1. **What is the pdf of Normal distribution and hence its mean and variance?**

-> pdf stands for probability density function. It represents the shape of the distribution.

f(x) = (1 / sqrt(2pisigma^2)) \* exp(-((x - mu)^2) / (2 \* sigma^2))

where:

x is the random variable representing the value of interest

mu is the mean of the distribution

sigma^2 is the variance of the distribution

pi is the mathematical constant pi, approximately equal to 3.14159265359

exp() is the exponential function, which raises the base of natural logarithm (e) to a given power

A special case of the normal distribution has mean (mu)=0 and a variance of (sigma^2) =0. The 'standard normal' is an important distribution. Mean (mu) and Variance (sigma^2) are the two parameters that fully characterize a normal distribution.

**2) Find the area under the standard normal curve between z = 0 and z = 1.53**

The area under the standard normal curve between z = 0 and z = 1.53 can be calculated using a standard normal distribution table or a statistical calculator that provides the cumulative distribution function (CDF) for the standard normal distribution.

So, Z=0 and Z=1.53, The value of Z=0 is 0.50.

And, The value of z under the standard deviation curve0.4364. So, it will be 0.50+0.4364=0.9364

Area between Z=0 and Z=1.53

=0.9364-0.50=0.4364

**3) Why normal distribution called symmetric?**

A normal distribution is a true symmetric distribution of observed values. When a histogram is constructed on values that are normally distributed, the shape of columns forms a symmetrical bell shape. This means that the distribution curve can be divided in the middle to produce two equal halves.

**4) Municipal corporation installed 2000 bulbs in the streets. These bulbs have an average life of 1000 hours and standard deviation of 200 hours. What is the probability that a bulb will fail in the first 700 burning hours?**

Z=(x-mu)/sigma

=(700-1000)/200

=-300/200

=-1.5

The area between Z = -1.5 and Z = 0 is same as area between Z = 0 and Z = 1.5. From the tables, area between Z = 0 and Z = 1.5 is 0.4332

P(Z < -1.5) = 0.5 – 0.4332 = 0.0668

5) **On average computer parts last for 10 years. The length of times is exponentially distributed. Find the probability that a computer will last more than 7 years.**

X=7

mu=10

lamda=1/mu=1/10=0.1

f(x) = lamda \* e^(-lamda \* x)

f(x)=0.1\*e^(-0.1\*7)=0.049

**6) What is the pdf of Log- Normal distribution**

The probability density function (PDF) of a log-normal distribution is given by the following formula:

f(x) = (1 / (x \* σ \* √(2 \* π))) \* exp(-((ln(x) - μ)^2) / (2 \* σ^2))

where:

x: the value at which the PDF is evaluated

μ: the mean of the logarithm of the random variable (not the mean of the original variable)

σ: the standard deviation of the logarithm of the random variable (not the standard deviation of the original variable)

ln(x): the natural logarithm of x

π: pi, a mathematical constant approximately equal to 3.141592653589793

**7) Suppose that the reaction time in seconds of a person can be modeled by a lognormal distribution with parameter values, mean = -0.35 and sd = 0.2.**

**a) What is the probability that the reaction time is less than 0.6 seconds?**

Let X be the reaction time. It is given that X has log normal distribution with paramters mean -0.35 and standard deviation sigma= 0.2

Property of normal distribution If X has log normal distribution with mean and standrd deviation .

Then log (X) has normal distribution with mean and standard deviation '

P(X < 0.6) = P( log(X) -mu/ sigma <log( o.6 - mu/ sigma) P(N(0,1) < -0.2218+0.35/0.2)

= P(Z< 0.128151/0.2) = P(Z < 0.64)

b) **Find the reaction time that is exceeded by 95% of the population.**

To find the reaction time such that

P(X > x) = 0.95

= P(X< x)= 1- 0.95 = 0.05

P(log(X) -mu /sigma <log( x) -mu/sigma)

= 0.05 P(Z<z)= 0.05 z= -1.64 log(x)- mu/sigma = z = -1.64 log(x) = mu -1.64 \*sigma log(x)= -.35 -1.64\* 0.2 log(x)= -0.678 x= exp( -0.678) x =2.04

**8) An item is randomly drawn from a two - parameter Weibull population having a shape parameter β = 1.5 and a scale parameter η = 100.0 hours. What is the probability that the item fails before achieving a life of x = 25 hours?**

Plugging in the values β = 1.5, η = 100, and x = 25 into the formula, we get:

CDF(25) = 1 - exp(-((25/100)^1.5)

=1-exp(0.125)