CompSci 101
Introduction to Computer Science

score = [10,8,10,9]

September 22, 2016

Prof. Rodger

Announcements

- Reading and RQ8 due next time
- Assignment 3 due tonight
  - Assignment 4 out, due Sept 29
- APT 3 is due on Tuesday
- APT Quiz 1 take Sunday-Tuesday midnight
  - Friday – practice APT quiz available

- Today - EOWF:
  - Solving problems with lists, ifs.

Getting help

- Consider a peer tutor – one hour of one on one help a week.
  - Many take advantage of this
  - contact peer tutoring center

- Are you getting too much help?
  - After solving APT
  - Can you solve again with a blank sheet of paper or blank file and no help?

- Are you using 7 step process to solve?

Are you Learning How to Debug?

- Print is your friend!
- Create variables!
- Isolate the problem
  - Comment out sections until you can isolate where the problem is
- Python Tutor – trace
  - Doesn't work with files but comment out file and create variable with sample input

Assignment 3 - Earthquakes

- Write QuarryBlastQuakes – **return** the list of earthquakes that are something from a Quarry such as a Quarry Blast Quakes –

- quakes is a list of earthquake strings in correct format

def QuarryBlastQuakes(quakes):

Assignment 3 - Earthquakes

- Write QuarryBlastQuakes – **return** the list of earthquakes that are something from a Quarry such as a Quarry Blast Quakes –
  - Description starts with “Quarry”
- quakes is a list of earthquake strings in correct format

def QuarryBlastQuakes(quakes):

Pattern to build and return new list

```
initialize newlist
for item in oldlist:
    if item fits criteria
        put item in newlist
return newlist
```

def **quarryQuakes(quakes):**

How do you use quarryQuakes?

- In main:

    print *"Quarry quakes"*

String Functions – What is output? bit.ly/101f16-0922-1

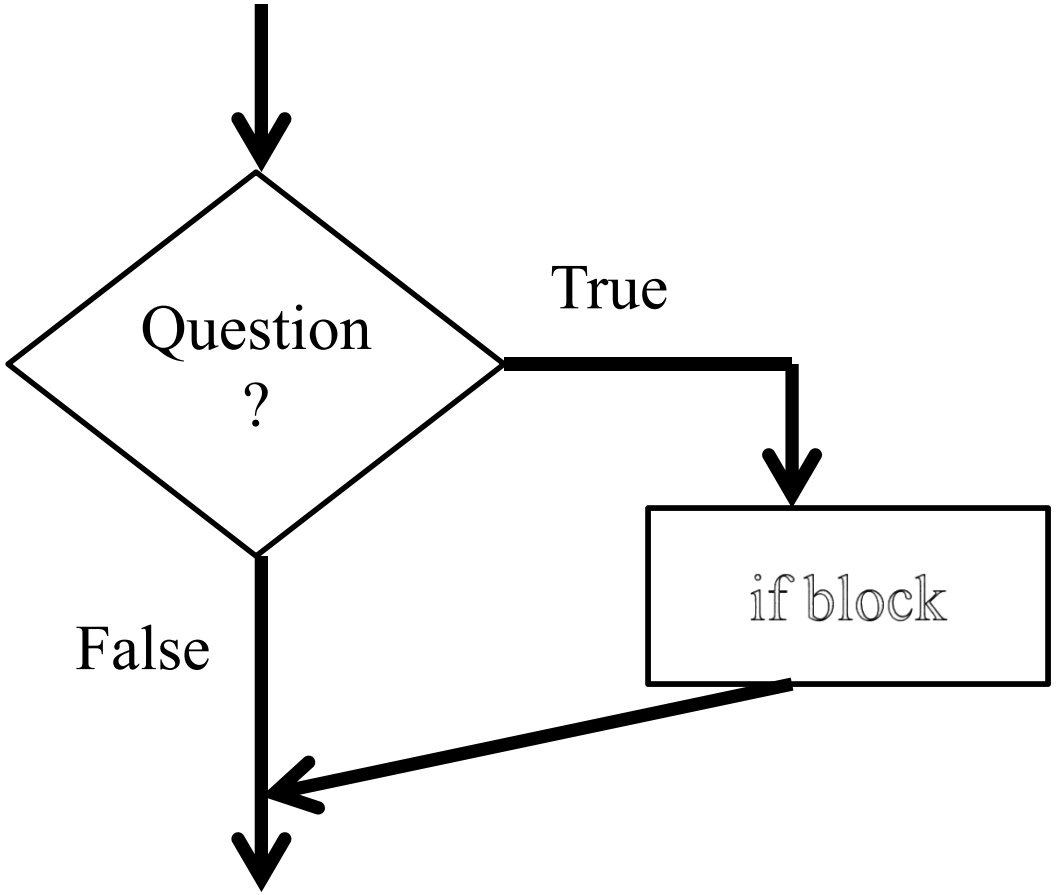
```
name = "VVDarth Vater Darth VaterVVV"
nm = name.strip("V")

phrase = "mississippi"
phrase = phrase.replace("ss","pp")

last  = "Darth Vater or Darth Vater"
last = last.replace("a","o").replace("or","es")

b = "the end is near oh dear"
a = b.endswith('s')
```

