ASSIGNMENT 5 : CBSE PROBABILITY CLASS-11

AI21BTECH11016

MISCELLINIOUS EXERCISE 16 : Q9

Question: If 4-digit numbers greater than 5,000 are randomly formed from the digits 0,1,3,5 and 7, what is the probability of forming a number divisible by 5 when,

 (i) the digits are repeated?
 (ii) the repetition of digits is not allowed?

Solution:
Let X=$\{0, 1\}$ be a random variable which represents the 4-digit number formed from the digits 0,1,3,5 and 7.

let Y=$\{0, 1\}$ be another random variable representing the repetition of digits in the 4-digit number.

Event	Description
X = 0	4-digit number is greater than 5,000
X = 1	4-digit number is divisible by 5
Y = 0	repetition of digits allowed
Y = 1	repetition of digits is not allowed

TABLE I

(i)

$$\Pr\left\{\frac{(X = 0)\,(X = 1)}{(Y = 0)}\right\} \qquad (1)$$

 a) Greater than 5,000 $\Rightarrow$ first digit = 5 or 7.

 b) Divisible by 5 $\Rightarrow$ last digit = 0 or 5.

 c) repetition allowed $\Rightarrow$ second and third digits = 0 or 1 or 3 or 5 or 7.

$$\Rightarrow \Pr\left\{\frac{(X = 0)\,(X = 1)}{(Y = 0)}\right\} = \frac{(2 \times 5 \times 5 \times 2 - 1)}{(2 \times 5 \times 5 \times 5 - 1)} \qquad (2)$$

$$= \frac{99}{249}. \qquad (3)$$

(ii)

$$\Pr\left\{\frac{(X = 0)\,(X = 1)}{(Y = 1)}\right\} \qquad (4)$$

 There are three possible cases :
 a) first digit = 5
   last digit = 0

 b) first digit = 7
   last digit = 0

 c) first digit = 7
   last digit = 5

 d) repetition not allowed $\Rightarrow$ second and third digits = two digits from the three left

$$\Rightarrow \Pr\left\{\frac{(X = 0)\,(X = 1)}{(Y = 1)}\right\} = \frac{6 + 6 + 6}{2 \times 4 \times 3 \times 2} \qquad (5)$$

$$= \frac{18}{48} \qquad (6)$$

$$= \frac{3}{8}. \qquad (7)$$