$X > x = E(Y) \geq E(x)$

4th moment $= m(3m+1)$ #

at least one $= 1 - P(x=0)$

Theoretical distribution

→ **Binomial distribution.** ⇒ used to find the probability when total number of outcomes is huge.

Formula ⇒ ${}^{n}C_{x}\, p^{x} q^{n-x}$

- n = no. of times the experiment is repeated
- x = requirement of the question
- p = prob. of success in each trial
- q = prob of failure in each trial

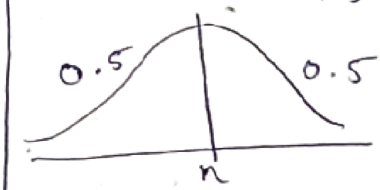
properties ⇒ of

3rd Central moment $= npq(q-p)$

4th Central moment $= \cancel{npq} \; 3(npq)^2$

1) applicable for discrete variable
2) biparametric (2 parameters n or p) → $x \sim B(n, p)$
3) $\boxed{\text{Mean}(\mu) = n \times p}$ → $\mu_2 = M$
4) Mode ⇒ Depends on the value of $(n+1)p$

Symmetric - $p = 0.5, q = 0.5$



$(n+1)p$ is an integer

- Mode 1 $= (n+1)p$
- Mode 2 $= (n+1)p - 1$

$(n+1)p$ is a fraction → Mode integral part in $(n+1)p$

ex = 5.33 so 5 will be a answer.

5) Variance $= n \times p \times q$ → (agar variance $p = q = 0.5$ hai to hume $\frac{n}{4}$ vala formula use karna hai)

↓ max at $p = q = 0.5$ $\boxed{\left(\frac{n}{4}\right)}$ → maximum value of variance → To find highest value of variance.

6) Standard deviation ⇒ $\sqrt{npq}$

7) Addition property ⇒ if $x \sim B(n_1, p)$ and $Y \sim B(n_2, p)$ then $x + Y \sim B(n_1 + n_2, p)$

[agar koi B.D hai x aur uske parameters hai n_1, p aur B.D hai Y uske p hai n_2, p so naya B.D hoga $x + y \sim B(n_1 + n_2, p)$]

Poisson distribution $\Rightarrow$ used to find the probability when Total no. of outcomes is huge and probability of success is very small.

$\rightarrow$ Formula $\Rightarrow$ $\dfrac{e^{-m} \times m^x}{x!}$

$e = 2.71828$
$m = \text{mean} = n \times p$
$x =$ requirement of the question

$\rightarrow$ properties

* Prob of success is very close to -1

* $np = (\lambda)$

1) applicable for discrete variable
2) uniparametric (m) $x \sim P(m)$
3) mean = variance = $n \times p \rightarrow$ finite.
4) Standard deviation $\Rightarrow$ $\sqrt{np}$ (Square root of variance)
5) Mode $\Rightarrow m$ (m is a mode)

M is an Integer

Mode 1 = m Mode 2 = $m-1$

M is a fraction

Mode Integral part in m

6) additive property is same as Binomial distribution.

~~Binomial distribution~~

$x+y \sim N(\mu, \sigma^2)$

Normal distribution → 2 parameters $N(\mu, \sigma^2)$

Formula ⇒ $\frac{1}{\sigma\sqrt{2\pi}} \times e^{\left(\frac{-(x-\mu)^2}{2\sigma^2}\right)}$

$e = 2.71828$
x = Random Variable
μ = mean of x
σ = SD of x

Mean = Mode = median

The height of the normal curve is max at the mean value

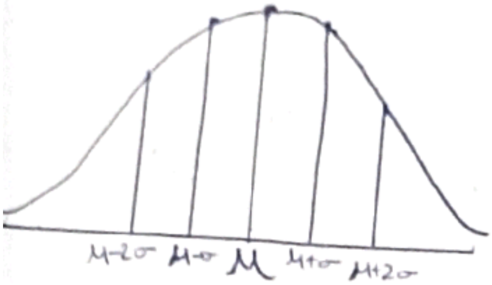
Lowest value = μ − half of range
Highest value = μ + half of range

