HOMEWORK FOR SEMINAR 7

Think about these probability problems and try to answer them. Write a well commented program for each problem to complement your reasoning. Bring a printout of your programs and conclusions to hand in.

(1) In some countries, having a son is considered important. Therefore, families go on getting children until they have a boy and then they stop. How does that influence the proportions of boys and girls? Compare your intuition with your simulation results.

(2) The 190 students in this course attend either the first or the second hour of a seminar. When the choice was left to each student, only 85 students turned up the first hour and 105 the second hour. May we draw the conclusion that the second hour is more popular? Is the difference significant on the 95 % level? On the 99 % level?

   Formulate the null hypothesis and test it in a simulation program.

(3) A net poker site has introduced a new game: Red Vibes. The objective is to guess when the next card is red. The stake is 100 SEK and the return is 200 SEK if your guess is correct. This is how it goes:

   A shuffled face-down deck of cards is on the screen. Every second, the top card is turned face-up and then discarded. At any time during the fifty-three seconds that one game takes you may click on the face-down top card and if it turns out to be red, you win. If you don't click at all, your choice is taken to be the last card. The deck contains 26 reds, 26 blacks and one joker.

   Obviously, clicking the first card will make you lose money on average, but possibly there exists a better strategy, something like "await a situation where more blacks than reds have been turned up, then click!" If you can program a bot who plays a winning strategy, the millions will start rolling in effortlessly. Worth trying? Why don't you program a strategy and test!

(4) In each box of Cerebral Cereal there is a plastic figurine portraying a well-known philosopher. If there are 66 different philosophers, how many boxes would you have to buy on average to get a complete set? As this is an old maths problem, Johan and Henrik both believe that they remember the solution. According to Johan, the average is $n \ln n$ but according to Henrik it is $n \cdot e$. Let your simulation determine who is right!