

print() is a function
print(objects, separator="", end='\n')
 print("Hello World!") \$ Hello World!

Coding Operators

\ Multiline (explicit join) Statements:
 Not needed within [], {}, or ()
; Multiple Statements on a Line: not
 used/needed with **for**, **if**, **while**
line comment
''' block comment '''

Operators

Math: =(execute/assign) value swap
 a,b=b,a; +; -; *; /; ** (exp); +=
 a+=b a=a+b; -=; *=; **=; /=;
 //(floor div-truncated no remainder;
 % (modulo) \$ remainder from division;
Boolean: False, True (0, 1)
Logical: and, or, not *modify compare*
Comparison: == (same as); != (is
 not equal); <; <=; >; >=; is; is
 not; all \$ **Boolean** values — (T/F)
Membership: in; not in; - a list,
 tuple, string, dictionary, or set
Identity: is; is not the same object
Binary: & (and); | (or); ^ (xor - 1
 not both); ~ inversion, = -(x+1);
 << (shift left); >> (shift right)
 bin(0b0101 <<1) \$ '0b1010'
Sequence Variable Operators
strings: + -concatenate, * - repeat;
single char slice s[i]; **range slice** s
 [i:j:k] **from, to, step** -> start at i,
 end j-1, increment by count

Number Tools

abs(x) \$ absolute value of x
bin(x) \$ int to binary bin(5) = '0b101'
 (a 4, no 2's, a 1); bin(7)[2:] = '111'
divmod(dividend,divisor) from
 noncomplex numbers \$ quotient
 and remainder tuple
float(x) \$ a floating point number
 from an integer or string; if x="1.1"
 print(float(x)*2) \$ 2.2
hex(x) \$ int to hex string
 hex(65536) \$ 0x10000 or
 hex(65536)[2:] \$ '10000'
oct(x) \$ int to octal
int(x) \$ int from float, string, hex
pow(x,y [,z]) \$ x to y, if z is
 present, returns x to y, modulo z
pow(5,2)=25, pow(5,2,7)=4
round(number [,digits]) floating
 point number rounded to digits or
 nearest integer if digits not used
round(3.14159, 4) \$ 3.1416
max, min, sort - see data containers
None -> constant for null; x=None

String Tools

Built-In Functions
ascii(str) \$ like repr, esc non-ascii
chr(i) \$ character of Unicode 97= 'a'
input(prompt) \$ user input as str
len() \$ length of str; count of iter-
 able items (list/dictionary/tuple/set)
ord(str) \$ value of Unicode char.
repr(object) \$ printable string
str(object) \$ string val of object

slice selection: str[:stop]; str[start:stop
 [:step]] \$ a string created by the selection
String Formatting
.format() - see **Format Toolbox!**
method: (1) substitution (2) pure format
 (1) 'string {sub0}{sub1}'.format(0, 1)
 print("Give {0} a {1}".format('me','kiss'))
 (2) '{:format_spec}'.format(value)
function: format(value, spec)
format_spec: (format mini-language string)
 [[fill] align] [sign] [# - alt form] [0-forced
 pad] [width] [,] [.precision] [type]
 x= format(12345.678, "=+12,.2f")
 \$ + 12,345.68
NEW in 3.6 f-strings: format strings
 print(f"{'Pay \$'}{9876.543:,.2f}")
 \$ Pay \$ 9,876.54
.center(width[, fillchar]) string centered in
 width area using fill character 'fillchar'
.capitalize() \$ First character capitalized
.ljust(width [, fillchar]) or **.rjust(same args)**
.lower()/ .upper() \$ change case
.strip; or .lstrip; or .rstrip; + ([chars]) \$
 a string with all *or* leading, *or* trailing,
 [chars] removed. If [chars] included, all are
 removed. If [chars] omitted or None, the
 argument removes whitespace
.swapcase() \$ cases exchanged
.title() \$ First Words Capitalized
.zfill(width) - left fill with '0' to len width

String Methods
 Str ".is" tests—(Note: tested here for char-
 acters 0 to 255) \$ **True** if all chars in the
 string meet attribute condition and string
 =>1 character in length. \$ **False** if Null
.isalnum()—True if all chars in a string are
 either .isalpha(), .isnumeric(), .isdigit() or
 .isdecimal() *Note False if your number
 contains a decimal point: to vet a variable
 v1 as a float: if (type(v1) == float): or
 convert in a **try/except** structure
.isalpha()—upper and lower case normal
 letters plus 64 printable characters between
 chr(170) and chr(255)
.isdecimal()—digits 0,1,2,3,4,5,6,7,8,9
.isdigit()—0 to 9 plus superscripts ² (178),
³ (179), and ¹ (185)
.isidentifier()—tests a string to see if it is a
 valid Python identifier or keyword
.islower()—lower case ltrs plus 36 printable
 characters between chr(170) and chr(255)
.isnumeric()— .isdigit plus ¼ (188),
 ½ (189), and ¾ (190)
.isprintable()—189 of the 256 characters
 between 0 and 255 starting with the space
 chr(32) sequentially to ~ chr(126), then chr
 (161) to (255) except for chr(173)
.isspace()—true for chrs (9-13), (28-32),
 (133) and (160). Note space: " " is chr(32)
.istitle()—for all practical purposes, every
 word in a string begins with a capital letter
.isupper()—normal upper case plus 30
 printable characters between chr(192-222)
.casefold() \$ casefold - caseless matching
.count(sub[,start[,end]]) \$ # of substrings
.encode(encoding="utf-8", errors="strict")
.endswith(suffix[, start[, end]]) \$ T/F
.expandtabs() replace tabs with spaces
.find(sub[, start[, end]]) \$ the index of
 substring start, or -1 if it is not found;
 print('Python'.find("th")) \$ 2
.index(sub[,start[,end]]) = **.find** but failure

to find sub causes **ValueError**
seperator.join([string list])
 joins strings in iterable with **sep**
 char; can be null
.partition(sep) \$ 3 tuple: before,
 sep, after
[new 3.9] .removeprefix(prefix, /)
 and **.removesuffix(suffix, /)**
.replace(old, new[, count]) \$
 substring old replaced by new in object;
 if count is given, only the count
 number of values are replaced
.rfind(sub[, start[, end]]) \$
 lowest index of substring in slice
 [start:end]. -1 on fail
.rindex() rfind but fail \$ **ValueError**
.rsplit—like **split**, except splits
 from right
.split([sep] [maxsplit=]) \$ word
 list, default sep is space(s)
.splitlines(keepends=False) \$
 list of lines broken at line
 boundaries
.startswith(prefix[,start[,end]])
 \$ **True/False** prefix can be a tuple
.translate(table) map to table
 made with **.maketrans(x[,y[,z]])**

