1. For a group of 7 people, find the probability that all 4 seasons (winter, spring, summer, fall) occur at least once each among their birthdays, assuming that all seasons are equally likely.

Sol)

Probability that all 4 seasons occur among their birthdays:

Let's assume that the 7 people have their birthdays distributed uniformly and independently across the 4 seasons.

The probability that all 4 seasons occur at least once among their birthdays can be calculated using the principle of inclusion-exclusion.

P(all 4 seasons occur) = 1 - P(at least one season is missing)

P(at least one season is missing) = P(only 3 seasons occur) + P(only 2 seasons occur) + P(only 1 season occurs)

P(only 3 seasons occur) = C(4, 3) \* (3/4)^7

P(only 2 seasons occur) = C(4, 2) \* (2/4)^7

P(only 1 season occurs) = C(4, 1) \* (1/4)^7

P(at least one season is missing) = P(only 3 seasons occur) + P(only 2 seasons occur) + P(only 1 season occurs)

P(all 4 seasons occur) = 1 - P(at least one season is missing)

1. Alice attends a small college in which each class meets only once a week. She is deciding between 30 non-overlapping classes. There are 6 classes to choose from for each day of the week, Monday through Friday. Trusting in the benevolence of randomness, Alice decides to register for 7 randomly selected classes out of the 30, with all choices equally likely. What is the probability that she will have classes every day, Monday through Friday?

Sol)

Probability of having classes every day, Monday through Friday:

The total number of ways to choose 7 classes out of 30 is C(30, 7).

The number of ways to choose 1 class for each day of the week is 6^5.

P(having classes every day) = (number of favorable outcomes) / (total number of possible outcomes)

= 6^5 / C(30, 7)