Sample STT 647, A Sample Midterm Exam Question, Dr. Dan Voss, Winter 2006

Scenario. A study was conducted to investigate the effect of two factors, "laboratory" and "method," on the mean level of sulfur content in coal. Seven laboratories were selected at random for inclusion in the experiment. Two methods of analysis were included, these being the two standard methods used. The 28 coal specimens used for the experiment, all from the same source, were randomly assigned, two to each of the 7×2 combinations of laboratory and method of analysis. The data are provided in the accompanying program `midterm.sas`, along with corresponding SAS output.

1. Identify which factors have fixed effects and which have random effects. State the hypotheses for each of the three usual tests conducted as part of the analysis of variance.
2. Conduct the three usual tests for the analysis of variance, and interpret the results.
3. Construct a 95% confidence interval for the main-effect-of-methods contrast comparing methods 1 and 2. Interpret the results.
4. Construct a 95% confidence interval for the variance component for main-effects-of-labs. Interpret the results.
5. To the extent possible, repeat problems 2–4 using "proc mixed" in SAS and compare the results with those obtained using "proc glm".