

# Probability(NCERT)

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## CLASS XI

**16.4.6** 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  $X$  be the random variable denoting the number of letters in proper envelopes. Then the total number of outcomes in this experiment's sample space is given by

$$n(S) = 3! = 6 \quad (16.4.6.1)$$

So, the possible values for  $X$  are  $\{0, 1, 3\}$ . And,

$$n(X = 1) = {}^3C_1 \times 1 \times 1 = 3 \quad (16.4.6.2)$$

$$n(X = 3) = 1 \times 1 \times 1 = 1 \quad (16.4.6.3)$$

$$\therefore P_{req} = \frac{n(X = 1) + n(X = 3)}{n(S)} = \frac{4}{6} = \frac{2}{3} \quad (16.4.6.4)$$

## 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:**

Event	Description
$X_1$	Selecting 1 good orange
$X_2$	Selecting 2 good oranges
$X_3$	Selecting 3 good oranges

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

$$= P(X_1 X_2 X_3) \quad (13.2.3.1)$$

$$= P(X_1)P(X_2|X_1)P(X_3|X_2 X_1) \quad (13.2.3.2)$$

$$= \frac{12 \times 11 \times 10}{15 \times 14 \times 13} = \frac{44}{91} \quad (13.2.3.3)$$

Probability	Value
$P(X_1)$	$\frac{12}{15}$
$P(X_2 X_1)$	$\frac{11}{14}$
$P(X_3 X_2 X_1)$	$\frac{10}{13}$

**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  $X$  be the random variable denoting the number of defective bulbs. Let  $E_1$  and  $E_2$  be the event of drawing a non-defective bulb and a defective bulb.

$$P(E_1) = \frac{24}{30}, P(E_2) = \frac{6}{30} \quad (13.4.6.1)$$

Since we replace the item after drawing out of the box, (using multiplication rule)

Probability	Calculation	Value
$P(X = 0)$	${}^4C_0 \times \frac{24}{30} \times \frac{24}{30} \times \frac{24}{30} \times \frac{24}{30}$	$\frac{256}{625}$
$P(X = 1)$	${}^4C_1 \times \frac{6}{30} \times \frac{24}{30} \times \frac{24}{30} \times \frac{24}{30}$	$\frac{256}{625}$
$P(X = 2)$	${}^4C_2 \times \frac{6}{30} \times \frac{6}{30} \times \frac{24}{30} \times \frac{24}{30}$	$\frac{96}{625}$
$P(X = 3)$	${}^4C_3 \times \frac{6}{30} \times \frac{6}{30} \times \frac{6}{30} \times \frac{24}{30}$	$\frac{16}{625}$
$P(X = 4)$	${}^4C_4 \times \frac{6}{30} \times \frac{6}{30} \times \frac{6}{30} \times \frac{6}{30}$	$\frac{1}{625}$

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

TABLE 13.4.6.1  
PROBABILITY DISTRIBUTION OF  $X$

\*\*Read question numbers as (CHAPTER NUMBER).(EXERCISE NUMBER).(QUESTION NUMBER)