Week 3 Worksheet

(1) Suppose `todo` is an existing variable whose value is a list. Write code that will print `"task overload!"` if `todo` has 10 or more elements, and otherwise will print `"Begin working on"` followed by the first element of the list.

(2) Suppose the variable `c` has value that is a string of length 1 (i.e. a character). Write code to determine whether `c` is an alphabet character (A-Z,a-z), a digit (0-9), or other type of character. It should print a message stating the category that `c` belongs to. HINT: A solution using only the concepts we've discussed so far, but not involving too much typing, might begin

```
alphabet_chars = "ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz"
```

(3) Using only the string variables `s` with value `"knights"` and `t` with value `"rook"`, write expressions that produce the given string. In your expressions, string literals are forbidden!
  (a) `"night"`
  (b) `"took"`
  (c) `"rig"`
  (d) `"ghost"`

(4) Write a script that reads a string from the keyboard that consists of a float literal followed by either the character `"C"` or `"F"`, for example `25.2C` or `87.5F`. The program should store the float in a variable `temp` and the final character in a variable `scale`, and then print a message depending on the input, as follows:
  - If `scale` is `"F"` and `temp` is greater than or equal to 90, print `"It is hot"`
  - If `scale` is `"F"` and `temp` is less than 90 but greater than or equal to 40, print `"It is nice"`
  - If `scale` is `"F"` and `temp` is less than 40, print `"It is cold"`
  - If `scale` is `"C"` and `temp` is greater than or equal to 32.2, print `"It is hot, but at least you're using the metric system"`
  - If `scale` is `"C"` and `temp` is less than 32.2 but greater than or equal to 4.4, print `"It is nice, like the metric system"`
  - If `scale` is `"C"` and `temp` is less than 4.4, print `"It is cold"`

  Hint: An efficient way to write this is to put one `if` inside of another.

(5) Write a script similar to the previous one, but which simply reads a temperature in either Celsius or Fahrenheit and then prints it in Celsius. For example, if the input is `32F` it should print `0.0C`, and if the input if `41.5C` it should print `41.5C`.

(6) After this code runs:
```
L = [ [1,"fish",2,"fish"], "ring", [72], "plus"*2 ]
```
predict the value of each expression (or determine that it would produce an error):
  (a) `L[-1][-5]`
  (b) `L[-5][-1]`
  (c) `2 in L`
  (d) `2 in L[0]`
  (e) `"2" in L[0]`
  (f) `len(L[0])*L[1]`
  (g) `len(L) | len(L[-2])`
  (h) `"fish" in L[2] or "fish" in L[1]`

(7) Write a script that asks for two strings using prompts `"Message?"` and `"Enthusiastic?
(y or n)"`. Then, if the user answered `"n"` at the second prompt, it should print their answer to the first question unchanged. But if the user answered `"y"` at the second prompt, it should print their answer to the first question, followed by forty exclamation points.

(8) Suppose you want to transmit a secret 3-bit number using the following code. You will compose a sentence, and then the 6th, 11th, and 20th characters will be converted to bits as follows: Vowels (a,e,i,o,u) and spaces mean 0, all other characters mean 1. These bits are then arranged left to right in the same order they appear in the string. Write a program that reads a sentence from the keyboard, decodes it using this scheme, and then prints the decoded number as a decimal value (between 0 and 7).

Extension: *Millions of peaches.* First, write code that creates a list `L` with three elements: The first and second elements should be `L` itself, and the last element should be the string `"peach"`.

Now, once you've done this, all of the following expressions should evaluate to `"peach"`:

- `L[2]`
- `L[0][2]`
- `L[1][2]`
- `L[0][0][1][1][0][1][2]`

There are many other ways to retrieve `"peach"` from this list. Can you find some?

Can you find all such ways? For example, can you determine how many different ways there are to access the element `"peach"` using a maximum of 5 pairs of square brackets? (For simplicity, let's say that negative indices are not allowed.) What if you are allowed to use up to 25 pairs of square brackets?

Revision history:

- 2020-09-06 Initial release