Python 3 Cheat Sheet

Base Types

integer, float, boolean, string, bytes

int 783 0 -192 0b010 0o642 0xF3

zero binary octal hexa

float 9.23 0.0 -1.7e-6

bool True False ×10-6

str "One\nTwo"

escaped new line

Multiline string:

"""X\tY\tZ
1\t2\t3"""

'I\'m'

escaped '

escaped tab

bytes b"toto\xfe\775"

hexadecimal octal

☝ *immutables*

Container Types

- **ordered sequences**, fast index access, repeatable values

list [1,5,9] ["x",11,8.9] ["mot"] [] (1,5,9) 11,"y",7.4 ("mot",) ()

tuple *tuple*

Non modifiable values (immutables) ☝ *expression with only comas →*

str bytes *(ordered sequences of chars / bytes)* b""

- **key containers**, no *a priori* order, fast key access, each key is unique

dictionary dict {"key":"value"} dict(a=3,b=4,k="v") {}

(key/value associations) {1:" one ",3:"three",2:"two",3.14:"π"}

collection set {"key1","key2"} {1,9,3,0} set()

☝ *keys=hashable values (base types, immutables…)*

frozenset *immutable set* *empty*

Identifiers

for variables, functions, modules, classes… names

a…zA…Z_ followed by a…zA…Z_0…9

- ☐ diacritics allowed but should be avoided
- ☐ language keywords forbidden
- ☐ lower/UPPER case discrimination

☺ a toto x7 y_max BigOne

☹ 8y and for

Variables assignment

=

☝ assignment ⇔ **binding** of a *name* with a *value*

1) evaluation of right side expression value

2) assignment in order with left side names

x=1.2+8+sin(y)

a=b=c=0 *assignment to same value*

y,z,r=9.2,-7.6,0 *multiple assignments*

a,b=b,a *values swap*

a,*b=seq
*a,b=seq *unpacking of sequence in item and list*

x+=3 *increment* ⇔ x=x+3 *= and

x-=2 *decrement* ⇔ x=x-2 /=

x=None *« undefined » constant value* %= …

del x *remove name* x

Conversions

int("15") → 15

type(*expression*)

int("3f",16) → 63 can specify integer number base in 2nd parameter

int(15.56) → 15 truncate decimal part

float("-11.24e8") → -1124000000.0

round(15.56,1) → 15.6 rounding to 1 decimal (0 decimal → integer number)

bool(x) False for null x, empty container x , None or False x ; True for other x

str(x) → "…" representation string of x for display *(cf. formatting on the back)*

chr(64) → '@' ord('@') → 64 code ↔ char

repr(x) → "…" *literal* representation string of x

bytes([72,9,64]) → b'H\t@'

list("abc") → ['a','b','c']

dict([(3,"three"),(1,"one")]) → {1:'one',3:'three'}

set(["one","two"]) → {'one','two'}

separator str and *sequence of* str → *assembled* str

':'.join(['toto','12','pswd']) → 'toto:12:pswd'

str *splitted on whitespaces* → list *of* str

"words with spaces".split() → ['words','with','spaces']

str *splitted on separator* str → list *of* str

"1,4,8,2".split(",") → ['1','4','8','2']

sequence of one type → list *of another type (via list comprehension)*

[int(x) for x in ('1','29','-3')] → [1,29,-3]

Sequence Containers Indexing

for lists, tuples, strings, bytes…

negative index	-5	-4	-3	-2	-1	
positive index	0	1	2	3	4	
	lst=[10,	20,	30,	40,	50]	
positive slice	0	1	2	3	4	5
negative slice	-5	-4	-3	-2	-1	

Items count

len(lst) → 5

☝ **index from 0**

(here from 0 to 4)

Individual access to **items** via lst[*index*]

lst[0] → 10 ⇒ *first one*

lst[1] → 20

lst[-1] → 50 ⇒ *last one*

lst[-2] → 40

*On mutable sequences (*list*), remove with* del lst[3] *and modify with assignment* lst[4]=25

Access to **sub-sequences** via lst[*start slice*:*end slice*:*step*]

lst[:-1] → [10,20,30,40] lst[::-1] → [50,40,30,20,10] lst[1:3] → [20,30] lst[:3] → [10,20,30]

lst[1:-1] → [20,30,40] lst[::-2] → [50,30,10] lst[-3:-1] → [30,40] lst[3:] → [40,50]

lst[::2] → [10,30,50] lst[:] → [10,20,30,40,50] *shallow copy of sequence*

*Missing slice indication → from start / up to end. On mutable sequences (*list*), remove with* del lst[3:5] *and modify with assignment* lst[1:4]=[15,25]

Boolean Logic

Comparisons : < > <= >= == !=

(boolean results) ≤ ≥ = ≠

a and b logical and *both simultaneously*

a or b logical or *one or other or both*

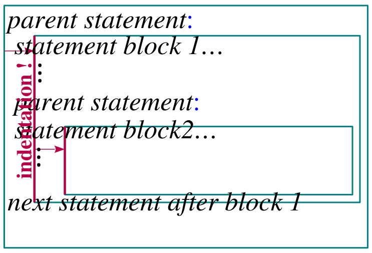
☝ pitfall : and *and* or *return value of* a *or of* b *(under shortcut evaluation).*

