Programming Problems

For each of these problems (unless otherwise specified), write the needed code directly in the Python file in the corresponding function definition.

All programming problems may also be checked by running 'Run current script' on the starter file, which calls the function `testAll()` to run test cases on all programs.

#1 - `onlyPositive(lst)` - 5pts

Can attempt after Lists and Methods lecture

Write a function `onlyPositive(lst)` that takes as input a **2D list** and returns a new 1D list that contains only the positive elements of the original list, in the order they originally occurred. You may assume the list only has numbers in it.

Example: `onlyPositive([[1, 2, 3], [4, 5, 6]])` returns `[1, 2, 3, 4, 5, 6]`, `onlyPositive([[0, 1, 2], [-2, -1, 0], [10, 9, -9]]` returns `[1, 2, 10, 9]`, and `onlyPositive([[-4, -3], [-2, -1]])` returns `[ ]`.

#2 - `getCharacterLines(script, character)` - 10pts

Can attempt after Lists and Methods lecture

Assume you're provided a string script that has been formatted in a specific way. Each line of the script begins with a character's name, followed by a colon, followed by their line of dialogue. Lines are separated by newlines, which are represented in Python by the string `'\n'`. For example:

```
'''Buttercup: You mock my pain.
Man in Black: Life is pain, Highness.
Man in Black: Anyone who says differently is selling something.'''
```

Using the algorithm provided below, write the function `getCharacterLines(script, character)`, which takes a script and a character name (both strings) and returns a list of the lines spoken by that character. The lines should be stripped of the leading character name and any leading/trailing whitespace. So if we use the following script:

```
'''Burr: Can I buy you a drink?
Hamilton: That would be nice.
Burr: While we're talking, let me offer you some free advice: talk
less.
Hamilton: What?
Burr: Smile more.
Hamilton: Ha.
Burr: Don't let them know what you're against or what you're for.
Hamilton: You can't be serious.
Burr: You want to get ahead?
Hamilton: Yes.
Burr: Fools who run their mouths oft wind up dead.'''
```

Then:

```
getCharacterLines(script, "Hamilton") == [ "That would be nice.",
"What?", "Ha.", "You can't be serious.", "Yes." ]
```

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To solve this problem, use the following algorithm:

1. Create a list that will be used to store all the character's lines.
2. Split the script into lines and store the result
3. Iterate over the lines of the script
    a. For each line, check if the character who is saying that line is the character who was given to you as a parameter.
    b. If it is, separate the dialogue line from the rest of the string. Note that the line always occurs after the first colon - use that!
    c. Then add the resulting line into the result list
4. Finally, return the list of all the lines for this character

Hint: you'll want to use string and list **methods** and **operations** to make this problem more approachable. Specifically:

- `split` can help you separate the lines of text
- `index` can help you locate where a line of text switches from name to dialogue
- slicing can help you separate the name from the dialogue
- `strip` can remove excess whitespace from the front and end of the string

#3 - `addToEach(lst, s)` - 5pts

Can attempt after References and Memory lecture

Write the function `addToEach(lst, s)` which takes a list of strings and a string `s` and **destructively** modifies the list so that every element has `s` concatenated to it, returning `None` once done. For example, if `a = ["how", "are", "you"]`, calling the function `addToEach(a, "yah")` will evaluate to `None`, but will also change `a` to hold `["howyah", "areyah", "youyah"]`.

#4 - `recursiveLongestString(lst)` - 10pts

Can attempt after Recursion lecture

Write a function `recursiveLongestString(lst)` that takes a list of strings as input and returns the longest string in the list. You may assume the list contains at least one element and there will not be a tie. This function must use **recursion** in a meaningful way; a solution that uses a loop or the built-in max function will receive no points.

For example, `recursiveLongestString(["a", "bb", "ccc"])` returns `"ccc"`, and `recursiveLongestString(["hi", "its", "fantastic", "here"])` returns `"fantastic"`.

Hint: what properties does the recursive result have if the function works as expected?

Another hint: consider what the **base case** for this algorithm should be. It isn't the usual list base case where the list is empty, because an empty list can't have a longest string. What should it be instead?

#5 - `generateBubbles(canvas, bubbleList)` - 10pts

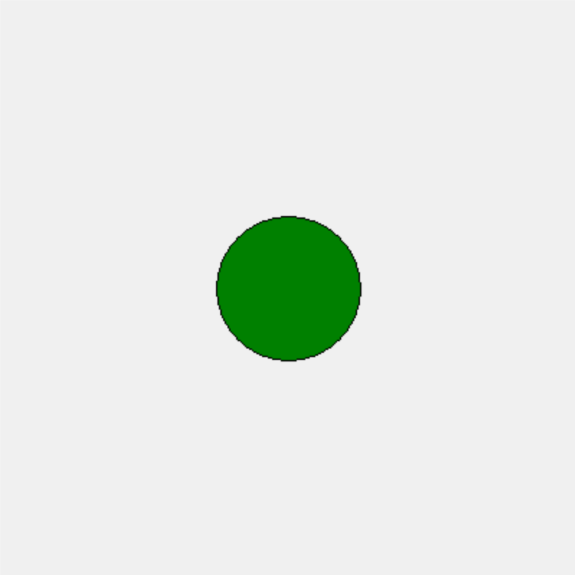
Can attempt after Dictionaries lecture

Write the tkinter function `generateBubbles(canvas, bubbleList)` which takes a tkinter canvas and a **list of dictionaries**, `bubbleList`, and draws bubbles as described in `bubbleList`.

