Use the body temperature data set found on the course website. This was originally posted in the Journal of Statistical Education (at http://www.amstat.org/publications/jse/datasets/normtemp.dat.txt), and the data set there was based on a data set from an article in the Journal of the American Medical Association entitled “A Critical Appraisal of 98.6 Degrees F, the Upper Limit of the Normal Body Temperature, and Other Legacies of Carl Reinhold August Wunderlich,” by Mackowiak, Wasserman, and Levine in 1992.

Since the subjects in this data set were not drawn at random from a larger population, the primary source of variability in these measurements is the variability in individual body temperature among these individuals that would arise naturally in different measurements. The population to which our inferences apply is the individuals in this sample, and we are estimating the average body temperature among these individuals (and we model the measurement process as having some inherent randomness).

Let $X$ be the random variable whose value is the value of body temperature obtained by measuring one of the individuals in this group of 130 individuals.

Also, let $\mu[X]$ denote the true, unknown random variable mean of $X$.

Let $M$ be the random variable whose value is the sample mean of a 130-sample of $X$. As usual, we use $M$ as an estimator of $\mu[X]$.

1. What is the value of the point estimate of $\mu[X]$ obtained from $M$ with this sample?

2. What is the standard error of $M$ used in computing a 95% confidence interval for $\mu[X]$?

3. How many degrees of freedom does the relevant $t$ distribution have for this confidence interval computation?

4. What is the central 0.95-quantile for that $t$ distribution?

5. What is a 95% confidence interval for $\mu[X]$?

6. Conventional wisdom is that average body temperature is 98.6 degrees Fahrenheit. To test this, you will now conduct a hypothesis test with $H_0 : \mu[X] = 98.6^\circ F$ and $H_a : \mu[X] \neq 98.6^\circ F$.

As usual, use a significance level of 0.05.

What is the standard error of $M$ used in this hypothesis test?

7. What approximation of the distribution of $M$ under the null hypothesis should we use for this hypothesis test?

8. What is $T$, the studentized value of $M$, for this particular sample?

9. What is the $p$-value of this hypothesis test for this sample?

10. Did you find statistically significant evidence against the null hypothesis?

11. How should this be interpreted in terms of what it tells you about body temperature?