COMP 141

Lists I

Rhodes College

Announcements

Program 7 assigned – due Sunday, November 10th

Reminder:

Midterm 2 on Wednesday, November 6th

Introduction to Lists

- **<u>List</u>**: an object that contains multiple data items
  - <u>Element</u>: An item in a list
  - Format: `list = [item1, item2, etc.]`
  - Can hold items of different types
- **`print` function can be used to display an entire list**
- **`list()` function can convert certain types of objects to lists**

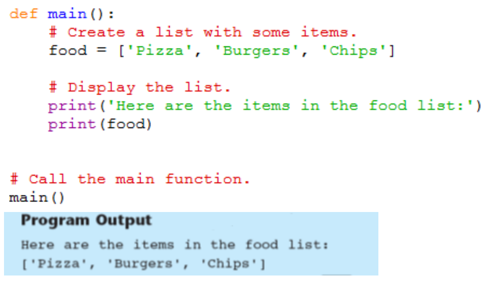
Introduction to Lists

A list of integers
```
    even_numbers = [2, 4, 6, 8, 10]
```

A list of strings:
```
    names = [‘Molly’, ‘Steven’, ‘Will’, ‘Alicia’]
```

A list holding different types:
```
    info = [‘Alicia’, 27, 1550.87]
```

Example Using Lists



```
def main():
    # Create a list with some items.
    food = ['Pizza', 'Burgers', 'Chips']

    # Display the list.
    print('Here are the items in the food list:')
    print(food)


# Call the main function.
main()
```

Program Output

```
Here are the items in the food list:
['Pizza', 'Burgers', 'Chips']
```

5

Why use lists?

- Lists exist so programmers can store multiple related variables together.
- Useful when we don't know ahead of time how many items we are going to store.
  - Lists solve this problem because a single list can hold from zero to practically any number of items in it.

Basic list operations

- Lists are created using square brackets around items separated by commas.

  ```
  mylist = [1, 2, 3]
  numbers = [-9.1, 4.77, 3.14]
  fred = ["happy", "fun", "joy"]
  ```

- Lists are accessed using indices/positions just like strings.
- Most (but not all) string functions also exist for lists.

Strings	Lists
string_var = "abc123"	list_var = [item1, item2, ...]
string_var = ""	list_var = [ ]

len("abc123")
len(string_var)
	len([3, 5, 7, 9])
	len(list_var)

string_var[p] string_var[p:q]	list_var[p] list_var[p:q]

str3 = str1 + str2
str3 = "abc" + "def"
	list3 = list1 + list2
	list3 = [1, 2, 3] + [4, 5, 6]

"i" in "team" -> False	7 in [2, 4, 6, 8] -> False

One important difference

Strings are ***immutable***

- You can't change a string without making a copy of it.

```
s = "abc"
s[0] = "A"      # illegal!
s = "A" + s[1:] # legal
```

Lists are ***mutable***

- Can be changed "in-place" (without explicit copying)

```
L = [2, 4, 6, 8, 10]
L[0] = 15       # legal
L.append(26)    # legal
```

Compare Immutable and Mutable

- **How can we switch the first and last letter in a string?**
- **How can we switch the first and last items in a list?**

Three common ways to make a list

- Make a list that already has stuff in it:
  `lst = [4, 7, 3, 8]`
- Make a list of a certain length that has the same element in all positions:
  `lst = [0] * 4      #makes the list [0,0,0,0]`
  - Common when you need a list of a certain length ahead of time.
  - Uses the repetition operator, similarly to strings
- Make an empty list:
  `lst = []`
  - Common when you're going to put things in the list coming from the user or a file.

Simple list problem

- How would we write a function to convert a number from 1-12 into the corresponding month of the year as a string?

```
def getmonth(month):
```

```
Ex: getmonth(2) should return
“February”
```

Examples of Concatenation

```
a = [1,2,3]
b = [4,5,6]
c = a + b
print(c)     # prints [1, 2, 3, 4, 5, 6]

mylist = ['a','b','c']
other = ['d','e','f']
print(mylist + other)  #['a', 'b', 'c', 'd', 'e', 'f']
```

