Sequential Experiments:-

⇒ Many random experiments can be viewed as sequential experiments, that consists a sequence.

→ Different experiments may have same type of behavior, so they have same probability dist and can be represented by a single formula.

Random variable:- A random variable is a quantity whose values depends on chance.

⇒ Discrete random variable can take only a discrete set of integers. or whole numbers, that is value are taken by jumps, or breaks e.g no of persons in a ~~house~~ family, no of rooms in a house etc.

⇒ Continuous random variable can assume any value in a given range or interval i.e there is no gap or jumps. e.g height of a person, the amount of rain fall etc.

Probability distribution:- Probability dist of a discrete random variable is a list of all possible values of the variable and corresponding probabilities.

Discrete Probability distribution.

1. Binomial Distribution

If the probability of each outcome remains same throughout the trials then such trials are called Bernouli trials, and the experiment having n Bernouli trials is called Binomial experiment. ~~Binom~~ Binomial experiment possesses these four properties.

⇒ The outcome of each trial may be classified into one of the two categories. (Success or Failure)

⇒ The probability of success remains constant throughout the trials.

⇒ The repeated trials are all independent.

⇒ The experiment is repeated a fixed no of times, says n.

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

$$x = 0, 1, 2, \ldots, n$$

⇒ It has two parameters n and p.

⇒ denoted by $b(x; n, p)$

⇒ Binomial probability is appropriate when a random sample of size n is drawn W.R.

⇒ widely used in two outcome situation.

Alive or dead, Good and defective Infected and not infected, head and tail, Success or failure)

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X : No. of successes

P : Probability of success

q : probability of failure

n ; No. of trials.

(Where success is outcome of interest)

Example 8.4 :- A and B play a game in which A's probability of winning is 2/3. In a series of 8 games, what is the prob that A will win

i) Exactly 4 games

ii) Atleast 4 games

iii) A will not win 2 games.

$b(x; 8, \frac{2}{3})$

Solution:-

i) $n = 8$, $P = \frac{2}{3}$, $q = 1/3$

$$P(x=4) = \binom{8}{4}\left(\frac{2}{3}\right)^4\left(\frac{1}{3}\right)^4$$

$$\boxed{P(x=4) = 0.1707}$$

ii) $P(x \geq 4) = P(x=4) + P(x=5) + P(x=6) + P(x=7) + P(x=8)$

OR

$$P(x \geq 4) = 1 - P(x < 4)$$

$$= 1 - [P(x=0) + P(x=1) + P(x=2) + P(x=3)]$$

$$= 1 - \left[\binom{8}{0}(2/3)^0(1/3)^4 + \binom{8}{1}(2/3)^1(1/3)^3 + \binom{8}{2}(2/3)^2(1/3)^2 + \binom{8}{3}\left(\frac{2}{3}\right)^3(1/3)^1\right]$$

$$= 0.9121$$

(iii) A doesn't win 2 games. $b(x; 8, 1/3)$

Now $n = 8$, $p = 1/3$, $q = 2/3$

$$P(x=2) = \binom{8}{2}(1/3)^2(2/3)^6$$

$$= (28)(1/9)(64/729)$$

$$\boxed{P(x=2) = 0.2732}$$

8 $\boxed{nCr}$ 2 = 28