Probability(NCERT)

Ahilan R - FWC22090

CLASS XI

16.4.6 [1]Three letters are dictated to three persons and an envelope is addressed to each of them, the letters are inserted into the envelopes at random so that each envelope contains exactly one letter. Find the probability that at least one letter is in its proper envelope.

Solution: Let the letters be $X = \{0, 1, 2\}$ and the persons be $Y = \{0, 1, 2\}$. Let the placement of letters be P. The possible placements of letters,

$$P_1 = \{0, 1, 2\}, \quad P_2 = \{0, 2, 1\}$$
$$P_3 = \{1, 0, 2\}, \quad P_4 = \{1, 2, 0\}$$
$$P_5 = \{2, 0, 1\}, \quad P_6 = \{2, 1, 0\}$$

The placements P_1, P_2, P_3, P_6 are favourable outcomes . Hence, the probability = $\dfrac{4}{6}$.

https://github.com/ahilan22/fwc-2/tree/main/
probability/assignment/codes/11-16-4-6.py

CLASS XII

13.2.3 A box of oranges is inspected by examining three randomly selected oranges drawn without replacement. If all the three oranges are good, the box is approved for sale, otherwise, it is rejected. Find the probability that a box containing 15 oranges out of which 12 are good and 3 are bad ones will be approved for sale.

Solution: Let the selected oranges be $X = \{0, 1, 2\}$ and the quality of orange be $Y = \{0, 1\}$, where 0 means bad and 1 means good. The desired set of selection is $\{01, 11, 21\}$.

Probability	Value
P(01)	$\frac{12}{15}$
P(01|11)	$\frac{11}{14}$
P(01|11, 21)	$\frac{10}{13}$

Probability of the given box being approved for sale, (using multiplication rule)

$$= \text{P}(01, 11, 21) \qquad (13.2.3.1)$$
$$= \text{P}(01)\text{P}(01|11)\text{P}(01|11, 21) \quad (13.2.3.2)$$
$$= \frac{12 \times 11 \times 10}{15 \times 14 \times 13} = \frac{44}{91} \qquad (13.2.3.3)$$

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 E_1 and E_2 be the event of drawing a non-defective bulb and a defective bulb.

$$\text{P}(E_2) = p = \frac{6}{30}, \quad \text{P}(E_1) = q = \frac{24}{30}$$
$$p + q = 1 \implies \text{Bernoulli trials}$$

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

$$\text{P}(X = x) = {}^4C_x p^x q^{4-x} \qquad (13.4.6.1)$$

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

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

[1]Read question numbers as (CHAPTER NUMBER).(EXERCISE NUMBER).(QUESTION NUMBER)