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.**
   Given that seasons are equally likely and all 4 seasons (winter, spring, summer, fall) occur at least once each among their birthdays

   Total outcomes: Each person is allotted a season out of 4. Hence 48 possibilities

   Number of Outcomes that one or more season has no student having their birthday:

   Using Inclusion and Exclusion, 4C1*38 - 4C2*28 + 4C3*18 [i.e. Exclude 1 season - Exclude 2 season + exclude 3 season, also note that we can't exclude all the 4 seasons]

   Probability that one or more season has no student having their birthday:

   (4C1*38 - 4C2*28 + 4C3*18) / 48 = 0.377

   Required probability that all 4 seasons (winter, spring, summer, fall) occur at least once each among their birthdays:

   1-0.377=0.623

   = 4P(A1) 6P(A1 \ A2)+4P(A1 \ A2 \ A3). We have P(A1) = (3/4)7

2. **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?**

   There are two general ways that Alice can have class every day: either she has 2 days with 2 classes and 3 days with 1 class,

   or she has 1 day with 3 classes, and has 1 class on each of the other 4 days. The number of possibilities for the former is:

   (52)(62)263(52)(62)263 (choose the 2 days when she has 2 classes, and then select 2 classes on those days and 1 class for the other days).

   The number of possibilities for the latter is:

(51)(63)64(51)(63)64

So the probability is: (52)(62)263+(51)(63)64(307)(52)(62)263+(51)(63)64(307) which is close to 30.2%.