

Homework Assignment 1
(Due Friday, September 2, 2022 at 5PM)

Total Points: 44

Please email your answer (compiled pdf file from R markdown) and R code to Yen-Yi Ho (hoyen@stat.sc.edu). For Questions 1 to 3, please use the R markdown Homework template (Stat704_HWtemplate.Rmd) to write your homework solutions. **For question 4, you can hand write the solution**, and combine it with Q1-3 into one single pdf file.

1. Specify R code, using the function `rep`, to create the vector (1, 1, 1, 1, 1, 2, 2, 2, 2, 3, 3, 3, 3, 4, 4, 5). (3 points)
2. Specify R code for pulling out the rows of the `mat` object (below) for which the fourth column is not missing and is less than 14. (4 points)

```
>mat<-matrix(c(1:13, NA, 14:15), nrow=4)
```
3. Use the built-in dataset **airquality** [Hint: use `data(airquality)`],
 - (a) Create a new data set with more than 50 rows and 4 columns that does not contain any missing values (5 points)
 - (b) Use **write.csv** to save this data frame to a csv file. Read it in back and check the structure of the data. [Hint: use **str**] (5 points)
 - (c) Use **save** to save this data frame to a file (.RData). **load()** the file. Check the structure of the data. (5 points)
4. Let $Y_1, Y_2,$ and Y_3 be independent random variables with means $E\{Y_i\} = \mu_i$ for $i = 1, 2, 3$ and common variance $\sigma^2\{Y_i\} = \sigma^2$. Define $\bar{Y} = \frac{1}{3}(Y_1 + Y_2 + Y_3)$.
 - (a) Find $\sigma\{Y_1 - \bar{Y}, \bar{Y}\}$. (6 points)
 - (b) Find $E\{(Y_1 + 2Y_2 - Y_3)^2\}$ (6 points)
 - (c) Now assume common covariance $\sigma\{Y_i, Y_{i'}\} = w, i, i' = 1,2,3$. Re-derive $\sigma\{Y_1 - \bar{Y}, \bar{Y}\}$. (10 points)