**Problem Set 1**

1. What **class** of object is mtcars? What function did you use to find out?
   1. Data frame, class(mtcars)
2. Is precip defined as a **1-dimensional array** or a **vector**? How did you find out?
   1. Vector, dim(precip) NULL and length(precip) 70
3. How would you convert the **data.frame** trees into a matrix?
   1. Data.matrix(trees, rownames.force = NA)
   2. OR as.matrix(trees)
4. What is the name of the 14th city in the precip dataset?
   1. Atlanta
5. What function would you use if you wanted to combine all three data sets into a single object?
   1. MyList<-list(trees,precip,mtcars)
6. Does precip consist of numeric data? How did you find out?
   1. Yes, typeof(precip)
7. Code **four** different ways to **subscript** the **2nd row** and **7th column** of mtcars using bracket notation - i.e., 17.02.
8. How would you change the precipitation values of "Juneau", "Phoenix", and "Sacramento" to 23, 46, and 12 in theprecip dataset. (Hint: You will need to use **subscripts** and the <- operator).
9. Are there **any** trees in the trees dataset with more **girth** than **volume**? How did you find out?
10. Take the sum of all elements in column **height** of the trees dataset, call this value **A**. Take the sum of all elements in row**Valiant** of the **mtcars** dataset, call this value **B**. Take the sum of the first **8 elements** of the **precip** dataset, call this value **C**. Divide **C** by **B** and add **A**. What is your final answer?

***Intermediate:***

#### Section 1 Questions

1. What does the REPLACE= argument of the sample( ) function do?
   1. Replacing data/subs in new data
2. Usingas(MyMatrix,"numeric") will not convert MyMatrix to numeric data! Can you think of a property of logicals that you can use to convert the logicals to 0's and 1's other than the as( ) function?
   1. MyMatrix + 0
3. If you wanted to check if **all** of the elements in each row are true, how would you do this?
   1. Sum(MyMatrix)
      1. Equals 57, not 96

#### Section 2 Questions

1. How many times does the number 7 occur in MyMatrix?
   1. 16
2. How do you find the sum of each column?
   1. Apply(MyMatrix,2,sum)
   2. colSums(MyMatrix, na.rm = FALSE, dims = 1)
3. How do you find the product of each column?
   1. Apply(MyMatrix,2,prod)
4. How would you change every instance of the number 10 to 12?
   1. MyMatrix[which(MyMatrix==10)]<-12
5. How many values in MyMatrix are greater than 3 and less than 8?
   1. 32
6. How do you change the elements of column 12 into **character data**, while keeping columns 1- 11 as numeric data??
   1. As.character(MyMatrix[12])
7. Find which rows of MyMatrix have a sum >70. Make a new version of MyMatrix where the 13th column is a set of TRUE and FALSE values denoting which rows have a sum >70. (Hint: What type of object allows you to store both logical and numeric data at once?)

***Advanced***

1. Load the iris dataset we used in the earlier tests. Write a function that takes iris as its argument, and returns three subsets of the data.frame split by the three different types of species (saved as a single object).
2. Write a function that takes iris as its argument. The function should, for each row, add **Sepal.Length** and**Petal.Length** if **Sepal.Width** is > 3.1. It should substract **Petal.Length** from **Sepal.Length** if **Sepal.Width** is <3.1. The answer should be returned as a vector.
3. Load the mtcars dataset we used in the earlier tests. Write a function that takes a number of cylinders as its argument. Have the function return the average miles per gallon (column **mpg**) for all cars with that many cylinder (column **cyl**).
4. Write a function that simulates 1,000,000 powerball drawings. A powerball drawing takes a random **sample** of 5 numbers (without replacement) from 1 through 69, plus one powerball number ranging from 1 through 26. The function should return a single object recording all of your draws.
5. Write a function that take a single set of lottery numbers (as a vector) as its **argument**. As before, write a function that simulates 1,000,000 powerball drawings. Have the function return a TRUE or FALSE value if you won any of the drawings.