Python Built-in Objects

Goal: use Python built-in objects to manipulate data better than a spreadsheet. This is your new **HAMMER** for **FRAMING**!

- Why? Spreadsheets are second tier objects, not first. as their secondary, not primary, data structures database\object.
  - Manipulating data in objects make you more agile and confident grab.get data from anywhere.
  - Data transposition skills using lists, dictionary, etc gives you a better means to combine, sort, find data u need

Apply this work throughout the system design and analysis lifecycle. It helps perform the work with agility and deftness.

Mechanics

```
1. mylist,mytuple  = [  'a',  'b',  'c',  10,   20,   ]
a. iterator/index [i]    0    1    2     3      4
b.        len(mylist)    |->                  <-| n=5
c. print( mylist[i])     'a'  'b'  'c'   10     20
```

Description

- create the data for list, tuple, etc

1. iteration or count; index[i] or position #
2. len() inherits total items from an object
3. iterator <for i in mylist>extracts data/index

Sequence type objects – list, range, tuple

Lists = []

- organize similar\dissimilar information
- mutable! (.append() ~.remove() ~.pop)
- sequential with an ID# per position
- contain string, list, dict., etc

```
mylist = ['bambam', "a+b=c", 2_0j, [1,2,3]]
for i in mylist: print(i)
bambam,  a+b=c,  20j,  [1, 2, 3]


comprehension places formula before
iterator to generate data
mylist =[i*2 for i in range(0,4) ]; mylist
[0, 2, 4, 6]

mytuple = (0,1,3,4)
mylist = [i*3 for i in mytuple]; mylist
[0, 3, 9, 12]

me1 = ['adam','carly','jackson','danny']
dict(enumerate(me1,start=100))
{100:'adam',101:'carly',102:'jackson',103: 'danny'}
```

Functions

```
.append()
.pop()
.remove()
```

Tuples = (a,b,)

- immutable w sequential ID[x] per position
- immutable! can't add/substract data
- practical reference table to other data
- need a trailing comma!=>(1,2,)
- use type(object) to know what it is

```
mytuple = ('snhu', 2+0j, [1,2,3],)
type(mytuple)
('snhu',(2+0j),[1,2,3]) #note diff.data types!
tuple

mytuple = (1,2,3,)
mytuple + mytuple  #note d
(1, 2, 3, 1, 2, 3)
```

Object Operations

Operation	Result
`x in s`	`True` if an item of *s* is equal to *x*, else `False`
`x not in s`	`False` if an item of *s* is equal to *x*, else `True`
`s + t`	the concatenation of *s* and *t*
`s * n` or `n * s`	equivalent to adding *s* to itself *n* times
`s[i]`	*i*th item of *s*, origin 0
`s[i:j]`	slice of *s* from *i* to *j*
`s[i:j:k]`	slice of *s* from *i* to *j* with step *k*
`len(s)`	length of *s*
`min(s)`	smallest item of *s*
`max(s)`	largest item of *s*
`s.index(x[, i[, j]])`	index of the first occurrence of *x* in *s* (at or after index *i* and before index *j*)
`s.count(x)`	total number of occurrences of *x* in *s*

Dictionary = { key:value }

- essential for pairing related data
- go-to-tool for real-world modeling
- keys immutable, values=mutable
- dict would reference your unique ID and an associated list would have the characteristic data in
- returns data unordered & random

```
mydict= {'key_1':['v1','v2'],'key1':(1,2,3,)}
{'key_1':['v1','v2'], 'key1':(1, 2, 3)}

mydict = dict(key_1= [1,2,'z'])
mydict
{'key_1': [1, 2, 'z']}

keytuple = ('customer_name','age')
valuelist = [['john','doe'],[35,76]]
dict(zip(keytuple,valuelist))
{'customer_name':['john','doe'],'age':[35, 76]}
```

Functions

```
dict(),dict(key = [1,2,3])|{'key': [1, 2, 3]}
.keys()
.values()
```

Core Python Objects – Part I of II: lists, tuples, dictionary, strings, sets, series, dataframes Objects

Python Built-in Objects

Goal: use Python built-in objects to manipulate data better than a spreadsheet. This is your new **HAMMER** !

- Why? You need to work with them instead of a spreadsheets as their secondary, not primary, data structures database\object.
  - Manipulating data in objects make you more agile and confident grab.get data from anywhere.
  - Data transposition skills using lists, dictionary, etc gives you a better means to combine, sort, find data u need
- Finally, these concepts apply across system analysis tools and concepts to perform IT system work and do it well.

