**Identifying unconditional and conditional probabilities.**

From probability you studied in elementary statistics, you are supposed to remember that probabilities deal with the relative frequency that an event occurs in a population. The denominator is the count of the population, and the numerator is the number of times that event occurs in the population.

Population is just a general term. It just means the group we are talking about. That group could be a population such as the population of the US, or of California, or of San Jose. But it could also be all the products you sell in a store, or all the mutual funds available, or all the pets you own, or all the days in the past year. In a probability problem, you first need to identify the population. It will be the biggest group that the problem is talking about.

For example, I could ask, what is the chance that a student randomly selected from our class is male? The ‘population’ is our class. We are ignoring the fact that it is a subset of SJSU students, or residents of California, or of the US, or the world. This chance is the probability that a member of our class is male.

For conditional probabilities, you need to identify the **subpopulation** that the new probability is about. That is usually called the ‘conditioning event.’ So there has to be first, a population, then second, a subpopulation that you are restricting your attention to.

So, I could ask the following questions:

1. What is the chance that a randomly selected student in our class got an ‘A’ in statistics?
2. What is the chance that a randomly selected male student in our class got an ‘A’ in statistics?
3. What is the chance a randomly selected student in our class who got an ‘A’ in statistics is male?

The notation would be:

1. P(student in class got A in statistics) – or even more reduced: P(A)
2. P(student in class got A in statistics|student is male) – or even more reduced: P(A|M)
3. P(student in class is male|student got A in statistics) – or even more reduced: P(M|A)

where A stands for ‘student got an A in statistics’ and M stands for ‘student is male’

In the first case, I am talking about anyone in our class population. But in the second two problems, I am restricting to the subpopulation of male students in the case of the second question, or a student who got an A in statistics in the second question.

Sometimes there are marker words that help you distinguish. I mentioned the words ‘given,’ ‘if,’ and ‘when’ as examples in class. For example,

4. Given a student in our class is female, what is the chance she got an A in statistics?

5. If a student does well in the quizzes, what is the chance he or she will do well on the final?

6. What is the chance a student does well on the final when he or she has a full-time job during the summer session as well?

So notice that I have given key words to highlight the conditioning events. I am still talking about students in our class, but I am breaking them up into subpopulations for the probabilities.

4. P(A|F) ( where F = female student)

5. P(Well on final|well on quizzes)

6. P(Well on final|has full-time job in summer session)

Sometimes the word ‘of’ can be a clue to the conditioning event or subpopulation, as in the following examples:

7. What is the chance of a female student having a full-time job in summer session?

8. What is the chance of a student who did all the homework to do well on the final?

9. What is the chance of a student whose native language is not English to do well on the final?

Notation:

7. P(full-time job in summer session | F)

8. P(do well on final|did all homework)

9. P(do well on final|native language not English)

I will set up some more examples for you to practice on.