

# A1110 Assignment 1

## 11.16.4.9

SHIRSENDU PAL  
CH22BTECH11033

**Question:** : 16 : 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;

$$R := \begin{cases} 1, & \text{if repetition allowed} \\ 0, & \text{if repetition not allowed} \end{cases}$$

$$T := \{0, 1, 3, 5, 7\}$$

$$S := \{x \mid (x \geq 5001) \wedge (\text{digits}(x) \in T)\}$$

$$\therefore |S| = 2 * 5^3 - 1 = 249$$

$\therefore$  2 choices for first position 2 choices for last position and 5 choices for middle position. Also, exclude case for 5000.

(i) Let:

$$E_1 := \{x \mid (x \in S) \wedge (5 \mid x) \wedge (R = 1)\}$$

Numbers of form: 5xx0, 5xx5, 7xx0, 7xx5  $\in E_1$  where  $x \in T$ . Example: 5005, 5175, 5550, 7550, 7735, etc. Note that 5000  $\notin E_1$ .

$$\therefore |E_1| = 2 * 2 * 5^2 - 1 = 99.$$

$$\Pr(E_1) = \frac{|E_1|}{|S|} = \frac{99}{249}.$$

(ii) Let:

$$E_2 := \{x \mid (x \in S) \wedge (5 \mid x) \wedge (R = 0)\}$$

Numbers of form:  $\{5xy0 \mid x \neq y \text{ and } x, y \in T - \{5, 0\}\}, \{5xy5 \mid x \neq y \text{ and } x, y \in T - \{5\}\}, \{7xy0 \mid x \neq y \text{ and } x, y \in T - \{7, 0\}\}, \{7xy5 \mid x \neq y \text{ and } x, y \in T - \{7, 5\}\} \in E_2$ .

Example: 5130, 5710, 5015, 5175, 7150, 7310, 7015, 7305, etc.

$$\therefore |E_2| = 1 * 1 * 3 P_2 + 1 * 2 * 3 P_2 = 18$$

$$\Pr(E_2) = \frac{18}{249} = \frac{6}{83}.$$