BIG DADDY'S PYTHON TOOLBOX For 3.5

R7b

V122016a

Reserve Words

Comparsion / Conjunction

True, **==** (equal), **false**, **none** (i.e., null), **and**, **not**, **or**,
in list, tuple, string, dictionary
is true if **same** object

Definition

class create a class
def create a function
del items in lists (del mylist[2]), whole strings, whole tuples, whole dictionaries

Module Management

import connects module, ex: import math
from gets a function from math import cos
as creates an alias for a function

Miscellaneous

pass (placeholder – no action)
with wrapper ensures **_exit_** method

Functions

def, return(obj), yield, next
def creates; inside functions **yield** is like **return** but returns a generator whose sequential results are triggered by **next**;
global declares global var in a function
non local a variable inside a nested function is good in the outer function
lambda anonymous inline function with no return statement

```
a = lambda x: x*2
for i in range (1,6):
    print (a(i))
```

Error Management

raise forces a ZeroDivisionError
try except else finally assert
used in error handling blocks

try:	code with error potential
except:	do this if you get the error
else:	otherwise do this code
finally:	do this either way

assert: condition=False raises **AssertionError**

Looping

while (some statement is true)
for alist=['Be','my','love']

```
for wordnum in range(0,len(alist)): #note :
    (wordnum, alist[wordnum])
```

range (start, stop, [step])
See data container functions
break ends the smallest loop it is in;
continue ends current loop iteration

Decision Making

if elif else

```
def if_example(a):
  if a == 1:
     print('One')
  elif a == 2:
     print('Two')
  else:
     print('Some other')
```

The Ternary if Statement
An inline **if** that works in formulas:
myval = (high if (high > low) else low) * 3

Multi-line Statements \
Not needed within the [], {}, or ()
Multiple Statements on a Line ; not with statements starting blocks

Reading Keystrokes

```
text = ""
while 1:
   c = sys.stdin.read(1)
   text = text + c
   if c == '\n':
      break
print("Input: %s" % text)
```

You must **import sys** before you can use the standard input (sys.stdin.read) function.

Major Built-In Functions

String Handling (↳=converts/returns)

str(object) ↳string value of object
repr(object) ↳ printable string
ascii(str) ↳ printable string
eval(expresion) ↳ value after evaluation
chr(i) ↳ character of Unicode [chr(97) = 'a']
input(prompt) ↳ user input
len(—) ↳ length of str, items in list/dict/tuple
ord(str) ↳ value of Unicode character
slice -> Xx**[start: stop [:step]]** ↳a new object selected by slice selection, Xx= "Python"; Xx[2:5] ↳ tho; Xx[:2] ↳ py; Xx[2:] ↳ thon; Xx[::2] ↳pto
format(value [,format_spec]) ↳ value in a formatted string—**extensive and complex** - 2 examples (comma separator & % to 3 places)
print('{:,}'.format(1234567890)) yields '1,234,567,890'
print('{:.3%}'.format(11.23456789)) yields '1123.457%'

Number Handling

abs(x) ↳ absolute value of x
bin(x) ↳ integer to binary bin(5)= '0b101' (one 4, no 2's, one 1) **bin(7)[2:] = '111'**
divmod(x,y) takes two (non complex) numbers as arguments, ↳a pair of numbers - quotient and remainder using integer division.
float(x) ↳ a floating point number from a number or string
hex(x) ↳ an integer to a hexadecimal string
hex(65536) = 0x10000 or **hex(x)[2:]='10000'**
int(x) ↳ an integer from a number or string
pow(x,y [,z]) ↳ x to y, if z is present returns x to y, modulo z **pow(2,7)=128, pow(2,7,3)=2**
round(number [,digits]) ↳ floating point number rounded to digits; Without digits it returns the nearest integer. **Round(3.14159,4)=3.1416**

Miscellaneous Functions

bool(x) ↳ true/false, ↳ false if x is omitted
callable(object) ↳true if object callable
help(object) invokes built-in help system, (for interactive use)
id(object) ↳unique object integer identifier
print(*objects, sep=' ', end='\n', file=sys.stdout, flush=False) prints objects separ-ated by sep, followed by end; **%** *see other side*

Data Container Functions list/tuple/dict

all(iterable) ↳ TRUE if all elements are true
any(iterable) ↳ TRUE if any element is true
both all and any are FALSE if empty
enumerate(iterable, start = 0)↳list

```
alst = ['x','y','z']
print(alst(enumerate(blst)))
↳ [(0,'x'), (1,'y'), (2,'z')]
```

