# Probability - Lecture 6 :

* Consider $X$ to be a R.V such that

$X(\omega)$ = number of head's appearance.

| | TTT | TTH | THT | HTT | HTH | HHT | THH | HHH |
|---|---|---|---|---|---|---|---|---|
| | $\downarrow$ | $\downarrow$ | $\downarrow$ | $\downarrow$ | $\downarrow$ | $\downarrow$ | $\downarrow$ | $\downarrow$ |
| $X \to$ | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |

→ Number of tosses = 3.

→ if number of tosses = n

Then corresponding R.V $X$ takes values

$= \{0, 1, 2, \ldots n\}$.

→ $P(TTT) = (1-p)^3$.

$P(1H) = P(TTH) + P(THT) + P(HTT)$

$= qqp + qpq + pqq = 3pq^2$.

$P(2H) = 3p^2q$. , $P(3H) = p^3$.

Hence $P(X=i) = {}^nC_i\, p^i q^{n-i}$

↳ probability mass function of Binomial distribution

→ Note that we are forming the power series corresponding to each variable by considering that values it may take.

Eg: Number of ways getting

$$X + Y + Z = 50 \quad \text{such that}$$

$X \rightarrow$ multiple of 2.
$Y \rightarrow$ multiple of 3
$Z \rightarrow$ multiple of 5

→ This is given by co-efficient of $x^{50}$ in

$$(1 + x^2 + x^4 + \cdots)(1 + x^3 + x^6 + x^9 + \cdots) \times (x^5 + x^{10} + x^{15} + \cdots).$$

→ We need to generalise just by practising more number of problems.