Homework 6

October 25, 2019

1 Textbook Problems

1. Problem 9.2 "H_0 or H_a?" page 391.

2. Problem 9.7 "Proper Hypotheses?" page 391. In addition to correcting the hypotheses, draw a plot of the sampling distribution of the test statistic when H_0 is true and shade in the p-value.

3. Problem 9.9 "P-value" page 391. **Extra Credit (+2 points):** Assuming the sampling distribution of the test statistic is standard normal (N(0,1)), for each p-value list 4 values the test statistic could be, and its corresponding alternative hypothesis.

4. Problem 9.22 "Garlic to repel ticks" page 407.

5. We are interested in the proportion of people who oppose fracking, and want to see if the proportion of people who oppose fracking are a minortiy. Out of a random sample of 1506, 740 said they oppose fracking. Based upon the R output below, identify the parameter of interest, H_0 and H_a, verify the output by showing the other four steps of a hypothesis test, and base your conclusion to the test at level $\alpha = 0.05$.

```
1-sample proportions test without continuity correction

data:  740 out of 1506, null probability 0.5
X-squared = 0.44887, df = 1, p-value = 0.2514
alternative hypothesis:  true p is less than 0.5
95 percent confidence interval:
0.0000000 0.5125538
sample estimates:
p
0.4913679
```

6. Coke wants to know if their new formula is better than the old. In order to find out, they asked young people. They decided to sample students from the University of Minnesota, each student evaluated was given a blind sample of the current formula and the new formula, then stated which one they preferred. Out of 75 students, 45 stated they liked the new formula better. Based upon the R output below state the parameter of interest, H_0 and H_a, verify the output by showing the other four steps of a hypothesis test and base your conclusion to the test at level $\alpha = 0.05$.

```
1-sample proportions test without continuity correction

data:  30 out of 75, null probability 0.5
X-squared = 3, df = 1, p-value = 0.04163
alternative hypothesis:  true p is less than 0.5
95 percent confidence interval:
0.0000000 0.4949608
sample estimates:
p
0.4
```

2 R Problems

1. Suppose we are interested in the proportion of college students that have had atleast one traffic ticket in the past. The baby boomers have been complaining that college students drive more carelessly than in the past. It is known many years ago, the proportion of college students that had at least one traffic ticket was 25%. We want to conduct a statistical test to see whether the complaint is correct or not.
   Conduct the five steps of this hypothesis test in R using the `prop.test()` function. Test at level 0.05. Below is code you might find helpful:
   ```
   NoU = read.csv("SurveyFall2019.csv",header = TRUE)
   table(ifelse(NoU$traffic.tickets > 0,1,0)
   ```

2. Next suppose we are interested in seeing if the proportion of female college students who have traffic tickets is the same as male college students. In this case, assume we know the proportion of male college students who have traffic tickets is 0.26.

3. Conduct the five steps of this hypothesis test in R using the `prop.test()` function. Test at level 0.05. Below is code you may find helpful:
   ```
   table(ifelse(NoU$traffic.tickets[NoU$gender == "Female"]>0,1,0))
   ```