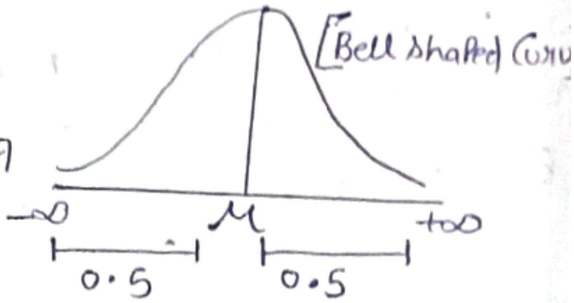
properties

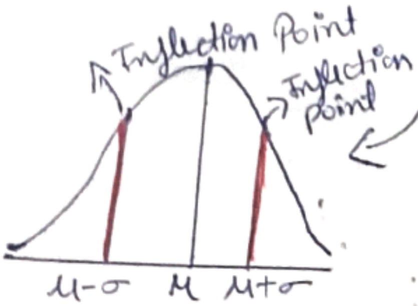
- applicable for continuous variable
- Biparameter
- Unimodal ⇒ ($\bar{x} = M = Z$)
- Relationship b/w MD, SD, QD

4 SD (siy)　　5 MD (mujhe)　　6 QD (kyu)

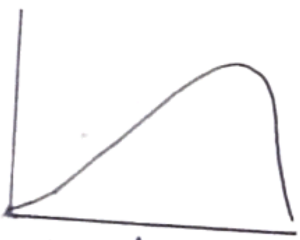
$\mu_1 + \mu_2 = \sqrt{\sigma_1^2 + \sigma_2^2}$



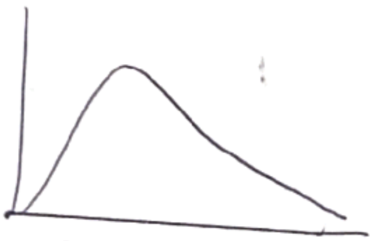




Skewness



Negative Skew



Positive Skew

Skewness of normal curve = 0

95% lies B/W => $\mu - 1.96\sigma, \mu + 1.96\sigma$

$\boxed{QD = 0.675\ SD}$

Bell Shaped Curve

Median = $\frac{Q_1 + \cancel{Q_2}}{\cancel{3}}$ $\frac{Q_1+Q_3}{2}$

$\boxed{Q_1 = \mu - 0.675\ SD}$

$\boxed{Q_3 = \mu + 0.675\ SD}$

$\boxed{MD = 0.8\ SD}$

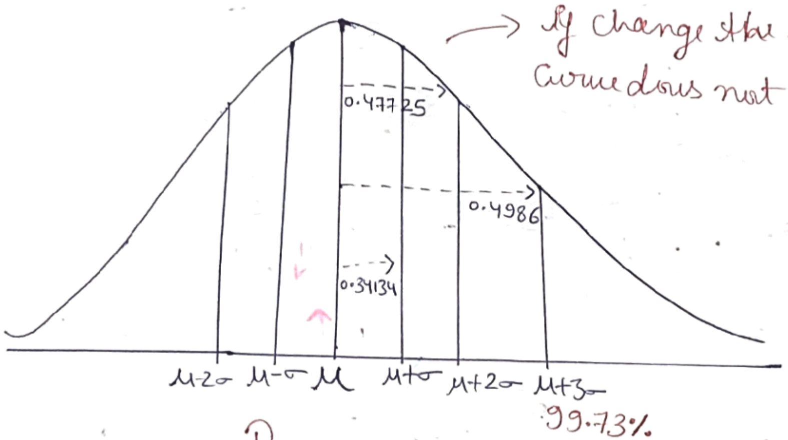
$\boxed{QD = \frac{Q_3 - Q_1}{2}}$

but in N.D

$\boxed{QD = 0.675\ SD}$

$\boxed{\mu = Z}$

$\Phi(1)$ => area towards left.



→ If change the parameters then curve does not change.

Point of inflection of a Normal curve

=> $\mu - \sigma, \mu + \sigma$.