

EE22BTECH11029 - Komakula Sreeja

Question 10.13.1.19

The probability that a non leap year selected at random will contain 53 sundays.

Solution: A non-leap year has 365 days, and a week has 7 days. Using the modulo operator, we can calculate the number of weeks and the remaining days as follows:

$$\text{no. of remaining days} = 365 \pmod{7} = 1. \quad (1)$$

$$\text{no. of weeks} = \frac{365 - 1}{7} = \frac{364}{7} = 52. \quad (2)$$

Therefore, a non-leap year has 52 weeks and 1 day in total.

$$\implies 52 \text{ sundays}. \quad (3)$$

Let X denote the day of a week.

$$X = \begin{cases} 1, & \text{Sunday} \\ 2, & \text{Monday} \\ 3, & \text{Tuesday} \\ 4, & \text{Wednesday} \\ 5, & \text{Thursday} \\ 6, & \text{Friday} \\ 7, & \text{Saturday} \end{cases} \quad (4)$$

$$p_X(n) = \frac{1}{7} \quad \text{for } n \in \{1, 2, 3, 4, 5, 6, 7\} \quad (5)$$

Hence probability of the extra day being a sunday is

$$p_X(1) = \frac{1}{7} \quad (6)$$

Parameters	Values	Description
X_i	1	Sunday
	2	Monday
	3	Tuesday
	4	Wednesday
	5	Thursday
	6	Friday
	7	Saturday