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:

 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.

 1) When repetition of digits is allowed :

 Let Event E represents The probability of forming a number greater than 5,000 divisible by 5 when the digits are repeated .

Total number of 4-digit numbers greater than 5,000	$2 \times 5 \times 5 \times 5 - 1 = 249$
Total number of 4 digit numbers greater than 5,000 divisible by 5	$2 \times 5 \times 5 \times 2 - 1 = 99$

TABLE 1

$$\Pr\left(\text{number divisible by 5 when digits repeated}\right) = \Pr\left(E\right) \tag{1}$$

$$= \frac{99}{249} \tag{2}$$

$$= \frac{33}{81} \tag{3}$$

 2) When repetition of digits is not allowed :

 The thousands place can be filled with either of the 2 digits 5 or 7 i.e by 2 ways .
 The remaining 3 places can be filled with any of the remaining 4 digits .
 Let event E represents Probability of forming a number greater than 5,000 divisible by 5 when the repetition of digits is not allowed .

Total number of 4-digit numbers greater than 5,000	$2 \times 4 \times 3 \times 2 = 48$
Number of 4-digit numbers starting with 5 and divisible by 5	$1 \times 3 \times 2 \times 1 = 6$
Number of 4-digit numbers starting with 7 and divisible by 5	$1 \times 2 \times 3 \times 2 = 12$
Total number of 4-digit numbers greater than 5000 divisible by 5	$6 + 12 = 18$

TABLE 2

$$\mathrm{Pr}\,(\text{number divisible by 5 when digits are not repeated}) = \mathrm{Pr}\,(E) \qquad (4)$$

$$= \frac{18}{48} \qquad (5)$$

$$= \frac{3}{8} \qquad (6)$$