Problem set 3, due Monday 9/21/2015

Note: Please submit Excel files to me by e-mail, before class on Monday

1. Birthdays on Mercury

Suppose that, sometime in the distant future, humans colonize the planet Mercury. (The weather there is weird, but let's say that they figure out a way to make that okay.) On Mercury, they use their own calendar, which has 88 days in the year. People are born on Mercury, and they grow up celebrating their birthdays according to that calendar.

Suppose that there are n Mercurians in a room. Use Excel to calculate, for each value of n from 1 to 88, the probability that at least one pair of them will share the same birthday. How large does n need to be before this probability is greater than 50%?

2. Binomial distribution

Use Excel to graph the binomial distribution for

a) $p = 1/2$ and $n = 4$

b) $p = 1/2$ and $n = 8$

c) $p = 1/2$ and $n = 16$

d) $p = 1/2$ and $n = 32$

That is, for each value of the parameters p and n, calculate the probability of getting k successes, for each value of k from 0 to n. Then, make this data into a column chart, with the values of k on the horizontal axis, and the probability of each k on the vertical axis. You are encouraged to decorate your charts with nice formatting, colorful shading, etc.

3. Normal distribution

For each binomial distribution in question 2, perform each of the following steps:

a) Find the mean and standard deviation, μ and σ.

b) At each value of k, calculate the density of a normal distribution with the same μ and σ.

c) To each of your column charts of binomial probabilities, add a curved line (from the scatter plot graph menu) representing the corresponding normal density function.

Exercises from the book

3.1, 3.10, 3.27