Math 10 - Spring 2013
Homework 1
Due April 1, 2013

While a man is an insoluble puzzle, in the aggregate he becomes a mathematical certainty. You can, for example, never foretell what any one man will do, but you can say with precision what an average number will be up to. Individuals vary, but percentages remain constant.—Sherlock Holmes

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Turn in: Exercises 1.5, 1.16, 1.22, 1.27, 1.42, and 1.50 from the textbook, and problems 7 and 8 below.
Practice (Optional, don't turn in): 1.9, 1.13, 1.25, 1.33, 1.39 from the textbook.

7. The table below lists the total number of Wins/Losses/Ties for the Dartmouth hockey team in recent years:

Year	Wins	Losses	Ties
2008-09	17	13	3
2009-10	11	20	3
2010-11	20	13	3
2011-12	16	16	5
2012-13	15	14	5

a. Find the average (mean) number of Dartmouth Hockey wins over the last five years.
b. Compute the sample variance (s^2) and standard deviation (s) for the number of wins.
c. Why did we use the sample variance/standard deviation, and not the population one? Would the values be larger or smaller if we found the population values instead?

8. The equation given in class for the population variance is

$$\sigma^2 = \frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2$$

where μ is the population mean. Another way to compute this value is

$$\sigma^2 = \frac{1}{N}\left(\sum_{i=1}^{N} x_i^2\right) - \mu^2$$

or, using a bar to denote the average, $\sigma^2 = \overline{x^2} - \bar{x}^2$. So (population) variance is the difference between the average square value, and the average value squared. Show that these two expressions are equal. (*Hint:* Start by expanding the quantity in the first expression. Remember the definition of μ!)

Note: While we will generally use the first expression, computer software typically uses the second for the following reason: To use the first expression the computer must keep track of all of the data, which uses a lot of memory (to first compute the mean, and then use the data again to compute the variance) while the second requires only that one keep a running total of $\sum x_i^2$ and $\sum x_i$.