Instructions

To complete this Problem Set, you are asked to write a set of small programs. The code should when entered into the **R**-console produce the answers to the questions below. Please use the comment operator to annotate and organize your code. Write your code using Sublime Text 4 and save it with the extension `.R` (e.g., `ProblemSet1.R`). Email me this file by 1:20pm February 1.

The purpose of this problem set is to review some basic topics covered so far – namely named objects called vectors, and basic functions.

Vector Problem I

Recall, that in **R** we can store "things" in named objects.

```
1 > Number_Nine <- 9
2 > Number_Nine
  [1] 9
```

In the above example I created an object named "Number_Nine" and assigned the value 9 to it. In other words I created a trivial vector of length one containing one element. This one element is 9 expressed as a "double."

For Question 1 you are to create a vector. You can pick any name you like. Instead of a trivial vector of length one, I want you to create a vector of length 10. In other words, this vector should have 10 elements. Create your vector using the function `c()`. Recall that this function combines values or elements into a vector. For example:

```
1 > Test <- c(1,2,3)
2 > Test
  [1] 1 2 3
```

The elements of this vector should be a sequence from 5 to 50 in increments of 5 (i.e., 5, 10, 15, 20, 25, ...).

Using the basic functions we covered in class, tell **R** to calculate the following for your named vector:

1. the mean

2. the length of the vector

3. the median

4. the standard deviation

5. the max

6. the sum of the vectors elements

7. the product of the vectors elements

Vector Problem II

For this second question I want you to create two named vectors. Name them Vector1 and Vector2. Instead of a vectors running from 5 to 50, I want Vector1 to run from 5 to 5000 in increments of 5. I want Vector2 to be a sequence running from 5 to 10000 in increments of 10.

Clearly this would be a tedious task using the `c()` function. Luckily, **R** knows a function called `seq()`. The `seq()` function can take a number of arguments or options. For our purposes here, only three of them matter. They are:

1. `from`

2. `to`

3. `by`

For example we can create a sequence from 1 to 999 in increments of 0.5 by writing the following code:

```
1 > seq(from = 1, to = 999, by = 0.5)
```

For our two vectors (Vector1 and Vector2) compute the following using the basic functions we covered:

1. the length

2. the min and max

3. the mean

4. the median

5. the standard deviation

6. the covariance

7. the correlation coefficient

Vector Problem III

Consider the following:

The sum of the squares of the first ten natural numbers is:

$$1^2 + 2^2 + 3^2 + ... + 10^2 = 385$$

The square of the sum of the first ten natural numbers is:

$$(1 + 2 + 3 + ... + 10)^2 = 55^2 = 3025$$

The difference between the sum of the squares of the first ten natural numbers and the square of the sum of the first ten natural numbers is $3025 - 385 = 2640$. Write a set of instructions to find the difference between the sum of the squares and the square of the sum of the first *one thousand* natural numbers.