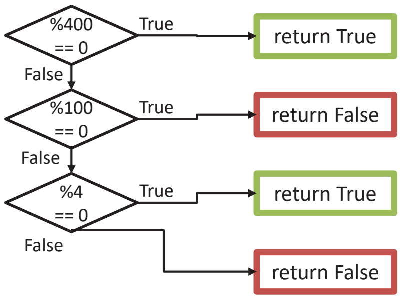
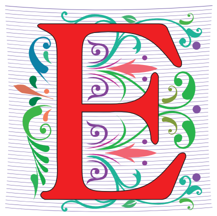
Compsci 101
Selection, Lists, Sequences, Totem



Susan Rodger
January 20, 2022

E is for …



- **Escape Sequence**
  - Why `\n` is newline and `\t` is a tab
- **Encryption**
  - From Caesar Ciphers to SSL and beyond
- **Enumerate**
  - Iterating over data, counting
- **Emoticon**
  - 🙂 😔

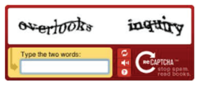
Luis von Ahn, Guatemalan entrepreneur
Duke BS Math 2000, CMU PhD CS

“I build systems that combine humans and computers to solve large-scale problem that neither can solve alone. I call this Human Computation, but others sometimes call it crowdsourcing.”

"In college, I thought my goal in life was to get a good GPA, but it's equally important to get involved with a good professor doing good research. Take advantage of what's going on around you."

ELIZABETH HOLMES: LA NUEVA ALIADA DEL MAGNATE CARLOS SLIM
Forbes
CENTROAMÉRICA
LUIS VON AHN
EL "PROFESOR" DE BILL GATES

duolingo



Announcements

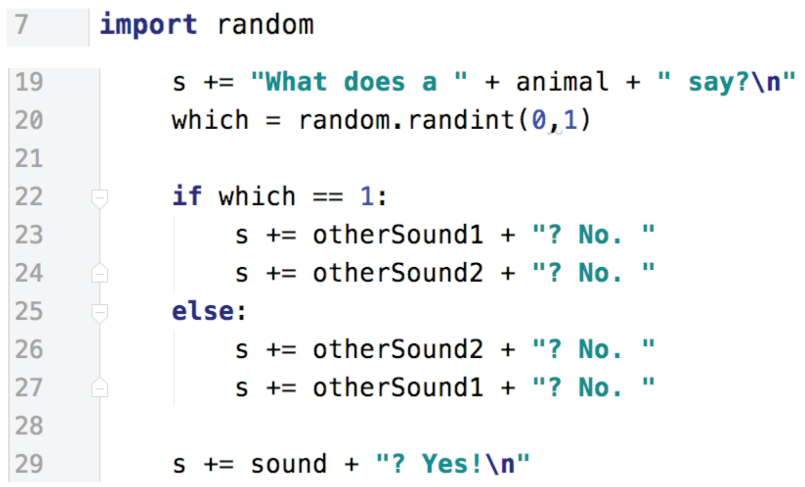
- APT-1 is due tonight! 11:30pm
  - Run each APT on the APT tester, 1 grace day
- QZ01-05 extended to Sat night 11:30pm (drop/add)
  - Remaining reading quizzes turn off 10:15am on due date
- Assignment 1 Faces is out, due Jan 27
  - Read the whole thing
  - Take assignment 1 quiz on Sakai – Due Jan 25
- Lab 2 Friday
  - Prelab 2 do before attending lab
- Always, Reading and Sakai quiz before next class

PFTD

- Assignment 1
- Selection continued
- Strings
  - Sequence of characters, “CompSci 101”
- Lists
  - Heterogenous sequences
- Sequences
  - len(…), indexing, and slicing

Finish WOTO-3 from last time

What does the animal say?