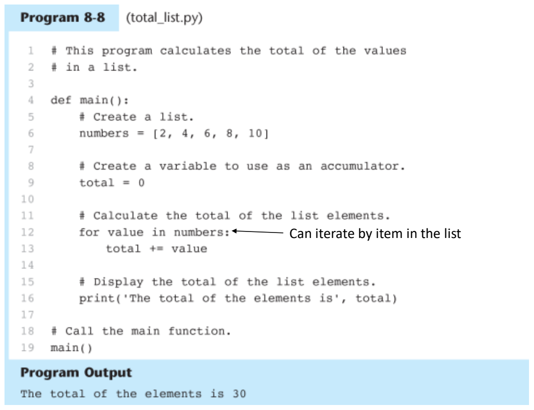
Simple list problem

- What does this code do?

```
lst = [2] * 3
lst2 = [4] * 2
lst3 = lst + lst2
for x in range(0, len(lst3), 2):
    lst3[x] = -1
```

Examples of List Slices

```
numbers = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

numbers[2: ]   #[3, 4, 5, 6, 7, 8, 9, 10]

numbers[:-2]   #[1, 2, 3, 4, 5, 6, 7, 8]

numbers[1:8:2] #[2, 4, 6, 8]

numbers[5::-1] #[6, 5, 4, 3, 2, 1]

numbers[::-1]  #[10, 9, 8, 7, 6, 5, 4, 3, 2, 1]
```

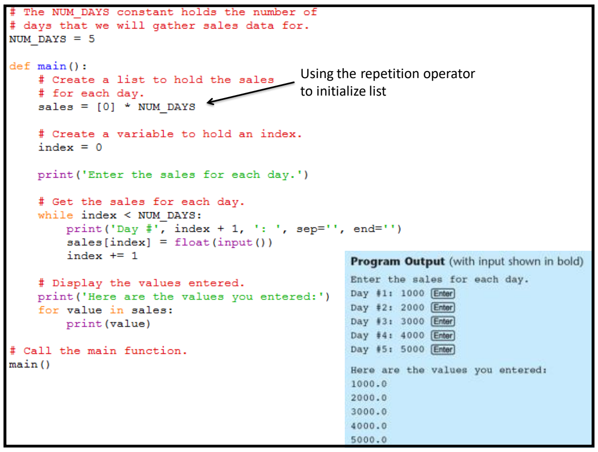


Program 8-8 (total_list.py)

```
# This program calculates the total of the values
# in a list.

def main():
    # Create a list.
    numbers = [2, 4, 6, 8, 10]

    # Create a variable to use as an accumulator.
    total = 0

    # Calculate the total of the list elements.
    for value in numbers:
        total += value

    # Display the total of the list elements.
    print('The total of the elements is', total)

# Call the main function.
main()
```

Program Output

```
The total of the elements is 30
```

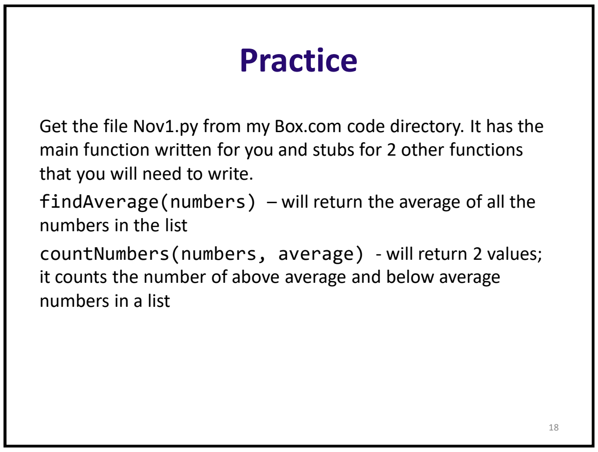


```python
# The NUM_DAYS constant holds the number of
# days that we will gather sales data for.
NUM_DAYS = 5

def main():
    # Create a list to hold the sales
    # for each day.
    sales = [0] * NUM_DAYS

    # Create a variable to hold an index.
    index = 0

    print('Enter the sales for each day.')

    # Get the sales for each day.
    while index < NUM_DAYS:
        print('Day #', index + 1, ': ', sep='', end='')
        sales[index] = float(input())
        index += 1

    # Display the values entered.
    print('Here are the values you entered:')
    for value in sales:
        print(value)

# Call the main function.
main()
```

Using the repetition operator to initialize list

Program Output (with input shown in bold)

```
Enter the sales for each day.
Day #1: 1000 Enter
Day #2: 2000 Enter
Day #3: 3000 Enter
Day #4: 4000 Enter
Day #5: 5000 Enter

Here are the values you entered:
1000.0
2000.0
3000.0
4000.0
5000.0
```



Practice

Get the file Nov1.py from my Box.com code directory. It has the main function written for you and stubs for 2 other functions that you will need to write.

`findAverage(numbers)` – will return the average of all the numbers in the list

`countNumbers(numbers, average)` - will return 2 values; it counts the number of above average and below average numbers in a list

18