(Session 24 Group Quiz)

In a 2011 study from Texas A & M University, forty-two drivers were placed behind the wheel of a car and drove around a closed track about 11 miles in length. The researchers monitored how long it took drivers to react to a flashing light while driving normally and while attempting to text or to read a message on a mobile phone. Here is a summary of the data.

conditions	# observations	mean	standard deviation
control	42	1.754	0.806
texting	42	4.302	1.614
reading	42	3.278	1.274

(Do Not Repeat Solutions) You already gave the appropriate hypothesis for this situation.

(Do Not Repeat Solutions) You already showed the hand calculation of the F statistic for a one way analysis of variance and included the details for the SSG, SSE, DFG, DFE.

v-worksheet - Anaylsis of Variance

a. Give the p-value for the test. What are you conclusions?

```
pf(42.465, df1 = 2, df2 = 123, lower.tail = FALSE)
```

```
## [1] 9.489851e-15
```

Since our p-value is extremely small, we can reject the null hypothesis. This means that at least one of the mean values is statistically different.

b. Give a 95% confidence interval for the difference in mean reaction times between texting and control and between reading and control.

```
tstar<-qt(0.975, 123)
sp<-sqrt(199.986/123)

mean_text <- 4.302
mean_read <- 3.278
mean_control <- 1.754

c1_lo <- (mean_text - mean_control) - tstar * sp * sqrt(1/42 + 1/42)
c1_hi <- (mean_text - mean_control) + tstar * sp * sqrt(1/42 + 1/42)

c2_lo <- (mean_read - mean_control) - tstar * sp * sqrt(1/42 + 1/42)
c2_hi <- (mean_read - mean_control) + tstar * sp * sqrt(1/42 + 1/42)
```

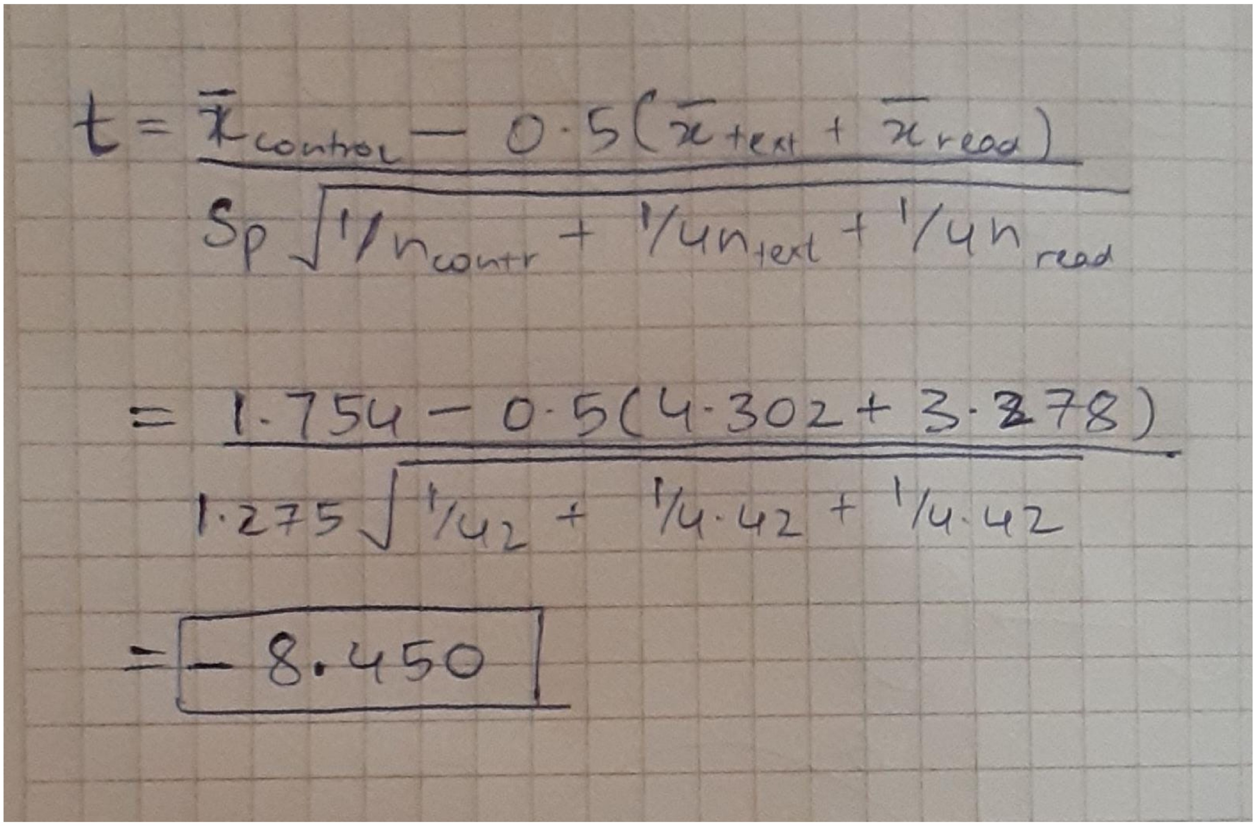
Confidence interval for difference in means between texting and the control group is (1.997218 , 3.098782)
Confidence interval for difference in means between texting and the control group is (0.9732181 , 2.074782)

c. Give a hypothesis for the contrast that compares the control to the average of the mean times for texting and reading.

$H_0 : \mu_{control} = 0.5(\mu_{texting} + \mu reading)$ The mean for the control group is equal to the average of the means of the texting group and reading groups

$H_1 : \mu_{control} \neq 0.5(\mu_{texting} + \mu reading)$ The mean for the control group is not equal to the average of the means of the texting group and reading groups

d. Give the value of the t-statistic for this test. What are the degrees of freedom?



$$t = \frac{\bar{x}_{control} - 0.5(\bar{x}_{text} + \bar{x}_{read})}{s_p\sqrt{1/n_{contr} + 1/4n_{text} + 1/4n_{read}}}$$

$$= \frac{1.754 - 0.5(4.302 + 3.278)}{1.275\sqrt{1/42 + 1/4\cdot 42 + 1/4\cdot 42}}$$

$$= \boxed{-8.450}$$

Figure 1: Part (d)

The degrees of freedom are the same as DFE = 123

e. Do you reject this hypothesis? Explain what this means in the context of the application.

```r
pt(-8.450, df=123, lower.tail = TRUE) * 2
```

```
## [1] 6.947123e-14
```

Once again, since the p-value is very small, we can reject the null hypothesis. This would mean that there is a difference between the mean reaction time for the control group and the average mean of the texting and reading group.