

## UNIT-III

### Discrete prob. Distribution

uniform

Bernoulli

Binomial

Poisson

Negative Binomial

Geometric

Hyper Geometric

### continuous prob. Distribution

uniform

Normal

Exponential

logarithm

## Discrete Prob. Distribution:

### ① Uniform Distribution

$X \sim U(n)$  read as  $X$  follows uniform distribution with parameter  $n$

P.M.F  $P(x) = \frac{1}{n}$   $x = 1, 2, \dots, n$

mean  $\mu = \frac{n+1}{2}$

$$E(x) = \frac{(n+1)(2n+1)}{6}$$

$$V(x) = \frac{(n+1)(n-1)}{12}$$

### Example Problem:

If  $X \sim U(6)$  then find its P.M.F, mean, variance,

## ② Bernoulli Distribution

A random variable  $x$  takes the values only '0' and '1'. Then the distribution is Bernoulli.

P.M.F  $P(x) = p^x \omega^{1-x}$   $\therefore x=0, 1$

Mean  $\mu = E(x) = p$   $p + \omega = 1$

$$E(x^2) = p$$

$$\sigma^2 = p\omega$$

### ③ Binomial Distribution

A random variable  $X$  takes the

values  $0, 1, 2, \dots, n$  with its

P.M.F  $P(X) = nC_k \cdot p^k \cdot q^{n-k}$

where  $0 < p < 1$ ,  $p+q=1$

$X \sim B(n; p)$  represents

Binomial dist. with parameters  
 $n$  and  $p$

$$P(X) = nC_k \cdot p^k \cdot q^{n-k}$$

mean  $\mu = np$

Variance  $\sigma^2 = npq$

# Problems on Binomial Distribution

Example 1: Four fair coins are tossed. If the outcomes are assumed to be independent, then find the p.m.f. and c.d.f. of the number of heads obtained.

Solution: Four coins are tossed  $\Rightarrow n=4$

Here  $P = \frac{1}{2}$ ,  $Q = \frac{1}{2}$

Hence  $X \sim B(n; P)$

$$X \sim B(4; \frac{1}{2})$$

Now its P.M.F  $P(X) = n C_x \cdot P^x \cdot Q^{n-x}$

$$P(X) = 4 C_x \cdot \left(\frac{1}{2}\right)^x \cdot \left(\frac{1}{2}\right)^{4-x}$$

$$= 4 C_x \cdot \left(\frac{1}{2}\right)^4$$

$$P(X) = 4 C_x \cdot \frac{1}{16}$$

Now

$$P(0) = 4 C_0 \cdot \frac{1}{16} = \frac{1}{16}$$

$$P(1) = 4 C_1 \cdot \frac{1}{16} = \frac{4}{16}$$

$$P(2) = 4C_2 \cdot \frac{1}{16} = \frac{6}{16}$$

$$P(3) = 4C_3 \cdot \frac{1}{16} = \frac{4}{16}$$

$$P(4) = 4C_4 \cdot \frac{1}{16} = \frac{1}{16}$$

Hence Probability Distribution Table

$x$	0	1	2	3	4
$P(x)$	$\frac{1}{16}$	$\frac{4}{16}$	$\frac{6}{16}$	$\frac{4}{16}$	$\frac{1}{16}$
$F(x)$	$\frac{1}{16}$	$\frac{5}{16}$	$\frac{11}{16}$	$\frac{15}{16}$	$\frac{16}{16} = 1$

Hence  $P(x)$  : P.M.F

$F(x)$  : C.D.F

Example 2: A and B play a game in which their chances of winning are in the ratio 3 : 2. Find A's chance of winning at least three games out of the five games played.

Solution Total games played  $n=5$

$$P(A) = \frac{3}{5} \quad \text{so } p = \frac{3}{5}, q = \frac{2}{5}$$

$$X \sim B(n; p) \Rightarrow X \sim B(5, \frac{3}{5})$$

$$\text{Now } P(x) = nC_x \cdot p^x \cdot q^{n-x}$$

$$P(x) = 5C_x \cdot \left(\frac{3}{5}\right)^x \cdot \left(\frac{2}{5}\right)^{5-x}$$

Now we find Prob. of A's winning at least 3 out of 5 games

$$\begin{aligned} \text{i.e. } P(X \geq 3) &= P(3) + P(4) + P(5) \\ &= 5C_3 \left(\frac{3}{5}\right)^3 \left(\frac{2}{5}\right)^{5-3} + 5C_4 \left(\frac{3}{5}\right)^4 \left(\frac{2}{5}\right)^{5-4} \\ &\quad + 5C_5 \left(\frac{3}{5}\right)^5 \left(\frac{2}{5}\right)^{5-5} \end{aligned}$$

$$P(X \geq 3) = 0.68$$

Example 3: The probability of a man hitting a target is  $\frac{1}{4}$ .

