CSC121H Lab 3

1 Objectives

- Practice using and manipulating vectors
- Practice writing logical expressions and conditional statements
- Practice writing functions with conditional if-statements.

2 Driver and navigator

As always, you must complete this lab with a partner, and you and your partner will take on distinct roles:

**driver:** The person typing at the keyboard.
**navigator:** The person watching for mistakes, and thinking ahead.

The rest of these instructions call you s1 and s2. Pick which one is which. s1 should log in, start up RStudio, and be the first driver.

3 Working with Vectors

In this part of the lab, you will be working with vectors. You will first write on the lab handout what you think the answer should be, and later you will try it out in the R Console to see if you’re correct.

Consider the vectors:

```r
a <- c(1, 2, 3)
b <- c(2, 4, 7, 8, 9, 12)
```

What is the result of `a + b`? ________________________________

Write an R expression that would create a vector that places the values of vector a right in the middle of vector b. ________________________________

Write an R expression that would create a vector that combines all values in a that are less than 3 followed by all numbers in b not equal to 8: ________________________________

Write an R expression that would create a vector that combines all of the odd numbers of a followed by all of the even numbers of b: ________________________________

Make sure you try your answers in the R Console.
Show your TA your work before moving on.

4 If statements

In this part of the lab, you will practice writing functions that use logical values and if statements.
Create a new R script file `lab3_functions.R` and design the functions below.
For every function, make sure to provide good argument names, a full docstring which includes the variable names and what the function returns, intermediate values, and proper style.
Create a separate file `lab3_test_script.R`, where you will call your functions to test them.

**Switch driver and navigator.**

- **How Long will it take?**
  A common calculation for estimating a runner's marathon time is to take their best half-marathon time, multiply by two and add ten minutes. This works pretty well unless the marathon course is hilly. If it is hilly, add an extra 20 minutes to the estimate.
  Write the function `MarathonTime` that takes a half-marathon time in minutes and whether or not the marathon course is hilly as arguments and returns the estimated number of minutes the runner will take to run the full marathon.

  In your `lab3_test_script.R`, create 3-4 test cases for your function, and use `print` to print the results of your function calls to the console. Make sure you get what you expect.

  **Switch driver and navigator.**

- **Going out with the gang?**
  You are planning an outing with some friends and need to calculate the total price of the tickets. A regular ticket usually costs $3.99 and a student ticket costs only $2.99. If the total number of tickets being ordered (including both non-students and students) is at least 10, then a 10% discount is applied to the order. However, if it is a holiday, the group discount is only 5%.
  Write the function `TotalTicketPrice` that given three arguments (the number of regular tickets, the number of student tickets and whether or not it is a holiday), computes and returns the total price of the tickets.

  Create 3-4 test cases in your `lab3_test_script.R`

  **Switch driver and navigator.**

- **Is it time for tea?**
  Your friend lives in London, England in a timezone that is normally 6 hours ahead of Toronto. But sometimes England and Canada switch to daylight savings time on different dates. If Toronto is on daylight savings time and England isn’t, then the time difference is only 5 hours. Conversely if England is on daylight savings time and Toronto isn’t, the time change is 7 hours. Of course if both are on daylight savings time, the difference is back to the standard 6 hours.
  Write the function `BritishTime` whose first argument is a value representing the time in Toronto from 0 to 24 (the time can be a decimal number). The next two arguments are logical values indicating whether or not Toronto and London are on daylight savings time respectively. Your function should return the time in London, England.

  One last complication is that your function should not return a time greater than 24.0 or less than 0.0
  **Suggestion:** At first, don’t consider this final complication. Run some test cases your where the expected output is already less than 24.0 (in the same day.) Once that is working, switch driver and navigator and add another example where the time in Toronto is so late at night that London is already the next morning. Fix the body of your function to work correctly.

  Create enough test cases in your `lab3_test_script.R` to cover all the different possibilities of logical value combinations. Test Toronto times close to 24 as well.

  Once you have completed the functions, demonstrate them to your TA. Show your TA your functions script and your test script. If you run out of time and would like to finish the lab on your own, the handout will be posted on the Labs webpage.