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:

$$\text{no. of weeks} = \frac{365}{7} = 52 \tag{1}$$

$$\text{no. of remaining days} = 365\%7 = 1. \tag{2}$$

Therefore, a non-leap year has 52 weeks and 1 day in total. Let X be a random variable denoting whether the last day is sunday.

$$X = \begin{cases} 0 & n \not\equiv 0 \pmod 7 \; thelastdayisnotsunday \\ 1 & n \equiv 0 \pmod 7 \; thelastdayissunday \end{cases} \tag{3}$$

Then

$$p_X(0) = \frac{6}{7} \tag{4}$$

$$p_X(1) = 1 - p_X(0) \tag{5}$$

$$= 1 - \frac{6}{7} \tag{6}$$

$$= \frac{1}{7} \tag{7}$$

Parameters	Values	Description
X_i	0	The last day is not Sunday
	1	The last day is Sunday