Mechanics

```
1.      mystring  = 'python training is fun '
2.    index [i]       012345...........................23
3.  len(mylist)       |->                    <-|   n=23
```

- slicing `mystring[10:] >>> 'ining is fun '`

Description

- <pending>

Strings = 'abc'

w	e	i	r	d
[0]	[1]	[2]	[3]	[4]

- text processors quotes =! python quotes
- strings factilate text and natural language processing.
- a whole book may be in a single string

```
fruit = 'apple'
i = 0
myL = []
while i < len(fruit):
    letter = fruit[i]
    myL.append(letter)
    i = i + 1
myL
['a', 'p', 'p', 'l', 'e']
```

set(), frozenset()

A set object is an unordered collection of distinct hashable objects. Common uses include membership testing, removing duplicates from a sequence, and computing mathematical operations such as intersection, union, difference, and symmetric difference.

Hashability makes an object usable as a dictionary key and a set member, because these data structures use the hash value internally.

```
mylist = ['a', 'p', 'p', 'l', 'e']
myset = set(mylist)
myset
{'a', 'e', 'l', 'p'}

'a' in myset    | 'a' not in myset
True                    False

{c for c in 'abracadabra' if c not in 'abc'}
{'d', 'r'}
```

pandas series and dataframe

import pandas as pd

Built-in Types + Conditionals Statements

Conditional Statements

Built-in types are truth testing logic using boolean, comparisons, (+,-,/,//,%)
Conditionals are the testing logic to evaluate whether sometime is True or False

Boolean - and, or, not

These are the Boolean operations, ordered by ascending priority:

Operation	Result	Notes
`x or y`	if *x* is false, then *y*, else *x*	(1)
`x and y`	if *x* is false, then *x*, else *y*	(2)
`not x`	if *x* is false, then `True`, else `False`	(3)

Notes:

1. This is a short-circuit operator, so it only evaluates the second argument if the first one is false.
2. This is a short-circuit operator, so it only evaluates the second argument if the first one is true.
3. `not` has a lower priority than non-Boolean operators, so `not a == b` is interpreted as `not (a == b)`, and `a == not b` is a syntax error.

Comparisons

There are eight comparison operations in Python. They all have the same priority (which is higher than that of the Boolean operations). Comparisons can be chained arbitrarily; for example, `x < y <= z` is equivalent to `x < y and y <= z`, except that *y* is evaluated only once (but in both cases *z* is not evaluated at all when

Operation	Meaning
`<`	strictly less than
`<=`	less than or equal
`>`	strictly greater than
`>=`	greater than or equal
`==`	equal
`!=`	not equal
`is`	object identity
`is not`	negated object identity

Numeric Type operations

Use constructors `int()`, `float()`, and `complex()` to product specific #s

Operation	Result	Notes
`x + y`	sum of *x* and *y*	
`x - y`	difference of *x* and *y*	
`x * y`	product of *x* and *y*	
`x / y`	quotient of *x* and *y*	
`x // y`	floored quotient of *x* and *y*	(1)
`x % y`	remainder of `x / y`	(2)
`-x`	*x* negated	
`+x`	*x* unchanged	
`abs(x)`	absolute value or magnitude of *x*	
`int(x)`	*x* converted to integer	(3)(6)
`float(x)`	*x* converted to floating point	(4)(6)
`complex(re, im)`	a complex number with real part *re*, imaginary part *im*. *im* defaults to zero.	(6)
`c.conjugate()`	conjugate of the complex number *c*	
`divmod(x, y)`	the pair `(x // y, x % y)`	(2)
`pow(x, y)`	*x* to the power *y*	(5)
`x ** y`	*x* to the power *y*	(5)

Iterators – Python's workhorses

Iterators
- for
- range
- while

- Iteration is the act of looping instructions repeatably
- instructions continuously execute until False or termination
- such as an end of range, conditional is !=
- most efficient means to cycle data in lists,tuples,ranges,etc
- Iterators are sequential like 0->1->2->3, and may step >1


Mechanics

```
   1.       mylist  = [ 'a',  'b',  'c',  10,  ]
1. iterator/index [i]    0     1     2     3
2.        len(mylist)    |->             <-|  n=4
3. print( mylist[i]*3)  aaa   bbb   ccc   30
4. negative index [i]   -4    -3    -2    -1
   for i in mylist: print(mylist[i]*3)
```

Mechanics Description

- create the data for list, tuple, etc
  4. iteration is the count; index is the position
  5. len() inherits count of total items from mylist
  6.
```
for i in mylist:
  print(mylist[i]*3) #multiply each list iterate *3
```
  7. negative index is neg. number values for an sequence position

for i in <object>:

- starts from 0 for all items in the object
- inherits length from object
- i shorthand for iterator
- regularly combined with conditional statements to make decisions if-elif-else
-
```
mylist = [1,4]
for i in mylist:
    print(i*3)
```
```
3, 12
```

```
from math import log10
def myfunction(x):
    return log10(x)
for i in range (2,4,1):
    print("loop#{a}, value={b}".
format(a=i,b=(round(myfunction(i),2))))
```
```
loop#2, value=0.3
loop#3, value=0.48
```

```
myL = [1,2,3]
data = (round(myfunction(i),3) for i in
myL)
print(list(data))
```
-
```
[0.0, 0.301, 0.477]
```

while i <= <value/object>:

