ID# ___________________________ Exam 1 PS306, Spring 1998

1. Dr. Jones decides to test the effectiveness of two different experimental methodology textbooks. He gets two of his colleagues to agree to use the texts and to give the same exams throughout the term. At the end of the term, he finds that there was no difference in mean performance between the two classes (Mean = 94% and 96% for Class A and Class B, respectively). He concludes that there is no difference between the two texts. Would you agree? [5 pts]

**Although we won't discuss confounds explicitly until later in the semester, you should recognize that the two groups differ in more than one way. They differ in both textbook AND teacher. Such a confound would make interpretation problematic. More to the point here, however, is the fact that the performance of both groups was extremely good. That is, you may well be seeing a ceiling effect due to the fact that the exam used was too easy. Thus, there may be a true difference between the two texts, but you'd need to do a better study to uncover the difference (one that removes the "teacher" confound and one that uses a better test).**

2. In the movie on methodology you saw an example of research on the effects of sensory deprivation on visual development in kittens. Describe the design of the experiment and the independent and dependent variables used in that experiment as completely as possible.

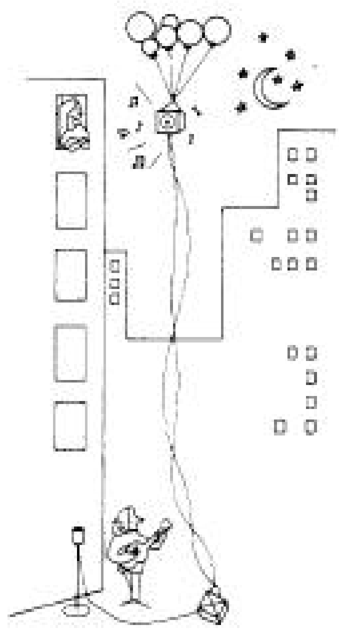
We discussed a more sensitive dependent variable for that experiment. What was it and do you agree that it would make the experiment more powerful? Be sure to define what you mean by power. [5 pts]

**To answer this question, you need to have seen the video and to have understood the IV and DV in the study. You also need to have understood the subsequent discussion. Power, of course, is the ability to correctly reject $H_0$. Thus, you need to think about ways in which using different DVs (for instance) might make the study more powerful.**

3. Using the Mook article, define external validity and then use either the Argyle glasses/intelligence study or the Higgins & Marlatt alcohol/anxiety study to illustrate Mook's points about the relative importance of external validity. [5 pts]

**This question is a fairly straightforward one in which you would make great use of the Mook article.**

4. Your textbook's author describes the Bransford and Johnson (1972) context/memory study in some detail. As a recall cue, I'm presenting the complete-context picture used in their memory study below. Your author only describes two of the conditions of the experiment (Full Context After and Full Context Before) in Chapter 6. In Chapter 8, you learn about all 5 conditions. Thus, there was also a Partial Context Before condition, in which participants were shown a picture like the one below prior to hearing the passage, but with the speaker on the ground, no balloons inflated, etc. Participants who were shown the less informative picture first did not have the complete context available to the Full Context Before condition participants, but they did have more information than the Full Context After group.



a. Describe $H_0$, the IV and DV in the Bransford & Johnson experiment, as well as the nature of the design as completely as you can. [5 pts.]

**$H_0$ would be that all the groups came from populations with equal means. That is, for only these three groups, it would be**

**$H_0$: $\mu_{PCB} = \mu_{FCB} = \mu_{FCA}$**

**The IV would be the nature of the context (Partial context before, Full context before, Full context after). The DV would be the amount of information retained. This design would be a single-factor independent groups design with 3 levels. (The actual experiment had 5 levels.)**

b. Bransford and Johnson found a difference among their groups (Partial Context Before, Full Context Before, Full Context After), as shown below, but were interested in testing the extent to which the difference was statistically significant. Obviously, they would use an ANOVA. Assuming an equal number of participants per condition, complete the following ANOVA source table, then interpret the results as completely as you can. [20 pts.]

| | | | | | |
|---|---|---|---|---|---|
| Partial Context Before | Mean | = 5.0 | Variance | = | 6.0 |
| Full Context Before | Mean | = 8.0 | Variance | = | 3.0 |
| Full Context After | Mean | = 3.6 | Variance | = | 6.0 |

| SOURCE | SS | df | MS | F | |
|---|---|---|---|---|---|
| Treatment | **101** | 2 | 50.5 | **10.1** | $F_{crit} = 3.35$ |
| Error | **135** | 27 | **5.0** | | |
| Total | **236** | **29** | | | |

**Given our results ($F_{Obtained} \geq F_{Critical}$), we would reject $H_0$ and conclude that at least two of the groups differed significantly. To determine which of the groups differed, we would need to compute HSD. With 3 conditions and $df_{Error} = 27$, $q = 3.5$. Thus, HSD = 2.47 and any two means that differ by 2.47 or more would be considered significant. For this study, people who received Full Context Before recalled significantly more than people who received Partial Context Before or Full Context After. People in the Partial Context Before condition did not differ from those in the Full Context After condition.**

