

STAT 110: Homework 10 Solutions (20 pts)

Fall 2017

1. Consider the data in the file **Student Survey Data.JMP**. In this problem, you will use these survey results to address the following research question: Do WSU male students have more alcoholic drinks on average than WSU female students on a typical night in which they consume alcohol? To address this research question, you will need to use the variables *Gender* and *Number Alcoholic Beverages per Night* (students were asked how many drinks they consume on a typical night when drinking).

a. Identify the explanatory variable (i.e. the predictor) in this experiment. (1/2 pt)

Gender

b. Identify the response variable in this experiment. (1/2 pt)

Number of Alcoholic Beverages per Night

c. Use JMP to find and report the following summaries for each group. (1 pt)

	Mean Number of drinks consumed	Standard deviation of number of drinks consumed
Females	2.81	2.92
Males	4.77	4.31

d. Next, you will use an independent samples t-test to address the research question. Comment on the assumptions behind this analysis (both independence and normality) and whether they are met in this case. (1 pt)

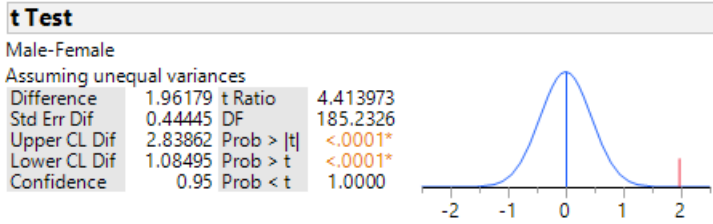
The observations in the two groups being compared are independent because the females in the study can't be paired with the males in the study in any meaningful way. The normality assumption is met simply because the sample size is large (above 30) for both groups (there were 199 females and 120 males in the study).

e. Set up the null and alternative hypotheses to test this research question. (2 pts)

$H_0: \mu_{\text{male}} - \mu_{\text{female}} = 0$ (or $\mu_{\text{male}} = \mu_{\text{female}}$)

$H_a: \mu_{\text{male}} - \mu_{\text{female}} > 0$ (or $\mu_{\text{male}} > \mu_{\text{female}}$)

- f. Use JMP to obtain the appropriate output for testing this research question. Note that the output below is blank. Sketch in the results that you obtained from JMP. (1 pt)



- g. Carry out the two-sample t-test using your JMP results. Report the appropriate p-value, and write a conclusion addressing the research question in the context of the problem. (3 pts)

p-value: <0.0001

Conclusion: **The survey results indicate that WSU male students have significantly more alcoholic drinks on average than WSU female students on a typical night in which they consume alcohol.**

- h. Find the 95% confidence interval for the difference in means, and **interpret** this interval in the context of the problem. (2 pts)

Lower endpoint: 1.08

Upper endpoint: 2.84

Interpretation: **We can be 95% confident that, on average, WSU male students drink anywhere from 1.08 to 2.84 more drinks than WSU female students on a typical night in which they consume alcohol.**

2. Once again, consider the data in the file **Student Survey Data.jmp**. In this problem, you will use the survey results to address the following research question: Do WSU students who drink alcohol have lower GPAs, on average, than WSU students who do not drink alcohol? To address this research question, you will need to use the variables *Drink Alcohol?* and *GPA*.

Research question: Is the mean GPA of WSU students who drink alcohol lower than that of WSU students who do not drink alcohol?

- a. Use JMP to find and report the following summaries for each group. (1 pt)

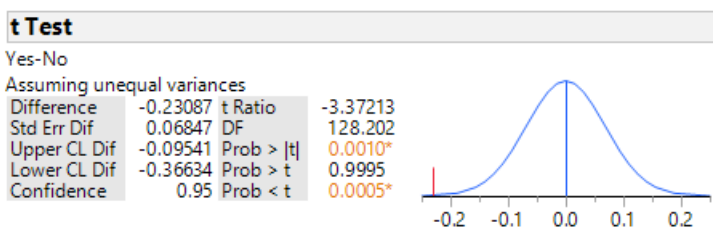
GPA		
<i>Drink Alcohol?</i>	Mean	Standard deviation
No	3.42	0.40
Yes	3.19	0.53

- b. Set up the null and alternative hypotheses to test the research question. (2 pts)

$$H_0: \mu_{\text{yes}} - \mu_{\text{no}} = 0 \text{ (or } \mu_{\text{yes}} = \mu_{\text{no}})$$

$$H_a: \mu_{\text{yes}} - \mu_{\text{no}} < 0 \text{ (or } \mu_{\text{yes}} < \mu_{\text{no}})$$

- c. Use JMP to obtain the appropriate output for testing this research question. Note that the output below is blank. Sketch the results that you obtained from JMP. (1 pt)



- d. Carry out the t-test using your JMP results. Report the appropriate p-value, and write a conclusion addressing the research question in the context of the problem. (3 pts)

p-value: 0.0005

Conclusion: The survey data provides evidence that the mean GPA of WSU students who drink alcohol is lower than that of WSU students who do not drink alcohol.

- e. Find the 95% confidence interval for the difference in means, and **interpret** this interval in the context of the problem. (2 pts)

Lower endpoint: -0.366

Upper endpoint: -0.095

Interpretation: **We can be 95% certain that, on average, the mean GPA of WSU students who drink alcohol is anywhere from 0.095 to -.366 points lower than that ow WSU students who do not drink alcohol.**