FINAL EXAM (PART II - QUESTION 1 THROUGH 5) OF MATH 5020

ASSIGNED: FEBRUARY 2, 2003 - DUE: FEBRUARY 16, 2003

There are a few instructions for this exam that I want to give in advance:

- I have the same expectations for this exam as I did for the first part of the final exam, that is, "the purpose of this exam is to encourage you to write clearly and succinctly." For that reason I am not asking you to give me answers, I am only looking for solutions. Each of the following questions that I am asking you has the answer given. This in this exam you must explain that answer.
- Expect to write and rewrite your solution to each problem 2 to 3 times. In order for you to receive full credit for your answer your explanation must be **complete and crystal clear.**
- The 'division principle' is difficult to explain clearly. You are hereby warned that any solution that you give using it will be marked down unless it is applied clearly and correctly.
- On the previous exam I asked you to work alone and this instruction was only followed to a certain degree. On this exam you may work with another person, however if you choose to speak with someone else about this exam they must do a different problem as you. Please write the name and question number of any person you discuss a problem with on the exam. When you discuss a question, please do not 'give' the solution to someone. I have the right to give a 0 if these instructions are not followed.
- You may ask me questions although I would like you to ask them in the FORUM, this way everyone has the chance to read the same instructions/information.
- Do one of the following 5 problems. Note that the probabilities in the following lotteries are approximate and are taken directly from the website `http://www.olgc.ca` .

(1) Ontario has a lottery called Keno. A player decides how many numbers to play between 2 and 10 that are between 1 and 70. A machine then picks 20 winning numbers also between 1 and 70 and the player then wins for matching some or all of the numbers. Explain why a player who plays the game with 7 numbers on their ticket has a probability of $1/619$ of matching 6 of the 20 winning numbers.

(2) Again for the game of Keno, explain why a player who plays the game with 10 numbers on their ticket has a probability of $1/39$ of matching with none of the 20 winning numbers.

(3) In the game of "Encore" a player buys a ticket with a six digit number (each of the 6 digits are between 0 and 9). A machine picks another 6 digit number and the player wins for matching some or all of the digits. Explain why the probability of matching the last three digits and the first digit is approximately $1/12,345.68$.

(4) Ontario has a lottery called Super 7 where a player chooses a ticket with 7 numbers from 1 to 47. A machine then picks 7 winning numbers and a bonus all from 1 to 47. A player then wins from matching some or all of the winning numbers. Explain why the probability of matching 3 of the 7 winning numbers and the bonus is $1/196.62$.

(5) Explain why the number of ways of placing 5 distinct objects in 5 different boxes in such a way that exactly one box is left empty is equal to 1200.