Finite Mathematics Problem Set D Solutions

3.1 15. Fred the weatherman states that on October 30 it will rain with probability .6, there will be a change in the wind direction with probability .7, and there will both rain and a change in the wind direction with probability .5. If Fred is right, what is the probability that either it will rain or there will be change in the wind direction, but not both.

I recommend drawing a Venn diagram for this problem. You remember my pretty Venn diagram from before. Maybe this time I will try to describe it instead. Please try drawing along with my description, and please complain to me if you want to see the diagram itself. My diagram has two sets, R and W. It is probability so the entire diagram is 1. All of R is 0.6. All of W is 0.7. The intersection is 0.5. The part that is in R but not in W is therefore 0.1, and the part in W but not R is 0.2. So, the probability that either it will rain or there will be change in the wind direction, but not both is the sum of these final two, $0.1 + 0.2 = 0.3$. The question doesn't ask, but if we want to complete the entire diagram, the probability that nothing happens is $1 - 0.1 - 0.5 - 0.2 = 0.2$.

3.1 21-22. Each Monday a student attends mathematics class with probability .6, skips accounting class with probability .3, and attends both with probability .5. Find the probability that they attend at least one class on Monday, and also find the probability that they attend exactly one class.

Again another simple Venn diagram. My diagram has two sets, M and A, which I will use for *attending* each of these classes on Monday. It is probability so the entire diagram is 1. All of M is 0.6. A' is 0.3 so all of A is 0.7. The intersection is 0.5. (wow, these numbers are exactly the same as the prior question, how silly is that?) Exactly one class, for exactly the same reasons as the prior question is still $0.1 + 0.2 = 0.3$. At least one class also includes the intersection , so increases to $0.3 + 0.5 = 0.8$.

3.2 20. A student has 7 tickets to a play; 3 are in row A, 2 are in row B, and 2 are in row C. Two tickets are selected at random, and it is noticed that one is *not* in row A.
(a) Find the probability that both are in row B.
(b) Find the probability that both are in the same row.

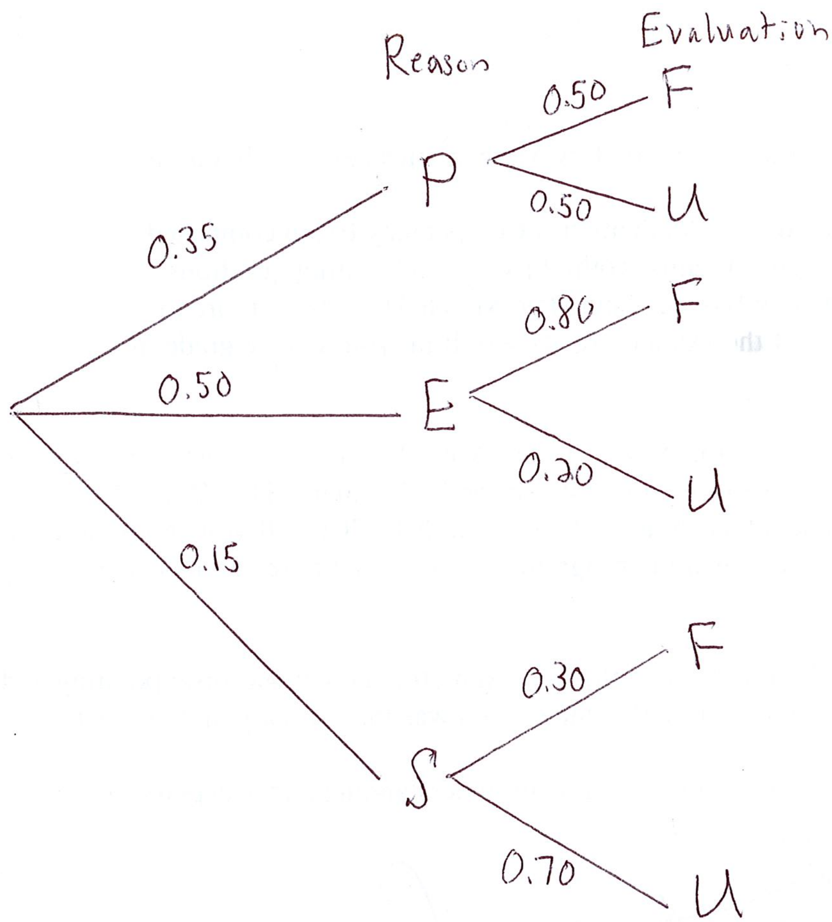
Two tickets are being selected from 7. The number of ways to do this is $C(7, 2) = \frac{7 \cdot 6}{2 \cdot 1} = 21$. Since one is not in row A, we may eliminate the possibility that they are both in row A. The number of ways to select two tickets both in row A is $C(3.2) = 3$. Therefore, there are 18 options that are being considered. For (a) we want both in row B. There is $C(2, 2) = 1$ way to do this (select the two tickets in Row B. So, the probability is $\frac{1}{18}$. For (b) there are two ways to be both in the same row, both in B and both in C. Because there are only two tickets in each of those rows, again, there is only one way for this to happen for each $1 + 1 = 2$ (ok, I didn't need to say that) and so the probability is $\frac{2}{18} = \frac{1}{9}$.