- (i) If he fires 7 times, what is the probability of his hitting the target at least twice?
- (ii) How many times must he fire so that the probability of his hitting the target at least once is greater than  $\frac{2}{3}$ ?

Solution: The prob. of man hitting a

target is  $\frac{1}{4}$  so  $P = \frac{1}{4}$ ,  $q = \frac{3}{4}$

(i) he fires 7 times  $n=7$ ,  $P = \frac{1}{4}$

$$X \sim B(n; p) \Rightarrow X \sim B(7, \frac{1}{4})$$

$$P(X) = nC_x \cdot p^x \cdot q^{n-x}$$

$$P(X) = 7C_7 \cdot \left(\frac{1}{4}\right)^7 \left(\frac{3}{4}\right)^{7-7}$$

Now we find prob. of his hitting target is at least twice

$$\text{i.e. } P(X \geq 2) = 1 - P(X < 2)$$

$$\begin{aligned} &= 1 - [P(X=0) + P(X=1)] \\ &= 1 - \left[ 7C_0 \left(\frac{1}{4}\right)^0 \left(\frac{3}{4}\right)^{7-0} + 7C_1 \left(\frac{1}{4}\right)^1 \left(\frac{3}{4}\right)^{7-1} \right] \end{aligned}$$

$$= 0.55$$

$$\therefore P(X \geq 2) = 0.55$$

(ii) Now we find how many times must he fire so that the probability of his hitting the target at least once is greater than  $\frac{2}{3}$

i.e. we find  $n$  for  $P(X \geq 1) > \frac{2}{3}$

$$P(X \geq 1) > \frac{2}{3}$$

$$1 - P(X < 1) > \frac{2}{3}$$

$$1 - P(X = 0) > \frac{2}{3}$$

$$P(X = 0) < \frac{1}{3}$$

$${}^n C_0 \left(\frac{1}{4}\right)^0 \left(\frac{3}{4}\right)^n < \frac{1}{3}$$

$$\left(\frac{3}{4}\right)^n < \frac{1}{3}$$

$$n \log \frac{3}{4} < \log \frac{1}{3}$$

$$n < \frac{\log \frac{1}{3}}{\log \frac{3}{4}}$$

$$n > \frac{\log 3}{\log \frac{4}{3}} = 3.8$$

$$n > 3.8 \approx 4$$

$$n > 4$$

Hence required no. of shots 4

Example 4 : The mean and variance of Binomial Distribution are 4 and  $\frac{4}{3}$  respectively, find  $P(X \geq 1)$

Solution:  $X \sim B(n; p)$

mean  $\mu = np = 4$

Variance  $\sigma^2 = npq = \frac{4}{3}$

Variance / Mean we get-  $q = \frac{1}{3}$

$$p = \frac{2}{3}$$

Hence for  $np = 4$

$$n \times \frac{2}{3} = 4$$

$$n = 6$$

Hence  $X \sim B(6; \frac{2}{3})$

$$P(x) = n_{Cx} \cdot p^x \cdot \omega^{n-x}$$

$$P(x) = 6_{Cx} \cdot \left(\frac{2}{3}\right)^x \cdot \left(\frac{1}{3}\right)^{6-x}$$

Now we find  $P(x \geq 1)$

$$P(x \geq 1) = 1 - P(x < 1)$$

$$= 1 - P(x=0)$$

$$= 1 - 6_{C0} \cdot \left(\frac{2}{3}\right)^0 \cdot \left(\frac{1}{3}\right)^{6-0}$$

$$= 1 - \left(\frac{1}{3}\right)^6$$

$$P(x \geq 1) = 1 - \left(\frac{1}{3}\right)^6$$

## A) Poisson Distribution

$X \sim P(\lambda)$ ; with parameter  $\lambda > 0$

P.M.F  $P(X) = \frac{e^{-\lambda} \lambda^X}{X!}, \lambda > 0$   
 $X = 0, 1, \dots$

mean  $\mu = \lambda$

Variance  $\sigma^2 = \lambda$

In Poisson Distribution

Average = mean = variance =  $\lambda$

Example 6: Messages arrive at a switchboard in a Poisson manner at an average rate of six per hour. Find the probability for each of the following events:

- Exactly two messages arrive within one hour.
- No message arrives within one hour.
- At least three messages arrive within one hour.