Use enumerate to make a dictionary: ex:
mydict = {**tuple**(enumerate(mytup))}
For dictionaries it enumerates keys unless you specifiy values, ex:
print(**dict**(enumerate(mydict.values())))

type([iterable])
↳a datatype of any object (list, tuple, dict)
max(type) min(type) - **not** for ~~tuples~~
sum(iterable [, start]) must be all numeric, if a=[8,7,9] then sum(a) returns 24
sorted(iterable [,key=][,reversed])
reversed is Boolean with default False; strings without key sorted alphabetically, numbers high to low; key examples: print (sorted(strs, key=len)) sorts by length of each str value; ex: key= strs.lower, or key = lambda tupsort: tupitem[1]
reverse() reverses in place; mylist.**reverse()**
reversed() reverses access order—list or tuple

```
alist=["Amy","Bo","Cy"]
alist.reverse()                    Cy
for i in alist:                    Bo
   print(i)                 ↳      Amy
for i in reversed(alist):          Amy
   print(i)                        Bo
                                   Cy
```

Reverse a word

```
word = "Python"
iterword = iter(word)
newword =""
for i in reversed(word):
   newword +=i
print (word, newword)
```

range (stop) or **(start, stop [,step])**

```
alist=["Amy","Bo","Cy"]                  0 Amy
for i in range (0,len(alist)):      ↳    1 Bo
  print(i, alist[i]) #note slice         2 Cy
```

iter and **next(iterator [,default])**
Create iterator then fetch next item from iterator. Default returned if iterator exhausted, otherwise StopIteration raised.

```
alist=["Amy","Bo","Cy"]
IterNum = iter(alist)                      Amy
print(next(IterNum, "listend"))            Bo
print(next(IterNum, "listend"))     ↳      Cy
print(next(IterNum, "listend"))            listend
print(next(IterNum, "listend"))
```

File open (and methods)

fileobject=**open**(file [,mode],buffering])
The basic modes: **r, r+, w, w+, a** ..more
file object methods: **.read(size)**, **.readline**, **.readlines**, **list(fo)**, **.write(string)**, **.close**, **.splitlines**

```
with open("C:\Python351\Jack.txt",'r+') as sprattfile:
   sprattlist=sprattfile.read().splitlines() *<- removes '/n'
print(sprattlist)
↳['Jack Spratt', 'could eat ', 'no fat.', 'His Wife', 'could eat', 'no lean.']
```

**The WITH structure auto closes the file.*

Other Functions

filter(), vars(), dir(), super(), globals(), map(), dict(), setattr(), bytearray(), oct(), set(), classmethod(), zip(), locals(), __import__(), object(), memoryview(), hasattr(), issubclass(), isinstance(), compile(), hash(), complex(), bytes(), exec(), frozenset(), delattr(), property(), getattr(), staticmethod()

String Methods

.find(sub[, start[, end]])
↳First char BEFORE sub is found or -1 if not found ex: aword = "python"; print (aword.find("th")) ↳ 2
.capitalize() ↳first character cap'ed
.lower() ↳ a copy of the string with all text converted to lowercase.
.center(width[, fillchar])
string is centered in an area given by width using fill character 'fillchar'
.ljust(width [, fillchar]) or **.rjust()**
.count(sub[, start[, end]])
number of substrings in a string
.isalnum() .isnumeric() .isalpha .isdigit() .isspace() .islower() .isupper .isprintable() may be null
↳ true if all char meet condition and variable is at least one char in length
.replace(old, new[, count])
↳ a copy of the string with substring old replaced by new. If opt argument count is given, only first count are replaced.
.rfind(sub[, start[, end]])
↳ the **highest index** in the string where substring sub is found, contained within slice [start:end]. Return -1 on failure.
.strip([chars]) ↳ a copy of the string with the leading and trailing characters removed. The chars argument is a string specifying the set of characters to be removed. If omitted or None, the chars argument removes whitespace.
.zfill(width) ↳ a copy of the string left filled with ASCII '0' digits to make a string of length width. A leading sign prefix ('+'/'-') is handled by inserting the padding after the sign character rather than before. The original string is returned if width is less than or equal to len(str).
str.split() - separates words by space

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Escape Characters

Non-printable characters represented with backslash notation:
\a bell or alert, **\b** Backspace, **\s** Space, **\cx** or **\C-x** Control-x, **\e** Escape, **\M-\C-x** Meta-Control-x, **\f** Formfeed, **\n** Newline, **\t** Tab, **\v** Vertical tab, **\x** Character x, **\r** Carriage return, **\nnn** Octal notation, where range of n is 0-7 **\xnn** Hexadecimal notation, n is in the range 0-9, a-f, or A-F

