Homework 1

Your Name Here

Due Date Here

Exercise 1 (STAT 612: 5 points; STAT 412: 10 points)

Complete the following exercises.

Useful functions `seq()`, `sum()`, `[]`, `c()`, `length()`, `log()`

1. Create a vector that contains all integers divisible by 3 from 33 to 639. Assign this vector to a variable. Add up the elements of this vector.
2. Create a vector of numerics of length 100 that starts at 33 and ends of 639. Assign this vector to a variable. The difference between any two consecutive elements should be the same. Add up the elements of this vector.
3. Extract the 9th element from the vector you created in part 1.
4. Extract the 9th to 150th elements from the vector you created in part 1.
5. Combine the vectors from parts 1 and 2 and assign this combined vector to a new variable.
6. Use a function to determine the length of the vector in part 5.
7. What is the sum of the log of every element in the vector in part 5?

Exercise 2 (STAT 612: 5 points; STAT 412: 5 points)

Using piping `%>%`, sample from the vector `1:10` 1000 times **with replacement**, calculate the resulting sampled vector's mean, then exponentiate that mean.

Exercise 3 (STAT 612: 5 points; STAT 412: 10 points)

The following are the functions I used this for this homework (but it is also possible that you find alternative ways to solve the following problems):`outer()`, `colSums()`, `which()` (with the `arr.ind` argument set to `TRUE`), `rbind()`, `print()`, `sample()`, `as_tibble()`.

1. Write a function of an integer n that does the following:
   a. Prints the matrix

$$A = \begin{pmatrix} \frac{1}{1} & \frac{1}{2} & \cdots & \frac{1}{n} \\ \frac{1}{2} & \frac{1}{3} & \cdots & \frac{1}{n+1} \\ \vdots & \vdots & \ddots & \vdots \\ \frac{1}{n} & \frac{1}{n+1} & \cdots & \frac{1}{2n-1} \end{pmatrix}$$

   with column sums appended to the bottom.

   b. Find all entries in A above that are between 0.12 and 0.15. Print out the indices (with row and column numbers) and the entries that meet that criteria.

   As an example, the function output of $n = 6$ should be

```
##           [,1]      [,2]      [,3]      [,4]      [,5]       [,6]
## [1,] 1.0000000 0.5000000 0.3333333 0.2500000 0.2000000 0.16666667
## [2,] 0.5000000 0.3333333 0.2500000 0.2000000 0.1666667 0.14285714
## [3,] 0.3333333 0.2500000 0.2000000 0.1666667 0.1428571 0.12500000
## [4,] 0.2500000 0.2000000 0.1666667 0.1428571 0.1250000 0.11111111
## [5,] 0.2000000 0.1666667 0.1428571 0.1250000 0.1111111 0.10000000
## [6,] 0.1666667 0.1428571 0.1250000 0.1111111 0.1000000 0.09090909
## [7,] 2.4500000 1.5928571 1.2178571 0.9956349 0.8456349 0.73654401
##
## # A tibble: 9 x 3
##     row   col value
##   <int> <int> <dbl>
## 1     6     2 0.143
## 2     5     3 0.143
## 3     6     3 0.125
## 4     4     4 0.143
## 5     5     4 0.125
## 6     3     5 0.143
## 7     4     5 0.125
## 8     2     6 0.143
## 9     3     6 0.125
```

Print the output from the function you created in part 1 with $n = 5$ and $n = 10$.

Exercise 4 (STAT 612: 5 points; STAT 412: 5 points)

(From the book) Implement a `fizzbuzz()` function. It takes a single number as input. If the number is divisible by three, it returns `"fizz"`. If it's divisible by five it returns `"buzz"`. If it's divisible by three and five, it returns `"fizzbuzz"`. Otherwise, it returns the number. Make sure you first write working code before you create the function. Be sure to test it out and **show your test results using the following inputs**: `3`, `5`, `15`, `2`.