HW- T-tests and Interpret P-values

Yelapa Statistics Course

March 27, 2017

Homework

Please write your answers in a word document. All of the below word problems involve t-tests. For each problem:

1. Say what type of test it is.

- One sample, Two sample, Paired
- One sided, Two sided
- If two sample: equal variances or unequal variances

2. List any assumptions of the test.
3. Write out the hypotheses (null and alternative)
4. Write down the p-value compared to the critical value (alpha=0.05). Do you reject or fail to reject the null hypothesis?
5. Write down your conclusions from the result of the test.

Problem 1.

Josh is a cookie addict. He loved oreo cookies. He is worried that the company who makes oreos is ripping him off. The bags of oreos that he likes to buy say they contain 435g of oreos in them. He buys 50 bags to verify this. The results are shown below.

```
##
##  Shapiro-Wilk normality test
##
## data:  oreo
## W = 0.95832, p-value = 0.0756
```

```
##
##  One Sample t-test
##
## data:  oreo
## t = 1.5069, df = 49, p-value = 0.9309
## alternative hypothesis: true mean is less than 435
## 95 percent confidence interval:
##     -Inf 453.166
## sample estimates:
## mean of x
##  443.5991
```

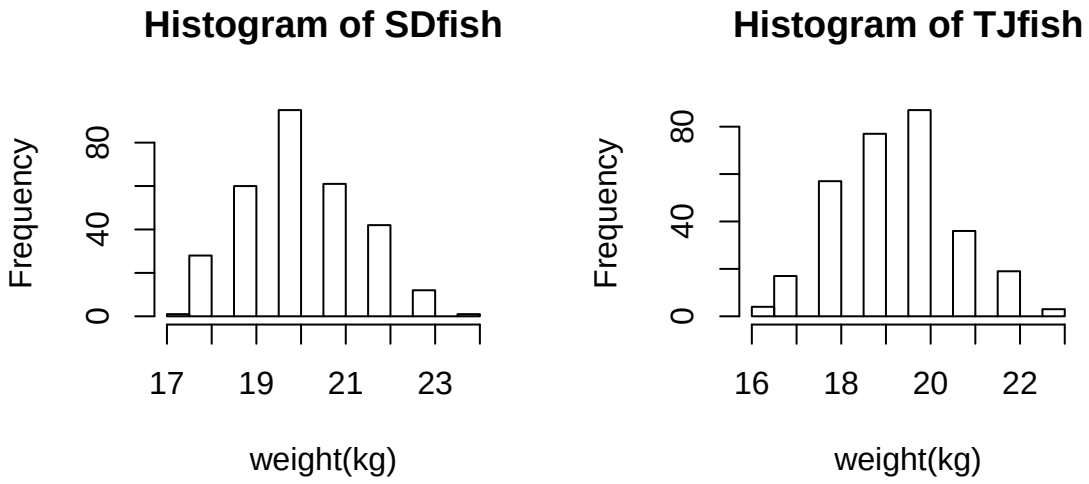
Problem 2.

We measured the microbial concentration in the guts of captive mobulas. We have 40 captive mobulas that were all born in captivity. We measured the gut microbial concentration when they are 6 weeks old, and then after 2 years. We are curious if younger or older mobulas have more microbes in their guts.

After running the test you find out the p-value is p-value = 0.00253.

Problem 3.

We go to 2 fish markets - San Diego and Tijuana. We measure the weights of adult white seabass caught in both markets. We sample 300 fish from each market. We are curious if San Diego fish weigh more than Tijuana Fish. The fish weights are all given in kg.

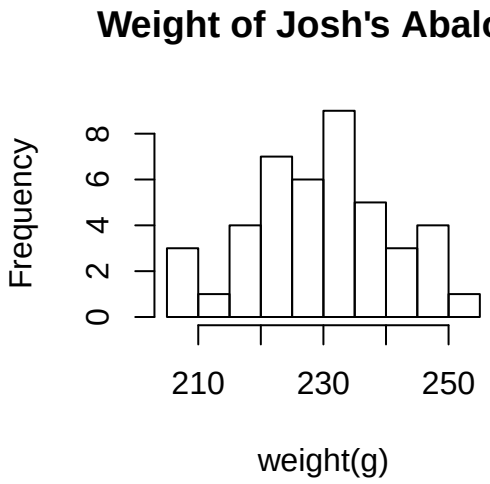


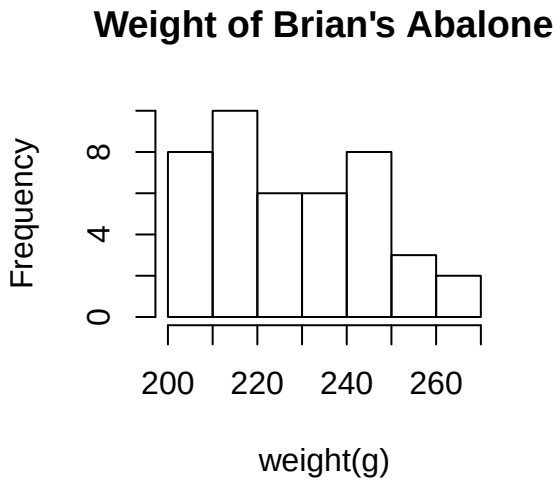

```
##
##  F test to compare two variances
##
## data:  SDfish and TJfish
## F = 0.92944, num df = 299, denom df = 299, p-value = 0.5274
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
##  0.7405959 1.1664396
## sample estimates:
## ratio of variances
##          0.9294409
```