Looping

while (expression evaluates as True):
 process data statements; **else:**
break ends **while** loop, skips else:
for expression to be satisfied: **ex:**
alist=['A','B','C']; x=iter(alist)
for i in range(len(alist)):
 print(i+1, next(x)) *can use **else:**
else: while and **for** support **else:**
range (start, stop [,step])
continue skips to next loop cycle

Decision Making

if elif else:
if somenum == 1: # do this code
elif somenum == 2: # do this code
else:
 # otherwise do this code
The ternary if: an inline **if** that
 can be use in formulas
 print(x if x in myword **else** "", end="")

Error Management

use in error handling blocks
try: code with error potential
except error type: code if this error
else: otherwise do this code
finally: do this either way
assert: condition = **False** will raise
 an **AssertionError**
raise forces a specified exception

List Comprehensions

Make a new list with exclusions and
 modifications from an existing list or
 tuple: brackets around the expression,
 followed by 0 to many **for** or **if** clauses;
 clauses can be nested:
**new_list = [(modified)item for item in
 old_list if some-item-attribute of (item)]**
 atuple=(1,-2,3,-4,5)
 mylist=[item*2 for item in atuple if item>0]
 print(atuple, mylist)
 \$ (1, -2, 3, -4, 5) [2, 6, 10]
if modifying items only:
 up1list = [x+1 for x in L]

Data Containers

Methods & Operations

↓ Usually: i,j,k: indexes x: value or object

L / T / D / S / F / SF ↗ instances of:

list, tuple, dictionary, set, frozen set, both

Unique Data Type Statements/Methods

LISTS: [] - Ordered, Mutable

create **L=[]**; **L=list(L/T/S/F)**; **L=[x**

,x]...]; **L=L[i:j:k]** list from slice;

list(D) ↗ list of all dictionary keys

add/remove members **.append(x)**

where x is string or data object; **L1 + L2**

concatenate (lists only); **insert(ith member,**

as new element); **.copy()** duplicate

list; **.pop(i)** return & remove ith item,

last item if no i; **.clear()** remove all mem-

bers; **.extend(iterable)** adds iterable

members; strings add letters as members;

query **L[x]** ↗ value at position x, can

be multiple values; **a,b=L[2:4]**; **L.index**

(x[,at/after index i][,before index j]) ↗ slice

position of string or value x in list,
ValueError if not in found; **.count(x)** find

number of instances of x in list; **min(L)**;

max(L); **len(L)**; **x in L**; **x not in L**;

manipulate **.sort(key=None/function,**

reverse=False); **sorted(L[,reverse])**;

L.reverse() reverse item order;

TUPLES: () - Ordered, Immutable

create **T=()**; **T=(x,[x],(x)...)];** **T=**

tuple(T/L/S/F);

add members **+=(x,[x])** add 1 or

more items, note comma for 1 item; **T1**

+ T2 concatenate (tuples only);

query **T[i:j]** get slice values, end is

last item + 1; **.count(x)** find number of

instances of x in tuple; **T.index(x[,at/**

after index i][,before index j]) ↗ slice

position of possible member x; **min(T)**;

max(T); **len(T)**; **x in T**; **x not in T**;

manipulate **sorted(T, reverse=T/F)**;

T[::-1] reverse order;

DICTIONARIES: { } Mutable, Mapped,

Unordered, Unique keys in Pairs

k ↗ 'key', **v** ↗ 'value':

create **D={k:v, [k:v]}**; **=dict(i=j**

[,k=l]); **=dict(zip(L1, L2))**; **D2=**

D1.copy(); **=dict.fromkeys(L/T/F,**

pair members with v/None/ iterable);

add/remove members

D[k]=new_value; **D.update(D2)** add D2

items to D replacing dup values; **D=(**D|**

****D2)**; **D.setdefault(k[,default])**

return value if k in dict, if not, insert and

return default; **D.clear()**; **del D[k]** remove

member; **D.pop(k)** ↗ v and removes k;

new [3.9]: D=D2|D3; **D|=k/v pairs**;

query see setdefault also; **x=D[k]** ↗ v

or keyerror if no k; **x=D.get(k[,x])** like D

[k] but ↗ x if no k; **len(D)**; Dictionary

views: D.keys(); **D.values()**; **D.items()**;

for item view, x ↗ a (key, value) **tuple**;

keys, values, items can all be iterated

x in D.view; **x not in D.view**;

manipulate **D[existing k]=value**

change value; **[new in 3.8]** where **ri** is a

reversed iterator **ri=reversed(D.view)**

iterate with next(ri); output sorted using

sorted(D.items())

SETS: Unique, Mutable, Unordered

FROZENSETS: immutable after creation;

create **S={x,x,x}**; **S=set(L/T/F)**;

S='string' ↗ unique letters

create **F=frozenset([iterable])** ↗ only

add/remove members

Set only **S.add(i)**; **S.remove(element)**

Key Error if missing; **S.discard(element)** no

error if missing; **S.pop()** remove/return

random element; **S.clear()**;

S.update(iterable); or **S1 |= S2**; These

add members from iterable(s) or set(s).

S.intersection_update(other iterables);

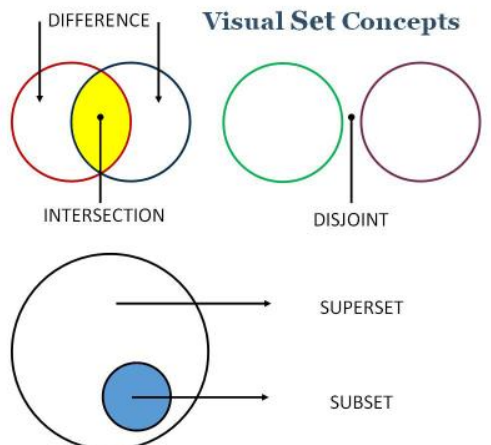
or **S1 &= S2**; Keep universal elements.

S.difference_update(iterable) or **S1 -=**

S2 Remove members found in others.

S.symmetric_difference_update(iterable)

S1 ^= S2; keep unique elements only



Sets & Frozensets

SF.copy() Return a shallow copy.

