MATH 367, fall 98
PROJECT 2
Due: Mon Apr 15

NAME:

BIRTHDAY PROBLEMS

It's Friday night and people start arriving, one by one, to the Ballroom for the monthly Swing Dance. Tonight the *Blues Kings* are playing. Today is Mary Jane's birthday, a regular at the dance. She is curious and wonders if there is anybody else in the room with her same birthdate. She wants to know how often birthdate coincidences happen.

Your task is to help her elucidate these questions.

(a) What is the probability that if the ballroom has n people (including Mary Jane), there is another person in the room with Mary Jane's birthdate? How large should n be so that this probability is at least 1/2?

(b) Mary Jane is curious to know the chances that in the ballroom there are two people with the same birthdate (even if it is not her same birthdate). Give a formula for the probability that in a group of n people, there are at least two people with the same birthdate.

(c) Mary Jane wants to know how many people must be at the ballroom before the odds are even or better of having two people with the same birthdate. (That is, the probability of 2 people having the same birthdate is at least 1/2)

Help her with this question. You could start with computing a few of the probabilities in (b). For example, you may want to compute the formula in item (b) when n varies from 20 to 30.

(d) Explain to Mary Jane what is the expected number of people that should be in the ballroom so that there are at least two people with the same birthdate? (You'll be able to answer this question soon).

(e) Explain to Mary Jane what is the expected number of people that should be in the ballroom so that there is at least onother

person with her same birthdate? (You'll be able to answer this question soon).

Note: You may want to use a computer program like **Maple** to do the calculations. If you need help with **Maple**, come talk to me.

Instructions for people registered for the Z-section:
You have to first solve the problem and then write up the explanation of your solution as if you where explaining it to a person who has not thought in mathematical terms in a long time. That is, you have to write a detailed explanation of your solution in your own words and in simple terms.

The paper should be typed in double space. Formulas may be done by hand.

As before, the format of your project should be:

(a) statement of problem,
(b) discussion of the solution, and
(c) conclusion. Are you surprised at your findings? Why? What did your intuition tell you?