Introductory syntax exercises

1. Write a function that calculates the resultant of two components. The resultant is expressed as:

$$r = \sqrt{x^2 + y^2}$$

The function should have two input arguments x and y, and one return argument r. The square root should be calculated using `sqrt`, as shown in Listing 1.

Listing 1: Using the square root function.

```
import math
math.sqrt(p) # Returns the square root of p
```

The square (e.g. x^2) can be calculated following Listing 2.

Listing 2: Using the to the power of syntax.

```
x**2 # Returns the square of x
```

Test the function using the values $x = 3$ and $y = 4$. The function should return 5.

2. Write a function that sums all of the values in a list, where the list contains integer (whole number) values. The function should have one input argument that is the list and one return value that is the result of the sum. The function should use a `for` loop to calculate the sum. Test the function by comparing the return value with the result of using the `sum` function. The sum function is demonstrated in Listing 3.

Listing 3: Using the sum function.

```
lst = [2,4,5,6,10,2]
sum(lst) # Returns the sum of the values in lst.
```

3. Write a function that counts the number of words within an input text string. The function should have one argument, which is the input text string. Words can be separated by:

   - A space `" "`.
   - A tab character `"\t"`.
   - A new line character `"\n"`.

   Use a `for` loop to loop over each character in the input text string and count the number of words. An initial `for` loop that can be modified is given in Listing 4.

Listing 4: Looping over the characters in a text string.

```
text = "This is a text string."
for c in text:
    print(c) # For debugging only.
    # TODO: Decide if this is a new word or not.
```

4. A typist mixes up “there” and “their” in their text document. Write a function to replace “their” with “there” when necessary. The function should rely on the rules:

   - “their was” should always be “there was”.
   - “their used to be” should always be “there used to be”.

- "over their" should always be "over there". (This rule is not always true in English.)

The function should use the string `replace` function to replace the text. An example of this is given in Listing 5. The function should use a `for` loop to try each of the rules in turn. The function should have one input argument that is the input text string and one return value that is the corrected text string.

Listing 5: Replacing a string with another one.

```
1 s = "Once upon a time their was a"
2 s = s.replace("their was","there was")
```

Test the function with a few example input strings.

5. Write a function that returns a list in reverse. The function should have one input argument that is the input list and one return argument that is the reversed list. The first value in the input list should become the last value in the returned list. Find the length of the list by using `len`. Then use a `for` loop to loop from the last element of the input list to the first element. Append to a new list and return the result.

   Compare the returned list from the function with calling the `reverse` function. An initial program is given in Listing 6, where `reverseList` is the name of the function that needs to be written.

Listing 6: The reverse function and a user function.

```
1 lst = [ 1, 2, 4, 1 ]
2 copyOfLst = lst.copy()
3 copyOfLst.reverse() # copyOfLst is now reversed.
4 reversedLst = reverseList(lst) # Calling the user function.
5 print(copyOfLst)
6 print(reversedLst)
```