SF.union(SF2) or **SF3=SF1|SF2[...]**

merge the sets

SF.intersection(SF2) or **SF1 & SF2**

intersection of S1 & S2

SF.difference(S2) or **SF-SF2** unique in SF

SF.symmetric_difference(SF2) or

SF^SF2 elements in either but not both

query (Sets & Frozensets) **len(SF)**;

Boolean Tests: **x in SF**; **x not in SF**;

SF.isdisjoint(SF2) T if no common items

SF.issubset(SF2) & **SF1<=SF2** One set

is contained by the other

SF1<SF2 set is a proper subset

SF1.issuperset(SF2) or **SF1>=SF2**

Every element of SF1 in SF2

SF1>SF2 set is a proper superset

/ for iterable (argument) unpack**

***** for list/tuples, ****** for dictionaries; **Ex:**

a,*b,c = [1,2,3,4,5]; ↗ **a=1, c=5, b=[2,3,4]**

d1={1:'a', 2:'b'}; d2={2:'c', 3:'d'};

d1={d1, **d2}** or new in [3.9] **d1|=d2**

↗ **d1={1:'a', 2:'c', 3:'d'}**

More Data/Iterable Tools

all(iterable) ↗ True if all elements are True

any(iterable) ↗ True if any element is

True ***all** and any are both FALSE if empty

del(iterable instance) - delete

enumerate(iterable, start = 0) ↗ tuples list

alist = ['x','y','z']; l1 = list(enumerate(alist)); print(l1)

↗ **[(0,'x'), (1,'y'), (2,'z')]**

Use enumerate to make a dictionary. **ex:** **mydict = dict(enumerate(mylist))**

filter(function, iterable) selector

for elements for which function is True

iter and **next(iterator, default)]**

create iterator with **iter**; fetch items

with **next**; default returned if iterator

exhausted, or StopIteration ↗

team = ['Amy', 'Bo', 'Cy']; it1 = iter

(team); myguy = "" ↗ Amy

while myguy is not "Cy": ↗ Bo

myguy = next(it1, "end") ↗ Cy

print(myguy)

map(function, iterable) can take

multiple iterables - function must take

just as many

alist=[5,9,13,24]; x = lambda z: (z+2)

list2 = list(map(x, alist)); print(list2)

↗ **[7, 11, 15, 26]**

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

alist=["Amy", "Bo", "Cy"] ↗ 0 Amy

for i in range(0, len(alist)): ↗ 1 Bo

print(str(i), alist[i]) # note slice ↗ 2 Cy

reversed() reverse **iterator**: list or

tuple

alist=["A", "B", "C"]; print(alist)

alist.reverse(); print(alist);

rev_iter = reversed(alist)

for letter in range(0, len(alist)):

print(next(rev_iter), end=" ")

sum(iterable [, start]) all numeric

ex: if a=[8,7,9] then sum(a) ↗ 24

type([iterable]) ↗ object datatype

zip() creates aggregating iterator

from multiple **iterables**, ↗ iterator of

tuples of ith iterable elements from

each sequence or iterable

Other Object Commands

Working with object attributes

(most useful for created class objects)

getattr(object, 'name' [, default])

listatr = getattr(list, '__dict__')

for item in listatr:

print(item, listatr[item], sep=" | ")

setattr(object, 'name', value)

hasattr(object, 'name')

delattr(object, 'name')

exec(string or code obj[, globals

[, locals]) dynamic code execution

compile(source, filename, mode,

flags=0, don't_inherit=False,

optimize=-1) create a code object

that **exec()** or **eval()** can execute

hash(object) ↗ integer hash value if

available

dir() ↗ names in current local scope

dir(object) ↗ valid object attributes

arg#1: B
arg#2: C
arg#3: T
arg#4: A

formal arg: 1
('dog', 'cat')
('arg2', 'two')

User Functions

def create function: `def functionName(args):`
return(variable object) - return the value a function derived - **or** - **yield/next**; in a generator function, returns a **generator** with sequential results called by **next**
global x creates global variable - defined **inside** a function
nonlocal a variable in a nested function is valid in an outer function

Creating a Function

(required in red, optional in green)

(examples: return & generator functions)

\rightarrow **command key word** \rightarrow **arguments**

***1 def name** (input or defined params):

\rightarrow **new function name** **colon** \rightarrow

***2** `"""a docstring"""` (can be multiline)

***2-x or 3-x** **code block**

***last return**(expression to pass back)

or a **generator** passed using **yield**:

vowels, myword = 'aeiouy', 'idea'

def gen1(wordin):

for letter in wordin:

yield(letter) \rightarrow **aei**

for x in gen1(vowels):

print(x if x in myword else "", end="")

next

Lambda: unnamed inline function

lambda [parameters]: expression

z = lambda x: format(x3, ".2f");**

print(z(52.1)) \rightarrow **141,420.76**

CLASS - an object **blueprint** or **template**

(required in red, optional in green)

Common components of a class include:

***1 inheritance** creates a **derived class**

\rightarrow **command key word** \rightarrow **colon** \rightarrow

class class-name (inheritance):

your class name & *class definition header*

Class creates a namespace and provides

instantiation and **attribute reference**

***2 a docstring**, "Docstring example"

***3 instantiation with special method:**

def __init__(self, arguments):

autoinvoked when class is created; Arguments

are passed when a class instantiation is called.

Includes variable name assignments, etc.

***4 function definitions and local variable assignments** **example:**

1 `class mammalia(object):`

2 `"A class for mammal classification"`

3 `def __init__(self, order, example):`

`self.ord = order`

`self.ex = example`

`self.cls = "mammal"`

4 `def printInfo(self):`

`info = "class/order: " + self.cls + "/" + \`

`self.ord + ", Example: " + self.ex`

`print(info)`

`mam_instance = mammalia("cetacea", "whales")`

`mam_instance.printInfo()`

\rightarrow **class/order: mammal/cetacea, Example: whales**

File Access

`wholefilepath = "C:\\file\\mytest.txt"`

open(file[,mode],buffering)

helpful methods: **.readline()**,

read(size), **.readlines()**, **.write**

(string), **.close()**, **list(openfile)**,

.splitlines([keepends]),

with open(wholefilepath) [as textfile]:

textfile=mytest.read().splitlines()

WITH structure closes a file automatically

***Many other functions not shown here**

Functions * **boldface** not in this basic toolbox

abs()	callable()	enumerate()
all()	chr()	eval()
any()	classmethod	exec()
ascii()	compile()	filter()
bin()	complex()	float()
bool()	delattr()	format()
breakpoint()	dict()	frozenset()
bytearray()	dir()	getattr()
bytes()	divmod()	globals()

hasattr()	list()	pow()	staticmethod
hash()	locals()	print()	str()
help()	map()	property()	sum()
hex()	max()	range()	super()
id()	memoryview	repr()	tuple()
input()	min()	reversed()	type()
int()	next()	round()	vars()
instance()	object()	set()	zip()
issubclass()	oct()	setattr()	__import__()
iter()	open()	slice()	
len()	ord()	sorted()	

