

## Midterm 3 Review — Stat 100

For the midterm: YOU WILL NEED a calculator.

Midterm 3 will cover 8.4-5, 9.2-3, 10.1-2, 10.4. Most of the questions will ask for a confidence interval or will ask you to run a hypothesis test. You will be given the necessary normal and t-tables. There will also be a question with true/false statements testing your understanding.

You can bring a standard size page of paper of notes, with writing or printing on both sides, and you will probably need one for all the formulas. You might want to include a xerox of page 463 on one side of the paper.

### HYPOTHESIS TESTS.

When you run a hypothesis test, write it out in the following framework:

1. Hypotheses.
2. Test Statistic.
3. Rejection Region.
4. Computation of test statistic from sample data.
5. Conclusion and statement of P-value.

Above, when you write down the test statistic in step 2, include in the definition of your test statistic all the numbers you know BEFORE the particular sample numbers are examined. For example, with a sample size of 8 and a null hypothesis  $H_0 : \mu = 5$ , in step 2 you should have

$$T = \frac{\bar{X} - \mu_0}{S/\sqrt{n}} = \frac{\bar{X} - 5}{S/\sqrt{8}} .$$

Note, you should never in step 2 substitute numbers for the sample average and sample standard deviation. Those numbers are not part of your statistic (which is a random variable with a certain probability distribution of likely values – NOT the particular number you get with a particular sample).

The conclusion should make it clear that you know the meaning of the conclusion. (“Conclusion: reject” is not enough.) When you work with the  $t$  distribution, the tables will usually only be good enough for you to say that the P value is between two numbers.

## QUESTIONS ON THE TEST

The test is not written, but there will likely be five problems as follows.

1. Large sample population proportion (8.4):

- determine sample size to achieve bound on the error margin, or
- run hypothesis test, or
- determine a confidence interval.

2. Small population mean (9.2-3):

- find confidence interval, or
- run hypothesis test.

3. Difference of two population means, samples from two populations (10.2):

Case I: large sample

- (use Z statistic to run hyp. test or find CI)

Case IIa: small sample pooled

- (use T statistic to run hyp. test or find CI)
- (rule of thumb: the assumption that  $\sigma_1$  is approximately  $\sigma_2$  is acceptable if  $\frac{1}{2} < (s_1/s_2) < 2$ )

Case IIb: small sample not pooled

- (use T\* for “conservative” hypothesis test or “conservative” CI)

4. Difference of two population means, matched pairs (10.4):

You’ll be asked for a confidence interval or hypothesis test. You use a  $Z$  or  $T$  distribution depending on the sample size.

5. true/false statements to test your understanding. For example:

the meaning of a confidence interval;

the meaning of a conservative confidence interval;

the meaning of the level of confidence  $\alpha$  in a hypothesis test;

the reasons for using or not using a matched pair design.

Remark: you will have be able to figure out the appropriate cases and formulas for the problems.

Remark: in every one of the small-sample cases, you make an assumption of approximate normality in the underling population(s) to justify/legitimize your procedure.