OBJECTIVE MATHEMATICS

Volume 2

Descriptive Test Series

Prof. M. L. Khanna
Bhushan Muley

CHAPTER-15 : PROBABILITY

UNIT TEST-1

1. Consider three sets $E_1 = \{1,2,3\}, F_1 = \{1,3,4\}$ and $G_1 = \{2,3,4,5\}$. Two elements are chosen at random, without replacement, from the set E_1, and let S_1 denote the set of these chosen elements. Let $E_2 = E_1 - S_1$ and $F_2 = F_1 \cup S_1$. Now two elements are chosen at random, without replacement, from the set F_2 and let S_2 denote the set of these chosen elements.

Let $G_2 = G_1 \cup S_2$. Finally, two elements are chosen at random, without replacement, from the set G_2 and let S_3 denote the set of these chosen elements.

Let $E_3 = E_2 \cup S_3$. Given that $E_1 = E_3$, let p be the conditional probability of the event $S_1 = \{1,2\}$. Then the value of p is

(a) $\frac{1}{5}$ (b) $\frac{3}{5}$

(c) $\frac{1}{2}$ (d) $\frac{2}{5}$

2. A number is chosen at random from the set {1, 2, 3, ..., 2000}. Let p be the probability that the chosen number is a multiple of 3 or a multiple of 7. Then the value of $500p$ is

3. Three numbers are chosen at random, one after another with replacement, from the set $S = \{1,2,3,\ldots,100\}$. Let p_1 be the probability that the maximum of chosen numbers is at least 81 and p_2 be the probability that the minimum of chosen numbers is at most 40. The value of $\frac{625}{4}p_1$ is.

Hints and Solutions

1. (214) $E_1 =$ Event that it is a multiple of 3

$E_2 =$ Event that it is a multiple of 3

$\therefore \quad P(E_1 \cap E_2) = P(E_1) + P(E_2) + P(E_1 \cap E_2)$

$$= \frac{666+285-95}{2000} = \frac{856}{2000}$$

$$\therefore \quad \text{GE} = 500 \times \frac{856}{2000} = \frac{856}{4} = 214$$

2. (a) The situation is represented as:

Required probability

$$= \frac{\frac{1}{3}\times\frac{1}{2}\times\frac{1}{10}}{\frac{1}{3}\times\frac{1}{2}\times\frac{1}{10}+\frac{1}{3}\times\left[\frac{1}{2}\times 1\times\frac{1}{10}+\frac{{}^3C_2}{{}^4C_2}\times\frac{1}{6}\right]+\frac{1}{3}\times\left[\frac{2}{3}\times\frac{1}{10}\right]}$$

$$= \frac{\frac{1}{20}}{\frac{1}{20}+\frac{1}{20}+\frac{1}{12}+\frac{1}{15}} = \frac{1}{20}\times\frac{60}{(6+5+4)} = \frac{1}{5}$$

3. (76.25)

$P_1 \to$ Probability that maximum of chosen number is atleast 91

$$\Rightarrow P_1 = 1 - \text{Probability of chosen numbers} \le 80$$

$$= 1 - \frac{80}{100}\times\frac{80}{100}\times\frac{80}{100} \quad (\because \text{ with replacement})$$

$$\Rightarrow P_1 = 1 - \frac{64}{125} = \frac{61}{125}$$

$$\Rightarrow 125P_1 = 61$$

$$\Rightarrow \frac{625}{4}P_1 = \frac{305}{4} = 76.25$$