Other Built-in Functions

definition: ITERABLE: an object that

can return members 1 at a time

pass (placeholder - no action)

del deletes variables, data containers,

items in iterables: `del mylist[x]`

breakpoint enters debugger - **with**

wrapper ensures **_exit_** method

eval(Python expression) \rightarrow value

bool(expression) \rightarrow T/F (F default)

callable(object) \rightarrow True if it is

help(object) invokes built-in help

system, (for interactive use)

id(object) \rightarrow unique identifier

:= (New [3.8]) - assignment

expression operator assigns values to

variables inside a larger expression

bytearray([source[, encoding

[, errors]]) \rightarrow a new bytearray;

source can be an iterable of integers 0

to 255, an integer defining array size,

or a string with encoding which will be

converted to bytes using **str.encode()**

globals() \rightarrow a dictionary of current

global symbols of the current module

isinstance(object, classinfo) \rightarrow

True if object is an instance of classinfo

issubclass(object, classinfo) \rightarrow

True if object is a subclass of classinfo

locals() \rightarrow a dictionary of the current

local symbol table

vars([object]) \rightarrow the **__dict__**

attribute for a module, class,

instance or object

Operators and Precedence

lambda

if - else

or - and - not x Boolean OR, AND, NOT

in - not in - is - is not

< - <= - > - >= - != - ==

| - ^ - & bitwise OR, XOR, AND

<< - >>

+

***** **@ - / - // - %** (Multiplication, matrix multiply,

division, floor div, remainder)

+x -x ~x (pos, neg, bitwise NOT)

****** (exponentiation)

await x (Await expression)

x[index] - x[index:index] - x[argu-ments...]

x.attribute (subscription, slicing, call, attr ref)

Built-in Types numerics, sequences, mappings, classes, instances, exceptions

Numeric Types

int float complex constructors:

complex(real, imaginary) *imaginary defaults to 0*

Numeric Operations

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

x % y remainder of x / y **-x** x negated

+x x unchanged **abs(x)** absolute value x

int(x) x converted to integer

float(x) x converted to floating point

complex (real, imaginary) imaginary defaults to 0

c.conjugate() conjugate of complex number c

divmod(x, y) the pair (x // y, x % y)

pow(x, y) x to the power y

x ** y x to the power y

round(x[,n]) round to n digits, half to even

math module (import math) adds these operations:

math.trunc(x); math.floor(x); math.ceil(x)

Sequence Operations (4.6.1)

x in s True if an item of s is equal to x

x not in s False if an item of s is equal to x

s + t the concatenation of s and t

s * n or n * s concatenate s n times

s[i] ith 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) number of occurrences of x in s

Mutable Sequence Operations

s[i] = x item i of s is replaced by x

s[i:j] = t slice of s from i to j is replaced by the contents

of the iterable t

del s[i:j] removes i to j; same as **s[i:j] = []**

s[i:j:k] = t the elements of s[i:j:k] are replaced by those of

t; start, stop, step

del s[i:j:k] removes the elements of s[i:j:k] from the list

s.append(x) appends x to the end of the sequence

s.clear() removes all items from s (same as **del[:]**)

s.copy() creates a shallow copy of s (same as **s[:]**)

s.extend(t) or **s +=** extends s with the contents of t (for the

most part the same as **[len(s):len(s)] = t**)

s * n updates s with its contents repeated n times

s.insert(i, x) inserts x into s at the index given by i (same

as **s[i:i] = [x]**)

s.pop([i]) retrieves the item at i and removes it from s

s.remove(x) remove the first item from s where **s[i] == x**

s.reverse() reverses the items of s in place

**** see: <https://docs.python.org/3.6/library/stdtypes.html>**

Keywords (reserved) and, as, assert, async, await,

break, class, continue, def, del, elif, else, except,

False, finally, for, from, global, if, import, in, is,

lambda, nonlocal, None, not, or, pass, raise, return,

True, try, while, with, yield

Built-in Constants False, True, None,

NotImplemented, Ellipsis (same as literal **'...'**),

__debug__, quit(), exit(), copyright, credits, license

f-string Formatting : [new 3.6]**conversion types**

'd' Signed integer decimal.
 'i' Signed integer decimal.
 'o' Signed octal value.
 'u' Obsolete type – it is identical to 'd'.
 'x' Signed hexadecimal (lowercase).
 'X' Signed hexadecimal (uppercase).
 'e' Floating point exponential format (lowercase).
 'E' Floating point exponential format (uppercase).
 'f' Floating point decimal format.
 'F' Floating point decimal format.
 'g' Floating point format. Uses lowercase exponential format if exponent is less than -4 or not less than precision, decimal otherwise.
 'G' Floating point format. Uses uppercase exponential format if exponent is less than -4 or not less than precision, decimal format otherwise.
 'c' Single character - accepts integer or single character str
 'r' String - uses repr() to convert object
 's' String - uses str() to convert object
 'a' String - uses ascii() to convert object
 '%' Puts '%' character before result

conversion flags

'#' conversion will use "alternate form"
 '0' conversion zero padded for numerics
 ' ' (space) Leave a space before a + or #
 '+' A sign character ('+' or '-') will precede conversion (overrides "space" flag).

Boolean Operations**Operation / Result** (ascending priority)

x or y if x is false, then y, else x
x and y if x is false, then x, else y
not x if x is false, True, else False

Integer Bitwise Operations**Operation / Result**

x | y bitwise *or* of x and y
x ^ y bitwise *exclusive or* of x and y
x & y bitwise *and* of x and y
x << n x shifted left by n bits
x >> n x shifted right by n bits
~x the bits of x inverted

Bytes and Bytearray Operations

x = means this method can be used with "bytes." or "bytearray." i.e.,
 x.count(sub[, start[, end]]) is same as bytes.count(sub[, start[, end]]) or bytearray.count(sub[, start[, end]])
 x.decode(encoding="utf-8", errors="strict")
 x.endswith(suffix[, start[, end]])
 x.find(sub[, start[, end]])
 x.index(sub[, start[, end]])
 x.join(iterable)
 static bytes.maketrans(from, to)
 static bytearray.maketrans(from, to)
 x.partition(sep)
 x.replace(old, new[, count])
 x.rfind(sub[, start[, end]])
 x.rindex(sub[, start[, end]])
 x.rpartition(sep)
 x.startswith(prefix[, start[, end]])
 x.translate(table[, delete=b""])
 x.center(width[, fillbyte])
 x.ljust(width[, fillbyte])
 x.lstrip([chars])
 x.rjust(width[, fillbyte])
 x.rsplit(sep=None, maxsplit=-1)
 x.rstrip([chars])
 x.split(sep=None, maxsplit=-1)
 x.strip([chars])

Errors

ArithmeticError
 AssertionError
 AttributeError
 BaseException
 BlockingIOError
 BrokenPipeError
 BufferError
 BytesWarning
 ChildProcessError
 ConnectionAbortedError
 ConnectionError
 ConnectionRefusedError
 ConnectionResetError
 DeprecationWarning
 EOFError
 EnvironmentError
 FileExistsError
 FileNotFoundError
 FloatingPointError
 IOError
 ImportError
 IndentationError
 IndexError
 InterruptedError
 IsADirectoryError
 KeyError
 KeyboardInterrupt