- use to iterate in a forward or reverse direction
- slash breaks code to next line

```
i = 0
mylist = [] #add result to list
while i <=1:
  mylist.append(i); i +=1
mylist
```
```
[0, 1]
```

```
i=1   #loop+print custom results
while i < 2:
    print("loop# i={}".format\
(str(i)))
    i +=1
print("final loop i is
="+str(i))
```
```
loop# i=1
final loop i is =2
```

range(start,stop,step)

- use set a numeric range to iterator or calculate with
- default start is zero and default setp is one
- may inherit values form use objects, attributes

```
for i in range(0,2): print(i)
```
```
0 ,1
```

```
me1=('adam','carly','jackson','danny')
for i in range(len(me1)): print(i)
```
```
0, 1,2 ,3
```

```
#see data transposition slide
me1 = ['w','e','i','r','d']
me2 = []                    # (+) indexing
for i in range(0,5):
    me2.append(me1[i])
```
```
['w', 'e', 'i', 'r', 'd']
```
```
me1 = ['d','r','i','e','w']
me2 = []                    # (-) indexing
for i in range(1,6):
    me2.append(me1[-i])
```
```
['w', 'e', 'i', 'r', 'd']
```

Misc

- row for row in open ('filepath.txt')
- generator <fix this>

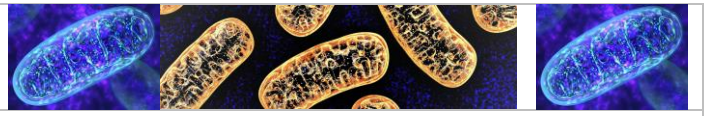
```
sum((i*3 for i in range(2))
```

```
with open ('path of file.txt',
'r') as data_file:
  for line in data_file:
    print(line)
```

-Quickly create lists or dict with-

```
enumerate() adds list index #
me1 =
['adam','carly','jackson','danny']
me2 = list(enumerate(me1)); me2
```
```
[(0, 'adam'), (1, 'carly'), (2, 'jackson'), (3,
'danny')]
```

Functions – Python's mitochondria

Essetial Functions	Functions are the workhorses helping transform, transpose, combine and just about anything else you can think of	

Mechanics

- each function has unique parameters (values it accepts) and means of operating. To figure out read the docs and when necessary look for examples on stackoverflow, jupyterform, and google but try to be selective so your time is not wasted

Description

it.304 – choose 2-3 and write an example

Built-in Functions

A
abs()
aiter()
all()
any()
anext()
ascii()

B
bin()
bool()
breakpoint()
bytearray()
bytes()

C
callable()
chr()
classmethod()
compile()
complex()

D
delattr()
dict()
dir()
divmod()

E
enumerate()
eval()
exec()

F
filter()
float()
format()
frozenset()

G
getattr()
globals()

H
hasattr()
hash()
help()
hex()

I
id()
input()
int()
isinstance()
issubclass()
iter()

L
len()
list()
locals()

M
map()
max()
memoryview()
min()

N
next()

O
object()
oct()
open()
ord()

P
pow()
print()
property()

R
range()
repr()
reversed()
round()

S
set()
setattr()
slice()
sorted()
staticmethod()
str()
sum()
super()

T
tuple()
type()

V
vars()

Z
zip()

_
__import__()

```
def sum(a, b):
    return (a + b)
a = int(input('Enter 1st number: '))
b = int(input('Enter 2nd number: '))

print(f'Sum of {a} and {b} is {sum(a, b)}')
```

```
Enter 1st number :              1
Enter 2nd number:               2
Sum of 1 and 2 is               3
```

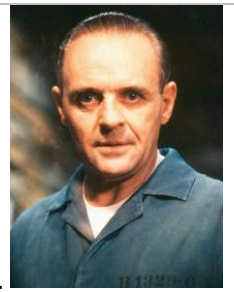
built-in functions
Examples=> pending

Objects – the Actors, "memory, agent starline, is what i have instead of a view"

Building your own Object 'class'

a. **Classes** are a framework for creating objects, functions specific to an object family, attributes, and child class via inheritance
b. **Objects** are entities that perform work.
c. **Methods** are instructions detailing "how" to perform work. Built parent or child level.
d. **Attributes** are alpha\numeric values associated with an object or class. Methods can use this values to perform work and make decisions
e. **self** <self.attribute> is the first argument in a class function self-identifying itself while processing instructions
f. **Function** – set of instructions to perform a task independent of any object. Methods are functions but associated with an object.