Making Decisions



Making Decisions in Python

if *condition1*:

    Block of code to do if condition is true

elif *condition2*:

    Block of code to do if condition1 false, condition2 is true

else:

    Block of code to do if other conditions false

- Can have many elifs, leave out elif, leave out else

Making Decisions tools

- Boolean values: True, False
- Boolean operators: and, or, not

X	Y	X and Y	X or Y
True	True	True	True
True	False	False	True
False	True	False	True
False	False	False	False

- Relational operators: <, <=, >, >=
- Equality operators: ==, !=

bit.ly/101f16-0922-2

```
def isVowel(letter):
    answer = False
    if letter == 'a':
        answer = True
    elif letter == 'e':
        answer = True
    elif letter == 'i':
        answer = True
    elif letter == 'o':
        answer = True
    elif letter == 'u':
        answer = True
    return answer
```

```
def isVowel2(letter):
    answer = False
    if letter == 'a':
        answer = True
    if letter == 'e':
        answer = True
    if letter == 'i':
        answer = True
    if letter == 'o':
        answer = True
    if letter == 'u':
        answer = True
    return answer
```

```
def isVowel3(letter):
    if letter == 'a':
        return True
    else:
        return False
    if letter == 'e':
        return True
    else:
        return False
    if letter == 'i':
        return True
    else:
        return False
    if letter == 'o':
        return True
    else:
        return False
    if letter == 'u':
        return True
    else:
        return False
```

```
def isVowel4(letter):
    answer = False
    if letter == 'a':
        answer = True
    else:
        answer = False
    if letter == 'e':
        answer = True
    else:
        answer = False
    if letter == 'i':
        answer = True
    else:
        answer = False
    if letter == 'o':
        answer = True
    else:
        answer = False
    if letter == 'u':
        answer = True
    else:
        answer = False
    return answer
```

Lists

- A list is a collection of objects

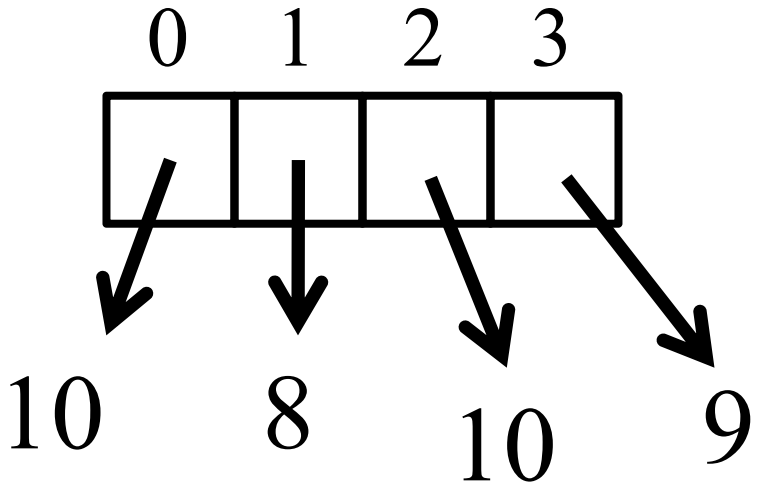
```
scores = [99, 78, 91, 84]
allAboutMe = [“Mo”,25, “934-1234”]
club=[‘Mo’,‘Jo’,‘Po’, ‘Flo’, ‘Bo’]
```

- Lists are *mutable* – use [num] to change a value
- Lists are indexed starting at 0, or -1 from the end
- Functions: max, min, len, sum
- Slice lists [:]