3.2 26. Students at GSU register for courses, and then their schedules are prepared by computer [a fascinating idea to consider]. The computer is programmed to assign each student who registers for a course to a specific section of the course. There are 3 morning sections and 1 afternoon section of accounting and 1 morning section and 1 afternoon section of economics. All these sections are at different times, and the computer assigns students to sections at random. Jose registers for accounting and economics. If he is assigned 1 morning class and 1 afternoon class, what is the probability that he has accounting in the morning?

Jose has $\frac{1}{2}$ probability of being in morning economics and $\frac{1}{2}$ probability of being in afternoon economics. He also has probability $\frac{3}{4}$ probability of being in morning accounting and $\frac{1}{4}$ probability of being in afternoon accounting. Because they are all at different times, these are independent events (the computer doesn't consider one when planning the other, only if they conflict, which they do not). There are two ways to have one morning and one afternoon, either economics then accounting (which has probability $\frac{1}{2} \cdot \frac{1}{4}$) or accounting then economics (which has probability $\frac{1}{2} \cdot \frac{3}{4}$). These are two cases so we add them. When we do so we find the probability of being assigned one morning class and one afternoon class is simply $\frac{1}{2}$. The event that accounting is in the morning (with economics in the afternoon), as indicated above has probability $\frac{1}{2} \cdot \frac{3}{4} = \frac{3}{8}$. So, if he is assigned 1 morning class and 1 afternoon class, the probability that he has accounting in the morning is $\frac{3}{8} \div \frac{1}{2} = \frac{3}{4}$.

3.3 22. A group of people who had recently purchased new cars was surveyed about the purchases. Each person was asked to select the single most important factor in the determining their choice and to indicate whether the purchase had proved satisfactory. Of this group, 35 percent cited price as the most important factor, 50 percent cited fuel economy, and the remainder cited styling. Fifty percent of those who cited price as the most important factor expressed satisfaction with their purchase, 80 percent of those who cited fuel economy were satisfied, and 30 percent of those who cited styling were satisfied. View this as an experiment whose outcomes are a reason for purchase (price, fuel economy, styling) and an evaluation of satisfaction (satisfied, not satisfied).
(a) Draw a tree diagram for this experiment, and find the probability for all outcomes.
(b) Let F be the event consisting of all outcomes in which the purchaser was satisfied. Find $\Pr[F]$.

From the tree diagram we can see the outcomes and their probabilities. To find $\Pr[F]$ we add the probabilities for PF, EF, and SF, to get $0.175 + 0.40 + 0.045 = 0.62$, or 62%.



Outcome	Prob
PF	0.175
PU	0.175
EF	0.40
EU	0.10
SF	0.045
SU	0.105