Binomial Distribution

(Complete Concepts)

Probability of r success is

$$P(r) = {}^{n}C_r \, p^r \, q^{n-r}$$

$n \rightarrow$ no. of repeated trials

$p \rightarrow$ probability of a success

$q \rightarrow$ probability of a failure.

$$p + q = 1$$

$${}^{n}C_r = \frac{\lfloor n}{\lfloor r \, \lfloor n-r}$$

$${}^{n}C_0 = 1$$

$${}^{n}C_1 = n$$

$${}^{n}C_n = 1$$

$$ {}^{n}C_{r} = \frac{\lfloor n}{\lfloor r \, \lfloor n-r} $$

Mean, $m = np$

Variance $= npq$

Standard deviation $= \sqrt{npq}$

Note: when the experiment be repeated 'N' times, the frequency of r succes is $N \, {}^{n}C_{r} \, p^{r} q^{n-r}$.

Binomial Distribution

Problem#1

The probability that a pen manufactured by a company will be defective is 1/10. If 12 such pens are manufactured, find the probability that

i. exactly 2 will be defective

ii. none will be defective

iii. atleast 2 will be defective

BINOMIAL DISTRIBUTION

Que ① The probability that a pen manufactured by a company will be defective is 1/10. If 12 such pens are manufactured, find the probability that (a) Exactly two will be defective.

(b) None will be defective.

(c) Atleast two will be defective.

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Sol^{n} Total no. of pens, $n = 12$.

Probability of a defective pen, $p = 1/10 = 0.1$

Probability of a non-defective pen, $q = 1 - p = 0.9$

(a) Probability that exactly two will be defective

$$P(2) = {}^{12}C_2 (0.1)^2 (0.9)^{12-2} = \frac{12}{12\,10} (0.1)^2 (0.9)^{10}$$

$$= \frac{\overset{6}{\cancel{12}} \times 11 \times \cancel{10}}{\cancel{2} \times \cancel{10}} (0.1)^2 (0.9)^{10} = 0.2301$$

$= \frac{12 \times 11 \times \cancel{10}}{\cancel{2} \times \cancel{10}} (0.1)^{2} (0.9)^{10} = 0.2301$

(b) Probability that none will be defective

$P(0) = {}^{12}C_0 (0.1)^0 (0.9)^{12} = 1 \times 1 \times (0.9)^{12} = 0.2824.$

(c) Probability that atleast two will be defective

$P(2) + P(3) + P(4) \cdots + P(12) = 1 - [P(0) + P(1)]$

$= 1 - [{}^{12}C_0 (0.1)^0 (0.9)^{12} + {}^{12}C_1 (0.1)^1 (0.9)^{11}]$

$= 1 - [0.2824 + 12 (0.1)^1 (0.9)^{11}]$

$= 1 - [0.2824 + 0.3766]$

$= 0.3410$

Ans

Binomial Distribution

Problem#2

In a sampling, a large number of parts manufactured by a machine, the mean number of defectives in a sample of 20 is 2. Out of 1000 such samples, how many would be expected to contain atleast 3 defective parts.

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