Each dictionary in the bubble list contains exactly four keys: `"left"`, `"top"`, `"size"`, and `"color"`. The first three all map to integers (the left coordinate, top coordinate, and diameter size of the bubble), and the fourth maps to a string (its color). Use this information to draw the bubble (with `canvas.create_oval`) in the appropriate location, with the correct size and color.

For example, if we make run the function with the bubble list from the first test:
`bubbleList1 = [ {"left":150, "top":150, "size":100, "color":"green"} ]`

We'll get:



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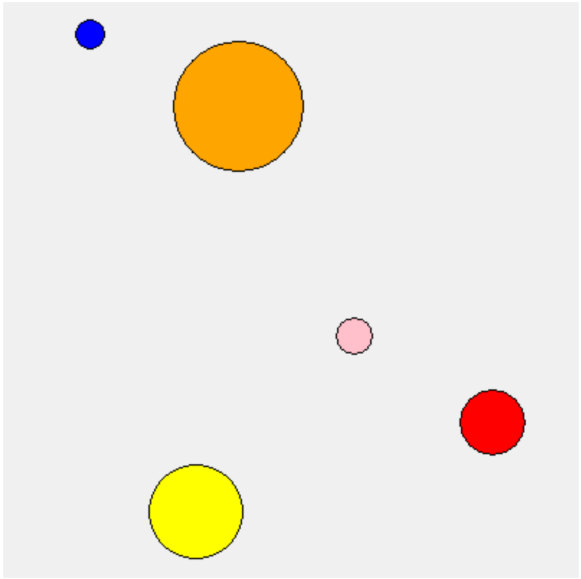
And the second test, which has:

```
bubbleList2 = [
      {'left': 317, 'top': 269, 'size': 45, 'color': 'red' },
      {'left': 118, 'top': 27, 'size': 90, 'color': 'orange'},
      {'left': 101, 'top': 321, 'size': 65, 'color': 'yellow'},
      {'left': 231, 'top': 219, 'size': 25, 'color': 'pink' },
      {'left': 50, 'top': 12, 'size': 20, 'color': 'blue' } ]
```

Should produce this:



The third test randomly generates 10 bubbles using the provided `makeNBubbles(n)` function. Try changing the size of `n` to generate more or less bubbles, and see how it looks! Your bubbles will be different every time.

Hint: a list of dictionaries might sound intimidating at first, but it's not so bad! Just loop over the list, access the dictionary using the loop control variable, then index into the dictionary to get the needed values.

#6 - `getBookByAuthor(bookInfo, author)` - 5pts

Can attempt after Dictionaries lecture

Dictionaries are very good at searching for keys, but not so good at searching for values. Write the function `getBookByAuthor(bookInfo, author)` which takes a dictionary mapping book titles (strings) to author names (also strings) and an author name (a string) and returns the book associated with that author, or `None` if the author does not appear in the dataset. You are guaranteed that no author will appear more than once in the dictionary.

For example, calling the function on `{ "The Hobbit" : "JRR Tolkein", "Harry Potter and the Sorcerer's Stone" : "JK Rowling", "A Game of Thrones" : "George RR Martin" }` and `"JK Rowling"` would return `"Harry Potter and the Sorcerer's Stone"`.

Hint: you basically want to implement **linear search** over a dictionary instead of a list. Make sure you use the right kind of loop!

#7 - `makeIMDB(actorList, movieList)` - 5pts

Can attempt after Dictionaries lecture

Write the function `makeIMDB(actorList, movieList)` that takes two lists, a list of names of actors and a list of movie names (both strings), and returns a dictionary mapping names of actors to names of movies. You may assume that the two lists match up, i.e., each actor is at the same index as their movie.

You should use a **loop** to construct the dictionary. You'll need to loop over both the `actorList` and the `movieList` *at the same time* to access the key and value together. To do this, use the same loop control variable on both lists in each iteration.

If a person occurs in `actorList` multiple times (in other words, if they were in multiple movies), you should map their name to the **first** movie they were paired with. For example, given the names `["Ni Ni", "Sofia Vergara", "Ni Ni"]` and the movies `["Suddenly Seventeen", "Hot Pursuit", "Love Will Tear Us Apart"]`, the function would return the dictionary `{"Ni Ni" : "Suddenly Seventeen", "Sofia Vergara" : "Hot Pursuit" }`