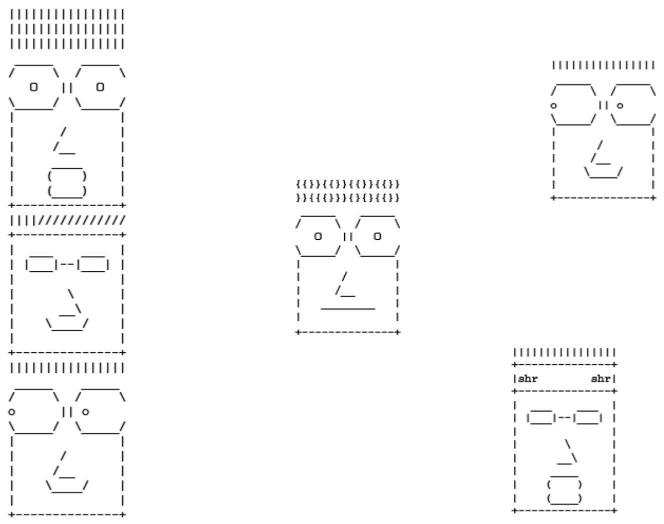
```
import random

    s += "What does a " + animal + " say?\n"
    which = random.randint(0,1)

    if which == 1:
        s += otherSound1 + "? No. "
        s += otherSound2 + "? No. "
    else:
        s += otherSound2 + "? No. "
        s += otherSound1 + "? No. "

    s += sound + "? Yes!\n"
```

Assignment 1: Faces



Learning Goals: Faces

- Understand differences and similarities:
  - Function definitions vs function calls
  - Functions with return statements vs those without
  - Functions with parameters vs those without
  - Functions can be arguments
- Be creative and learn lesson(s) about software design and engineering
  - Create a small, working program, make incremental improvements.
  - Read the directions and understand specifications!

Function Name Format

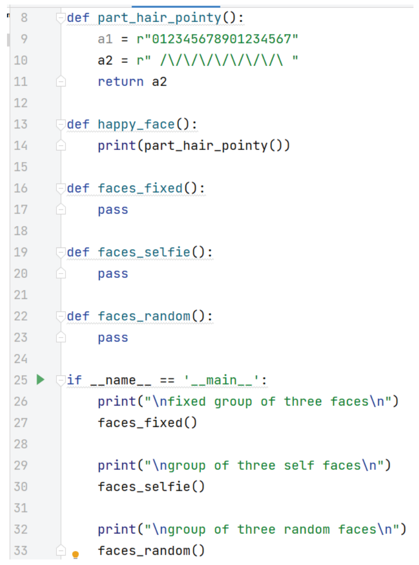
Function	Parameters	Returns	Example
`part_DESCRIPTION`	No parameters	A string	`part_smiling_mouth`
`DESCRIPTION_face`	No parameters	No return value, only prints	`happy_face`
`face_with_DESCRIPTION`	1 or 2 parameters of type function	No return value, only prints	`face_with_mouth`
`faces_DESCRIPTION`	No parameters	No return value, calls face functions	`faces_fixed`, `faces_selfie`, `faces_random`
`selfie_band, face_random` – helper functions!			

Creating your program

Start small and build incrementally

Use seven steps! Plan what to do!

With functions grow by…



```python
def part_hair_pointy():
    a1 = r"012345678901234567"
    a2 = r" /\/\/\/\/\/\/\/\ "
    return a2

def happy_face():
    print(part_hair_pointy())

def faces_fixed():
    pass

def faces_selfie():
    pass

def faces_random():
    pass

if __name__ == '__main__':
    print("\nfixed group of three faces\n")
    faces_fixed()

    print("\ngroup of three self faces\n")
    faces_selfie()

    print("\ngroup of three random faces\n")
    faces_random()
```

Minimal code that does run and can be submitted

Where go from here?

- Add face part functions to create happy_face()
- Create the next face function for faces_fixed and any new face part functions
- Try a face_with function
- Go to the next group of faces
- etc.

