

## CS 150 Fall 2021 – Quiz 8 “Cheat Sheet”

### Input/Output

- Reading input from the user  
**input(message)**: Displays message to the user and returns what the user typed as a string
- Reading from a file  
**with open(filename, "r") as file:**  
    **for line in file:**  
        **# do something with line (a string)**
- Writing to a file  
**open(filename, "w")**: Write to file (overwrite any existing content)  
**open(filename, "a")**: Append to the end of existing contents  
**file.write(item)**: Writes item to file (e.g. string, number) w/o trailing newline
- Reading from a URLs (webpages)  
**import urllib.request**  
**with urllib.request.urlopen(some\_url) as web\_page:**  
    **for line in web\_page:**  
        **line = line.decode('utf-8', 'ignore')**  
        **# do something with line (now a string)**
- Command-line arguments  
**import sys**  
**sys.argv**: is a list containing the command-line arguments (the first element is always the program name)

### Sequences

- Range  
**range(stop)**: Equivalent `range(0, stop, 1)`  
**range(start, stop[, step])**: Create sequence from inclusive **start** to exclusive **end** by **step**
- Slicing  
**seq[start[:stop[:step]]]**: Slice **seq** from inclusive **start** to exclusive **stop** by **step**

### Strings

- The following functions are built-in and answer questions about strings  
**len(string)**: Returns the number of characters in the string  
**int(string), float(string)**: Converts a string to an int or float
- String object methods  
**upper(), lower(), capitalize()**: Returns a new upper or lower-cased, or 1<sup>st</sup> letter upper-cased string  
**find(some\_string)**: Returns the first index that **some\_string** occurs at in the string or -1 if not found  
**find(some\_string, index)**: Same as above, but starts searching at index  
**replace(old, new)**: Return a copy of the string with all occurrences of old substituted with new  
**startswith(prefix)**: Returns **True** if the string starts with prefix, False otherwise  
**endswith(suffix)**: Returns **True** if the string ends with suffix, False otherwise  
**strip()**: Returns a copy of the string with leading and trailing whitespace removed  
**split()**: Return a list of the words in the string using whitespace as the delimiter
- String operators  
**string1 + string2**: Returns a new string that is the concatenation of string1 and string2  
**string \* int**: Returns a new string that is string repeated int times  
**substr in string**: Returns True if substr is a substring of string, False otherwise

### Lists

- Creating new lists  
**[]** creates empty list  
**[object1, object2, ...]** creates list containing objects

**list(iterable)** creates a list from any iterable object (e.g., range, set, string)

- The following functions are built-in and answer questions about lists
  - len(list)**: Returns the number of elements in `list`
  - sum(list)**, **min(list)**, **max(list)**: Returns the sum, min, or max of elements in `list`
  - sorted(list)**: Returns a new copy of the list in sorted order
- List object methods
  - append(x)**: Adds `x` to the end of the list
  - extend(other\_list)**: Adds all elements of `other_list` to the end of the list
  - index(item)**: Returns the index of the first occurrence of `item` in the list or error otherwise
  - insert(index, x)**: Insert `x` at `index` in the list
  - pop()**: Removes the item at the end of the list and returns it
  - pop(index)**: Removes item at `index` from the list and returns it
  - reverse()**: Reverses the elements in the list
  - sort()**: sorts the elements in the list
- List operators
  - list1 + list2**: Returns a new list that contains the elements of `list1` followed by the elements of `list2`
  - list \* int**: Returns a new list that contains the items in `list` repeated `int` times
  - item in list**: Returns True if `item` is an element of `list`, False otherwise

## Sets

- Creating new sets
  - set()** creates empty set
  - {elt1, elt2, ...}** creates a new set with the given elements
  - set(iterable)** creates a set from any iterable object (e.g., string, list)
- The following functions are built-in and answer questions about sets
  - len(set)**: Returns the number of elements in the set
- Set object methods
  - add(elt)**: Adds `elt` to the set
  - clear()**: Removes all elements from the set
  - pop()**: Removes an arbitrary element from the set and returns it
  - remove(elt)**: Removes `elt` from the set
- Set operators
  - elt in set**: Returns True if `elt` is an element of `set`, False otherwise
  - set1 <= set2**: Returns True if `set1` is a subset of `set2` (every element of `set1` is in `set2`), False otherwise
  - set1 | set2**: Returns union of the two sets (new set with elements from both set)
  - set1 & set2**: Returns intersection of the two sets (new set with only elements common to both sets)
  - set1 - set2**: Returns set difference (new set with elements `set1` not in `set2`)

