

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)

$$\Pr \left\{ \frac{(X = 0) \cap (X = 1)}{(Y = 0)} \right\} \quad (1)$$

- 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.

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

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

(ii)

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

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

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

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

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