Psychology 205: Fall, 2007
Problem Set 1

In order to refresh what you learned in your statistics class, you should try to apply the appropriate statistical test to each of the following problems.

1. An investigator believes that caffeine facilitates performance on a simple spelling test. Two groups of subjects are given either 200 mg of caffeine or a placebo. Although there are several ways of testing if these two groups differ, the most conventional would be a t-test. Apply a t-test to the data in Table 1:

Table 1: The effect of caffeine on spelling performance

placebo	caffeine
24	24
25	29
27	26
26	23
26	25
22	28
21	27
22	24
23	27
25	28
25	27
25	26

2. Another investigator believes that introversion/extraversion has a linear relationship to spelling ability and reports the following data (Table 2). This can be solved by finding the linear regression of Spelling on Introversion or by finding the correlation between spelling and introversion. Do either one (or both).

Table 2: Does introversion predict spelling ability?

Introversion	Spelling
21	31
14	33
13	39
13	24
20	35
21	37
11	36
15	20
23	46
12	31
17	44
26	44

3. Still another investigator believes that spelling performance is a function of the interaction of caffeine and time of day. She administors 0 or 200 mg of caffeine to subjects at 9 am and 9 pm. These data are typically examined using an Analysis of Variance (ANOVA), although a multiple regression using the general linear model would work as well. If the results are as below (Table 3), do the ANOVA.

4. Another experimenter wants to test the hypothesis that gender is related to interest in football. 100 subjects (50 male and 50 female) are asked whether or not they watched a recent football game. The results are in Table 4 The question of whether a relationship between two dichotomous variables is larger than chance is typically done by using a χ^2 test. Find the χ^2 to determine if there is a relationship between gender and watching the football game.

5. A professor believes that taking statistics increases one's ability to reason analytically. To test this hypothesis, she develops a test of reasoning and gives it to two sets of students. Those who have just started a statistics course and those who have just finished a statistics course. The results are shown in Table 5 These data could be analyzed by using t-test (or by doing an ANOVA). Notice that this design is not as powerful as doing a pre-post within subjects design.

6. Another professor has the same hypothesis, but decides to use a pre-post design. That is, each student takes the reasoning test twice, once before and once after the class. The data can now be analyzed by using a t-test for correlated scores, or a t-test comparing the difference scores to 0. Do so.

Table 3: Time of day, caffeine, and spelling performance

9am	9 am	9pm	9pm
0 mg	200 mg	0 mg	200 mg
26	27	28	24
27	30	27	23
25	28	25	25
22	32	25	21
27	25	31	23
23	29	32	21
21	31	25	25
28	28	32	21
21	28	26	26
23	26	25	22
20	29	27	23
23	31	26	26

Table 4: Gender differences in football interest

	Watched	Did not watch
Male	30	20
Female	20	30

Table 5: The effect of taking a statistics course on reasoning analytically.

before	after
12	15
11	23
15	17
14	22
11	18
10	17
11	21
12	21
18	16
17	17
13	23
16	18

(a) If the numbers are the same as in problem 5, what test should be applied?

(b) There are advantages and disadvantages of the designs used in questions 5 and 6a. What are some of them?

7. (a) If a test is normally distributed and has a mean of 100 and a standard deviation of 15, then what percentage of students would you expect to have scores of 100 or greater?

   This, of course, requires knowing how to think about the normal distribution. This one should be easy, the next one is also fairly easy.

   (b) With the same assumptions, what percentage of students would you expect to have scores greater than 115?

8. If you flip a fair coin 10 times, how often would you expect to observe at least 8 heads?