Intro to Python

EECS 592

10 January 2018

Programming in EECS 592

- We will support C/C++ and Python
  - Reviewing Python basics today
  - C++ review document available on Canvas
  - Other languages are not permitted
- First assignment is a programming review
  - Posted on Canvas - due Thursday, January 18th
  - Covers logic, sorting, and graph construction
- Some coding on most assignments
- Do not copy or share code!!!

Facts About Python

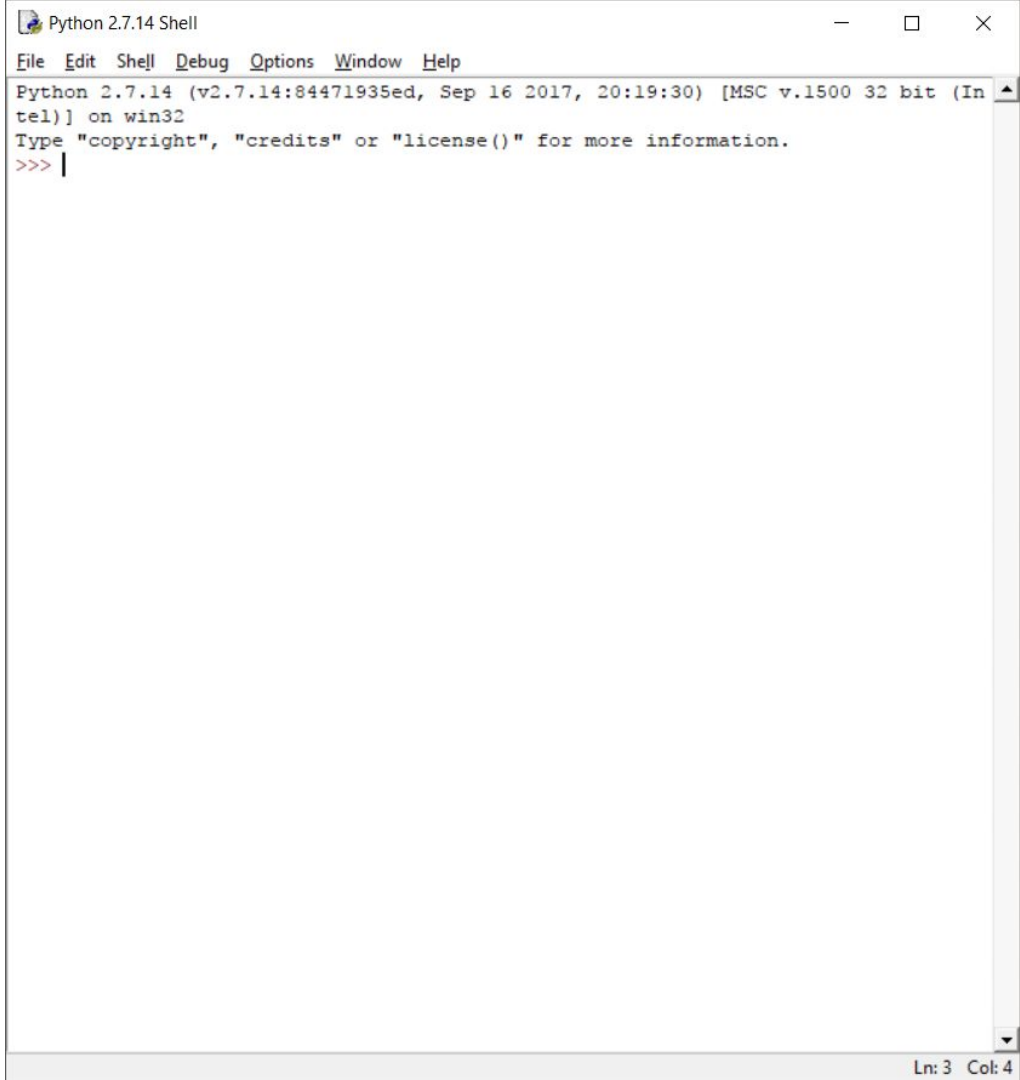
- Interpreted programming language
- Features
  - Lots of useful libraries (also called modules)
    - Standard libraries found here: https://docs.python.org/3/library/index.html
    - Other useful modules: https://wiki.python.org/moin/UsefulModules
  - Dynamic typing
  - Strongly typed
  - Supports object oriented programming
  - Automatic memory management
- Whitespace matters!!
  - Affects flow of control
  - Tab == 4 spaces

