MA381 Introduction to Probability, HW 15

Instructions: This homework will be collected at the beginning of class Friday, Feb 12. Some problems will be graded in depth; remaining problems will be awarded completion credit. Late HW's are not accepted.

1: Suppose that a simple random sample of 50 bottles of a particular brand of cough syrup is selected, and the alcohol content of each bottle determined. Let μ denote the average alcohol content for the population of all bottles of the brand under study. Suppose that all assumptions/requirements for the 95% percent confidence interval are met and that its value for this sample is (7.8, 9.4).

i. A 90% confidence interval calculated from this same sample will be **(circle one) narrower/wider** than the given interval?

ii. True/False There is a 95% chance that μ is between 7.8 and 9.4.

iii. True/False We can be highly confident that 95% of all bottles of this type of cough syrup have an alcohol content that is between 7.8 and 9.4.

iv. True/False If the process of selecting a sample of size 50 and computing the corresponding 95% interval is repeated 100 times, about 95 of the resulting intervals will include μ.

2: The capacities (in ampere-hours) were measured for a sample of 120 batteries. The average was 178 and the standard deviation was 14. Do the following:

i. Compute a 90% confidence interval for the average capacity of this make of battery.

ii. An engineer claims that the mean capacity of these batteries is between 176 and 180 ampere-hours. If she is making this claim based on the 120 measurements, what is the level of confidence of her claim?

3: Methyl t-butyl ether (MTBE) is an organic water contaminant that oftern results from gasoline spills. The level of MTBE (in parts per billion) was measured for a sample of 12 well sites near a gas station in New Jersey (the *garden* state!). The actual data (from *Environmental Science and Technology*, Jan. 2005) is given below:

150	367	38	12	11	134
12	251	63	8	13	107

Note that since $n = 12$ is too small, we cannot use our large-sample confidence interval formula to estimate the mean level of MTBE near the gas station. Estimate the necessary sample size to estimate the mean MTBE level μ_M to within 10 parts per billion with 95% confidence.

4: Determine $z_{\alpha/2}$ for an 80% confidence interval.

5: According to Fox News (http://www.foxnews.com/politics/2009/11/19/fox-news-poll-palin-going-rogue/), in a recent telephone poll of 900 registered voters, 61% felt Palin is unfairly treated by the media. Compute a 95% confidence interval for the true fraction of voters who feel Palin is unfairly treated by the media.

6: It seems that on most polls done by the major networks, the error margin is stated as being plus or minus two percentage points. If the plus or minus two percentage points corresponds to a confidence interval having at least a 95% confidence level (irrespective of the sample proportion observed), what sample size are they using?