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 **48possibilities**

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

Seasons = {Winter, spring, summer, fall}

Number of people = 8

X be a variable such that it denotes the number of seasons which consists of birthdays of all 8 people,

All seasons are equally likely,

P(Winter) = P(spring) = P(Summer) = P(Fall) =1/4

P{X = i} is probability of birthdays occurring in i seasons,

P{X=1} (4 1) (1/4)^8 = 0.00006103515

P{X = 2} (4 2) (1/2)^8 = 0.02345

P{X = 3} (4 3) (3/4)^8 = 0.4004

P{X=4}=1— (P{X =3} — P{X=2} + P{X =1})

P{X = 4} =1 — (0.4004 — 0.02345 + 0.0000610)

P{X =4} =1- 0.377011 = 0.623

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?**