Built-In Data Types

- Primitives - dynamically typed
  - Numbers: integers, floating point, complex
  - Booleans (true/false)
- Data Structures
  - Strings: ‘ and “ are both acceptable
  - Lists (also called arrays) - frequently useful
  - Dictionaries (dict) - useful for graph representation!
  - Tuples - convenient for passing multiple objects back from a function
  - Sets

Environment

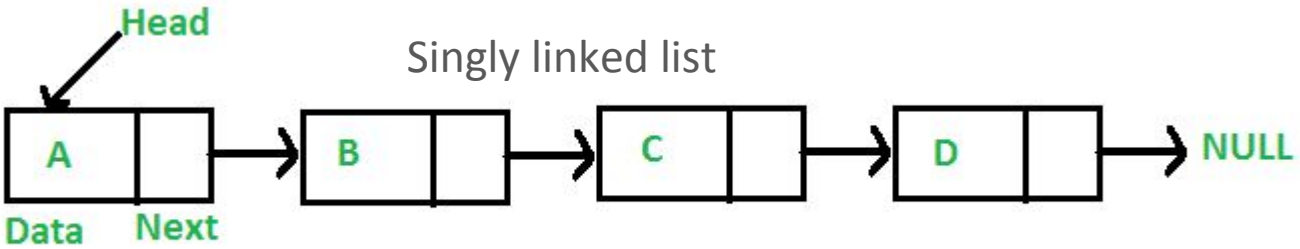
- Option 1: command line
- Option 2: IDLE - Python development environment
  - Download appropriate installer from Python website: https://www.python.org/downloads/
  - Program name is IDLE
  - This is a nice tutorial on installing Python and some useful modules for Windows



Selection Sort and Binary Search

- Selection sort
  - Not especially efficient: $O(n^2)$
- Binary search: checks if an element is present in an array
  - Quite efficient: O(log n)
  - Can return index of element
  - Precondition: list array must be sorted

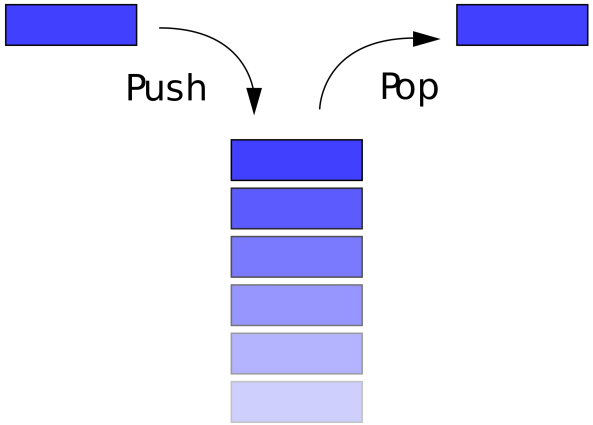
Linked Lists



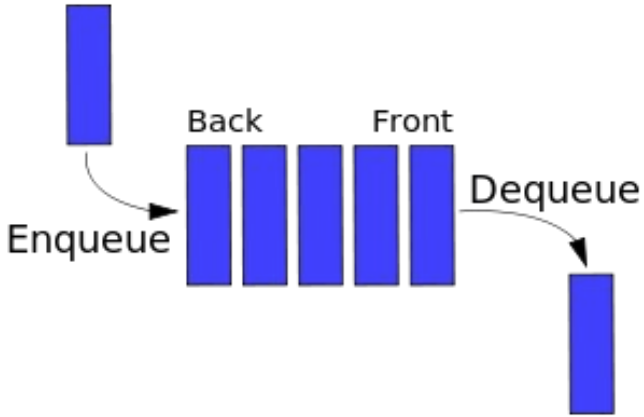
- Elements are not in contiguous memory, but have pointers to each other
- Constant time insertion/removal (just resetting a couple of pointers)
- Linear element access (for arbitrary access)
- In practice, doubly linked lists are more common

Stacks and Queues

- Often internally represented as a linked list (lots of pushing and popping elements)



Stack (LIFO)



Queue (FIFO)

Final Note on Style/Documentation

- Use # and “”” to provide *useful* comments in Python - for the graders
- Pythonic Code - not strictly a requirement, but good practice
  - Clear and concise
  - Don’t reinvent the wheel (unless required for the class)
  - Use the language’s idioms

```
mylist = [1,4,2]

# this is not pythonic
for i in range(len(mylist)):
    print(mylist[i])

print('---')

# this is pythonic
for element in mylist:
    print(element)
```

Additional Resources

- List of modules
- Built-in data structures
- Graphs - use this link as a starting guide for the homework