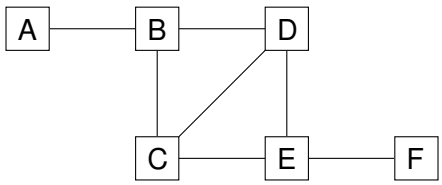
C241 Homework Assignment 6

1. Suppose you want to assign seats for a single row of 4 guys and 4 gals in such a way that each guy is sitting next to *at least* one gal, and *vice versa*. How many ways are there to do this? HINT: Use a decision tree, and practice by solving the 3-guy, 3-gal problem.

2. Your neighborhood has a street map isomorphic to the undirected graph shown below. Use a decision tree count the number of ways to get from point A to point F without visiting the same point twice.



3. A license plate consists of two letters of the alphabet followed by three decimal digits. How many different license plates are possible?

4. A committee of 12 is to be selected from 10 men and 10 women. In how many ways can the selection be carried out if

(a) There are no restrictions?

(b) There must be six men and six women?

(c) There must be an even number of women?

(d) There must be more women than men?

(e) There must be at least eight men?

5. A hand of seven cards is dealt from a standard deck of 52 cards.

(a) In how many ways can the resulting hand contain two spades (♠) and five red cards (♡ or ♢)?

(b) The *likelihood* (probability) of an outcome with property P is the quotient of the number of outcomes with property P and the total number of outcomes. What is the likelihood that the hand described above will occur?

6. A fair coin is tossed six times. How many ways can the six tosses result in two heads and four tails? How likely is this to happen?

7.

(a) How many arrangements are there for all the letters in SOCIOLOGICAL?

(b) In how many of those arrangements are A and G adjacent?

(c) In how many of the arrangements are all the vowels adjacent?

8. A classroom contains n students. Disregarding leap years, how likely is it that at least two of the student have the same birthday—that is, born on the same day of the month but possibly in different years?

HINTS:

(a) The likelihood (probability) of an outcome with property P is the quotient of the number of outcomes with property P and the total number of outcomes. In this problem the total number of outcomes is 365^n because each student's birthday could be any day of the year.

(b) If the likelihood of an outcome with property P is p then the likelihood of an outcome that *does not* have property P is $1 - p$.

(c) Evaluating the liklihood for this problem is a messy job. If you want to give a numerical solution, rather than a formula, write a program to compute it. The numbers involved may be quite large, so beware of truncation errors. Remember that Scheme has "*bignums,*" and can do arithmetic on unbounded integers.

Supplemental Problem. (Monty Hall Problem) This problem appeared in the *Ask Marylyn* (Marylyn Vos Savant) column of *Parade* Magazine on September 9, 1990. It has come to be called the *Monty Hall Problem.*[1]

You are a contestant in a game show called *Goat or No Goat.* In the final round, you are to select one of three doors to win the prize behind it. Behind two of the doors are goats, and behind the third is *A Brand New Car!.* The game works like this:

1. You choose a door.
2. The game-show host shows you which of two unchoosen door has a goat behind it.
3. You now have the option of sticking with your original choice or changing your choice to third, unopened door.

What should you do?

[1]Monty Hall was the original host of the game show *The Price Is Right*, after which *Goat or No Goat* is modelled