LookupError
 MemoryError
 ModuleNotFoundError
 NameError
 NotADirectoryError
 NotImplementedError
 OSError
 OverflowError
 PermissionError
 ProcessLookupError
 RecursionError
 ReferenceError
 RuntimeError
 SyntaxError

SystemError
 TabError
 TimeoutError
 TypeError
 UnboundLocalError
 UnicodeDecodeError
 UnicodeEncodeError
 UnicodeError
 UnicodeTranslateError
 ValueError
 WindowsError
 ZeroDivisionError

The Python Standard Library

Content: docs.python.org/3/py-modindex.html

Text Processing Services - 7

modules including:

string — Common string operations
re — Regular expression operations
textwrap — Text wrapping and filling
Binary Data Services - 2 modules
Data Types - 13 modules including:
datetime — Basic date and time types
calendar — Calendar-related functions
copy — Shallow and deep copies
enum — Support for enumerations
pprint — Data pretty printer

Numeric and Mathematical Modules - 7

modules including:

numbers — Abstract base classes
math — Mathematical functions
cmath — complex #: decimal - accurate
random — Generate pseudo-random #s
statistics — Statistical functions
fractions — Rational numbers

Functional Programming - 3 modules**File and Directory Access - 11**

modules including:

pathlib — Object-oriented file paths
os.path — Common path functions
fileinput — Iterate lines—multiple inputs
filecmp — File and directory compare
shutil — High-level file operations

Data Persistence - 6 modules including:

pickle — Python object serialization
marshal — Internal Python object serialization
sqlite3 — DB-API 2.0 interface for SQLite databases

Data Compression and Archiving - 6

modules including:

zipfile — Work with ZIP archives
tarfile — Read and write tar archive files

File Formats - 5 modules including:**csv** — CSV File Reading and Writing**Cryptographic Services - 3 modules:****Generic Operating System Services - 16 modules inc:**

os — Miscellaneous operating system interfaces
time — Time access and conversions

io — Core tools working with streams**platform** — Access to platform

identifying data

Concurrent Execution - 10 modules

including:

threading — Thread-based parallelism**multiprocessing** — Process-based parallelism**Interprocess Communication and****Networking - 9 mods****Internet Data****Handling - 10 modules:****Structured Markup Processing Tools - 13 modules:****Internet Protocols and Support - 21****modules****Multimedia Services - 9 modules**

including:

wave — Read and write WAV files**Internationalization - 2 modules:****Program Frameworks - 3 modules**

including:

turtle — Turtle graphics**Graphical User Interfaces with Tk - 6**

modules including:

tkinter — Python interface to Tcl/Tk**IDLE****Development Tools - 9 modules:****Debugging and Profiling - 7 modules:****Software Packaging and Distribution - 4 modules including:**

distutils — Building and installing modules

ensurepip — bootstrapping pip installer**Python Runtime Services - 14 modules**

including:

sys — System-specific parameters and functions**sysconfig** — Access to Python's config information**__main__** — Top-level script environ.**inspect** — Inspect live objects**Custom Python Interpreters - 2 mods****Importing Modules - 5 modules**

including

zipimport — Import modules from Zip archives**runpy** — Locating and executing Python modules**Python Language Services - 13 mods :****keyword** — Testing for Py keywords**py_compile** — Compile Python source files**Miscellaneous Services - 1 module:****MS Windows Specific Services - 4****modules****Unix Specific Services - 13 modules:****Superseded Modules - 2;****Undocumented Modules - 1****pypi.org** another 257M+ modules

including: RPI.GPIO, Pillow, pandas,

fuzzywuzzy, Anaconda, miniconda,

conda, playsound, Poetry, Numpy, etc.

To find installed modules from

Python: **>>> help('modules')****Selected Standard Library Module Constants and Methods for New Users****calendar** import calendar

a couple of fun examples:

c=calendar.TextCalendar(calendar.SUNDAY)**c.pyear(2021,w=2,l=1,c=6,m=3)** or try**c=calendar.TextCalendar(calendar.MONDAY)****c.setfirstweekday(calendar.SUNDAY)****print(c.formatmonth(2021,1,w=0,l=0))**many functions - see: www.wikipython.com ->

OTHER MODULES -> calendar

cmath - A suite of functions for complex #**copy** - import copy relevant for compound

objects, (objects containing other objects)

.copy(x) <-relies on references to objects**.deepcopy(x[, memo])** <-copies objects (so you can

change the copy and not the original)

csv import csv comma separated values**.reader(csvfile, dialect='excel', **fmpargs)** file and

list objects ; file obj opens with newline=""

.reader objects: csv.reader(file path). +**__next__()**, **dialect**, **line_num**, or **fieldnames****.writer(csvfile, dialect='excel', **fmpargs)****writer objects: csv.writer(file path). +****writerow(row)**, **writerows(rows)**, **dialect**, or**writeheader()****.list_dialects()** - return registered dialect names

includes classes to read/write dictionary objects

Constants: .QUOTE_ALL, .QUOTE_MINIMAL,**.QUOTE_NONNUMERIC, .QUOTE_NONE****datetime** import datetime**Constants: MINYEAR, MAXYEAR**From datetime import **timedelta**: tools for duration

and difference between dates and times.

Supports functions for the following **types: .date,****.time, .datetime, .timedelta, .tzinfo, .timezone**Minimum constructor: **datetime.datetime(year, month, day);**To create today's date object: **datetime.date.today();**

x.capitalize()
 x.expandtabs
 (tabsize=8)
 x.isalnum()
 x.isascii()
 x.isalpha()

x.isdigit()
 x.islower()
 x.ispace()
 x.islower()
 x.isupper()
 x.lower()

x.splitlines
 (keepends=False)
 x.swapcase()
 x.title()
 x.upper()
 x.zfill(width)

Escapes

\ newline
 \\ backslash
 \' "quote sgl/db
 \a ascii bell
 \000 octal val 000
 \xhh hex value hh

Module Management

import get module, ex: import math
from get a single module function:
from math import cos; print(cos(9))
as creates an alias for a function

object attributes: .year, .month, .day (iyr=idte.year)

Get a time tuple: `datetime.datetime.timetuple(arg)`

ex: \rightarrow `time.struct_time(tm_year=2020, tm_mon=7, tm_mday=26, tm_hour=11, tm_min=10, tm_sec=0, tm_wday=6, tm_yday=208, tm_isdst=-1)`

ex: Using `timedelta` to find a future date:

