Q: What is binomial or bernoulli trial?

Ans: Any trial having only two possible complementary outcomes is called binomial trial or bernoulli trial.

e.g. I Success or failure

II When we toss a coin, there may be head or a tail.

Q: What is binomial experiment and what are its properties?

Ans: When binomial trials are repeated for a definite no. of times 'n' then it is called binomial experiment.

It has following properties.

I It has only two possible complementary outcomes.

i.e, Success or failure

II It is repeated for a definite no. of times 'n'.

III The probability of Success remains constant through trial to trial.

IV The successive trials remain independent.

Q: What is binomial probability distribution?

Ans: If x denotes the no. of success in, then the P.d.f (Probability density function)

$$P(x=x) = \binom{n}{x} p^x q^{n-x} \quad \text{for } x = 0, 1, 2, \ldots\ldots n$$

Where

P = Probability of Success

$q = 1 - P$ = Probability of failure

n = no. of trials

is called binomial probability distribution.

Note: It has only two parameters i.e, n, P.

Q: What is binomial frequency dist.

Ans: When the binomial experiment is repeated for a large no. of times 'N', then it is resulting dist. called binomial frequency dist.

i.e, $f(x=x) = N \binom{n}{x} p^x q^{n-x}$ for $x = 0, 1, 2, \ldots\ldots n$

OR $f(x=x) = N(q+p)^n$

Q: What is hypergeometric experiment and what are its properties?

Ans: In binomial experiment, when the probability of success changes from trial to trial and successive trials become

dependent, then it becomes hypergeometric experiment.

It has following properties

I It has only two possible complementary outcomes i.e, Success or failure

II It is repeated for a definite no. of times 'n'.

III The probability of Success changes from trial to trial.

IV The Successive trials become dependent.

Q: What is hypergeometric probability dist.

Ans: If x denotes the no. of success, then the P.d.f (Probability density function)

$$P(X = x) = \frac{\binom{K}{x}\binom{N-K}{n-x}}{\binom{N}{n}} \quad \text{for } x = 0, 1, 2, \ldots\ldots n$$

Where

N = Total no. of units

n = Sample size to be drawn

K = no. of favourable units.

is Called hypergeometric dist.

Note: It has three parameters N, n, K.

Q: Describe Poisson dist. OR Define Poisson dist.

Ans: In binomial dist. When the no. of trials 'n' is very large and probability of success 'p' is very small

$$\text{i.e, } n \longrightarrow \infty$$
$$p \longrightarrow 0$$

then a special kind of dist. is introduced named as Poisson distribution.

$$P(X=x) = \frac{e^{-\mu}\mu^{x}}{x!} \quad \text{for } x = 0,1,2,\ldots\ldots\infty$$

Where $\mu = np$

Note: I It has only one parameter 'μ'

II Many Statisticians use Poisson dist. inplace of binomial dist. When $n \geq 20$ OR $p \leq .05$ OR both

Q: What are Poisson Frequency distribution?

Ans: When Poisson experiment are repeated for a large no. of times 'N', then resulting dist. is called Poisson frequency distribution.

$$\text{i.e, } f(X=x) = N\,\frac{e^{-\mu}\mu^{x}}{x!} \quad \text{for } x = 0,1,2,\ldots\ldots\infty$$

Q: What is the relation between binomial and hypergeometric experiment.

OR Discuss the difference in conditions that must exisit in a problem situation for application of the hypergeometric

and the binomial distribution.

Ans: We use binomial dist. if its experiment has following properties.

I It has only two possible complementary outcomes i.e, Success or failure

II It is repeated for a definite no. of times 'n'.

III The probability of success remains constant through trial to trial.

IV The Successive trials remain independent.

And we use hypergeometric ~~experime~~ dist. If its experiment has following properties.

I It has only two possible complementary outcomes i.e, Success or failure

II It is repeated for a definite no. of times 'n'.

III The probability of success changes from trial to trial.

IV The successive trials become dependent.

Q: State the relation between binomial and Poisson distribution.

