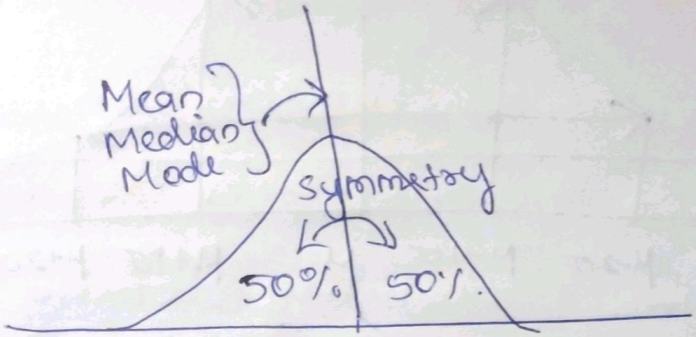
Normal Distribution:-

→ Normal distribution is also called the Gaussian Distribution.

→ It is the most significant continuous probability distribution.

Sometimes it is also called a bell curve.



The Normal distribution has

* Mean = median = mode
* Symmetry about the center
* 50% of values less than the mean and 50% greater than the mean.

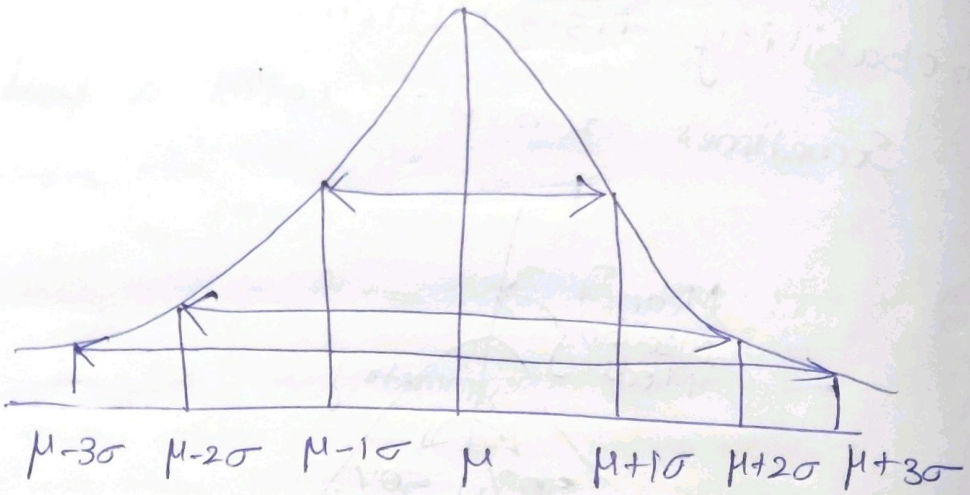
Normal Distribution Formula

The probability density function of normal or gaussian distribution is given by

$$f(x, \mu, \sigma) = \frac{1}{\sigma\sqrt{2\pi}} e^{\frac{-(x-\mu)^2}{2\sigma^2}}$$

where,

* x is the variable
* μ is the mean
* σ is the standard deviation.



Parameters of the Normal Distribution

① Mean

→ Mean is the central tendency of normal distribution.

→ It defines the location of the peak for the bell curve.

→ Most values cluster around the mean.

→ On a graph, changing the mean shifts the entire curve left or right on the X-axis.

Standard Deviation

→ The standard deviation is the measure of variability.

→ It defines the width of the normal distribution.

→ It determines how far away from the mean the values tend to fall.

→ It represents the typical distance between the observations and the average.

Population:-

μ - population mean

σ - population standard deviation.

Z-Score

$$Z = \frac{X - \mu}{\sigma}$$

X - represents the raw value.

μ & σ represents the population parameters.

1) Calculate the probability density function of normal distribution using the following data

$x = 3$, $\mu = 4$ and $\sigma = 2$

Given

$x = 3$

mean $= 4$ and standard deviation $= 2$

$$f(3,4,2) = \frac{1}{2\sqrt{2\pi}} e^{\frac{-(3-2)^2}{2\times 2^2}}$$

$$= \frac{1}{2\sqrt{2\pi}} e^{\frac{-(1)}{2\times 4}}$$

$$= \frac{1}{2\sqrt{2\pi}} e^{\frac{-1}{8}}$$

$$= 1.106$$

2) If the value of random variable is 2 mean is 5 and the standard deviation is 4 then find the probability density function of gaussian distribution.

Variable $X = 2$

Mean $= 5$ and

Standard deviation $= 4$.

$$f(2,2,4) = \frac{1}{4\sqrt{2\pi}} e^{\frac{-(2-2)^2}{2\times 4^2}}$$

$$= \frac{1}{4\sqrt{2\pi}} e^{0}$$

$$= 0.0997$$

Properties

1) In a normal distribution, mean, median and mode are equal.

2) The total area under the curve should be equal to 1.

3) The normally distributed curve should be symmetric at the centre.

4) The normal distribution should be defined by the mean and standarddeviation.

5) The normal distribution curve must have only one peak.

Central Limit Theorem

Given a population w mean μ and standard deviation σ

E.g.