CS 110 A – Creative Problem Solving in Computer Science

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Homework 7

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- This homework is about recursion in Python. Solutions using loops will not be graded.
- Submit one Python file with the solutions to all the coding problems.
- Submit a separate file with the hand trace/execution in exercise 2b.

Exercises

1. Read Chapter 5 of Computing for Biologists.
2. (a) (20 points) Write a recursive Python function `replace`(x, y, lst) that returns the result of replacing every x by y in lst.

```
>>> replace(1,'A',[1,7,3,1])
['A', 7, 3, 'A']
>>> replace(1,'A',[])
[]
>>> replace(2,'A',[1,7,3,1])
[1, 7, 3, 1]
>>>
```

   (b) (15 points) Write a hand trace or execution of `replace (2,3,[1,4,2])`.

3. (35 points) Write a recursive Python function `replaceFirstN`(x, y, lst, n), that returns the result of replacing the first n occurrences of x by y in lst.

```
>>> replaceFirstN(3,'A',[5,3,6,7,8,3,3,3,9], 2)
[5, 'A', 6, 7, 8, 'A', 3, 3, 9]
>>> replaceFirstN(3,'A',[5,3,6,7,8,3,3,3,9], 0)
[5, 3, 6, 7, 8, 3, 3, 3, 9]
```

```
>>> replaceFirstN(3,'A',[], 6)
[]
>>>
```

4. (30 points) This exercise is part of the Mastermind game problem we saw in class. Define a recursive Python function `makeRandomCode`(holes, colors), that creates a random code. *Hint: Include import random in your file.*

   ```
   >>> makeRandomCode(4,5)
   [3, 1, 4, 2]
   >>> makeRandomCode(4,5)
   [3, 2, 4, 4]
   >>> makeRandomCode(4,5)
   [1, 2, 4, 3]
   >>>
   ```

   Notice that each call with the same argument might give a differen answer since it is creating a random code.

Course Outcomes

This homework is an assessment instrument for the following Course Outcomes.

1. **Problem solving** - Systematically divide a problem into a sequence of steps. (BS-CS B analyze) (BS-CyS B analyze)
2. **Programming** - Compose a solution to a problem using a high-level language. (BS-CS C design) (BS-CyS C design)
3. **Execution** - Demonstrate the dynamic behavior of programs that include conditional execution, looping, and recursion by describing their behavior and output. (BS-CS A apply)