`start = datetime.date(2019, 1, 1)`

`duration = datetime.timedelta(days=180)`

`enddate = start + duration`

`print(enddate)` \rightarrow 2019-06-30

`with idte=datetime.datetime.today()`, instance

attributes are: .year, .month, .day, .hour, .minute,

.second, .microsecond, .tzinfo, .fold ex: `idte.minute`

much more - *also in **PyPi** see new **python-dateutil** module

decimal fast, correctly rounded fp math with a

gazillion functions and pages of instruction

ensurepip - bootstrap pip into an existing

Python environment - pip is the installer for

modules **not in the Standard Library**

Windows **command line invocation:**

`python -m ensurepip -- upgrade`

enum - from `enum` import `enum`

mimicks `enum` in C, fast integer access and iter.

filecmp import `filecmp`

`.cmp(f1, f2, shallow=True)` Compare f1 and f2,

returning True if they seem equal

fileinput import `fileinput`

for line in `fileinput.input()`:

`process(line)`

`.input(files=None, inplace=False,`

`backup="", *, mode='r', openhook=None)`

`.filename()` \rightarrow file being read

`.fileno()` \rightarrow file descriptor (-1 is none open)

`.lineno()` \rightarrow cumulative # of last line read

`.filelineno()` \rightarrow line # in current

`.isfirstline()` \rightarrow True if first line of its file

`.isstdin()` \rightarrow True if last line was read

from `sys.stdin`

`.nextfile()` close file, read next line from next file

`.close()` close

fractions.py import `fractions`

`.Fraction(numerator=0, denominator=1)`

`.Fraction(other_fraction)`

`.Fraction(float)`

`.Fraction(decimal)`

`.Fraction(string)`

`a = '22'; print(fractions.Fraction(a))` \rightarrow 11/50

`print(fractions.Fraction(math.pi))`

\rightarrow 884279719003555/281474976710656

idlelib IDLE is Python's native IDE see:

<https://docs.python.org/3.6/library/idle.html>

io import `io` three types: `text`, `binary`, `raw`

for example: *continued next page*

`f = open("myfile.txt", "r", encoding="utf-8")`

`f = open("myfile.jpg", "rb")`

`f = open("myfile.jpg", "rb", buffering=0)`

json - import `json` **methods include:**

`.loads(str,...)` - json str to Python dict and objects

`.dumps(obj,...)` - Py dictionary and nested objects

converted to json string for storage

`.load(fp,...)` - json obj from file converted to Python

dict and other obj(s)

`.dump(obj, fp,...)` - encode Py obj(s), save to file

keyword import `keyword`

`.iskeyword(str)` **kwlist** (note no prens)

math - import `math` functions include:

`.ceil(x)` smallest int $\geq x$

`.comb(n,k)` ways to choose k items from n

`.copysign(x,y)` absolute value of x, sign of y

`.fabs(x)` \rightarrow absolute value of x

`.factorial(x)` \rightarrow x factorial as integer

`.floor(x)` \rightarrow largest int $\leq x$

`.fmod(x,y)` mathematically precise ver of $x\%y$

`.frexp(x)` \rightarrow mantissa and exponent of x (m,e)

.fsum(iterable) returns fp sum of values

.gcd(a,b) \rightarrow greatest common divisor of a & b

.isclose(a, b, *, rel_tol=1e-09, abs_tol=0.0) True if a & b are close, otherwise False, relative or abs tolerance

.isfinite(x) \rightarrow True if x not infinity or a NaN

.isinf(x) True if x is a positive or negative infinity

.isnan(x) \rightarrow True if x is a NaN (not a number), False otherwise.

[new 3.8] .isqrt(n) \rightarrow the integer square root of the nonnegative integer n. This is the floor of the exact square root of n, or equivalently the greatest integer such that $a^2 \leq n$. To compute the ceiling of the exact square root of n, a positive number, use $a = 1 + \text{isqrt}(n - 1)$.

.ldexp(x, i) \rightarrow $x * (2^{**i})$; inverse of **frexp()**

.modf(x) \rightarrow fractional and integer parts of x

.trunc(x) \rightarrow Real value of x truncated to integral

.exp(x) \rightarrow e^{**x} .

.expm1(x) \rightarrow $e^{**x} - 1$

.log(x[, base]) 1 argument, \rightarrow natural logarithm of

x (to base e). 2 arguments, \rightarrow the logarithm of x to

the given base, calculated as $\log(x)/\log(\text{base})$.

.log1p(x) \rightarrow the natural logarithm of $1+x$ (base e).

accurate for x near zero

.log2(x) \rightarrow the base-2 logarithm of x

.log10(x) \rightarrow base 10 log of x

.pow(x,y) \rightarrow x raised to y

.sqrt(x) \rightarrow square root of x

Trigonometric Functions: **.radians** **.atan2(y,x)**

.hypot(x,y) \rightarrow $\sqrt{x^2 + y^2}$ **.acos(x)** **.asin(x)**

.atan(x) **.cos(x)** **.sin(x)** **.tan(x)**

.degrees(x) angle from radians to degrees

.radians(x) angle from degrees to radians

Hyperbolic Functions: **.radians**

.acosh(x) \rightarrow the inverse hyperbolic cosine of x

.asinh(x) \rightarrow the inverse hyperbolic sine of x

.atanh(x) \rightarrow the inverse hyperbolic tangent of x

.cosh(x) \rightarrow the hyperbolic cosine of x

.sinh(x) \rightarrow the hyperbolic sine of x

.tanh(x) \rightarrow the hyperbolic tangent of x

Constants:

math.pi $\pi = 3.141592...$ **math.e** $e = 2.718281...$

math.nan A floating-point "not a number" (NaN)

[New 3.6] math.tau $\tau = 6.283185...$

[New 3.5] math.inf A floating-point positive

infinity. (For negative infinity, use `-math.inf`.)

numbers - operations from abstract base

classes - four classes defined: `Complex` (compon-

ents: real, imaginary), `Real`, `Rational` (adds

numerator and denominator properties), `Integral`

os import `os` ****hundreds of functions, many**

os specific; a few universal

`.environ['HOME']` home directory,

`.chdir(path)` change working dir

`.getcwd()` current working dir

`.listdir(path)` `.mkdir(path)` `.mkdtemp(path)`

make all intermediate directories `.remove(path)`

`.strerror()` translate error code to message

`.curdir()` `.rename(src, dst)` `.rmdir(path)`

`.walk(start directory, topdown=True)` produces a

generator of filenames in a directory tree

`.system(command)` Unix and Windows, execute

the command in a subshell

os.path **Lib/posixpath or Lib/ntpath** (windows)

import `os.path` [as `ospl`]

.abspath(path) normalized absolutized version of

the pathname path.

.basename(path) base name of pathname path.

