ASSIGNMENT-2

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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=1	4-digit number formed from the digits 0,1,3,5 and 7
X=0	4-digit number formed without the digits 0,1,3,5 and 7
Y=1	repetition of digits in the 4-digit number
Y=0	without repetition of digits in the 4-digit number

TABLE II

(i)

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

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.

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

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

(ii)

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

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

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

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

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