**Laboratory Exercise Week 1**

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*Directions*:

* Write your R code inside the code chunks after each question.
* Write your answer comments after the # sign.
* To generate the word document output, click the button Knit and wait for the word document to appear.
* RStudio will prompt you (only once) to install the knitr package.
* Submit your completed laboratory exercise using Blackboard’s Turnitin feature. Your Turnitin upload link is found on your Blackboard Course shell under the Laboratory folder.
* Create a vector of three elements (2,4,6) and name that vector vec.a. Create a second vector, vec.b, that contains (8,10,12).
* Add these two vectors together and name the result vec.c.
* Create a vector, named vec.d, that contains only two elements (14,20). Add this vector to vec.a. What is the result and what do you think R did (look up the recycling rule using Google)? What is the warning message that R gives you?
* Next add 5 to the vector vec.a. What is the result and what did R do? Why doesn’t it give you a warning message similar to what you saw in the previous problem?

**Code chunk**

*# Insert your code for this question after this line*  
trial.vec <- 1**:**20  
trial.vec

## [1] 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

vec.a <- **c**(2,4,6)  
vec.b <- **c**(8,10,12)  
vec.c <- vec.a **+** vec.b  
vec.d <- **c**(14,20)  
vec.a **+** vec.d *# According to the recycling rule, when we try to add two structures of different lengths then R resizes the smaller structure to match the size of bigger structure by repeating all its values multiple times.*

## Warning in vec.a + vec.d: longer object length is not a multiple of shorter  
## object length

## [1] 16 24 20

*# The warning message that R gives us is "longer object length is not a multiple of shorter object length"*  
  
vec.a **+** 5 *# In this case R added 5 to each element of vec.a and the result is [7,9,11].*

## [1] 7 9 11

*# R doesn't give us an error message because this time the length of the smaller structure could be recycled 3 times to match the length of the bigger structure which was not possible with lengths of vec.a and vec.d.*  
*# last R code line*

* Generate the vector of even numbers {2, 4, 6, . . . , 20}
* Using the seq() function and
* Using the a:b shortcut and some subsequent algebra. *Hint: Generate the vector 1-10 and then multiple it by 2.*

*# Insert your code for this question after this line*  
vec.sq <- **seq**(from = 2, to = 20, by = 2)  
vec.evn <- 1**:**10 **\*** 2

* Create a vector y containing (2, 2, 2, 2, 4, 4, 4, 4, 8, 8, 8, 8) using the rep() function. You might need to check the help file for rep() by typing ?rep in the console to see all of the options that rep() will accept. In particular, look at the optional argument each=.
* Find the mean of vector y using the function mean().
* Use google search to find the function in R that computes the variance of a vector and find the variance of y.

*# Insert your code for this question after this line*  
y <- **rep**(**c**(2,4,8),each = 4)  
**mean**(y)

## [1] 4.666667

**var**(y)

## [1] 6.787879

* The vector letters is a built-in vector to R and contains the lower case English alphabet.
* Extract the 9th element of the letters vector.
* Extract the sub-vector that contains the 9th, 11th, and 19th elements.
* Extract the sub-vector that contains everything except the last two elements.

*# Insert your code for this question after this line*  
letters[9]

## [1] "i"

letters[**c**(9,11,19)]

## [1] "i" "k" "s"

letters[1**:**24]

## [1] "a" "b" "c" "d" "e" "f" "g" "h" "i" "j" "k" "l" "m" "n" "o" "p" "q" "r" "s"  
## [20] "t" "u" "v" "w" "x"