5. A sleep researcher tests two drugs for the effects on insomnia. A sample of $n$ = 10 insomniacs is pretested with a placebo before bedtime, and the latency to onset of sleep is measured to serve as a baseline. A week later, the participants receive the first drug before bedtime, and the time that elapses between drug administration and sleep onset is measured again. Finally, a week later the second drug is tested in the same fashion. The latency to sleep onset (in minutes) is measured for each of the participants. A portion of the data look like this:

| Participant | Pretest | Drug 1 | Drug 2 |
|---|---|---|---|
| E.B. | 136 | 24 | 33 |
| K.F. | 92 | 107 | 21 |
| . | . | . | . |

Below is a partially completed StatView source table. Complete the source table and interpret the results of this study as completely as you can. [20 pts]

**ANOVA Table for Test Time**

| | DF | Sum of Squares | Mean Square | F-Value | P-Value | Lambda | Power |
|---|---|---|---|---|---|---|---|
| Subject | 9 | 19678.000 | 2186.444 | | | | |
| Category for Test Time | 2 | 13930.067 | 6965.033 | 6.042 | .0098 | 12.084 | .830 |
| Category for Test Time * Subject | 18 | 20750.600 | 1152.811 | | | | |

**Means Table for Test Time**
**Effect: Category for Test Time**

| | Count | Mean | Std. Dev. | Std. Err. |
|---|---|---|---|---|
| Pretest | 10 | 109.700 | 34.422 | 10.885 |
| Drug1 | 10 | 72.700 | 38.936 | 12.313 |
| Drug2 | 10 | 58.600 | 42.322 | 13.383 |

**Because the P-value is less than .05, we would reject $H_0$ in this repeated measures design. [You should note a major confound in the study. That is, Drug is confounded with Time because of a lack of counterbalancing.] To determine which of the means differed, you would need to compute Tukey's HSD. With q = 3.61, HSD = 38.8. Thus, people who took Drug 2 [or who were tested 2 weeks later ☺] went to sleep significantly faster than the pretest. No other differences were significant.**

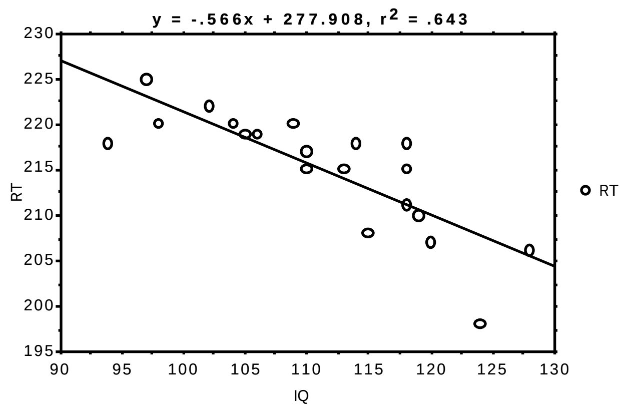
6. Hume and his colleagues (1975) have conducted several studies examining the relationship between intelligence and the speed of basic mental processes. In a typical study, Hunt measured reaction time for a simple mental task (e.g., determining whether two letters are the same or different) and then computed the correlation between the participant's reaction times and their IQ scores. Below is a StatView analysis of these data.

**Simple Regression $X_1$: IQ $Y_1$: RT**

| Count: | R: | R-squared: | Adj. R-squared: | RMS Residual: |
|---|---|---|---|---|
| 20 | .802 | .643 | .624 | 4.009 |

Analysis of Variance Table

| Source | DF: | Sum Squares: | Mean Square: | F-test: |
|---|---|---|---|---|
| REGRESSION | 1 | 521.701 | 521.701 | 32.466 |
| RESIDUAL | 18 | 289.249 | 16.069 | p = .0001 |
| TOTAL | 19 | 810.95 | | |




Interpret the results of this study as completely as possible. If a person has an IQ of 110, what would be your best prediction of that person's reaction time? If a person has an IQ of 135, what would be your best prediction of that person's reaction time? On the basis of these data, does it appear that IQ causes people to be faster in their reaction times? How much of the variability in reaction time data appears to be explainable by knowing a person's IQ? [10 pts]

**Because $p < .05$, we could reject $H_0$: $\rho = 0$. With a negative slope, we could conclude that there is a significant negative linear relationship between RT and IQ. That is, as IQ goes up, RT goes down. If a person has an IQ of 110, the regression equation would predict a RT of 215.6. If a person has an IQ of 135, you might predict a RT of 201.5, but that would require an assumption that the observed trend continued beyond the data obtained in the study. You might be safer in making no prediction until you'd obtained data on people with IQ's in the range of 135. You should never be comfortable making a causal claim based on a correlational study. Thus, a third variable (neural wiring?) may lead to the relationship between IQ and RT. With $r^2 = .643$, you would conclude that the two variables share 64% of their variability. Thus, knowing IQ would "explain" 64% of the variability in RT.**