Solution : Here  $X \sim P(\lambda)$

where  $\lambda = 6$

$X \sim P(6)$

$$P.M.F = P(x) = \frac{e^{-\lambda} \cdot \lambda^x}{x!}$$

$$P(x) = \frac{e^{-6} \cdot 6^x}{x!}$$

$x = 0, 1, 2, \dots$

$$\textcircled{1} \quad P(x=2) = P(2) = \frac{e^{-6} \cdot 6^2}{2!} = 18e^{-6}$$

$$\textcircled{2} \quad P(x=0) = P(0) = \frac{e^{-6} \cdot 6^0}{0!} = e^{-6}$$

$$\textcircled{3} \quad P(x \geq 3) = 1 - P(x < 3)$$

$$= 1 - [P(0) + P(1) + P(2)]$$

$$= 1 - \left[ \frac{e^{-6} \cdot 6^0}{0!} + \frac{e^{-6} \cdot 6^1}{1!} + \frac{e^{-6} \cdot 6^2}{2!} \right]$$

$$= 1 - 25e^{-6}$$

$$P(X \geq 3) = 1 - 25e^{-6}$$

**Example 8:** If  $X$  and  $Y$  are independent Poisson variates such that

$P(X = 1) = P(X = 2)$  and  $P(Y = 2) = P(Y = 3)$ , find the variance of  $X - 2Y$ .

Given  $X$  and  $Y$  are poisson variaty

Consider  $X \sim P(\lambda)$ ,  $Y \sim P(\mu)$

For  $X \sim P(\lambda)$

$$P(X = 1) = P(X = 2)$$

$$\frac{e^{-\lambda} \cdot \lambda^1}{1!} = \frac{e^{-\lambda} \cdot \lambda^2}{2!}$$

$$2\lambda = \lambda^2$$

$$\lambda^2 - 2\lambda = 0$$

$\lambda = 0$  or  $\lambda = 2$

$$\boxed{\lambda = 2}$$

$\lambda > 0$

Hence  $V(X) = 2$

For  $Y \sim P(\mu)$

$$P(Y=2) = P(Y=3)$$

$$\frac{e^{-\mu} \cdot \mu^2}{2!} = \frac{e^{-\mu} \cdot \mu^3}{3!}$$

$$6\mu^2 = 2\mu^3$$

$$\mu^3 - 3\mu^2 = 0$$

$$\mu = 0, 0, 3$$

$$\boxed{\mu=3}$$

$\mu > 0$

Hence  $V(Y) = 3$

Now we find the  $V(X - 2Y)$

we know that-

$$v(\alpha x + \beta y) = \alpha^v v(x) + \beta^v v(y)$$

$$v(x - 2y) = (1)^v v(x) + (-2)^v v(y)$$

$$= (1)(2) + 4(3)$$

$$v(x - 2y) = 14$$

## ⑤ Negative Binomial

$X \sim NB(n; p)$  where  $n, p$  are parameters

P.M.F  $P(x) = {}^n C_{x+k-1} \cdot p^x \cdot q^{n-1}$

where  $x = 0, 1, 2, \dots$

mean  $\mu = \frac{np}{p}$

variance  $\sigma^2 = \frac{np}{p^2}$

Problem:

Find the prob. that there are two daughters before the second son in a family when probability of a son is 0.5

Sol. Let  $x$  be the no. of daughters before the second son

$g_1$  = no. of son

Here  $x = 2$ ,  $g_1 = 2$

$$P(x) = {}_C_{g_1-1} p^{g_1} q^x$$

$$P(2) = {}_{2-1} C_1 \cdot \left(\frac{1}{2}\right)^2 \cdot \left(\frac{1}{2}\right)^2$$

$$= 3 {}_1 C_1 \cdot \left(\frac{1}{2}\right)^4 = \frac{3}{16}$$

$$\boxed{P(2) = \frac{3}{16}}$$

## ⑥ Geometric Distribution

$X \sim GD(q)$  where  $q$  is parameter

P.M.F  $P(X) = p \cdot q^{x-1} \quad x=0, 1, 2, \dots$

mean  $\mu = \frac{q}{p}$

variance  $\sigma^2 = \frac{q}{p^2}$

### Problem:

Find the prob. of there are two daughters before the first son in a family where prob. of son is 0.5. Here  $X$  is no. of daughters before the first son = 2

$$p = \frac{1}{2}, q = \frac{1}{2}$$

$$P(X) = p \cdot q^x, x=0, 1, 2, \dots$$

$$P(2) = \left(\frac{1}{2}\right) \left(\frac{1}{2}\right)^2 = \frac{1}{8}$$

$$\boxed{P(2) = \frac{1}{8}}$$

## ⑦ Hypergeometric Distribution

A random variable  $X$  is said to have Hypergeometric Distribution if its

P. M. F

$$P(r) = \frac{M \cdot N-M \cdot C_{n-r}}{N \cdot C_n}$$

where  $r=0, 1, 2, \dots, \min\{n, M\}$

$$\text{Mean } \mu = \frac{nm}{N}$$

$$\text{Variance } \sigma^2 = \frac{NM(N-M)(N-n)}{N^2(N-1)}$$

Problem:

