Tutorial 13 - Programming and custom functions in R

Learning to problem solve and languages

As we said at the beginning of the semester, this is like a philosophy and language class all in one. You are learning a new way to think and a new language (actually two)!

- The recent challenges are more realistic and therefore include an important step of conceptualizing or decomposing the problem
- Seems like most of you are getting pretty good at R and decomposing problems, but both of these skills require a lot of practice
- It is definitely ok to ask for help on decomposing the problem, and don't let struggles with this convince you that you aren't learning R

Defining a custom function

```
myMean<-function(x){
      n=length(x)
      total=sum(x)
      average=total/n

      return(average)
}
```

Lecture Challenge 2

Now create a solution for the student assignment:

You have asked students in your biocomputing class to create a function that randomly creates a text file with any number of lines and a single number on each row, but the sum of numbers in the file must be less than 100. You, as the instructor, have to check each file, but want to do it in an automated way.

Decomposing lecture challenge 2

- define a file name
- pick how many numbers
- pick the numbers
- check if the sum is less than 100
- if the sum is less than 100, fix it

Coding lecture challenge 2

See comments in challenge answers on Canvas for complete description of each line

```
  answer<-function(filename){
    howMany<-sample(x=1:50,size=1)
    numbers<-rnorm(n=howMany,mean=100/howMany,sd=1)
    sumNumbers<-sum(numbers)
    if(sumNumbers<100){
      write.csv(x=matrix(data=numbers,
                         nrow=length(numbers)),
                file=filename,
                row.names=FALSE,col.names=FALSE)

...
```

Coding lecture challenge 2

See comments in challenge answers on Canvas for complete description of each line

```
...

    }else{
      diff<-sum(numbers)-100
      cumulativeSumNumbers<-cumsum(numbers)
      removeUpTo<-min(which(cumulativeSumNumbers>diff))
      numbers<-numbers[-(1:removeUpTo)]
      write.csv(x=matrix(data=numbers,
                         nrow=length(numbers)),
                file=filename,
                row.names=FALSE,col.names=FALSE)
    }
  }
```

R Project

Due December 14th at 11:59 pm via GitHub

You can work in groups of 1, 2, or 3 people, as you did for the bash project.

Work time is available in lecture next week on Monday and Wednesday. Office hours will occur as normal all of next week.

Extra Challenge 1

Create a function that returns rows from wages.csv with a specified gender, years experience, and years of education. If no rows meet the criteria provided by the arguments, the function should return nothing and print a message that no individuals in the dataset meet the specified criteria.

Extra Challenge 2

Write a function to convert between miles and kilometers. The function should take a vector of any length as the first argument and return a vector of the same length. A second argument should allow users to specify "miles2km" or "km2miles" and the function should do the appropriate conversion. 1 mile = 1.60934 km.