Lab 4 – Don't Drink and Drive

In the state of Wisconsin a driver is defined to be driving under the influence of alcohol (DUI) if their blood alcohol concentration (BAC) is at least 0.08%. Lawmakers in the state of Wisconsin would like to answer a couple of questions about citizens who have been arrested for drunk driving.

Thirty Wisconsin citizens who have recently been arrested for drunk driving were randomly selected. Two variables were recorded for each person: their BAC and their age. The data is in a file named dui.txt. Here is what the first few lines of data look like:

```
bac   age
0.09  23
0.08  67
0.11  45
0.08  37
0.08  27
```

R

Wisconsin Lawmakers are interested in $\mu =$ the mean age among people who have been arrested for drunk driving. They want to know if $\mu = 38$ and suspect it may be greater than 38. First, write out the steps of the hypothesis test:

Null and Alternative Hypothesis:

Draw the Rejection Region (if $\alpha = .05$):

Use R to read in the data set and find the sample mean and sample standard deviation among the ages, then compute the test statistic by hand. Round off to the second decimal place.

Conclusion:

Place bounds on the p-value (draw picture):

Use the R function **`t.test`** to confirm the value of your test statistic and to find the exact p-value (see R6 handout). What is the exact p-value? Round off to the third decimal place.

It is necessary to assume the data is normally distributed? Why or why not?

Use the **`t.test`** function to answer these "what if?" questions:

What if everything had been the same but the alternative hypothesis was $H_a: \mu > 37$? What would have been the p-value? Round off to the third decimal place.

What if everything had been the same but the alternative hypothesis was $H_a: \mu > 36$? What would have been the p-value? Round off to the third decimal place.

What if everything had been the same but the alternative hypothesis was $H_a: \mu > 35$? What would have been the p-value? Round off to the third decimal place.

SAS

Wisconsin Lawmakers are interested in $\mu =$ the mean BAC among people at the time of their arrest. They want to know if $\mu = 0.102$ and suspect it may be different than 0.102. First, write out the steps of the hypothesis test:

Null and Alternative Hypothesis:

Draw Rejection Region (if $\alpha = .05$)

Use SAS to read in the data set and find the sample mean and sample standard deviation among the bacs, then compute the test statistic by hand. Round off to the second decimal place.

Conclusion:

Place bounds on the p-value (draw picture):

Use the SAS proc named **`ttest`** to confirm the value of your test statistic and to find the exact p-value (see SAS6 handout). What is the exact p-value? Round off to the third decimal place.

Use the SAS proc named **power** to to answer these "what if?" questions. (See SAS6 handout page 7)

Suppose someone is interested in $\mu =$ the mean speed (mph = miles per hour) among drivers in Wisconsin who have been ticketed for speeding in a zone restricted to 55 mph. They are about to do the hypothesis test $H_0: \mu = 70$ vs. $H_a: \mu \neq 70$ with $\alpha = .05$ but they do not realize the population is normally distributed, the population mean actually is $\mu = 72$ and the population standard deviation actually is $\sigma = 3$.

What is the power (the probability of correctly rejecting $H_0: \mu = 70$) at the following sample sizes? Round off to the third decimal place.

n	Power
4	
8	
12	
16	
20	
24	

What sample sizes would be necessary to achieve the desired power levels?

Power	n
0.95	
0.96	
0.97	
0.98	
0.99	

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After you have completed this handout, complete the Canvas quiz titled: <u>Lab 04 – Don't Drink and Drive</u>