A bag contains 4 white balls, 3 green balls; Three balls are drawn, what is the probability that 2 are white

Sol.

$$N = \text{Total no. of balls} = 4 + 3 = 7$$

$$x = \text{no. of white balls} * = 2$$

$$m = \text{white balls} * = 4$$

$$n = \text{green balls} = 3$$

$$P(x) = \frac{m_C_x \cdot N-m_C_{n-1}}{N_C_n}$$

$$P(2) = \frac{4C_2 \cdot 3C_1}{7C_3} = \frac{18}{35}$$

$$P(2) = \frac{18}{35}$$

## Example problems in Binomial

① The mean of Binomial distribution is 3 and variance is  $\frac{9}{4}$  Find

(i)  $n$  (ii)  $P(X \geq 7)$  (iii)  $P(X < 10)$

(iv)  $P(1 \leq X < 6)$  (v)  $P(X \leq 12)$

② The probability that the life of a bulb is 100 days is 0.05

Find the prob. that out of

6 bulbs (i) At least one

(ii) greater than four

(iii) none

## Example of Poisson Distribution

① If the variance of a Poisson variate is 3, then find the probability that  $x=0$

That  $x=0$   $0 < x \leq 3$

③  $1 \leq x < 4$  ④  $x > 1$  ⑤  $x \geq 3$

② If a Poisson distribution is such that  $P(x=1) \cdot \frac{3}{2} = P(x=3)$

Find (i)  $P(x \geq 1)$  (ii)  $P(x \leq 3)$

(iii)  $P(2 \leq x \leq 5)$



# Continuous Probability Distribution

## Normal Distribution

A random variable  $X$  is said to have a normal distribution, if its P.d.f is given by

$$f(x) = \frac{1}{\sigma \sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}} \quad ; \quad -\infty < x < \infty$$
$$-\infty < \mu < \infty$$
$$\sigma > 0$$

Note: Normal distribution is represented as  $X \sim N(\mu, \sigma^2)$

## Standard Normal Distribution

we can transform any normal distribution to the standard normal distribution with mean  $\mu=0$  and S.D.  $\sigma=1$  regardless of  $\omega$

## Standard Normal Distribution

If we take  $z = \frac{x-\mu}{\sigma}$  in p.d.f

$$f(z) = \frac{1}{\sigma \sqrt{2\pi}} e^{-\frac{(z-\mu)^2}{2\sigma^2}}$$
 we obtain

## The Standard Normal Distribution

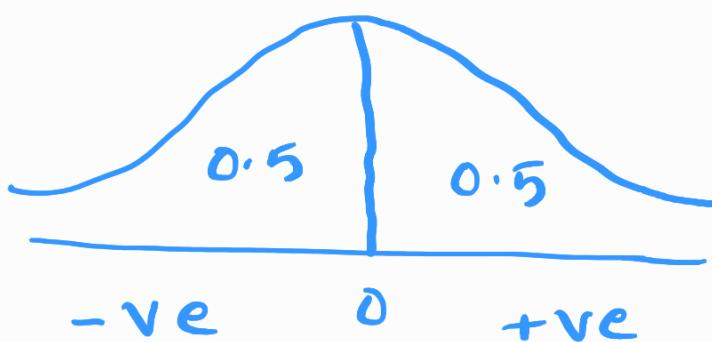
with Mean  $\mu=0$ , S.D.  $\sigma=1$  and

its p.d.f  $f(z) = \frac{1}{\sqrt{2\pi}} e^{-z^2/2}$

$$-\infty < z < \infty$$

Here  $Z$  is called the Standard normal variate with Mean 0 and S.D 1 and in short we say that  $P(Z) \sim N(0,1)$   
ie  $Z \sim N(0,1)$

Area of the normal curve is 1



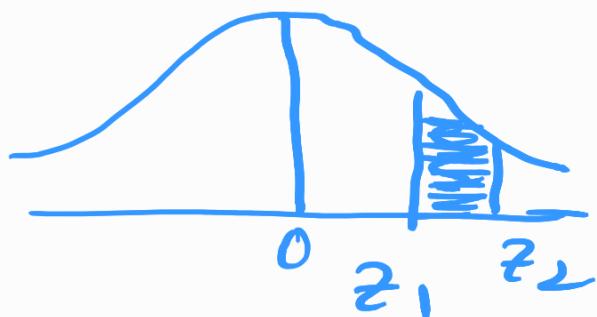
# How to find Probability of normal curve

