Assignment 2

AI1110: Probability and Random Variables
Indian Institute of Technology Hyderabad

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Chapter 16 , Exercise 16.4

Question 9 :

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 :

1) the digits are repeated?
2) the repetition of digits are not allowed?

Solution:

'S' = Sample space = 4-digit numbers greater than 5,000
'A' = Event that number greater than 5,000 is divisible by 5
'B' = Event that number greater than 5,000 is starting with 5
'C' = Event that number greater than 5,000 is starting with 7

Since 4-digit numbers greater than 5,000 are formed , The thousands place is either 7 or 5.
A number is divisible by 5 if the digit at it's unit place is either 0 or 5.

Let X be a random variables such that,

$$X = \begin{cases} 1, & \text{if number greater than 5,000 is divisible by 5} \\ 0, & \text{if number greater than 5,000 is not divisible by 5} \end{cases} \tag{1}$$

1) When repetition of digits is allowed :

$$n(A) = 2 \times 5 \times 5 \times 2 - 1 = 99 \tag{2}$$
$$n(S) = 2 \times 5 \times 5 \times 5 - 1 = 249 \tag{3}$$

$$\Pr(X = 1) = \frac{n(A)}{n(S)} \tag{4}$$
$$= \frac{99}{249} \tag{5}$$
$$= \frac{33}{81} \tag{6}$$

2) When repetition of digits is not allowed :

$$n(S) = 2 \times 4 \times 3 \times 2 = 48 \tag{7}$$
$$n(B) = 1 \times 4 \times 3 \times 2 = 24 \tag{8}$$
$$n(C) = 1 \times 4 \times 3 \times 2 = 24 \tag{9}$$
$$n(AB) = 1 \times 3 \times 2 \times 1 = 6 \tag{10}$$
$$n(AC) = 1 \times 2 \times 3 \times 2 = 12 \tag{11}$$
$$n(A) = n(AB) + n(AC) = 18 \tag{12}$$

$$\Pr(X = 1) = \frac{n(A)}{n(S)} \tag{13}$$
$$= \frac{18}{48} \tag{14}$$
$$= \frac{3}{8} \tag{15}$$