MTH208: Worksheet 1

Introduction to R

R is a statistical coding language made for and by statisticians. We will be using R predominantly in this course as well as throughout your degree. It is thus absolutely crucial that you invest in getting familiar with the language.

The machines in the lab all have R and RStudio already installed. However, you can also install R and RStudio (for free) on your personal machines. To setup, you need the following:

- R downloaded from https://cran.r-project.org/ compatible with your system
- Rstudio is **highly** recommended. RStudio is an Integrated Development Environment (IDE) for R. That means that Rstudio allows you to integrate the various features of R into one visual GUI environment.
- Latex installed on your system in order to use R Markdown (or now Quadro!). Quadro allows us to write pdf documents integrating mathematical equations, automatic code evaluations, plots!
- If you want to practice some R coding, you can find exercises here: https://dvats.github.io/BasicRProblems/

Introduction to GitHub

We will be using GitHub every day for this course. A GitHub folder is called a *repository.* I will be sharing all worksheets on GitHub through a GitHub classroom link. That link makes a copy of the GitHub repository in your account, giving you complete access to all files shared.

Please get comfortable with GitHub in the first month of the course. On your personal computer, I recommend installing GitHub Desktop.

Some Coding Practices

As we progress in this course, we want to make sure we develop good coding habits that will help us in the future

- Don't be lazy!
  - Codinglanguagesarelikeanylanguage. Every object, operation, etc is a word and you must use "space" to make it easier to read.
  - Comment your code! See `starter.R` file for how I use comments in my code. That will help the reader understand you better.
- Be organized
  - Don't save files randomly on your desktop. Make a folder for the course, and within that folder, make subfolders for every worksheet or task.
  - Pretty soon you'll be writing long complicated codes. Think about which codes should be in which files or folders.

  - Name files appropriately
  - Remember to push changes to GitHub when your work session is done.
- Naming objects
  - Don't use `a`, `b`, `c`, etc only. Use variable names based on their purpose.
  - Assume that the next time you run your code, you have no idea what the code is supposed to do. That is, write the code for your future self.
- Script vs Console
  - R has both an active console and a script.
  - The script is basically a text file that allows you to keep organize your working code. Make sure any script you write, can run in a different person's computer with a fresh R session.
  - The console is a place for you to run R code. Additionally, during the process of writing code, you can view your results as it comes along, debug your code, and keep a track of results.

Worksheet Problems

1. Carefully do the following steps

   a. Create a folder on your machine somewhere easily accessible called `MTH208`.

   b. Within that folder create a new folder `Worksheet1`.

   c. Go to your GitHub repository for this Worksheet, click on the green button, and select `Download Zip` option. Download the Zip to the `Worksheet1` folder created above.

   d. Right click on the zip file and click on extract files.

   e. Remember these sequence of steps. You will need to do this every time.

2. Carefully go through the code in file `starter.R` and run the code in RStudio.

3. Write a function in R to find $n!$. This function should have an argument `n` that can be used to call the function for a given integer. Verify your answer with `factorial()` function.

4. Euler's number, e, is accessed through exp(1) in R. Similarly e^3 is `exp(3)`. It is well known that

$$e = \lim_{n\to\infty} \left(1 + \frac{1}{n}\right)^n$$

   Write a function in R that calculates the right hand side (without the limit) for a user-given value of n.

5. Load the seating dataset:

```
seat <- read.csv("https://dvats.github.io/assets/course/mth208/seating.csv")
```

   Write R code to find your assigned seat using your roll number as reference.

6. The `seating.csv` dataset is also shared in the repository folder. Using `read.csv()` function, load the locally downloaded `seating.csv` into your R session. You will need to make sure you set the working directory to the folder where the csv file is.