.commonpath(paths) longest common sub-

path **.commonprefix(list)** \rightarrow the longest prefix

.dirname(path) \rightarrow directory name of path

.expandvars(path) \rightarrow environment variables expanded

.exists(path) \rightarrow True if path exists

.getsize(path) \rightarrow n the size, in bytes, of path.

.isabs(path) \rightarrow True if path is absolute pathname

.isfile(path) \rightarrow True if path is existing file

.isdir(path) \rightarrow True if path is existing directory

.islink(path) \rightarrow True if ref is an existing directory

.join(path, *paths) Join one or more path

components intelligently.

.normcase(path) Normalize case of a pathname

.normpath(path) On Windows, converts forward

slashes / to backward slashes \.

.relpath(path, start=os.curdir) \rightarrow relative filepath

from the current directory or an optional start

.samefile(path1, path2) \rightarrow True if both pathname

arguments refer to the same file or directory.

.sameopenfile(fp1, fp2) \rightarrow True if the same

.samestat(stat1, stat2) Return True if the stat

tuples stat1 and stat2 refer to the same file.

.split(path) Split path into a pair, (head, tail)

pathlib (3.5) from `pathlib` import `Path` [as `pt`]

(For `PurePath` objects see online documentation.)

For MOST of the following concrete **methods** use:

.cwd() ex: `my_current_dir = pt.cwd()`; **.home()**

For a user defined file the following functions

require that the file variable first be instantiated

with the `Path` class; i.e., for "myfile" holding

"C:\temp.txt": `test_file = pt(myfile)`, then, **pt.exists**

(`test_file`) is noted just as: **.exists(test_file)**

is_dir(test_dir) **.is_file(test_file)**

*****.glob**—in our testing **.glob** does NOT work

outside the **sorted()** wrapper:

`print(sorted(p.glob(test_file, "*.py")))`

.iterdir() - creates an iterator; for directory x:

for dir in `x.iterdir()`: `print(dir)`

.mkdir (`mode=0o777`, `parents=False`,

`exist_ok=False`) create new directory F

.open (`mode='r'`, `buffering=-1`, `encoding=None`,

`errors=None`, `newline=None`)

.read_text(); **.rename(target)**; **.rmdir()** - remove

empty directory (**file_path.resolve**

(**strict=False**) - make absolute path

.write_text (`data`, `encoding=None`, `errors=None`) -

open, write, close - all in one fell swoop

pickle import `pickle` - non-human-readable

object serialization (**json** is text strings only)

.dump (`obj`, `file`, `protocol=None`, `*, fix_imports=True`,

`buffer_callback=None`)

.dumps (`obj`, `protocol=None`, `*, fix_imports=True`,

`buffer_callback=None`)

.load (`file`, `*, fix_imports=True`, `encoding="ASCII"`,

`errors="strict"`, `buffers=None`)

.loads (`data`, `*, fix_imports=True`,

`encoding="ASCII"`, `errors="strict"`, `buffers=None`)

platform import `platform`

.machine() \rightarrow machine type

.node() \rightarrow network name

.processor() \rightarrow real processor name

.python_version \rightarrow version as string

.system() \rightarrow 'Linux', 'Darwin', 'Java', 'Windows'

pprint import `pprint`

allows output of objects, including objects holding

other objects in a reasonably readable format.

Begin by creating an instance: (assume "mylist")

`pp = pprint.PrettyPrinter(indent=3)` set indent

then use your instance ("pp" above) to output:

`pp.pprint(mylist)`

some `PrettyPrinter` objects new/changed in [3.8]

`.pformat(obj)`, `.pprint(obj)`, `pp.isreadable(obj)`, more

ex: `print(pp.isreadable(mylist))`

py_compile.py import `py_compile`

.compile(file) - the compiled file is placed on file

path in added directory `'/_pycache/'`

random import `random`

only for non-cryptographic applications

.seed initialize the random number generator

.getstate() ret object with internal generator state

.setstate() restores internal state to getstate value

.getrandbits(k) ret integer with k random bits

For integers:

.randrange(stop) **.randrange(start, stop[, step])**

.randint(a, b) `fileinput.filename()` a random

integer N such that $a \leq N \leq b$. Alias

for randrange(a, b+1).

For sequences:

.choice(sequence) \rightarrow random element
.shuffle(x[, random]) shuffle sequence in place
.random() \rightarrow the next random floating point number in the range (0.0, 1.0).

.uniform(a, b) \rightarrow fp between a and b

re import re complex search and match

re.**search**(pattern, string, flags=0)

re.**match**(pattern, string, flags=0)

re.**ignorecase**

shutil import shutil

.copyfileobj(fsrc, fdst[, length])

.copyfile(src, dst, *, follow_symlinks=True)

.copymode(src, dst, *, follow_symlinks=True)

Copy the permission bits from src to dst.

.copystat(src, dst, *, follow_symlinks=True)

Copy the permission bits, last access time, last

modification time, and flags from src to dst

.copy(src, dst, *, follow_symlinks=True)

Copies the file src to the file or directory dst. src and dst should be strings.

.copy2(src, dst, *, follow_symlinks=True)

copy2() also attempts to preserve file metadata

.copytree(src, dst, symlinks=False, ignore=None,

copy_function=copy2, ignore_dangling_symlinks=False, dirs_exist_ok=False)

.disk_usage(path) \rightarrow disk usage stats as tuple (total, used and free) in bytes—a file or a directory

Sound if your objective is to play a sound using a

Python Standard Library module save your time -

none of the modules listed under Multimedia

Services do that. SEE: PyPi — **playsound**

sqlite3 import sqlite3

initialize using the Connection cursor() object:

conn = sqlite3.connect("database_name.db")

use special name :memory to create in RAM

cur = conn.cursor() #create cursor object,

connection objects: cursor(), commit(),

rollback(), close(), execute(), executemany(),

backup(),executescript(), create_function(),

iterdump(), create_aggregate()

cursor objects: execute(), executemany(),

executescript(), fetchone(), fetchmany(), fetchall()

or close()

row objects: keys()

statistics import statistics

.mean(data) average

.harmonic_mean(data) harmonic mean

.median(data) middle value

.median_low(data) low middle value

.median_high(data) high middle value

.median_grouped(data) 50th percentile

.mode(data) most common

.pstdev(data,mu=None) population std dev

.pvariance(data,mu=None) pop variance

.stdev(data, xbar=None) sample std dev

.variance(data, xbar=None) sample variance

more...extensive normal distribution functions

string

string.ascii_letters,

string.ascii_lowercase string.ascii_uppercase

string.digits string.hexdigits

string.octdigits string.punctuation

string.printable string.whitespace

string.capwords(str, sep=None)

sys import sys mostly advanced functions

.exit([arg]) - exit python

.getwindowsversion()