Step ①: Change Scale  $z = \frac{x-\mu}{\sigma}$   
and find  $z_1$  and  $z_2$   
corresponding to the  
values of  $x_1$  and  $x_2$  desired

Step ②: To find

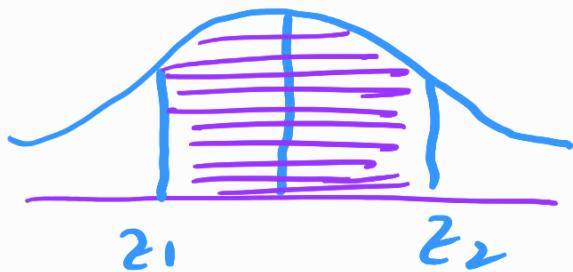
$$P(x_1 \leq x \leq x_2) = P(z_1 \leq z \leq z_2)$$

(i) If both  $z_1$  and  $z_2$  are positive  
(ii) negative



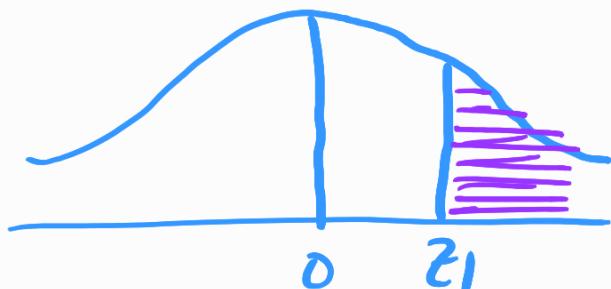
Then  $P(z_1 \leq z \leq z_2) = A(z_2) - A(z_1)$

(iii) If  $z_1$  -ve,  $z_2$  +ve :  
 $P(z_1 \leq z \leq z_2)$



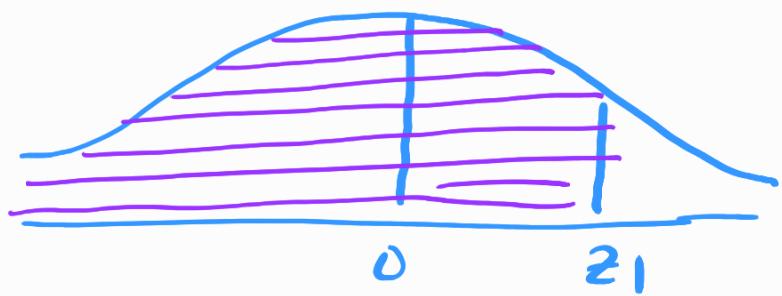
Then  $P(z_1 \leq z \leq z_2) = A(z_1) + A(z_2)$

