Probability&RV Assignment-06

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https://github.com/Anuradha−Uggi/Assignments−AI5002−Probability−and−Random−Variables/blob/main/Prob_ass06/rvsp6_51.py

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I. QUESTION(PROB,5.1)

It is given that in a group of 3 students, the probability of 2 students not having the same birthday is 0.992.What is the probability that 2 students have the same birthday?

II. SOLUTION

Let X is a random variable indicates number of people sharing their birthday and Y is a random variable indicates X people sharing or not sharing their birthdays.

Given Data:
Probability of 2 people not sharing the Birthday is

$$P(Y = 0/X = 2) = 0.992 \tag{1}$$

from the Axioms of Probability we can say that

$$P(Y = 0/X) + P(Y = 1/X) = 1 \tag{2}$$

from above equation (2)
Probability that 2 students among 3 have same birthday is

$$P(Y = 1/X = 2) = 1 - P(Y = 0/X = 2) \tag{3}$$

$$P(Y = 1/X = 2) = 1 - 0.992 = 0.008 \tag{4}$$

Generalization:

- Let us consider non leap years having 365 days/year.
- Then Probability that k among n people share birthday is given by

$$P(Y = 1/X = k) = \frac{\binom{n}{k} \times \binom{365}{n+1-k} \times (n+1-k)!}{365^n} \tag{5}$$

Conclusion:
Probability that 2 among 3 people having same birthday is 0.008.