## Dictionaries

- Creating new dictionaries
  - {}** creates empty dictionary
  - {key1:value1, key2:value2, ...}** creates a new dictionary with key-value pairs
- The following functions are built-in and answer questions about dictionaries
  - len(dict)**: Returns the number of entries (key-value pairs) in the dictionary
- Dictionary object methods
  - clear()**: Removes all entries from the dictionary
  - keys()**: Returns an iterable object of all the keys in the dictionary
  - values()**: Returns an iterable object of all the values in the dictionary
  - items()**: Returns an iterable object of all (key, value) tuples in the dictionary

**get(key[, item]):** Returns value associated with **key** if in dictionary, **item** otherwise. **item** defaults to None.

- Dictionary operators

**item in dict:** Returns True if **item** is in the keys of **dict**, False otherwise

## Tuples

- Creating new tuples

**()** creates empty tuple

**(object1, object2, ...)** creates tuple containing objects

- The following functions are built-in and answer questions about tuples

**len(tuple):** Returns the number of elements in the tuple

- Tuple operators

**item in tuple:** Returns True if **item** is contained in **tuple**, False otherwise

**tuple1 + tuple2:** Returns a new tuple that is the concatenation of **tuple1** and **tuple2**

## Modules

- **random** module

**randint(a, b):** Return a random integer  $N$  such that  $a \leq N \leq b$

**uniform(a, b):** Return a random floating point number  $N$  such that  $a \leq N \leq b$

- **math** module

**sqrt(num):** Return the square root of **num**

- **turtle** module

**forward(dist), backward(dist):** Move the turtle forward or backward by the specified length **dist**

**right(angle) left(angle):** Turn the turtle right/left by **angle** (in degrees)

**goto(x, y):** Move turtle to position **x, y**

**setheading(angle):** Set the turtles heading to **angle**

**circle(radius):** Draw a circle with specified **radius**; the center is **radius** units left of the turtle

**dot(size):** Draw a dot with diameter **size** centered on the current location of the turtle

**penup():** Pull the pen up – no drawing when moving

**pendown():** Put the pen down – drawing when moving

**fillcolor(color):** Change the fill color to **color**, where **color** is a string

**begin\_fill(), end\_fill():** Start and end filling shapes with fill color

- **numpy** module (**import numpy as np**)

**np.array([10, 12, 14, 20]):** creates 1-D vector from list

**a+b a-b a\*b a/b:** element-wise operations on vector

**a>3:** element-wise comparison (returns boolean vector)

**np.sqrt(a):** compute element-wise sqrt

**np.power(a, exp):** raise **a** to the power **exp** element-wise

**len(x):** number of elements in a vector

**np.sum(x), np.max(x), np.min(x), np.mean(x):** compute sum, max, min, mean of vector

- **datascience** module (**import datascience as ds**)

**ds.table().with\_columns('a', [1,2], 'b', [3,4]):** Create table with columns **a** and **b**

**t["b"], t["b"]=:** Evaluate to column named **b** in table **t** as a vector, create/assign to column named **b**

**t.with\_column('b', [1,2]):** Return table **t** with new column named **b**

**t.select(["a", "b"]):** Evaluate to the subset of table **t** with just columns named **a** and **b**

**t.where(expr):** Extract rows of table **t** for indices at which **expr** is True

- **matplotlib** module (**import matplotlib.pyplot as plt**)

**plt.plot(x, y):** add data in iterables **x** and **y** to the plot

**plt.show():** display the graph

**plt.xlabel(string):** label the x-axis with string (similarly pyplot.ylabel)

**plt.title(string):** set string as the title of the plot