Biostat Exam 11/18/03

Coverage: *StatPrimer* 5–8

Part A (Closed Book)

INSTRUCTIONS

- In an effort to save copy costs, please respond on the separate sheets of paper provides.
- Write your name on the *back* of the answer page in its usual location.
- **List the number of each problem on your answer page!**
- Budget your time wisely.
- Turn in your Lab Workbook at the beginning of the exam. It is worth [10 pts]
- When you are done with Part A, turn in its *answer sheet* and pick up your Procedure Notebook.
- All questions worth 1 pt unless otherwise noted.

Chap 5

1. What is (i.e., define) *statistical inference*? [2 pts]
2. Name the two types of statistical inference. [2 pts]
3. Name the theorem that states hypothetical sampling distributions of means tend toward normality even when the data itself are not normal (especially when the sample size is large).
4. What percentage of 99% confidence intervals fail to capture the parameter.
5. When do you use the *t* distribution instead of the *z* distribution when making inferences about μ?

Chap 6

Match the definitions below with the following terms: *p* value, alpha, beta, type I error type II.
Definitions:

6. The probability of seeing a test statistic as extreme or more extreme than the current statistic assuming the null hypothesis is true.
7. The probability of making a type I error
8. The probability of making a type II error
9. The act of rejecting a true null hypothesis.
10. The act of retaining a false null hypothesis.

Chaps 7 and 8

11. Write the null hypothesis for testing whether a paired difference is significant.
12. Write the null hypothesis for testing whether an independent difference is significant.
13. A confidence interval for a mean seeks to capture the _____ mean.
14. What does EDA stand for?
15. Is $\Phi(-1.00)$ greater than 50% of less than 50%?
16. What is the minimum satisfactory power of a study?
17. Is a pre-test/post-test sample paired or independent sample?
18. Is a sample of males and (unrelated) females paired or independent?
19. Other than "independence," identify a classical statistical assumption needed for an independent *t* test.

Part B (Procedure Notebook)

Write your name on the *back* of the answer booklet, **list the number of each problem,** and show all work.

(1) A sample of $n = 9$ from a normal population with a standard deviation of 18 shows a sample mean of 37.
(A) Calculate the standard error of the mean. [1 pt]
(B) Calculate the 95% confidence interval for μ. Show all work. [3 pts]
(C) Interpret the above confidence interval. [2 pts]

(2) After a public health intervention, 4 cities show an average decrease in the rate of cigarette sales to minors of 5.25 with a standard deviation of 2.22. You want testing to test whether the observed decrease is significant. Let $\alpha = .05$ (two-sided).
(A) List the null and alternative hypothesis. [1 pt]
(B) Calculate the standard error. [1 pt]
(C) Calculate the test statistic and its degrees of freedom. [2 pts]
(D) Draw the sampling [*t*] distribution curve showing the location of the *t* statistic, *p* value regions, and *t* percentiles landmarks that are used to determine the approximate *p* value.[2 pts]
(E) The precise two-sided $p = .018$. State your conclusion about H_0. [1 pt]
(E) Do data provide significant evidence in support of the program? (Answer "yes" or "no.") [1 pt]

(3) *Paired* samples demonstrate the following values:

AFTER	BEFORE
39	8
20	11
2	3

(A) List differences (DELTA) values. [1 pt]
(B) Construct a stem-and-leaf plot of these differences. [2 pts]
(C) Determine the central location (i.e., median) of the differences. [1 pt]
(D) Describe the spread (range) of the differences. [1 pt]
(E) Calculate the mean difference. [1 pt]
(F) Calculate the standard deviation of the mean difference [2 pts]

(4) Summary statistics for independent groups are:

	Group 1	Group 2
mean	32.4	19.7
standard deviation	10.2	9.8
sample size	15	16

(A) How many degrees of freedom in group 1? [1 pt]
(B) How many degrees of freedom in group 2? [1 pt]
(C) How many degrees of freedom are there in both groups combined? [1 pt]
(D) Calculate the pooled estimate of variance. [1 pt]
(E) The standard error of the mean difference is 3.59. Multiple choice: This is a: (a) point estimate of parameter $\mu_1 - \mu_2$ (b) a measure of the variability of the data (c) a measure of the precision of the estimate or (d) a measure of significance. (Select best response.) [1 pt]
(F) Calculate and 95% confidence interval for $\mu_1 - \mu_2$. [3 pts]
(G) Interpret the above interval. [2 pts]