(iii) If  $z_1 > 0$  :  $P(z > z_1)$



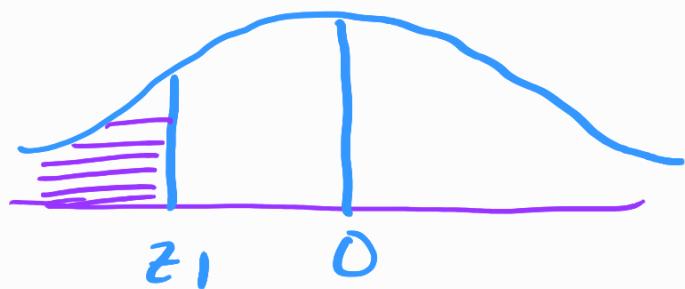
$P(z > z_1) = 0.5 - A(z_1)$

if  $z_1 > 0 \quad P(z < z_1)$



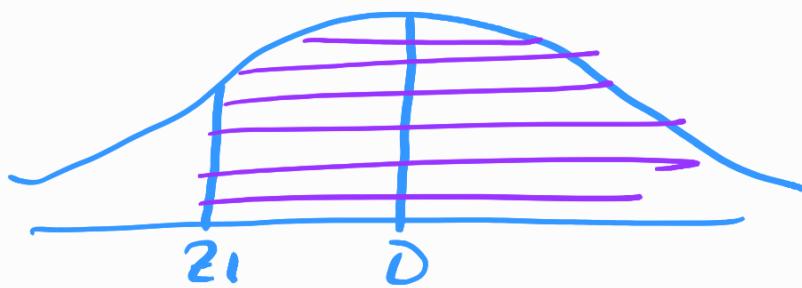
$$P(z < z_1) = 0.5 + A(z_1)$$

(iv) if  $z_1 < 0 \quad P(z < z_1)$



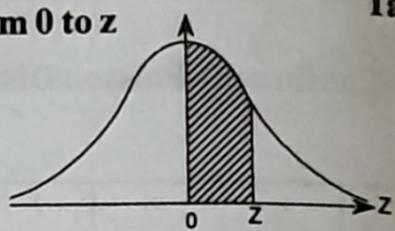
$$P(z < z_1) = 0.5 - A(z_1)$$

if  $z_1 < 0$  :  $P(z > z_1)$



$$P(z > z_1) = 0.5 + A(z_1)$$

Table - 3



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

## Areas under the Standard Normal Curve from 0 to $z$

## Problems

① If  $x$  is normal variate with mean 30, SD 5. Find the probabilities ①  $26 \leq x \leq 40$  ②  $x \geq 45$

Q: Given  $x \sim N(\mu; \sigma^2)$

$$\mu = 30, \sigma = 5$$

①  $P(26 \leq x \leq 40) \therefore$

$$P(26 \leq x \leq 40) = P(x_1 \leq x \leq x_2) = P(z_1 \leq z \leq z_2)$$

$$z_1 = \frac{x_1 - \mu}{\sigma}$$

$$= \frac{26 - 30}{5}$$

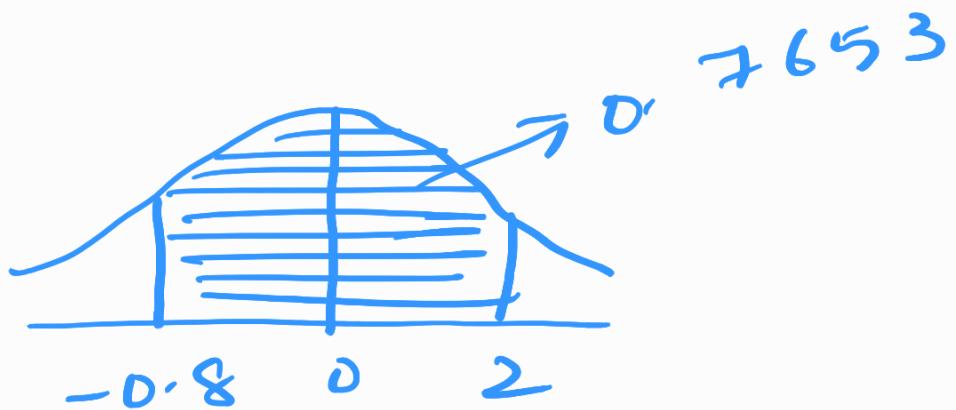
$$= -0.8$$

$$z_2 = \frac{x_2 - \mu}{\sigma}$$

$$= \frac{40 - 30}{5}$$

$$= 2$$

$$\therefore P(26 \leq X \leq 40) = P(-0.8 \leq Z \leq 2)$$



$$= A(0.8) + A(2)$$

$$= 0.2881 + 0.4772$$

$$= 0.7653$$

$$\therefore P(26 \leq X \leq 40) = 0.7653$$

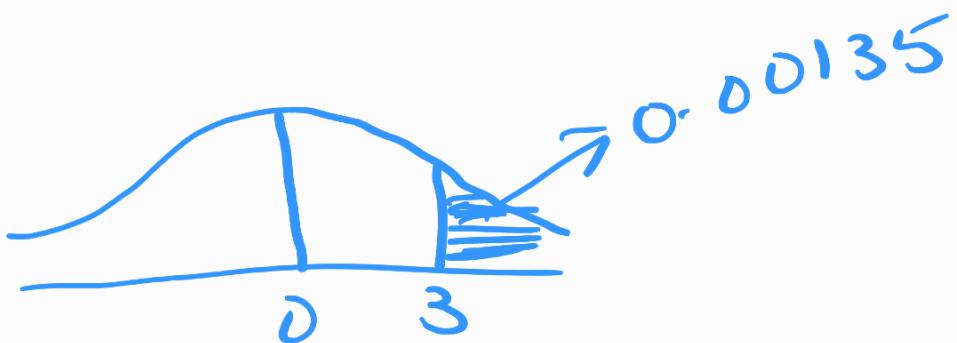
$$\textcircled{2} \quad P(X \geq 45)$$

$$P(X \geq 45) = P(Z \geq z_1)$$

$$z_1 = \frac{x_1 - \mu}{\sigma}$$

$$= \frac{45 - 30}{5} = \frac{15}{5} = 3$$

$$\therefore P(X \geq 45) = P(Z \geq 3)$$



$$= 0.5 - A(3)$$

$$= 0.5 - 0.49865$$

$$P(X \geq 45) = 0.00135$$

- ② If the masses of 300 students are normally distributed with mean 68 kg, S.D 3 kg. how many students have masses
- Greater than 72 kg
  - less than or equal to 64 kg
  - Between 65 and 71 kg

