CSci 5541, Fall 2007: Homework 1

Due electronically on Friday 9/21 at NOON.

1. Probability Calculation: [10 pts.]
   Calculate probabilities for the following 'Koolaid friends' scenario:

   Chris, Sandy, Pat, and Dana are all friends who like Koolaid. Sandy stays home all the time. On any given day, there is 50% chance that Chris will visit Sandy for the day; otherwise Chris visits the movies. Two days out of five Pat will tag along with Chris wherever Chris goes; otherwise Pat visits the swimming hole. Sandy is a Koolaid connoisseur, and normally will make Koolaid 60% of the time. However, if Pat, a notorious glutton, is coming over, Sandy only makes Koolaid 20% of the time. If Sandy makes Koolaid, Dana comes over to Sandy's house half the time; otherwise she never visits.

   (a) Write out the probability equations, and calculate the joint distribution over all possible configurations of events (activities and Koolaid).

   (b) What is the probability that Sandy will be serving Koolaid?

2. Programming: [10 pts.]
   Implement code using random variable and probability model templates in the Random Variable Template Library (RVTL) to compute and output the full joint distribution over all combinations of events (as calculated in 1a). Your code should read and write probability tables as model files in the RVTL format (input files will be provided on-line).

3. Programming: [10 pts.]
   Implement code using random variable and probability model templates in the RVTL to compute and output the probability of Sandy serving Koolaid (as calculated in 1b). Use your results from problem 2. Again, your code should read and write probability tables as model files in the RVTL format (input files will be provided on-line).

4. Programming: [10 pts.]
   Implement code using the RVTL to compute and output:

   (a) the most likely atomic event for this scenario (from the full joint distribution of all random variables, including Koolaid).

   (b) the most likely (marginal) outcome for Sandy making Koolaid in this scenario.