

Assignment 1

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- 1) If a leap year is selected at random, what is the chance that it will contain 53 tuesdays?

Solution: We know that, A leap year has 366 days - 52 weeks and 2 days. In 52 weeks, there are 52 Tuesdays. Define the random variable X for the first day of 2 consecutive days as in the following table 1

| RV | Description | Probabilities |
|---------|-------------|---------------|
| $X = 0$ | Monday | $\frac{1}{7}$ |
| $X = 1$ | Tuesday | $\frac{1}{7}$ |
| $X = 2$ | Wednesday | $\frac{1}{7}$ |
| $X = 3$ | Thursday | $\frac{1}{7}$ |
| $X = 4$ | Friday | $\frac{1}{7}$ |
| $X = 5$ | Saturday | $\frac{1}{7}$ |
| $X = 6$ | Sunday | $\frac{1}{7}$ |

TABLE 1: Random variable X

The probability that the leap year will contain 53 Tuesdays is equal to the probability that the remaining 2 days will contain a tuesday. The first day should be either Monday or tuesday.

$$X = 0 \text{ or } X = 1 \equiv X \in \{0, 1\} \quad (0.0.1)$$

$$X = 0 \text{ and } X = 1 \equiv X = \phi \quad (0.0.2)$$

Hence, the required probability is given by,

$$\Pr(X \in \{0, 1\}) = \Pr(X = 0) + \Pr(X = 1) - \Pr(X = \phi) \quad (0.0.3)$$

$$= \frac{1}{7} + \frac{1}{7} \quad (0.0.4)$$

$$= \frac{2}{7} \quad (0.0.5)$$