⇒ *ensure that* a *and* b *are booleans.*

not a logical not

True
False True and False constants

Statements Blocks



☝ *configure editor to insert 4 spaces in place of an indentation tab.*

Modules/Names Imports

module truc⇔*file* truc.py

from monmod import nom1,nom2 as fct →*direct access to names, renaming with* as

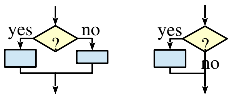
import monmod →*access via* monmod.nom1 …

☝ modules and packages searched in *python path (cf* sys.path*)*

Conditional Statement

statement block executed only if a condition is true

if *logical condition*:
→ *statements block*



Can go with several *elif*, *elif*... and only one final *else*. Only the block of first true condition is executed.

☝ *with a var x:*

if bool(x)==True: ⇔ if x:

if bool(x)==False: ⇔ if not x:

```
if age<=18:
  state="Kid"
elif age>65:
  state="Retired"
else:
  state="Active"
```

Maths

☝ *floating numbers… approximated values*

angles in radians

Operators: + - * / // % **

Priority (…) × ÷ ↑ ↑ a^b

integer ÷ ÷ remainder

@ → matrix × *python3.5+numpy*

(1+5.3)*2 → 12.6

abs(-3.2) → 3.2

round(3.57,1) → 3.6

pow(4,3) → 64.0

☝ *usual order of operations*

from math import sin,pi…

sin(pi/4) → 0.707…

cos(2*pi/3) → -0.4999…

sqrt(81) → 9.0 √

log(e**2) → 2.0

ceil(12.5) → 13

floor(12.5) → 12

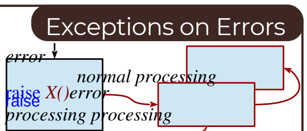
modules math, statistics, random, decimal, fractions, numpy, *etc. (cf. doc)*

Exceptions on Errors

Signaling an error:
raise *ExcClass(…)*

Errors processing:

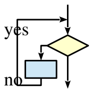
```
try:
    normal procesising block
except Exception as e:
    error processing block
```



☝ finally *block for final processing in all cases.*

Conditional Loop Statement

statements block executed ***as long as*** *condition is true*



```
while logical condition:
    statements block
```

beware of infinite loops!

```
s = 0
i = 1
```

initializations ***before*** *the loop*

condition with a least one variable value (here i)

```
while i <= 100:
 s = s + i**2
 i = i + 1
print("sum:",s)
```

☝ *make condition variable change !*

Algo:

$$s=\sum_{i=1}^{i=100} i^2$$

Loop Control

break *immediate exit*

continue *next iteration*

☝ else *block for* ***normal*** *loop exit.*

Display

```
print("v=",3,"cm :",x,",",y+4)
```

items to display : literal values, variables, expressions

print options:

- sep=" " items separator, default space
- end="\n" end of print, default new line
- file=sys.stdout print to file, default standard output

Input

```
s = input("Instructions:")
```

☝ input always returns a **string**, convert it to required type (cf. boxed *Conversions* on the other side).

Generic Operations on Containers

len(c) → items count

min(c) max(c) sum(c)

sorted(c) → list sorted copy

Note: For dictionaries and sets, these operations use ***keys*** *.*

val in c → boolean, membership operator in (absence not in)

enumerate(c) → *iterator* on (index, value)

zip(c1,c2…) → *iterator* on tuples containing ci items at same index

all(c) → True if all c items evaluated to true, else False

any(c) → True if at least one item of c evaluated true, else False

ordered sequences containers *(lists, tuples, strings, bytes…)*

reversed(c) → *inversed iterator*

c*5 → duplicate

c+c2 → concatenate

c.index(*val*) → *position*

c.count(*val*) → *events count*

Specific to

```
import copy
```

copy.copy(c) → shallow copy of container

copy.deepcopy(c) → deep copy of container

Operations on Lists

☝ modify original list

lst.append(*val*) add item at end

lst.extend(*seq*) add sequence of items at end

lst.insert(*idx*,*val*) insert item at index

lst.remove(*val*) remove first item with value *val*

lst.pop(*[idx]*)→*value* remove & return item at index *idx* (default last)

lst.sort() lst.reverse() sort / reverse list *in place*

Operations on Dictionaries

d[*key*]=*value*

d[*key*]→ *value*

d.clear()

del d[*key*]

d.update(*d2*) update/add associations

d.keys()

d.values()

d.items()

→iterable views on keys/values/associations

d.pop(*key[,default]*)→ *value*

d.popitem()→ *(key,value)*

d.get(*key[,default]*)→ *value*

d.setdefault(*key[,default]*) →*value*

Operations on Sets

Operators:

| → union (vertical bar char)

& → intersection

- ^ → difference/symmetric diff.

