Math 411 Lab 1

1. Suppose Z is a standard normal random variable. Use R to find the following.

   (a) $P(0.83 < Z < 1.74)$. Here you will use the `pnorm` command. You could type `help(pnorm)` to see the documentation of this command. Typing `pnorm(1.96)` should give you an idea of what this function does.

   (b) Find a number z_0 such that $P(-z_0 < Z < z_0) = 0.9$. Use the command `qnorm` on this problem. Try typing `qnorm(0.025)` to see what it does.

2. Import the file `Math411Lab1Data.txt`. Now, use the command `ls()` to see the variables that currently exist in your workspace. You will see a 1000×1 data frame called `Math411Lab1Data` that contains only one column of data. You could use the command `math=Math411Lab1Data$V1` to store this column in a vector called `math`. For this sample, answer the following questions. The commands `length`, `mean`, and `sd` can be applied to the vector `math` and should be helpful.

   (a) What is the sample size, sample mean, and sample standard deviation?

   (b) Find a 95% confidence interval for the population mean

   (c) Denoting the population mean by μ, test $H_0 : \mu = 508$ vs. $H : \mu \neq 508$ at the 5% significance level.

3. Write a function called `myprod` that accepts two numbers x and y as inputs and returns their product xy as output. Here is a similar example:

```
###mysum is a function that accepts two numbers x and y as inputs
###and returns their sum.

mysum=function(x,y){
         sum=x+y
         return(sum)}
```

4. Write a function called `myconfint` that accepts a vector x of sample observations and returns the corresponding 95% confidence interval for μ. The output should be a vector of length two whose first component is the lower bound of the confidence interval and whose second component is the upper bound. Test your function using the imported data. (To create a vector in R, use the `c` command, e.g., type `c(1,-4,9)` for the vector $(1, 4, 9)$.)

5. Write a function called `mytest` that accepts a vector x of sample observations and a number μ_0 and returns the p-value obtained from testing $H_0 : \mu = \mu_0$ vs. $H : \mu \neq \mu_0$ at the 5% significance level. Test your function using the imported data and $\mu_0 = 508$.

6. Bonus. Rewrite myconfint so that the significance level α is a variable accepted by the function.