Stat 544 Spring 2008
Mini-Project #1

In the "calibration phase" of a real "scale counting" problem, $p = 76$ units of product were weighed on a digital scale that reads out weights to the nearest .005 g The values obtained are summarized in the table below.

observed weight (g)	frequency
.270	2
.275	21
.280	35
.285	18

At a later point, some unknown number, n, of units of product were weighed on the same scale, and a value of 13.980 g was read on the digital readout. Do a complete Bayes analysis of this situation, assuming that actual weights of units of this product are iid $\mathrm{N}(\mu, \sigma^2)$ for an unknown mean and variance. (So n units have an actual total weight that is $\mathrm{N}(n\mu, n\sigma^2)$.) Compare inferences for several "sensible" choices of prior for (n, μ, σ^2). Do first analyses that treat the values $.270, .275, .280, .285$, and 13.980 as exact (infinite number of decimal places) numbers. Then treat them as representing values "good to within .0025 g." Be sure that you do some diagnostics that indicate that any MCMC algorithms you've used have "converged" before you draw inferences and that the model used here is not ridiculously wrong.

At the end of whatever technical discussion you decide to include in a write-up, conclude with a "plain English" statement of what you have learned about n, μ, and σ.

Limit what you type up to turn in to a cover page (**use one**!) plus at most 6 typewritten pages (including whatever figures you want to include). Use at least 11 point fonts, 1.5 line spacing, and 1 inch left and right margins. Also include an Appendix with "commented" `WinBUGS` and/or `R` code that you have used. (This Appendix does not count in the above "6 typewritten pages" limit.) PAY ATTENTION TO THE "MINI-PROJECT AND PROJECT WRITING 'TIPS'" on the course Web page.