String Format Operator: %

Depricated: use str.format(), however: **%** is used with print to build formatted strings
print ("My horse %s has starting slot %d!" % ('Arrow', 5))
Where the % character can format as:
%c character, **%s** string, **%i** signed integer decimal , **%d** signed integer decimal, **%u** unsigned decimal, **%e** exponential notation, **%E** exponential notation, **%f** floating point real number, **%g** the shorter of %f and %e, **%G** the shorter of %F and %E also: ***** specifies width, **-** left justification, **+** show sign, **0** pad from left with zero, **(much more)**

Data Containers Methods / Operations

Tuples fixed, immutable sets of data [a 1 element tuple requires a comma xtup=('test',)] Indexing and slicing the same as for strings.
=tuple (sequence or list) - converts to tuple: newtup =tuple(mylist) ; **len (tuple)**; **max (tuple)**; **min (tuple);** if mytup=(7,'yes',6,'no') then print(mytup[1]) ↳ yes

Dict **{key:value}** - "mapped" unordered pairs.
d= {"a":"dog", 2:"cat", "car":"Ford", "num":68}
~~**iteritems() ; itervalues() ; iterkeys()**~~
d.keys() - values of d; **d.values()**; **d.items()** - pairs list; **d[key] = value**; **len(d)**; **del d[key]**; **d.clear()** remove all; **key in d**; **key not in d**; **keys()**; **d.copy()** makes a shallow copy; **fromkeys (seq[, value])** from keys() is a class method - returns a new dictionary value, defaults to None. **get(key[, default])** -> test = d.get("car"): **items()**; **d.items()**; **d.values()**; **d.keys()**; **pop(key[, default])** remove and re-turn its value or default; **popitem()**; **setdefault(key[, default]); update([other])**
To find a key if you know the value:
KeyWanted=[key **for** key, value **in** mydict.items() **if** value==TheValueYouHave][0] #all on one line

Lists treelist =["oak", "pine", "hickory"]
lst[i] = x item i is replaced by x
lst[i:j] = t slice of lst from i to j is replaced by the contents of iterable t
del lst[i:j] same as lst[i:j] = []
lst[i:j:k] = t the elements of s[i:j:k] are replaced by those of t
del lst[i:j:k] removes the elements of s [i:j:k] from the list
lst.append(x) appends x to the end of the sequence (same as lst[len(lst):len(lst)] = [x])
lst.clear() removes all items from s (same as del lst[:])
lst.copy() ↳ shallow copy (same as lst[:])
lst.extend(t) or **s += t** extends lst with the contents of t (for the most part the same as **s**[len(s):len(s)] =t)
lst *= n updates lst with its contents repeated n times
lst.insert(i, x) inserts x into s at the index given by i (same as **lst[i:i] = [x]**)
lst.pop([i]) retrieves the item at i and also removes it from s
lst.remove(x) remove the first item from lst where **lst[i] == x**
lst.reverse() reverses the items of s in place
lst.sort() sort ascending, return None

Arrays - none, use **numpy** (generic data) on RPi or **array** (numeric only) modules

Sets an unordered collection of unique immutable objects - **no multiple occurrences of the same element**
myset = set(**"Bannanas are nice"**); print(myset)
↳: {'i', 'e', 's', 'a', 'B', ' ', 'c', 'r', 'n'}
add(), **clear()**, **pop()**, **discard()**, **copy difference()**, **remove()**, **isdisjoint()**, **issubset()**, **issuperset()**, **intersection()**
Example: Myset.add('x')

Useful Modules

Good 3rd Party Index:
https://pymotw.com/2/py-modindex.html
Python Standard Library Module Index with links:
https://docs.python.org/3.5/library/
pip is normally installed with Python but if skipped the **ensurepip** PACKAGE will bootstrap the installer into an existing installation.
python -m pip install SomePackage - command line
sys stdin standard input, stdout std output, exit("some error message")
os deep operating system access .open(name [,mode[, buffering]]) modes: '**r**' reading, '**w**' writing, '**a**' appending, binary append '**b**' like 'rb'
re– Regular Expressions—see block at right ->
time .asctime(t) .clock() .sleep(secs)
datetime date.today() datetime.now()
random .seed([x]) .choice(seq) .randint (a,b) .randrange(start, stop [, step]) .random() - floating point [0.0 to 1.0]
csv import/export of comma separated values .reader .writer .excel
math like Excel math functions .ceil(x), .fsum (iterable), .sqrt(x), .log(x[,base]), pi, e
urllib for opening URLs, redirects, cookies, etc
pygame see http://www.pygame.org/hifi.html
tkinter Python's defacto GUI; also see **ttk; tix**
calendar—a world of date options

```
>>> import calendar
>>> c = calendar.TextCalendar(calendar.SUNDAY)
>>> c.prmonth(2016, 9)
   September 2016
Su Mo Tu We Th Fr Sa
             1  2  3
 4  5  6  7  8  9 10
11 12 13 14 15 16 17
18 19 20 21 22 23 24
25 26 27 28 29 30
```