Ans: In binomial dist. when the no. of trials 'n' is very large and probability of

success 'p' is very small

i.e, $n \longrightarrow \infty$ and $p \longrightarrow 0$

then binomial dist. tends to Poisson dist.

i.e, $\binom{n}{x} p^x q^{n-x} \longrightarrow \frac{e^{-\mu} \mu^x}{x!}$

When $n \longrightarrow \infty$ and 'μ' remains constant.

Q: State the relation between binomial and Normal dist.

Ans: When the no. of trials 'n' is sufficiently large and p, q are not so small

i.e, $p \cong q$

OR When $np \geq 5$ and $nq \geq 5$ then binomial dist. approaches Normal dist.

Q: How the shape of binomial dist. depends upon the number of trials (n) and Probability of success 'p'.

Ans:- The binomial dist. is uni-modal.

I If $p = 0.5 = q$ for any 'n' the distribution becomes Symmetrical.

II If $p < \frac{1}{2}$ then dist. becomes +vely skewed.

III If $p > \frac{1}{2}$ then dist. becomes -vely skewed.

IV For large value of 'n' and for any values of p, q, the skewness decreases.

11 For small value of 'n' and greater difference between p, q increases the skewness.

Q: A person is known to win 2 games out of 8 on an average. Find the probability that out of 6 games he will win.

I First 3 games

II Any 3 games

Sol: $P(\text{win}) = 2/8 = 1/4 = p$ $\quad n = 6$

$P(\text{loose}) = 3/4 = q$

I $P(\text{first 3 wins}) = p.p.p.q.q.q = p^3q^3 = \left(\frac{1}{4}\right)^3\left(\frac{3}{4}\right)^3$

$= \frac{27}{4096}$ Answer

II $P(x = x) = \binom{6}{x}\left(\frac{1}{4}\right)^x\left(\frac{3}{4}\right)^{6-x}$ for $x = 0, 1, 2, 3, 4, 5, 6$

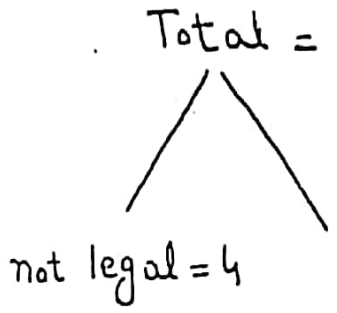
Let x denotes no. of games won by a player.

$P(\text{any three}) = P(x = 3) = \binom{6}{3}\left(\frac{1}{4}\right)^3\left(\frac{3}{4}\right)^3$

$= \frac{20 \times 1 \times 27}{4096} = \frac{540}{4096} = \frac{135}{4096}$

Q: What is the probability that a waitress will refuse to serve beverages to only 2 minors, if she randomly checks I.D.s of 6 students from among 9 students of which 4 are not of legal age.

Sol:



$x = 2$

$n = 6$

$K = 4$ not legal

$$P(X=2) = \frac{\binom{4}{2}\binom{5}{4}}{\binom{9}{6}} = \frac{6 \times 5}{84} = \frac{30}{84} = \frac{5}{14}$$

Q: What is Poisson Process?

Ans: Poisson Process is a physical process, governed at least in Past by some random mechanism. It is used to find the average no. of occurence per unit of time.

ie, $P(x, \mu t) = \frac{e^{-\mu t} (\mu t)^x}{x!}$

t = no. of units of time

x = no. of occurence in 't' time

$t\mu = \lambda$ = average no. of occurrence per unit time.

Q: What is the properties of binomial dist?

Ans: The binomial probability dist. has following properties.

I Total probability = 1

II mean = np

III variance = npq

IV mean > variance.

V Co-efficient of skewness = $\frac{q-p}{\sqrt{npq}}$

VI Co-efficient of kurtosis = $3 + \frac{1-6pq}{npq}$

Q: what are the properties of hypergeometric dist?

Ans: Hypergeometric p.d has following properties.

I Total probability = 1

II mean = np

III variance = $npq\left(\frac{N-n}{N-1}\right)$

Q: what are the properties of Poisson p.d?

Ans: The Poisson p.d has following properties.

I Total probability = 1

II mean and variance are same.

i.e mean = μ = variance.

III when $\mu \to \infty$ $\beta_1 = 0$ & $\beta_2 = 3$