Assignment 3

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PROBLEM: Savita and Hamida are friends. What is the probability that both will have

(i) Different birthdays?
(ii) The same birthday? (ignoring a leap year).

Solution: We assume that these 365 outcomes are equally likely.

Let's denote the situation of the problem by a random variable X such that $X \in \{0, 1\}$.
where,

Event	Description
X=0	Both girls having different birthdays
X=1	Both girls having same birthday

TABLE I: Randomn Variable and Event Distribution

(i) probability such that both girls having different birthdays can be given as:

If Hamida's birthday is different from Savita's,then the number of favourable outcomes for her birthday is $365 - 1 = 364$

$$\Pr(X = 0) = \frac{\text{Number of favourable outcomes}}{\text{Total number of days}} \tag{1}$$

$$= \frac{364}{365} \tag{2}$$

(ii) The probability that both girls having same birthday can be given as :

If Hamida's birthday is same of Savita's,then the number of favourable outcomes for her birthday is 1

$$\Pr(X = 1) = \frac{\text{Number of favourable outcomes}}{\text{Total number of days}} \tag{3}$$

$$= \frac{1}{366} \tag{4}$$

Note: Since we know that the event mentioned are mutually exclusive and exhaustive in nature, the probability that both girls having same birthday can also be given as :

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

$$= 1 - \frac{364}{365} \tag{6}$$

$$= \frac{1}{366} \tag{7}$$

$\therefore$ from (2),(4)

(i) probability that both girls having different birthdays is $\frac{364}{365}$.

(ii) The probability that both girls having same birthday is $\frac{1}{366}$.