This only works with a mono-spaced font like Consolas
☞ **output**

curses - does not work in windows
picamera - Python access to your RPi camera
RPi.GPIO - control Pi pins via Python
xml - to work with xml files - UNSECURE
array or **numpy** work with arrays
tarfile / **zipfile** - file compression
multiprocessing - take the course if you can handle it—similar to the **threading** module.
wave - interface to wav format
googlefinance 0.7—real-time stock data **$ pip install googlefinance**
Numpy - to do arrays: CAVEAT—very difficult to install in 64 bit windows

List Comprehensions

tool to make new list with item exclu-sions and mods from an existing list.
Newlst = [[modified]item for item in OldLst if a-conditional-item-attribute of (item)] or if mod only, ex: up1lst = [x+1 for x in ylist]

re-Regular Expresions module

re is a language in itself roughly the size of standard Python. It supports pattern matching on BOTH (1) module-level—for 1 time use and (2) compiled expressions (i.e., mirrored functions). To compile an expression set a variable like **mypat = re.compile (pattern)** then use it to either **search** or **match.** Match searches from first character only. Also you can **findall()** and **finditer().**

```
import re #if not found 'None'; attribs error
teststring = "The 1 quick brown fox just"
mypat = re.compile(r'\d', flags=0)
myso = mypat.search(teststring)
print (myso)
print ('group()', myso.group())
print ('start()', myso.start())
print ('end()', myso.end())
print ('span()', myso.span())
```

...or don't compile it...
print(re.search(r'\d', teststring).start())
Special characters **. ^ $ * + ? { } [ ] \ | ( )**
r'(pattern)' matches literally . any except newline \d decimal digit \D non-decimal \w any alphanumeric \W non-alphanum \s any white space chr \S non-whtspace * 0 or more + 1 or more ? 0 or 1 X{n} exactly n ,'X' chars X{m,n} between m & n X's **$** end of str **|** OR: a|b matches a OR b (...) whatever re is in the parens (?abcdef) one or more letters in parens (?=...) a look ahead assertion, "only if" (?!=...) negated look-ahead assertion, "not if" \A match only at start of string \Z match only end of string \b empty string at the start/ end of a word [ ] contains a set of chars to match: '-' a range – [a-c] matches a,b,or c special chars lose meaning inside [ ], ^ as 1st char starts complimentary match
Flags: DOTALL any char, A escapes match ASCII, IGNORECASE, MULTILINE affecting ^$, VERBOSE) ***About Backslashes****: use the '\' character to indicate special forms or allow a character's use without invoking its special meaning—be aware this conflicts with Python's usage of the same character in string literals.*
To test for true result, use bool operator:
if bool(re.search(r'\d', teststr))==True:

Operators

Math: **+**, **-**, *****, **/**, **//** (floor or truncated division), ****** (expo-nent), **%** (mod or modulo returns the remainder) **x = 8%3; print(x)** ↳2
Assignment: (execute & assign) **=**, **+=**, **-=**, ***=**, **/=**, ****=**, **%=**
Boolean/Logical: **and, or, not**
Comparison:**<**, **<=**, **>**, **>=**, **is**, **is not**, **==** (equal), **!=**(not equal)
Special String: **+** concatenation (repetition), **[]** (slice), **[:]** (range slice), **in** (true if found, if "c" in "cat"), **not in**, **r** (r'*str*' – raw string suppresses ESC characters)
Identity: **is/is not** checks if variables point to the same object
Bitwise: **&**, **|** (or), **^** (xor), **~** (flips), **<<** (shift lft), **>>**(shift rt)
New Soon: **@** - a matrix multiplier
Note: operator module adds more.

comments and suggestions appreciated:
john@johnoakey.com

Basic Programming Examples: http://www.java2s.com/Tutorial/Python/CatalogPython.htm or https://wiki.python.org/moin/BeginnersGuide/programmers/SimpleExamples