child objects are instantiated from parents



```
#create parent object
mydict = {"training done":[], "total animals":0}
class myAnimal:
    pass
    name = ""
    species = ""
    train = ""
#create a function to inventory training performed
def add_train(traintype):
    mydict["training done"].append(traintype)
    mydict["total animals"] =+1
#create 2 unique animal objects
a1 = myAnimal()     # a is shorthand for animal
a2 = myAnimal()     # <object names user defined>

#update animal name, species, and training attributes
a1.name = "arnold"
a1.species = "dog"
a1.train = "catch"
add_train(a1.train) #use function to add to dictionary storage
a2.name = "vinny"
a2.species = "horse"
a2.train = "jumping"
add_train(a2.train)

#create a simple report using a dictionary object
mydict_rpt = {a1.name:a1.species, a2.name:a2.species,"metrics=>":mydict}
    mydict_rpt
```

```
{'arnold': 'dog',
 'vinny': 'horse',
 'metrics=>': {'training done': ['catch', 'jumping'], 'total animals': 1}}
```

define a class

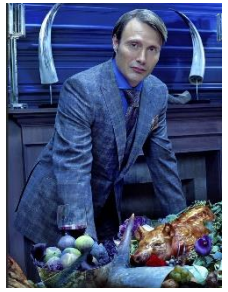
```
class myAnimal:
    pass
    name = ""
    species = ""
    train = ""
```

define its functions

```
def add_train(traintype):
    mydict["training
done"].append(traintype)
    mydict["total animals"] =+1
#create 2 unique animal objects
```

Constructor example

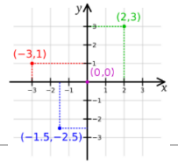
subclass example



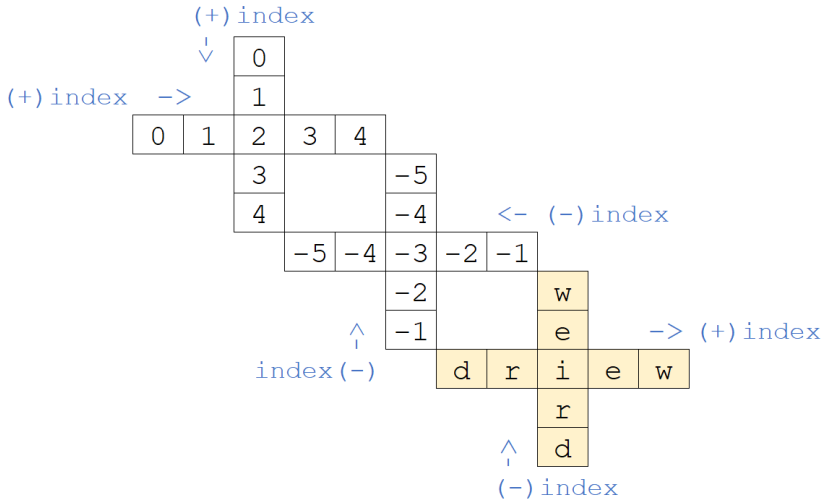
Data Transpose

Moving data around is art and may require wizardry.
For starters master 2 dimensions, rows and columns, x and y like cartesian coordinate system
Learn the basics of transposition

- up\down, left\right.
- down\up, right\left



Illustrates postive and negative sequential data indexing



(+) index

```
me1 = ['w','e','i','r','d']
me2 = []
for i in range(0,5):
    me2.append(me1[i])
me2
['w', 'e', 'i', 'r', 'd']
```

(-) index

```
me1 = ['d','r','i','e','w']
me2 = []
for i in range(1,6):
    me2.append(me1[-i])
me2
['w', 'e', 'i', 'r', 'd']
```

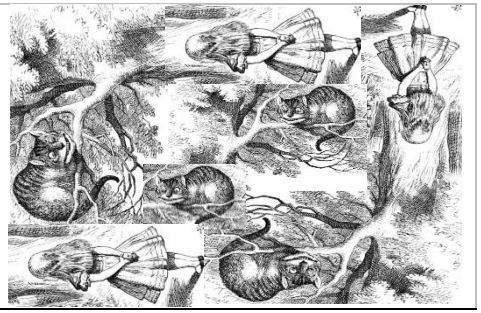
#Style 1 – left to right, right to left, top to bottom, bottom to top

#(+)index

```
me1 = ['w','e','i','r','d']
me2 = []
for i in range(0,5):
    me2.append(me1[i])
me2
#['w', 'e', 'i', 'r', 'd']
```

#(-)index

```
me1 = ['d','r','i','e','w']
me2 = []
for i in range(1,6):
    me2.append(me1[-i])
me2
#['w', 'e', 'i', 'r', 'd']
```

Data Transpose	Axis shifting	

Illustrates postive and negative sequential data indexing	#Style 1 – left to right, right to left, top to bottom, bottom to top