Math 283 Summer 2011 **Study Sheet for Exam #2**

Part 1. Hypothesis tests

For each situation below, identify the name of the test that should be performed.

- Set up the null and alternative hypotheses.
- State the assumptions.
- Compute test statistic and p-value.
- Make your conclusion **in the words of problem** (use $\alpha = 0.05$ for all problems).

Names of the Tests:

One-sample t-test   Matched Pairs t-test   2-sample t-test (independent samples)
z-test for proportion

1. Company officials are concerned about the length of time a particular drug retains its potency. A random sample of 10 bottles of the product is drawn from current products and analyzed. The average potency of this sample was 85.2 with standard deviation of 10.3.
A second sample of 10 bottles is obtained from the current products, stored for one year, and then analyzed. The average potency of this sample was 76.0 with standard deviation of 12.5.
We want to test for a difference in the average potency (current and stored).

2. The administrator of a nursing home would like to do a study of staff time spent performing non-emergency type chores. In particular, she would like to test if the average time spent on non-emergency chores is less than 16 hours per day. A random sample of 25 days is taken, yielding the mean of 16.4 hours and standard deviation of 3.6 hours.

3. Insurance adjusters are concerned with the high estimates they are receiving from garage I for auto repairs compared with garage II. To verify their suspicions, each of 9 cars recently involved in an accident was taken to both garages for separate estimates of repair costs. We want to test if the average estimate is higher at garage I than at garage II. The data are given below

Car No.	1	2	3	4	5	6	7	8	9
Garage I	560	40	670	3100	640	1450	3230	520	1930
Garage II	620	50	510	2840	510	1140	2710	570	1030

Are there any problems with using the t-test?

4. In a school district, 90% of all high-school students graduate. At a particular high school, out of 3,065 students enrolled, 2,678 eventually graduated. A superintendent wants to see whether the graduation rate in this school is significantly different from the district average.

Other: power, Type I error.

Part 2. Confidence intervals.

5. Tobacco companies claim that an average smoker usually smokes 18.6 cigarettes a day. To test this, an independent agency took a sample of 20 smokers, on a given day they smoked average of 20.1 cigarettes, with the standard deviation of 5.3 cigarettes.
Build a **90% C.I**. for the average number of cigarettes μ smoked in a day.

Ans. = [_____________;______________]

Using C.I. for testing:

Looking at the above interval, does it seem credible that $\mu = 18.6$? Yes No

(b) Test the hypotheses $H_0: \mu = 18.6$ vs. $H_A: \mu \neq 18.6$ using the C.I. above.
Write your conclusion. At what level α would you test?

6. If we knew that the population st.dev. $\sigma = 3.5$, and we wanted to estimate the mean μ within the margin 0.3 with 90% confidence, what sample size would be sufficient for that?

7. To determine the occurrence of side effects for a new drug, a study is planned.

(a) How large should a sample size be to determine the proportion of patients with minor side effects to within ±2% with the confidence 90%?

(b) If in the sample of 100 patients 18 had minor side effects, find a 98% confidence interval for the proportion of all likely patients who would have minor side effects.

(c) Is the Normal approximation valid in this case?

Comparisons w/out calculation:

As the confidence level increases, the Confidence interval (circle one)
Gets wider Gets narrower Stays the same

As the sample size increases, the Confidence interval (circle one)
Gets wider Gets narrower Stays the same

* 90% C.I. ≠ 90% of all population

<u>Part 3. Sampling distributions</u>

Sampling distribution of proportion: Binomial (Sec 5.1), normal approx.
For X = # "successes" out of n independent trials: $\mu = np$ and $\sigma = \sqrt{np(1-p)}$

Example: **5.31** p. 334
* compute Normal approximation (based on μ, σ above)
* is normal approximation acceptable? [Need both np and n(1−p) greater than 10.]

Sampling dist. of $\overline{X}$: See **5.75** p. 351

<u>Part 4. Chi-square test</u>

Expected counts, chi-square statistic, p-value