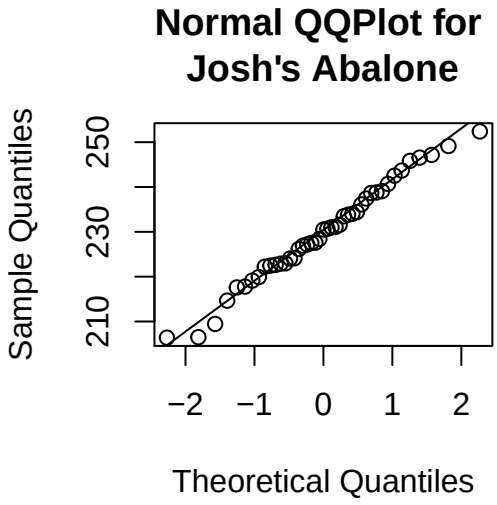
```
##
##  Two Sample t-test
##
## data:  SDfish and TJfish
## t = 7.3266, df = 598, p-value = 3.84e-13
## alternative hypothesis: true difference in means is greater than 0
## 95 percent confidence interval:
##  0.6227018       Inf
## sample estimates:
## mean of x mean of y
##  20.22000  19.41667
```

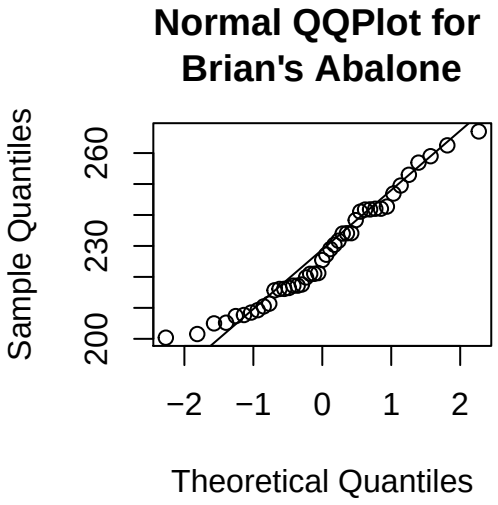
Problem 4.

Josh and Brian have both decided to become abalone farmers. Josh brags that he sells a larger weight of abalone in market than Brian on average. We want to find out if he is right. We sample 43 abalone that each of them sell in market. Weights are given in g.










```
##
##  F test to compare two variances
##
## data:  Brian.ab and Josh.ab
## F = 2.5183, num df = 42, denom df = 42, p-value = 0.003447
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
##  1.364002 4.649272
## sample estimates:
## ratio of variances
##           2.518257
```

```
##
##  Welch Two Sample t-test
##
## data:  Josh.ab and Brian.ab
## t = 0.64706, df = 70.813, p-value = 0.2598
## alternative hypothesis: true difference in means is greater than 0
## 95 percent confidence interval:
##  -3.251116       Inf
## sample estimates:
## mean of x mean of y
##  229.8874  227.8242
```

Problem 5.

Lynn likes to eat Snickers candy bars. The snicker bar says it weighs 75g. Lynn is worried that the manufacturer is lying and providing consumers with less candy bar. She goes out and buys 40 snickers bars. She does the test and gets a p-value of 0.995.

Problem 6.

Brian measures the lengths of adult Nassau Grouper at a spawning aggregation each year. He is curious if the average length (mm) has increased with time. He compares lengths from 2011 to 2014. He gets a p-value of 0.049999.

Problem 7.

Daniel is curious if fishermen are catching the same size of mobulas as they used to in Sri Lanka. In 2012 he sampled the disc width of 100 mobulas. In 2015 he sampled the disc width of another 100 mobuals. He got a p-value of 0.04.

Problem 8.

We are interested in if it is getting warmer in Yelapa. We compare the average daily temperature (deg C) during the month of July from 1900-1950 to the average daily temperature 1965-2015. The variances are equal. The p-value is 0.02.

Problem 9.

We are interested in comparing the weights of mangoes sold in Walmart to those sold at a farmer's fruit stand. We want to know if we would get heavier mangoes by going to the famer's fruit stand. The p-value is 0.034.

Problem 10.

A salmon farmer is testing out a new feed for their salmon. They have 2 types of feed. They feed 100 animals FEEDXX and see how much weight they gain. They feed 100 animals the standard feed, FEED01, and see how much weight they gain. They want to know if they should switch to FEEDXX from FEED01. The variances are not equal for weight gain in fish fed FEED01 and weight gain in fish fed FEEDXX.

When they write their R-code they type:

```r
t.test(FEED01,FEEDXX,var.equal=FALSE, alternative="greater")
```

The p-value is 0.079. What hypotheses did they actually test? What hypotheses did they mean to test?

What do they conclude from this test?

How do they fix this code?