Sol.  $X \sim N(\mu, \sigma^2)$

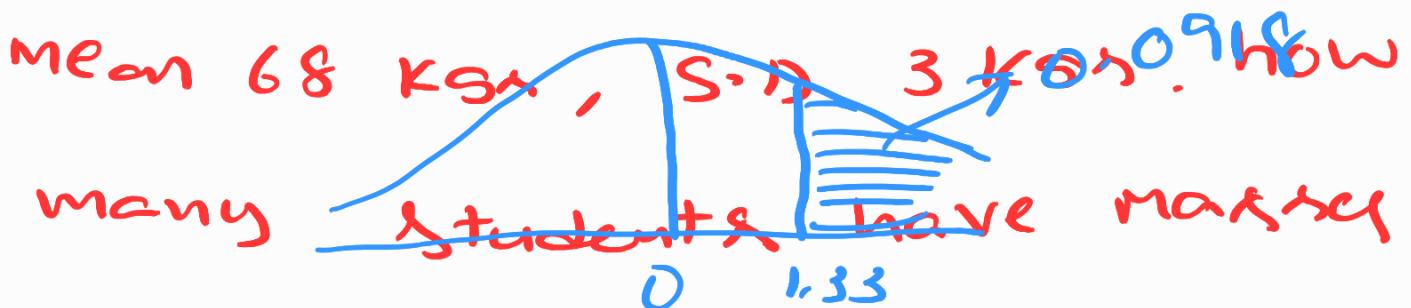
Here  $\mu = 68, \sigma = 3$

(i)  $P(X \geq 72)$

$$P(X \geq 72) = P(Z \geq z_1)$$

$$z_1 = \frac{x_1 - \mu}{\sigma} = \frac{72 - 68}{3} = 1.33$$

Q2.  $P(x \geq 72)$  Mass of 300 students are normally distributed with



(i) Greater than 72 kg

(ii) less  $= 0.5 - A(z_1)$  than or equal to 64 kg

(iii) Between 65 and 71 kg

Sol.  $x \sim N(68, 9)$

$$P(x \geq 72) = 0.0918$$

(i) The no. of students with more

$$P(x \geq 72) = P\left(z \geq z_1\right) = 0.0918$$

$$z_1 = \frac{x_1 - \mu}{\sigma} = \frac{72 - 68}{3} = 1.33$$

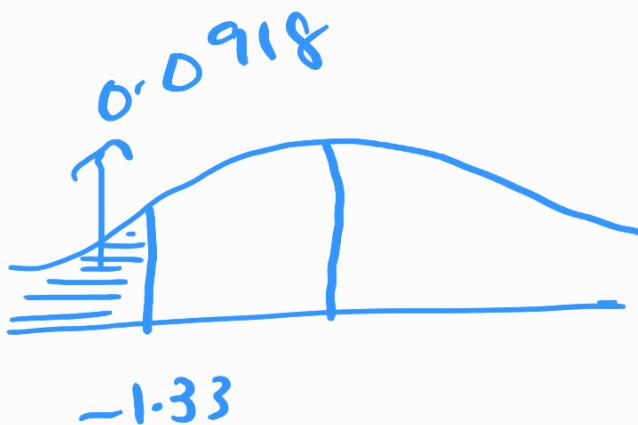
$$z_1 = \frac{x_1 - \mu}{\sigma} = \frac{72 - 68}{3} = 1.33$$

$$(11) P(X \leq 64)$$

$$P(X \leq 64) = P\left(\frac{X_1 - \mu}{\sigma} \leq \frac{64 - 68}{3}\right) = P(Z \leq -1.33)$$

$$Z_1 = \frac{x_1 - \mu}{\sigma} = \frac{64 - 68}{3} = -1.33$$

$$P(X \leq 64) = P(Z \leq -1.33)$$



$$= 0.5 - A(1.33)$$

$$= 0.5 - 0.4082 = 0.0918$$

$$P(X \leq 64) = 0.0918$$

hence the no of students have masses less than or equal to 64 kg

$$= 300 \times 0.0918$$

$$\approx 28$$

③  $P(65 \leq x \leq 71)$

$$P(65 \leq x \leq 71) = P\left(\frac{x_1 - \mu}{\sigma} \leq z \leq \frac{x_2 - \mu}{\sigma}\right)$$