Faces Assignment
What should you do …

- Read the assignment
- Do the Assignment 1 reading quiz
- Create project and start writing code (do not need to finish)

- Goal: Find your first question about how to do this assignment then ask on Ed Discussion (anonymously) or at consulting/office hours

Selection Syntax

```
if BOOLEAN_CONDITION:
    CODE_BLOCK_A
```

```
if BOOLEAN_CONDITION:
    CODE_BLOCK_A
else:
    CODE_BLOCK_B
```

```
if BOOLEAN_CONDITION:
    CODE_BLOCK_A
elif BOOLEAN_CONDITION:
    CODE_BLOCK_B
else:
    CODE_BLOCK_C
```

Could this else not be here?

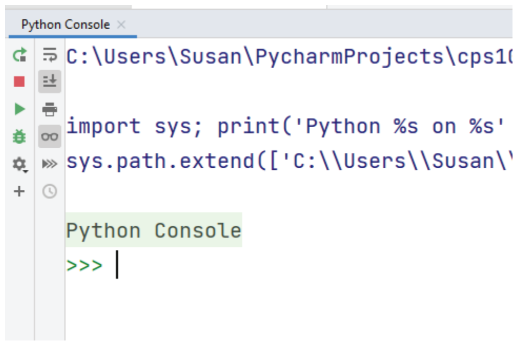
- What is similar and different?
  - What other variations could work?
  - Could only `elif…else` work?
- if – required
- elif – optional, as many as needed
- else – optional, no condition

Boolean condition (True/False)

```
if BOOLEAN_CONDITION:
    CODE_BLOCK_A
```

- See `type(3 < 5)`
- Relational operators: `< <= > >= == !=`
- Boolean operators: `and or not`

Console on Booleans



```
C:\Users\Susan\PycharmProjects\cps1(

import sys; print('Python %s on %s'
sys.path.extend(['C:\\Users\\Susan\'

Python Console
>>> |
```

Boolean Operations

	A	B	Result
A and B	True	True	True
A and B	True	False	False
A and B	False	True	False
A and B	False	False	False
A or B	True	True	True
A or B	True	False	True
A or B	False	True	True
A or B	False	False	False
not A	True		False
not A	False		True

IF my cat is hungry ***AND*** she likes the food, she will eat dinner.

IF it is raining ***OR*** it might rain today, I will carry an umbrella.

IF I did ***NOT*** have dessert yesterday, I may have dessert today.

Example with And and Or

```
x = 3
y = 8
if x < 2 or y > 2:
    print("first")
elif x > 2 and y < 2:
    print("second")
else:
    print("third")
```

```
x = 3
y = 2
if x < 2 or y > 2:
    print("first")
elif x > 2 and y < 2:
    print("second")
else:
    print("third")
```

WOTO-1 Review Functions and Booleans http://bit.ly/101s22-0120-1

- In your groups:
  - Come to a consensus

	A	B	Result
A and B	True	True	True
A and B	True	False	False

When is a leap year?

- https://en.wikipedia.org/wiki/Leap_year
- "years which are multiples of four (with the exception of years divisible by 100 but not by 400)"
- 2004/4 = 501, 2004/100=20.04, 2004/400=5.01
  - Leap year
- 2200/4 = 550, 2200/100=22, 2200/400 = 5.5
  - Not Leap Year
- 2000/4 =500 and 2000/100 = 20, 2000/400 = 5
  - Leap Year

WOTO-2: Which LeapYear correct? http://bit.ly/101s22-0120-2

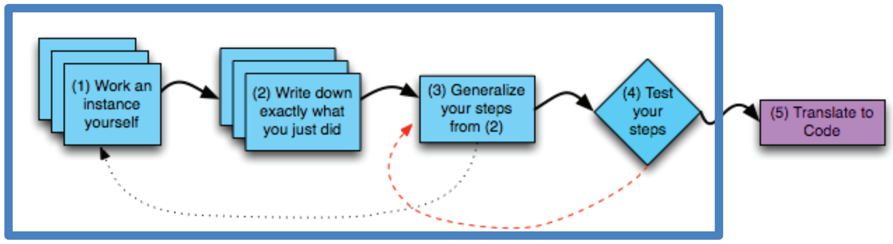
- is_leap_one
- is_leap_two

Which LeapYear correct?

