New York University
Wilf Family Department of Politics
Fall 2013

Quantitative Research in Political Science I

(POL-GA.1250)
Professor Patrick Egan

PROBLEM SET 1: Due Monday, September 30 at beginning of class.

A reminder: you may work with others in the class on this problem set, and you are in fact encouraged to do so. However, the work you hand in must be your own. Handwritten work is acceptable, but word-processed work (e.g., using LaTeX) is preferred.

The following two questions are designed to get you nimble with the sorts of proofs we'll be doing in class with scalar algebra and summation signs:

1. Prove that the sum of deviations of a set of measurements from their mean is equal to zero, that is:
$$\sum_{i=1}^{N}(y_i - \overline{y}) = 0.$$

2. Show that the variance of an empirical distribution is equal to the average of the squared observations minus the square of the average observation, that is:
$$\frac{1}{N}\sum_{i=1}^{N}(y_i - \overline{y})^2 = \frac{\sum_{i=1}^{N}(y_i)^2}{N} - (\overline{y})^2$$

*Most of the remaining problems come from WMS, **7th edition**. Note that the answers to odd-numbered, non-asterisked problems may be found in the back of the book. (In contrast to those answers, please show all your work.)*

3. WMS Exercise 2.77
4. WMS Exercise 2.78.
5. WMS Exercise 2.83.
6. WMS Exercise 2.106.
7. WMS Exercise 2.117.

8. You are an R.A. for a Politics professor conducting a lab experiment at NYU. The experiment is desperately seeking students who identify as Republican. There are very few Republican undergraduates at NYU (only 10 percent of undergrads identify as Republicans) and so most are reluctant to disclose their party affiliation. With just minutes to go before the lab experiment, you run out onto Mercer Street to try to find subjects. Knowing that many students will refuse to tell you if they are Republicans, you wonder if there is a less obtrusive question you can ask.

   Because NYU's business school (Stern) is known to enroll many Republican students, you first consider asking students if they are enrolled at Stern. (65% of the Republicans at NYU are enrolled at Stern, but only 15% of non-Republicans at NYU are enrolled at Stern.)

   (a) What is $P(\text{Republican}|\text{enrolled at Stern})$?

   (b) What is $P(\text{Republican} \cap \text{enrolled at Stern})$?

   (c) If you ask 100 random NYU students if they are enrolled at Stern and bring those who say "yes" to the lab, how many Republicans should you expect this to yield?

   Your answer to (c) seems like a low number, so you decide to ask a question that will yield more "yeses": ask students their favorite color. (Blue is the favorite color of 50% of NYU undergrads, regardless of their party affiliation.)

   (d) What is $P(\text{Republican}|\text{favorite color is blue})$?

   (e) What is $P(\text{Republican} \cap \text{favorite color is blue})$?

   (f) If you ask 100 random NYU students their favorite color and bring those who say "blue" to the lab, how many Republicans should you expect this to yield?

   (g) OK, one more idea: ask 100 students whether they are left- or right-handed and bring those saying "right-handed" to the lab. To determine whether this method is expected to yield more students than either of the two methods discussed so far, which of the following pieces of information would you like to know, and why?
      - the probability that a Republican is right-handed
      - the probability that a right-handed person is Republican