.path - search paths list

.version - Python version #

tarfile import tarfile extensive archive

including gzip, bz2 and lzma compression

ex: (assumes import tarfile - to extract to cwd)

tar = tarfile.open("sample.tar.gz")

tar.extractall()

tar.close()

textwrap import textwrap

textwrap.**wrap**(text,width=x,**kwargs)Lib/Lib/

time import time or from time import

a new user must understand terminology found at:

<https://docs.python.org/3.8/library/time.html>

print(time.time()) #seconds since the epoch

\rightarrow 1596486146.111275

mytime = time.time() #capture it

print(time.localtime(mytime)) #demo the tuple

\rightarrow time.struct_time(tm_year=2020,

tm_mon=8, tm_mday=3, tm_hour=16, tm_min=22,

tm_sec=26, tm_wday=0, tm_yday=216,

tm_isdst=1)

time_tuple=time.localtime(mytime) #capture it

print("The hour is: " + str(time_tuple[3])) #demo

\rightarrow The hour is: 16

print(time.strftime("%a, %d %b %Y %H:%M:%S

+0000", time.gmtime()))

\rightarrow Mon, 03 Aug 2020 20:22:26 +0000

seconds=5 ; print("Wait 5 seconds!")

time.sleep(seconds) # delay of five seconds

print(time.asctime(time.localtime()))

\rightarrow Mon Aug 3 16:22:31 2020

print(time.ctime(mytime))

\rightarrow Mon Aug 3 16:22:26 2020

tkinter from tkinter import *

**there is a 10 page tkinter toolbox available to

review at www.wikipython.com with a link to a

free download on GitHub

wave import wave

.open(file, mode=None) If file is a string, open

the file by that name, otherwise treat it as a file-like

object. mode can be: 'rb' (read), 'wb' (write) ex:

with wave.open("D:\alooop.wav", "rb") as tstfile:

print(tstfile.getnframes()) # length in frames

once an object is returned by open(),

wave_read objects have these methods:

.close() i.e., object.close **.getnchannels**()

.getsampwidth() **.getframerate**() **.getnframes**(n)

.readframes(n) **.rewind**()

wave_write objects have these methods:

.close() Make sure nframes is correct

.setnchannels(n) **.setsampwidth**(n) -

.setframerate(n) **.setnframes**(n) Set frames to n.

.setparams(tuple) tuple should be (nchannels,

sampwidth, framerate, nframes, comptype,

comptime), with values valid for the set*()

methods. Sets all parameters.

.tell() Return current position in the file

.writeframesraw(data) Write audio frames,

without correcting nframes.¶

A Few PyPi Modules <https://pypi.org>

Anaconda, Conda, MiniConda - 3 related

programs offering environment management at

different levels. **Anaconda** manages all variations

and compatibility issues unavoidable with many

modules. Over 300 applications come "installed" in

the base (root) environment, with thousands

available. **Installation(s) can be huge.** It qualifies

as a language within itself. Numerous IDEs are

available in any Anaconda environment including

Spyder, Visual Studio Code, IDLE, Jupyter

Notebooks ... more. **Miniconda** is a lightweight

version. **Conda** is similar to pip but is also an

environment manager.

NumPy - powerful N-dimension array objects

NumPy says installation works best with a prebuilt

package, see: <https://scipy.org/install.html> where

they suggest a "scientific distribution" but do give

pip directions: python -m pip install --user numpy

scipy matplotlib ipython jupyter pandas sympy

nose obviously adding a whole bunch of other

modules but violating the best advice of Jonathan

Helmus at Anaconda: "avoid all 'users' installs."

so... with conda: from the Anaconda prompt

type: conda install numpy (did not test this)

with pip: python -m pip install numpy (worked ok)

import numpy as np

.array([elements list][element list][...])

.zeros(# of 0 elements)

.ones(# of 1 elements)

.empty(# of elements, values are random)

.arange(# of elements) np.arange(5) \rightarrow ([0,1,2,3,4])

.linspace(start, stop, # of elements) <-linearly

spaced: **.linspace**(2,10,5) \rightarrow ([2,4,6,8,10])

dtype - default datatype is fp, but can specify with

dtype: xarray = np.ones(3, dtype=np.int)

np.sort(array variable)

.ndim the # of axes/dimensions, of the array

.size the total number of elements of the array

.shape a tuple of integers indicating # of elements

in each dimension

one zillion more functions

*For Raspberry Pi Aficionados

Rpi.GPIO - module to control Raspberry Pi

GPIO channels; see GPIO toolbox and download

link at: www.wikipython.com

Pillow - by Alex Clark, updated Aug 2020, a friendly

version of Fredrik Lundh's **Python Imaging Library**

Pillow version 7.2 works in Python 3.5 to 3.8

install: python3 -m pip install --upgrade Pillow

from PIL import Image

im = Image.open(testfilepath)

print(im.format, im.size, im.mode)

im.show()

playsound is a cross platform program pulled

from PyPi that is very easy to use. From windows:

python -m pip install playsound for example:

from playsound import playsound

testwave = "C:\\Windows\\Media\\Alarm09.wav"

playsound(testwave)

Poetry is a smaller more efficient way to manage

dependencies for 3.4+ but it's a little complicated.

Start with: <https://pypi.org/project/poetry/>

pandas for tabular data — "aims to be the funda-

mental" module for "real world data analysis" - it is

part of the Anaconda distribution (also installs with

Miniconda) but can be installed with pip:

pip install pandas then import pandas as pd

tables are **DataFrame**(s) and columns are **Series**

see the docs @: <https://pandas.pydata.org/>

finance) import yfinance as yf

*NOTE—a few functions no longer work

create stock instance with **.Ticker**(stock symbol)

ex: jnj = yf.Ticker("JNJ") i.e.[Johnson & Johnson]

.history(period="short cut symbol") valid periods

1d,5d,1mo,3mo,6mo,1y,2y,5y,10y,ytd,max or

.history(start="yyyy-mm-dd", end="yyyy-mm-dd")

.actions - dividends, splits

.dividends or **.splits** - show dividends or splits

.financials or **.quarterly_financials**

.major_holders **.institutional_holders**

.calendar **.recommendations**

plotly.express and **Kaleido** - **plotly.express**

is built-in to the **plotly** library and is considered a

"starting point" but may be all you ever need. *Plotly*

is an MIT Licensed module. **plotly.express** requires a

determined effort to learn because it creates more

than 35 types of graph images. It does **not** export

your graph as a static image—which is why you

need **Kaleido**. plotly has many dependencies,

kaleido has none. pip install kaleido.

What is not mentioned in this General Toolbox?

About 99.83% of Python capability now available

has no mention in this toolbox. Happy Coding!

Can methods of your favorite

module be briefly summarized?

Please send your suggestion(s)!

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