- Is 1900 a leap year?

- Which program is correct?
- What is wrong with the program that is not correct?

if's or if…elif…else?


(1) Work an instance yourself
(2) Write down exactly what you just did
(3) Generalize your steps from (2)
(4) Test your steps
(5) Translate to Code

- Remember steps 1-4 do not involve code!
- After have plan, choose based on what works best
  - There could be multiple ways to implement it

Strings

- x = “chair”
- y = “desk”
- z = x[2] + y[2] + y[3]
- w= len(x)
- v = x[len(y)]
- t = x[len(x)]

Lists

- Syntax: `[ITEM_1, ITEM_2, ITEM_3, …]`
  - Starts and ends with square brackets: `[ … ]`
  - Elements in the list are divided by commas "`,`"
- Lists can be *heterogenous* sequence
  - Strings, ints, lists, anything

```
[1, 2, 3]
["hello", "world"]
["count", "off", 1, 2, 3.0, "done"]
```

Python Sequences

- Types String and List are both sequences
- A sequence in Python has
  - Length - `len(…)`
  - Membership – `in`
  - Indexing and slicing – `[n], [n:m]`
- Difference:
  - String is immutable – cannot change
  - List is mutable – can change

`len(…)` for Python Sequences

- Length – the number of *elements* in a sequence
- `len(…)` – returns the length of a sequence

- `s="hello world"   l=["hello", "world"]`
  - What is `len(s)`?

  - `What is len(l)?`

`in` for Python Sequences

- `in` checks for membership in the sequence
  - True/False – if `element in seq`

- `s="hello world"  lst=["hello", "world"]`
  - What is an element for the string `s`? List `lst`?

  - What is `'h' in s`?
  - What is `'h' in lst`?
  - `"hello" in lst`?

Indexing Python Sequences

- **`s="hello world" l=["hello", "world"]`**
- Indexing provides access to individual elements
  - Compare **`s[0]`** and **`l[0]`**
    - Start with 0 offset, what is last valid positive index?
  - Compare **`s[-1]`** and **`l[-1]`**
    - What is negative index of second to last element?
    - Index **`–n`** is the same as index **`len(seq) - n`**

0	1	2	3	4	5	6	7	8	9	10
H	E	L	L	O		W	O	R	L	D
-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1

Slicing Python Sequences

- **`s="hello world"`**
- **`lst=["my", "big", "beautiful", "world"]`**
- Slicing provides sub-sequence (string or list)
  - `seq[n:m]` – all elements `i`, s.t. `n <= i < m`
  - Compare **`s[0:2]`** and **`lst[0:2]`**
    - **`s[0:2] is`**
    - **`lst[0:2] is`**
  - What is length of subsequence? **`len(lst[1:3])`**
    - **`lst[1:3] is`**
    - **`len(lst[1:3]) is`**

Slicing Python Sequences (more)

- **`s = "hello world"`**
- **`lst=["my", "big", "beautiful", "world"]`**
- Slicing provides sub-sequence (string or list)
  - Compare **`s[4:-1]`** and **`lst[2:-1]`**
    - **`s[4:-1] is`**
    - **`lst[2:-1] is`**
  - Is last index part of subsequence?

  - Omit last value. Compare s[2:] , s[:3]
    - **`s[2:] is`**
    - **`s[:3] is`**

WOTO-3 Sequence Length Indexing http://bit.ly/101s22-0120-3

- In your groups:
  - Come to a consensus