Math 297 -Programming Project  50 points

This project may be done alone or with one partner.
The project consists of a written report (typed) and the program in your TI calculator.
The written report consists of three parts:
1) a TI-Graph-Linked copy of the program in your calculator with explanatory comments (must match program in calculator except for comments)
2) a theoretical discussion of the mathematics involved
3) results (varies with project)

The program is worth 30 points.  The analysis ((2) theoretical discussion and (3) results) is worth 20 points.  It is expected that (2) and (3) are consistent- if not, gather more data or fix what is wrong.
The program must use one or more lists effectively.

Choose one of the following:

1. A building has f floors (above the ground floor) and 1 elevator.  The elevator has a button for each floor and stops at that floor if its button is pressed.  p people get on the elevator.  Each person wants to get off at a particular floor and presses the button for that floor.  In general, a person is equally likely to want any of the floors.  (Both f and p must be greater than or equal to 1 and less than or equal to 10.)  You are to investigate how many stops you expect the elevator to make, for various numbers of floors and people, both theoretically and experimentally.

   Write a program to simulate an experiment with the elevator to determine the probability of each possible number s of stops.  Accept as input the number of trials, the number of floors f, and the number of people p.  Record the fraction (as a decimal) of the trials that the elevator made s stops for each s (with 1 ≤ s ≤ f) in a list.  This is your experimental probability.  Report the average number of stops (= expected value of number of stops).

   For results (3), provide 2 tables.  Table 1 should list both experimental and theoretical probabilities of each number of stops (1 ≤ s ≤ 3 ) and average number of stops for 3 floors 3 people.  Table 2 should list experimental probability for each number of stops (1 ≤ s ≤ 6 ) and average number of stops for 6 floors 8 people.  Experimental probabilities should be based on at least 100 trials.

   Comment:  This project is challenging.  The theoretical probability is beyond the scope of this class for large numbers of floors.  I expect the theoretical analysis to be complete for 2 floors (any number of people), and done for 1-3 people for 3 floors.

2. You roll two standard dice and sum the results. You are to investigate the probability that the sum is n for n=2,...,12, theoretically and experimentally.

   Write a program to simulate an experiment to evaluate these probabilities (this means you treat each die as a separate random variable).  Accept as input the number of trials requested.  Report the results graphically (both theoretical and experimental probabilities).  The program should also create lists of data that can be accessed by the user if desired.

   For results (3), provide both a graph and a table of theoretical and experimental probabilities.  Experimental probabilities should be based on at least 1000 trials.

   Comment: The context and the theoretical probability in this project are very easy.  The programming of the simulation is also not difficult.

Note: Full credit (50 points) may be obtained by doing either project correctly.  Extra credit may be obtained by doing Project 1 correctly and independently.