While Loops and Randomness

While Loops

Problem 1. The "Collatz Sequence" for some number `n` is defined as...

```
f(n+1) = f(n)/2         (if n  is even)
f(n+1) =  3 * f(n) + 1  (if n  is odd)
```

...until f(n) eventually reaches 1.

Using the rule above and starting with 13, we generate the following sequence:

$13 \to 40 \to 20 \to 10 \to 5 \to 16 \to 8 \to 4 \to 2 \to 1$

Using a while loop, calculate the Collatz sequence for any integer. Your function should accept an integer argument and return a list.

Problem 2. Using `map`, find the Collatz sequences of all numbers between 5 and 100.

Problem 3. Using `filter`, find only the Collatz sequences where the length of the sequence is greater than its initial number.[1]

[1] For example,
`collatz(5)= [5, 16, 8, 4, 2, 1]`
so it should stay. However,
`collatz(12)= [12, 6, 3, 10, 5, 16, 8, 4, 2, 1]`
The length of this is 10, so this should be removed.

Randomness (and while loops)

Problem 4. Write a function called '`crazyCoin`' which, given an integer n as input, returns "`Heads`" n% of the time and "`Tails`" the other times.

Problem 5. Write a function which

- generates a random positive integer (call it n) less than 100
- generates a list (call it '`crazyCoinTosses`') containing n 'coin tosses' (where each 'coin toss' is obtained by using the function defined in problem 4 with input n).

Problem 6. Write a function which randomly shuffles a list.

Problem 7. Given a list $L = [c_1, ..., c_n]$ of n distinct characters, write a program which generates a random string s such that every character of s is an element of L and such that character c_i occurs i times in s.

Problem 8. Write a function called `rps` which takes as input a string x and then generates a random string of either "rock", "paper" or "scissors" and then: if x is one of rock, paper or scissors, then `rps` returns "you" if x wins the rock-paper-scissors game and "me"

otherwise; if x is **not** one of 'rock", "paper" or "scissors", then '`rps`' returns "I don't think you know how to play this game...".