On your way in...(on the side table)

Pick-up:
1. POGIL Activity #8
2. POGIL Activity #9 (and 10, combined)

Hand-in your homework
   (2 piles: ID under 45 or over 45)
Welcome to CS 134!

Introduction to Computer Science
Iris Howley

-Abstraction-
Grace Hopper/Richard Tapia Celebration of Women/Diversity in Computing
Info Session Tonight

• Monday February 11 at 9:15pm in the Computer Science Lounge (outside my office, TCL 308)

• Interested in learning more or attending either of these? Come to the info session!

• We’ll have students who have attended previously!
Have you found the TA + Office Hours?

Office Hours:
- Iris (TCL308): Tues. TBD, Wed. 12:30-2:30p, Thurs. 1-2:30p
- Duane (TPL506): Mon. 2:30-4:30p, Tues. 7:30-9p, Thurs. 9:45-11:20a

Lectures:
- MWF 11-11:50 Chemistry 123 (Wegl)

Labs:
- M 1-2:30pm, 2:30-4pm, T 10-11:30am, 1-2:30pm, 2:30-4pm, TCL 217a

Textbook:
- Think Python (2nd Edition), found at greentreepress.com and here

TAs:
- Noah Andrew, Chris Anton, Will Burford, Jimmy DeLano, Jacob Justh, Julia Kawano, Aidan Lloyd-Tucker, Grace Mazzarella, Merry Neal, Nathan Thimoteo, Alex Tretiuk, Linda Zeng

TA Hours:
- Sun. 4-10pm, Mon-Thu. 7-10pm, +Wed. 2-4p (in TCL312), +Wed. 4:30-6:30pm, Thu. 6-10p. (All office hours in TCL217a, unless otherwise described)
If Statements & Booleans

- return x//2 == 0

Is equivalent to (and much better than):

- if x//2 == 0:
  - return True
- else:
  - return False
One-line Python Conditionals

- $x*3+1$ if odd($x$) else $x//2$

Is equivalent to (but not always better than):

- if odd($x$):
  - $x*3+1$
- else:
  - $x//2$

Readability is often more important than conciseness
def odd(x):
    """Return True iff x is an odd integer."""
    return x%2 == 1

def syr(x):
    """Compute the 3n+1 function value associated with x.
    >>> syr(10)
    5
    >>> syr(3)
    10
    """
    return x*3+1 if odd(x) else x//2

def orbit(x):
    """Print the orbit of syr on x: apply syr to x until it becomes 1."""
    while x != 1:
        print(x)
        x = syr(x)
    print(x)

# This line is for running as a script
orbit(int(input("Number to start with: ")))

While Loops
For Loops

What does #1 do?

#1

name = input("Enter name:\n")
x = 0
while (x<20):
  print(name)
  x = x + 1

What does #2 do?

#2

name = input("Enter name:\n")
for x in range(20):
  print(name)
For Loops

#1

name = input("Enter name:")
x = 0
while (x<20):
    print(name)
x = x + 1

...will print "Iris" a total of 20x on 20 lines

#2

name = input("Enter name:")
for x in range(20):
    print(name)

...will ALSO print "Iris" a total of 20x on 20 lines
#3
name = input("Enter name:")
for letter in name:
    print(letter + "*")

#2
name = input("Enter name:")
for x in range(20):
    print(name)
TODAY’S LESSON

Abstraction makes programming GREAT

(abstraction, encapsulation, etc.)
Classes, Objects
Everything in Python is an object!
The **textbook** has really great activities to step through, with exercises to do at the end.

**Chapter 4: Case study: interface design**
The Syracuse Function
Running as a Script

In interactive python, (A) will *always* ask the user for a *Number to start with*!

With (B), that line only happens if the code is being run as a script, not if you want to use it as a library in interactive python!
Testing Comments

What are these comments for?
The line that starts with ‘>>>’ is a sample function call for this function
The immediately following line is the anticipated output

i.e., if we call the syr() function with a value of 10, we expect this function to return the number 5.
Testing Comments

```python
def syr(x):
    """Compute the 3n+1 function value associated with x.
    >>> syr(10)
    5
    >>> syr(3)
    10
    return x*3+1 if odd(x) else x//2
```

What are these comments for?
If you place `import doctest` under `if __name__ == "__main__"
doctest.testmod()`
This will run these tests and make sure your code is returning the values you expect (i.e.,
helpful for testing the logic of your program)
Format Printing

print("{} was born on {}/{}/{})".format("Pixel",5,16, 2018))

Pixel was born on 5/16/2018

This will print the same exact text:
name = “Pixel”
month = 5
day = 16
year = 2018
print("{} was born on {}/{}/{})".format(name,month,day, year))
Everything in Python is an Object

• Even functions!

```python
def do_something():
    return 'hello world'

def run_this_func(new_func):
    result = new_func()
    return result

run_this_func(do_something)
```
Syracuse Function

1. Start with any positive integer $n$
2. The next term is determined by $n$:
   - If $n$ is odd, the next term is $3n + 1$
   - If $n$ is even, the next term is $n/2$

Collatz (1937): “no matter what value of $n$, the sequence will always reach 1”

Erdős: "Mathematics may not be ready for such problems."

Lagarias (2010): "this is an extraordinarily difficult problem, completely out of reach of present day mathematics."
Syracuse Function

• The orbit for 4:
  - 4 ➔ 2 ➔ 1

• The orbit for 5:
  - 5 ➔ 16 ➔ 8 ➔ 4 ➔ ...
Syracuse Function

https://upload.wikimedia.org/wikipedia/commons/a/ad/Collatz-graph-all-30-no27.svg
How to program the Syracuse Function?

1. Start with any positive integer \( n \)
2. The next term is determined by \( n \):
   - If \( n \) is odd, the next term is \( 3n + 1 \)
   - If \( n \) is even, the next term is \( n/2 \)