Statistics 5303 — Exam 2   NAME _____
November 21, 2003
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This exam is open book, open notes; you may use a calculator. **Do your own work!** Use the back if more space is needed. There are seven questions, each worth 10 points. Please attach your data analysis notes for these data sets to your exam with the paper clips provided in the front of the room.

Questions 1 through 2 relate to the cookies data. **Provide some justification for your answers!**

1. Describe the experimental design.

2. Summarize the effects of dough type and temperature on cookie thickness.

For questions 3 through 5, describe the design that you would choose for each situation.

3. My family of four suffers from allergies, so we all take antihistamines of one sort or another. Our doctors have suggested four different drugs, but we would like to choose one drug for all four of us to use. We (I) want to run an experiment to choose that drug optimally. Some constraints on the design include (a) we should each try all the drugs, (b) the doctors say that we need to take a drug for a month or so to get a reasonable idea of how well it works, and (c) allergens change over time.

4. Some trumpets sound better than others, and there are groups that claim that temperature treatments will improve the sound of a trumpet. Some groups advocate cryogenic freezing, whereas other groups advocate a heat treatment. We wish to compare the freezing treatment, the heat treatment, and a control of no treatment. A professional musician will play the instruments, which will be judged for sound by a panel of experts; the average of the experts scores will be the response for any unit.

Without a doubt, different models of trumpet sound different. Some instrument manufacturers have loaned us twelve trumpets, two from each of six models. We also have the time constraint that we can only use each instrument once.

5. Recent research suggests that a mixture of caffeine and alcohol injected into the blood after stroke can reduce stroke damage by 80% (my wife suggests prophylaxis via Irish coffee). We wish to replicate their experiment and study their mixture, caffeine alone, alcohol alone, and a control. We can use 80 inbred rats, in which we can artificially induce stroke.

6. My daughters have supplied their Christmas wish lists (single spaced, double column, multipage—enough to bankrupt Bill Gates). These lists include many CDs and DVDs. You can buy these on-line or at "brick and mortar" stores. Being an impoverished academic, I'm always looking for good prices, so I collect some data. I randomly choose four each of CDs and DVDs from their combined wish list. From a list of retail and online stores, I randomly choose three brick and mortar stores and three on-line stores that sell digital media. I then price the eight selected items at the six selected stores.

Construct a Hasse diagram for analyzing the collected prices.

7. Here is the output of three different ANOVAs on the same set of (unbalanced) data.

```
Cmd> anova("y=a*b",fstats:T)
Model used is y=a*b
WARNING: summaries are sequential
                DF          SS          MS            F      P-value
CONSTANT         1      480.19      480.19     67.98994   8.5625e-13
a                3      194.58       64.86      9.18355   2.1171e-05
b                3      40.143      13.381      1.89460      0.13565
a.b              9      48.572      5.3969      0.76414      0.64955
ERROR1          96      678.01      7.0626

Cmd> anova("y=b*a",fstats:T)
Model used is y=b*a
WARNING: summaries are sequential
                DF          SS          MS            F      P-value
CONSTANT         1      480.19      480.19     67.98994   8.5625e-13
b                3      217.67      72.555     10.27307   6.2893e-06
a                3      17.058       5.686      0.80508      0.49406
b.a              9      48.572      5.3969      0.76414      0.64955
ERROR1          96      678.01      7.0626

Cmd> anova("y=a*b",fstats:T,marg:T)
Model used is y=a*b
WARNING: SS are Type III sums of squares
                DF          SS          MS            F      P-value
CONSTANT         1      22.288      22.288      3.15575     0.078828
a                3      19.816      6.6055      0.93527      0.42682
b                3      21.207      7.0691      1.00091      0.39596
a.b              9      48.572      5.3969      0.76414      0.64955
ERROR1          96      678.01      7.0626
```

What do you conclude about the significance of the effects? (You may assume that all assumptions about normality, constant variance, etc are met.)