CS 105 – Introduction to Scientific Computing

Assignment 8 – Scripts with Loops I

Objectives

After completing this assignment you should be able to:

1. Trace scripts that use *while* loops
2. Identify problems that can be solved using loops
3. Write scripts with loops to solve these problems

Part I: Textbook Exercises

Section 4.7

- **#**4.8
    - For each part state how many times each loop is **entered**. If there's multiple loops provide a way to identify each.
    - Reminder, mod(x,y) is similar to saying the remainder after x is divided the maximum integer number of times by y. I.e mod(12,5) = 2

Part II: Additional Hand-Written Exercises

1. Consider this MATLAB code:

```
% X is a vector of 1s and 0s obtained somehow (it already exists)
n = length(X);
i = 1;
while i <= n
     if X(i) == 1
          disp(i)
     end
     i = i + 1;
end
```

   a. Describe as succinctly and clearly as possible what this `while` loop does. As the comment indicates, `X` is a vector whose elements are all either 1 or 0.

   b. If `X` is `[ 1 1 0 0 1 0 1 0 0 0 1 ]`, what value will `i` have after completion of the loop?

2. State whether you think it would be easier to solve the problem below using a `for` loop or a `while` loop, and explain why. DO NOT WRITE ANY CODE. Instead, think about how you would solve the problem, then simply indicate whether you would choose `for` or `while`, and why.

   Using the infinite series

   $$\pi^2 = 6(1/1^2 + 1/2^2 + 1/3^2 + 1/4^2 + \ldots)$$

   compute an approximation of π that is accurate to a specified number of decimal positions by adding ever more terms to the series until the square root of the series is within 0.0000001 of π.

Part III: Script Exercises

Modify code from Assignment 6 Part 2 (the breaking distance computation) so that if the user provides bad input (either non-numeric or numeric but out-of-range) the program will re-prompt the user to re-enter the input, re-prompting as often as necessary until good input is entered. You should restructure your Assignment 6 Part 2 code (make sure it's correct) to use *while* loops rather than *if* statements. Of course this will involve a lot more than just replacing *if* with *while*; you will have to think significantly about how you want your program flow to work and code accordingly.

Submission

Submit a single zip file consisting of

- Your report, which will contain solutions for Parts I and II as well as thoughts/experiences for work done in Part III
- Your script for Part III