LAST NAME (Please Print): ________________________________

FIRST NAME (Please Print): ________________________________

HONOR PLEDGE (Please Sign): ________________________________

Statistics 101

Homework 5

You are allowed to discuss problems with other students, but the final answers must be your own work.

For all problems that require calculation, YOU MUST ATTACH SEPARATE PAGES, NEATLY WRITTEN, THAT SHOW YOUR WORK.

Please mark your answer in the space provided. As a general rule, each blank counts for one point. If necessary work is not shown, or if that work is substantially wrong, then you will not get credit even if the answer is correct. (The obvious purpose of this seemingly draconian policy is to prevent people from mindlessly copying each other’s answers.)

Report all numerical answers to at least two correct decimal places.

DUE DATE: Upload to Gradescope by 3:30 p.m. on Feb. 22.
1. You want to test whether the mean breaking strength of thread manufactured by Damocles Industries exceeds 3 pounds of force. Assume that you know that the standard deviation in breaking strengths is 0.5 pounds.

Suppose the true mean breaking strength is 3.2 pounds. How large a sample size would you need to have probability 0.9 of rejecting the null hypothesis at level 0.05?

Suppose the true mean breaking strength is 3.2 pounds. What is the power of a 0.01 level test with 100 observations?

Suppose the true mean breaking strength is 3.2 pounds. You have a test with power 0.8 and sample size 49. What is the probability of falsely rejecting the null hypothesis if the null hypothesis were true (i.e., your $\alpha$ level)?

2. Suppose you are the first Bayesian in the lecture on the RU486 study (i.e., your prior beliefs are all 1/9).

What is your probability that the next child born in the study has a mother who received RU486?

What is the probability that RU486 is at least as good as conventional therapy?

Suppose two additional children are born, one to an RU486 mother and one to a conventional therapy mother. What is your new posterior probability for the alternative hypothesis, that RU486 is better?

3. A study in the *New England Journal of Medicine* reported that children were less likely to be born on weekends (presumably because doctors want the day off, and induce or delay labor so as to avoid working on Saturdays and Sundays). Suppose the study found that 5% were born on Saturdays and Sundays, compared to 24% on Fridays and Mondays, with the other weekdays each having 14% of the births.

The midwives at the Quadrilateral Clinic worry that their numbers might show similarly unprofessional patterns. They check their records and report that for 700 random
births, 102 were on Monday, 98 on Tuesday, 101 on Wednesday, 99 on Thursday, 101 on Friday, 99 on Saturday, and 100 on Sunday, and they test whether they show the same pattern as doctors.

In words, what is your null hypothesis?

________________________________________________________________________

________________________________________________________________________

In words, what is your alternative hypothesis?

________________________________________________________________________

What is the value of your test statistic?

What distribution does this follow? (Include df if appropriate.)

What is your significance probability (or P-value)?

In words, what is your conclusion?

________________________________________________________________________

________________________________________________________________________

Comment on the midwives’ situation.
4. Go to our FAQ site and see the file named NYPD. It contains information on the number of police officers, broken out by rank and gender.

If last name begins with A-M, determine whether the rank is independent of gender for captains, lieutenants, and sergeants. If it begins with N-Z, determine whether it is independent for sergeants, detectives, and officers.

In words, what is your null hypothesis?

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In words, what is your alternative hypothesis?

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What is the value of your test statistic?

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What distribution does this follow? (Include df if appropriate.)

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What is your significance probability (or P-value)?

In words, what is your conclusion?

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How are you holding up? Let me know if there are problems.