type of data where values cluster around an average:

1. Education: Test scores often follow a normal distribution. Teachers can predict how many students will score near the average and identify those who may need extra support or advanced challenges.
2. Business and Economics: Sales figures, customer behavior, and product quality frequently follow a bell curve. Understanding the spread helps businesses forecast demand, manage risk, and identify unusual trends.
3. Health and Medicine: Measurements like blood pressure, cholesterol, or BMI often form a normal distribution. Doctors can use this to determine what's typical versus unusually high or low.

4.Calculating Z-Scores:-

z-score is a number that tells you how far a data point is from the average, measured in standard deviations.

- Think of it like a ruler: the mean (average) is the center, and the standard deviation is the unit of measurement.
- A z-score tells you how many "units" away from the average a value is.