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.**

Ans- There are 4 seasons, and we want each of them to occur at least once among the 7 people. We can think of this problem as assigning the seasons to the people in a particular order.

The first person can have their birthday in any season (probability 1).

The second person can have their birthday in any of the remaining 3 seasons (probability 3/4).

The third person can have their birthday in any of the remaining 2 seasons (probability 2/4).

The fourth person can have their birthday in the remaining season (probability 1/4).

Since the order of the people doesn't matter, we multiply the probabilities together:

P(All 4 seasons occur at least once) = 1 \* (3/4) \* (2/4) \* (1/4) = 3/32

Therefore, the probability that all four seasons occur at least once among the birthdays of the 7 people is 3/32.

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?**

Ans- Alice wants to have classes every day, Monday through Friday, by randomly selecting 7 classes out of 30. We can approach this problem using combinatorics.

The total number of ways for Alice to choose 7 classes out of 30 is given by the binomial coefficient:

C(30, 7) = 30! / (7! \* (30 - 7)!) = 2035800

Now, let's consider the favorable outcomes where Alice has classes every day of the week. We need to choose 1 class for each day from Monday to Friday, which means we choose 5 out of the 6 available classes for each day.

The number of ways to choose 5 classes out of 6 for each day is given by:

C(6, 5) = 6! / (5! \* (6 - 5)!) = 6

Since the choices for each day are independent, we multiply the number of ways for each day together:

Number of favorable outcomes = 6 \* 6 \* 6 \* 6 \* 6 = 7776

Therefore, the probability that Alice will have classes every day, Monday through Friday, is:

P(Classes every day) = Number of favorable outcomes / Total number of outcomes

= 7776 / 2035800

≈ 0.00382

So, the probability that Alice will have classes every day is approximately 0.00382 or 0.382%.