< <= > >= → inclusion relations

Operators also exist as methods.

s.update(*s2*) s.copy()

s.add(*key*) s.remove(*key*)

s.discard(*key*) s.clear()

s.pop()

Files

storing data on disk, and reading it back

```
f = open("file.txt","w",encoding="utf8")
```

file **variable** for operations

name of file on disk (+path…)

opening **mode**

- ☐ 'r' read
- ☐ 'w' write
- ☐ 'a' append

☐ …'+' 'x' 'b' 't'

encoding of chars for *text files*: utf8 ascii latin1 …

cf. modules os, os.path and pathlib

writing

f.write("coucou")

f.writelines(*list of lines*)

reading

f.read(*[n]*) → *next chars*

if n not specified, read up to end !

f.readlines(*[n]*) → *list of next lines*

f.readline() → *next line*

☝ *read empty string if end of file*

☝ *text mode t by default (read/write* str*), possible binary mode b (read/write* bytes*).* ***Convert from/to required type !***

f.close() ☝ dont forget to **close the file** after use !

f.flush() write cache

f.truncate(*[size]*) resize

reading/writing progress sequentially in the file, modifiable with:

f.tell()→*position*

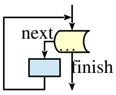
f.seek(*position[,origin]*)

Very common: opening with a guarded block (automatic closing) and reading loop on lines of a text file:

```
with open(…) as f:
    for line in f :
        # processing ofline
```

Iterative Loop Statement

statements block executed ***for each*** *item of a container or iterator*



```
for var in sequence:
    statements block
```

Go over sequence's **values**

```
s = "Some text"
cnt = 0
```

initializations ***before*** *the loop*

loop variable, ***assignment managed by*** for ***statement***

```
for c in s:
 if c == "e":
 cnt = cnt + 1
print("found",cnt,"'e'")
```

Algo: count number of e *in the string.*

loop on dict/set ⇔ loop on keys sequences

use *slices* to loop on a subset of a sequence

Go over sequence's **index**

- ☐ modify item at index
- ☐ access items around index (before / after)

```
lst = [11,18,9,12,23,4,17]
lost = []
for idx in range(len(lst)):
 val = lst[idx]
 if val > 15:
 lost.append(val)
 lst[idx] = 15
print("modif:",lst,"- los t:" ,lo st)
```

Algo: limit values greater than 15, memorizing of lost values.

☜ good habit : don't modify loop variable

Go simultaneously over sequence's **index** and **values**:

```
for idx,val in enumerate(lst):
```

Integer Sequences

range(*[start,] end [,step]*)

☝ *start* default 0, *end* not included in sequence, *step* signed, default 1

range(5) → 0 1 2 3 4

range(2,12,3) → 2 5 8 11

range(3,8) → 3 4 5 6 7

range(20,5,-5) → 20 15 10

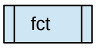
range(len(*seq*)) → *sequence of index of values in seq*

☝ *range provides an immutable sequence of int constructed as needed*

Function Definition

function name (identifier)

named parameters



```
def fct(x,y,z):
 """documentation"""
 # statements block, res computation, etc.
 return res
```

result value of the call, if no computed result to return: return None

☝ parameters and all variables of this block exist only *in* the block and *during* the function call (think of a "black box")

Advanced: def fct(x,y,z,*args,a=3,b=5,**kwargs):

**args variable positional arguments (→tuple), default values,*

***kwargs variable named arguments (→dict)*

```
r = fct(3,i+2,2*i)
```

storage/use of returned value

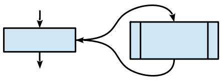
one argument per parameter

☝ this is the use of function name with parentheses which does the call

Advanced: fct() fct

**sequence*

***dict*



Operations on Strings

s.startswith(*prefix[,start[,end]]*)

s.endswith(*suffix[,start[,end]]*) s.strip(*[chars]*)

s.count(*sub[,start[,end]]*) s.partition(*sep*)→ *(before,sep,after)*

s.index(*sub[,start[,end]]*) s.find(*sub[,start[,end]]*)

s.is…() *tests on chars categories (ex.* s.isalpha()*)*

s.upper() s.lower() s.title() s.swapcase()

s.casefold() s.capitalize() s.center(*[width,fill]*)

s.ljust(*[width,fill]*) s.rjust(*[width,fill]*) s.zfill(*[width]*)

s.encode(*encoding*) s.split(*[sep]*) s.join(*seq*)

Formatting

formating directives

values to format

```
"modele{} {} {}".format(x,y,r) → str
"{selection:formatting!conversion}"
```

☐ **Selection** :

2

nom

0.nom

4[key]

0[2]

Examples

```
"{:+2.3f}".format(45.72793)
→'+45.728'
"{1:>10s}".format(8,"toto")
→'      toto'
"{x!r}".format(x="I'm")
→'"I\'m"'
```

☐ **Formatting** :

fill char alignment sign mini width.precision~maxwidth type

< > ^ = + - *space* 0 at start for filling with 0

integer: b binary, c char, d decimal (default), o octal, x or X hexa…

float: e or E exponential, f or F fixed point, g or G appropriate (default), % percent

string: s …

☐ **Conversion** : s (readable text) or r (literal representation)