STATISTICS 134 Practice Midterm

There are 5 questions, worth a total of 22 points. Calculations should be worked through to an explicit numerical answer. Show your work!

1. **[3 points]** There are 27 students taking this class. Suppose you know your own birthday, but you don't know anyone else's birthday. What would you say is the chance that there is someone else in the class with the same birthday as you?

2. **[3 points]** In a certain town
10% of families have 0 children
15% of families have 1 child
30% of families have 2 children
25% of families have 3 children
20% of families have 4 children
If you choose a child at random (i.e. each child has the same chance to be chosen), what is the probability that the child comes from a 3-child family?

3. **[6 points]** A jar contains 3 red, 2 white and 1 green ticket. 3 tickets are drawn at random without replacement. Let X be the number of red tickets drawn, and let Y be the number of green tickets drawn.

(a) Find the joint probability function for (X, Y), and display it in a small table.

(b) Calculate $E(XY)$.

4. **[4 points]** I am playing roulette, betting 1 dollar on red each time, and continue for 18 plays. At the same time you are at the same table betting 1 dollar on number 7 each time, for the same 18 plays. Each of us has some overall gain, positive or negative.

(a) Is your gain independent of my gain?

(b) Calculate approximately the chance that your gain is larger than my gain.

[Hint: think before calculating!]

[Information: the roulette wheel has 38 slots, of which 18 are red. Betting on red has payoff odds 1:1, and betting on a single number has payoff odds 35 to 1. The number 7 is a "red" number.]

5. **[6 points]** Newspapers like to publish articles complaining about the lack of knowledge of students nowadays. One article, referring to a survey done at Cal State Fullerton, was headlined "more students can identify Erica Kane than Andrew Jackson". Suppose that at U.C. Berkeley it's the other way round: say

65% of students know who both Jackson and Kane are
21% of students know who Jackson was, but not who Kane is
12% of students know who Kane is, but not who Jackson was
2% of students know neither.

If you took a random sample of 100 Berkeley students, what is the approximate chance that *in the sample* more students know who Kane is than know who Jackson was?

[Hint: consider the sample difference as a sum of 100 r.v.'s]