Quiz_5_Markdown_2

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R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see http://rmarkdown.rstudio.com.

1. A garment manufacturing company recorded the amount of time that it took to make a pair of jeans on 8 different occasions. The times in minutes are as follows: 12.5, 13.0, 11.9, 10.2, 13.1, 13.6, 13.8, and 14.0. Assume these measurements were taken from a population with a normal distribution. It is of interest to know if the sample data suggest that the average time it takes this company to make a pair of jeans is less than 13.5 minutes. Does the sample data support the alternative hypothesis at the ??? = 0.05 level? Test statistic = ***-1.6748***_______

```
x<-c(12.5, 13.0, 11.9, 10.2, 13.1, 13.6, 13.8,14.0)
t.test(x,mu=13.5,conf.level=0.95)
```

```
##
##  One Sample t-test
##
## data:  x
## t = -1.6748, df = 7, p-value = 0.1379
## alternative hypothesis: true mean is not equal to 13.5
## 95 percent confidence interval:
##  11.72124 13.80376
## sample estimates:
## mean of x
##   12.7625
```

Critical Value(s) = *-1.894579*___________

```
qt(0.05,7)
```

```
## [1] -1.894579
```

Conclusion: _____________
Since $t_{cal}=-1.6748 >-1.894579, we do not reject H_0.

Interpretation: The average time it takes this company to make a pair of jeans **NOT**_________less than 13.5 minutes.

Construct a 95% confidence interval for the mean amount of time it takes this company to make a pair of jeans.

```
mean.x <- mean(x)
t.alpha2 <- qt(0.975,7)
SE <- sd(x)/(sqrt(8))
CI=mean.x+c(-1,1)*t.alpha2*SE
CI

## [1] 11.72124 13.80376
```

The 95% confidence interval for the mean amount of time is (11.72124 ,13.80376).

2. Here are the red blood cell counts (in 106 cells per microliter) of a healthy person measured on each of 15 days:

dat2 <- c(5.6,5.4,5.2,5.4,5.7,5.5,5.6,5.4,5.3,5.5,5.5,5.1,5.6,5.4,5.4)

Find a 95% confidence interval estimate of the true mean red blood cell count for this person during the period of testing. What is 95% confidence interval?

```
dat2 <- c(5.6,5.4,5.2,5.4,5.7,5.5,5.6,5.4,5.3,5.5,5.5,5.1,5.6,5.4,5.4)

mean <- mean(dat2)
t05 <- qt(0.975,14)
SE <- sd(dat2)/sqrt(15)
mean+c(-1,1)*t05*SE

## [1] 5.351692 5.528308
```

The 95% confidence interval is (5.351692, 5.528308).

3. A customer service representative was interested in comparing the average time (in minutes) customers are placed on hold when calling Southern California Edison and Southern California Gas companies. The representative obtained two independent random samples and calculated the following summary information:

```
Dat3=cbind.data.frame("Statistics"=c("Sample Size", "Sample Mean", "Sample SD
"), "Southern Cal Edison"=c(9,3.2,0.5), "Southern Cal Gas"=c(12,2.8,0.7))
Dat3

##    Statistics Southern Cal Edison Southern Cal Gas
## 1 Sample Size                 9.0             12.0
## 2 Sample Mean                 3.2              2.8
## 3   Sample SD                 0.5              0.7
```

Assume the distributions of time a customer is on hold are approximately normal. Is it reasonable to assume equality of variances in this problem? Test whether there is a significant difference in average time a customer is on hold between the two companies. Calculate the value of the test statistic. Set up the appropriate rejection region for the test in part
The null hypothesis is $H_0: \mu_1 - \mu_2 = 0$
The alternative hypothesis is $H_1: \mu_1 - \mu_2 \neq 0$.

(a) assuming $\alpha = 0.10$. What is the appropriate conclusion?

(b) Test Statistic = ___________

```r
SE <- sqrt((0.5)^2/9+(0.7)^2/12)
tcal <- (3.2-2.8)/SE
tcal

## [1] 1.527083
```

Reject Region: Reject H0 if |t| > ___ $t_{\alpha/2}$ when the degree of freedom is $\min(9-1, 12-1)$

```r
qt(0.95,8)

## [1] 1.859548
```

Conclusion:
Since $T_{cal} = 1.527083 < 1.859548$, we do not reject the null hypothesis.
Then there is NO significant difference in average time a customer is on hold between the two companies.

4. A researcher believes she has designed a keyboard that is more efficient to use than a standard keyboard. In order to help decide if this is the case, typing speeds were taken for 8 different people on each keyboard. The lengths of time, in minutes, for each of the people to type a pre-selected manuscript are listed below.

The null hypothesis is $H_0: \mu D = 0$.
The alternative is $H_1: \mu_D > 0$.

```r
x1 <- c(15,9,17,10,9,4,30,29)
x2 <- c(12,8,15,8,5,4,25,21)
cbind.data.frame("Person"= 1:8, "Original"=x1,"New"=x2)

##   Person Original New
## 1      1       15  12
## 2      2        9   8
## 3      3       17  15
## 4      4       10   8
## 5      5        9   5
## 6      6        4   4
## 7      7       30  25
## 8      8       29  21
```

```r
x1 <- c(15,9,17,10,9,4,30,29)
x2 <- c(12,8,15,8,5,4,25,21)
d <- x1-x2
tcal <- mean(d)/sd(d)*sqrt(8)
tcal

## [1] 3.490935
```

The calculated t-statistic is 3.490935.

Find the critical value:

```
t025<- qt(0.95,7)
 t025

## [1] 1.894579
```

The critical value is 1.894579.

Since the $t_{cal} = 3.490935 > 1.894579$, we reject H_0. Then
Then $\mu_D > 0$. That is the original keyboard yields slower times.

5. A marketing research professor at a university conducted a survey to determine whether mode of transportation to the university and the person's position at the university were independent. The following data was recorded:

```
DAT5=cbind.data.frame("Position"=c("Faculty","Staff","Students"), "Walk"=c(19
,14,27), "Bike"=c(28,20,49), "Automobile"=c(75,63,88), "Other"=c(45,70,67))
DAT5

##   Position Walk Bike Automobile Other
## 1  Faculty   19   28         75    45
## 2    Staff   14   20         63    70
## 3 Students   27   49         88    67
```

```
Mat5=matrix(c(19,28,75,45,14,20,63,70,27,49,88,67),nrow=3,byrow=T)
chisq.test(Mat5)

##
##  Pearson's Chi-squared test
##
## data:  Mat5
## X-squared = 14.453, df = 6, p-value = 0.02496
```

The calculated chisquare is 14.453.
The critical value is

```
qchisq(0.9,6)

## [1] 10.64464
```

Since the calculated chisquare $\chi^2_{cal} = 14.453 > 10.64464$, we reject the null hypothesis. The mode of transportation to the university and the person's position at the university are DEPENDENT.

Alternatively, we can make conclusion by using p-value as the following.
Since $p-vale = 0.02496 <0.05, we reject the null hypothesis.