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: Out of the two friends, one girl, say, Savita's birthday can be any day of the year. Now, Hamida's birthday can also be any day of 365 days in the year.
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 :

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

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

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

∴ 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 $\frac{1}{366}$.