# Math 114 Exam 2

Ethan D. Bolker

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Your name: _____

1. ( 10 points) General guidelines

   - Read these guidelines. You get your 10 points by following them. Just reading them isn't enough.
   - Open book, open notes, open internet . . . open everything except text messages to friends asking for answers. But don't waste time on the net – there is no question that requires a search there.
   - For homework for Tuesday, rethink your answers. If you can write better ones, submit them.
   - The exam calls for two spreadsheets.

     When you finish each one (don't wait for the end of the exam, when the printer will be backed up):

     – Put your name in the spreadsheet.
     – Print it.
     – If there are calculations in your spreadsheet, print it again, this time showing the Excel *formulas* you used instead of the values Excel computed.

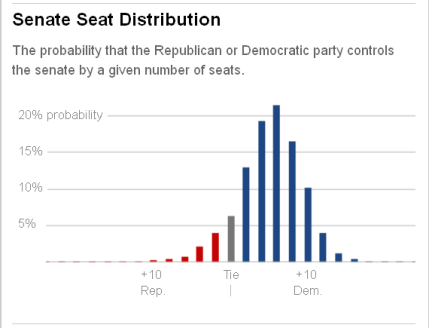
     (If the printer in the classroom misbehaves you won't lose points here)

     When you have finished the exam

     – email all your spreadsheets to yourself.
     – email all your spreadsheets to me, at `ebolker@gmail.com`, in one letter, as attachments. Use the subject line

     `Math114 Exam2 [your name]`

2. (45 points) This graphic appeared in Nate Silver's Five Thirty Eight column in *The New York Times* on October 31. [1] The $x$ axis displays the number of seats held by each party: the Tie in the middle is 50 Democrats, 50 Republicans. The +10 Dem corresponds to 55 Democrats, 45 Republicans.




Nate Silver constructed this histogram by imagining (simulating) many thousands of elections and recording the percentage of time each Democratic/Republican split occurred. I estimated the percentages in the chart and entered them in spreadsheet `http://www.cs.umb.edu/~eb/114/exam2/Oct31SenateProjection.xls` so you don't have to type them yourself. (I rounded the really tiny percentages to zero.) Use Excel whenever it's most convenient for you.

(a) What is the most likely number of Democratic Senators?

(b) What number of Democratic Senators represents the mode of this distribution?

(c) What is the probability that there are more than 50 Democratic Senators?

(d) What number of Democratic Senators is the median of this distribution?

(e) If you had the complete list of all Nate Silver's imagined elections and sorted it by the number of Democratic Senators, how many Democratic Senators would there be in the middle election on that list?

(f) Use Excel to compute the (weighted) average number of Democratic Senators for these imagined elections.

(g) Recreate the chart in Excel, with proper labels. You need not match the format exactly, but it might be fun to try – at home, after the exam, perhaps for Tuesday.

[1] The source is `http://fivethirtyeight.blogs.nytimes.com/2012/10/31/oct-30-what-state-polls-suggest-about-the-nationa` Don't bother visiting that site – you won't learn anything there that will help with this question. (You might learn lots there if you visit after the exam.)

3. (45 points) Comparing cell phone plans.

This figure appeared in *The Boston Globe* on June 14, 2012. The three columns display the cost of the phone, the monthly charge, and the total cost for two years of use.


(a) How much would it cost (in total) to buy the Cricket phone and use it for two months?

(b) Write an equation for the the total cost to buy and use the Virgin Mobile phone for $M$ months.

(c) Identify the slope and the intercept of your equation, with proper units for each.

(d) Create an Excel spreadsheet and use Excel formulas to complete a table like this:

| Months | Cricket | Virgin |
|---|---|---|
| 0 | | |
| 1 | | |
| ... | | |
| 24 | | |

(e) Check that your spreadsheet produces the answers in the graphic for 24 months.

(f) Create a properly labelled and formatted chart displaying the data in your table.

(g) When (in terms of months of use) would it be better to choose the Cricket phone?

(h) Suppose the monthly charge for the Cricket phone was just \$45 while that for the Virgin phone increased to \$35/month. Answer the previous question with this new data.