NCERT: Class XII

Ahilan R - FWC22090

13.4.6 From a lot of 30 bulbs which include 6 defectives, a sample of 4 bulbs is drawn at random with replacement. Find the probability distribution of the number of defective bulbs.

Solution: Let X = number of defective bulbs in a draw. Let $Y = \{0, 1\}$ where $Y = 0$ and $Y = 1$ be the event of drawing a non-defective bulb and a defective bulb.

$$\mathrm{P}\left(Y = 1\right) = p = \frac{6}{30}, \quad \mathrm{P}\left(Y = 0\right) = q = \frac{24}{30}$$

$$p + q = 1 \implies \text{Bernoulli trials}$$

Hence, we can define our probability distribution as binomial distribution, $\mathrm{B}\left(4, \frac{6}{30}\right)$. It's probability function is

$$\mathrm{P}(X = k) = {}^{4}C_{k} p^{k} q^{4-k} \tag{13.4.6.1}$$

X	0	1	2	3	4
$\mathrm{P}(X)$	$\frac{256}{625}$	$\frac{256}{625}$	$\frac{96}{625}$	$\frac{16}{625}$	$\frac{1}{625}$

Table 13.4.6.1: Probability Distribution of X

`https://github.com/ahilan22/fwc-2/tree/main/probability/assignment/codes/12-13-4-6.py`