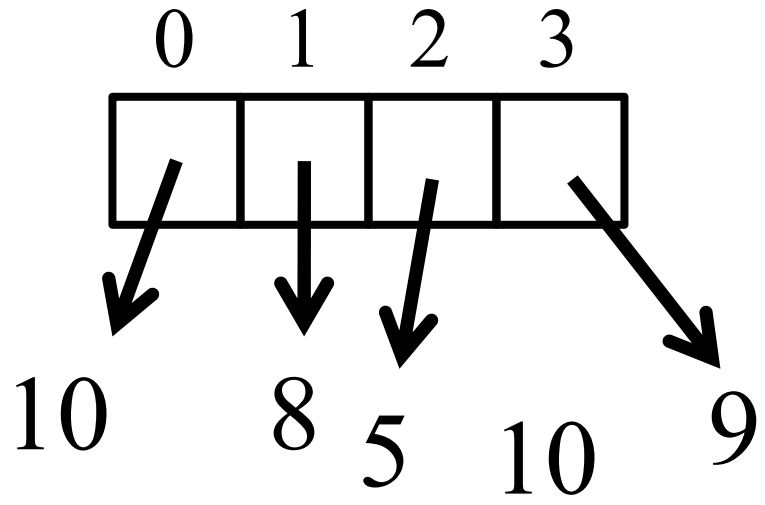
List Examples

```
scores = [10, 8, 10, 9]
print scores
scores[2] = 5
print scores
print max(scores), len(scores),
print sum(scores)
print scores[1:]
print scores[1], scores[-1]
scores.append(4)
scores += [5]
print scores
```

List before/after modification



score = [10,8,10,9]



score [2] = 5

Design pattern of accumulation *for item in something*

- Summing to tally a count

  value += 1

- Building a new string by concatenating

  str += ch

- Building a new list by appending

  lst.append(element)

  OR

  lst += [element]

Processing List Items

- Process all the items in a list, one item at a time
- Format: `for` variable `in` list:

  process variable
- Example:

```
sum = 0
nums = [6, 7, 3, 1, 2]
for value in nums:
    sum = sum + value
print sum
```

Learn list functions

```
nums = [6, 7, 3, 1, 2]
print sum(nums)
```

Problem: Sum up even numbers in list of numbers

- Could do it similar to two slides back
- OR Build a list of the correct numbers, then sum

How to build list of evens and sum?
bit.ly/101f16-0922-3

```
def sumUpEven(nums):
    answer = question1
    for item in nums:
        if question2:
            question3
    return question4
```

Problem: What is length of longest string in list of strings?

From APT 3 - TxMsg

http://www.cs.duke.edu/csed/pythonapt/txmsg.html

Problem Statement

Strange abbreviations are often used to write text messages on uncomfortable mobile devices. One particular strategy for encoding texts composed of alphabetic characters and spaces is the following:

- Spaces are maintained, and each word is encoded individually. A word is a consecutive string of alphabetic characters.

Specification

```
filename: TxMsg.py

def getMessage(original):
    """
    return String that is 'textized' version
    of String parameter original
    """

    # you write code here
```

- If the word is composed only of vowels, it is written exactly as in the original message.
- If the word has at least one consonant, write only the consonants that do not have another consonant immediately before them. Do not write any vowels.
- The letters considered vowels in these rules are 'a', 'e', 'i', 'o' and 'u'. All other letters are considered consonants.

Examples

- **Do one by hand?**
- **Explain to partner?**
- **Identify Pythonic/programming challenges?**

1. `"text message"`

   `Returns "tx msg"`

2. `"ps i love u"`

   `Returns: "p i lv u"`

3. `"please please me"`

   `Returns: "ps ps m"`

4. `"back to the ussr"`

   `Returns "bc t t s"`

5. `"aeiou bcdfghjklmnpqrstvwxyz"`

   `Returns: "aeiou b"`

Debugging APTs: Going green

- TxMsg APT: from ideas to code to green
  - What are the main parts of solving this problem?
  - Transform words in original string
    - Abstract that away at first
  - Finding words in original string
    - How do we do this?

```
def getMessage(original):
    ret = ""

        ret = ret + " " + transform(word)
    return ret   #initial space?
```

Why use helper function 'transform'?

- Structure of code is easier to reason about
  - Harder to develop this way at the beginning
  - Similar to accumulate loop, build on what we know

- We can debug pieces independently
  - What if transform returns "" for every string?
  - Can we test transform independently of `getMessage`?

Python via Problem Solving

In the loop for TxMsg we saw:

```
ret = ret + " " + transform(word)
```

- Why does this leave "extra" space at front?
- Eliminate with `ret.strip()`

Alternate: collect transform words in list, use join to return

Rather than construct string via accumulation and concatenation, construct list with append