$$z_1 = \frac{x_1 - \mu}{\sigma}$$

$$z_2 = \frac{x_2 - \mu}{\sigma}$$

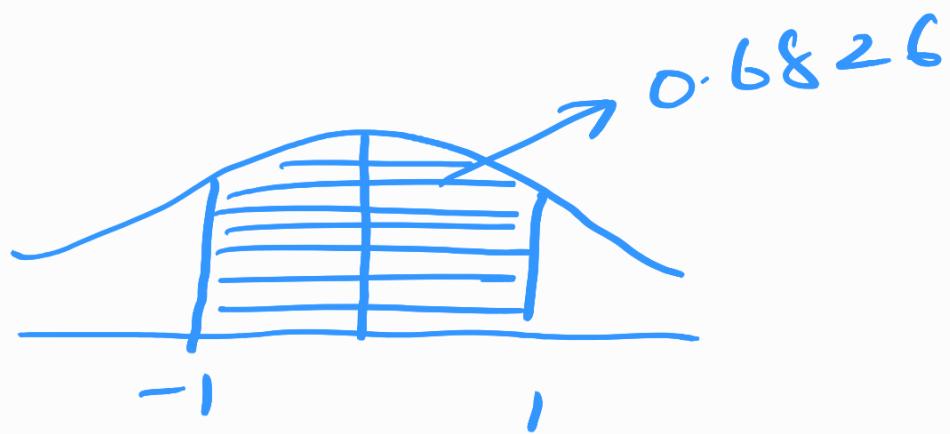
$$= \frac{65 - 68}{3}$$

$$= \frac{71 - 68}{3}$$

$$= -1$$

$$= 1$$

$$P(65 \leq x \leq 71) = P(-1 \leq z \leq 1)$$



$$= A(1) + A(1)$$

$$= 2 A(1)$$

$$= 2 (0.3413)$$

$$= 0.6826$$

$$\therefore P(65 \leq x \leq 71) = 0.6826$$

NO. of Students having marks between

$$65 \text{ and } 71 \bar{x} = 300 \times 0.6826$$

$$\approx 205$$

**Example 2: If  $X$  is normally distributed with mean 12 and standard deviation , then**

**(a) Find the probabilities of the following :**

- (i)  $X \geq 20$
- (ii)  $X \leq 20$  and
- (iii)  $0 \leq X \leq 12$

**(b) Find  $x$  when  $P(X > x) = 0.24$**

**(c) Find  $x_1$  and  $x_2$  when  $P(x_1 < X < x_2) = 0.5$  and  $P(X > x_2) = 0.25$**

**Example 3: The local authorities in a certain city install 10,000 electric lamps in the streets of the city. If these lamps have an average life of 1,000 burning hours with a standard deviation of 200 hours, assuming normality, what number of lamps might be expected to fail**

- (i) in the first 800 and 1200 burning hours?
- (ii) between 800 and 1200 burning hours?

**Example 4: A coin is tossed 10 times. Find the probability of getting between 4 and 7 heads inclusive using the (a) binomial distribution and (b) the normal approximation to the binomial distribution.**

**Example 5:**

1. The mean and standard deviation of a normal variate are 8 and 4 respectively, find
  - (i)  $P(5 \leq x \leq 10)$  (ii)  $P(x \geq 5)$  [JNTU 2005 S, JNTU (H) Nov. 2009 (Set No. 1)]
  - (iii)  $P(10 \leq x \leq 15)$  (iv)  $P(x \leq 15)$  [JNTU 2004 (Set No.2)]
2. If the mean and standard deviation of a normal distribution are 70 and 16, find  $P(38 < x < 46)$ . [JNTU 2005S (Set No.4)]
3. If  $X$  is normally distributed with mean 70 and standard deviation 16, find
  - (i)  $P(38 \leq X \leq 46)$  (ii)  $P(82 \leq X \leq 94)$  (iii)  $P(62 \leq X \leq 86)$
4. Find the probability that a random variable having standard normal distribution will take on a value between 0.87 and 1.28. [JNTU 2001]
5. If  $X$  is a normally distributed with mean 30 and standard deviation 5, find  $P(|X-30|>5)$ .

## uniform distribution

A continuous R.V  $x$  is said to follow uniform distribution

If its p.d.f is given by

$$f(x) = \begin{cases} \frac{1}{b-a} & \text{if } x \in [a, b] \\ 0 & \text{otherwise} \end{cases}$$

$a \leq x \leq b$

$$\text{Here } \mu = \frac{a+b}{2}$$

$$\sigma^2 = \frac{(b-a)^2}{12}$$

## Exponential Distribution

A continuous R.V  $x$  is said to follow an exponential distribution

If its p.d.f is given by

$$f(x) = \lambda e^{-\lambda x}$$

where  $x \geq 0$

$$\text{Here } \mu = \frac{1}{\lambda}, \sigma^2 = \frac{1}{\lambda^2}$$