Assignment #2

This assignment is due in class next Thursday, February 4, 1999. As with the previous assignment, I expect you to talk to classmates about the assignment, but expect each of you to do the work yourself.

(1) So that you don't start to think that problems that require pooling sources of information only happen in the business world, here's a recent one from *Science* (12/18/98). It's a fundamental one: What's the strength of gravity (G)? Whereas many physical constants are known to many decimals, estimates of G are crude. So, a committee has defined the standard value **6.672**.

Recently, several groups set out to compute G using various methods; some of the results are shown below. Three sources obtained the values shown below. Assuming independence of the sources, what's the pooled range for G? Is the pooled range consistent with the current standard?

i) BIPM (int'l standards group, Paris) [6.671, 6.693]

ii) Univ. of Colorado [6.677, 6.696]

iii) Univ. of Zurich [6.673, 6.677]

(2) Physicists talk to each other, and no one wants to be embarrassed or to embarrass a colleague. Consequently, these results might be a bit correlated. What's the effect of mild correlation (r = 0.3) among these intervals on your pooled interval in "a"? What about a more substantial correlation (r = 0.8)?

(3) Other groups have been working on the same quest. One group, located at the German standards lab PTB, obtained the interval [6.715, 6.717].

(a) What happens if you pool this interval with the first three listed in "a"? That is, re-compute the pooled interval in "a", but with this added fourth source. Treat the four sources as independent for this question.

(b) Should this fourth source (from PTB) be pooled with the other three?

(4) The recent interest in G was started by a conflict between two groups, namely PTB with the interval [6.715, 6.717] and a lab (MSL) in New Zealand that offered the interval [6.665, 6.667]. Both intervals are very short, do not overlap, and exclude the standard. Without additional calculation and ignoring the other sources listed above, how accurate would an experiment need to be in order to distinguish which of these was right? That is, if you could "build" a third source, how short an interval would this third source need to produce in order to distinguish these two?