Python 3 Cheat Sheet

Official Python documentation on http://docs.python.org/py3k

Base Types

integer, float, boolean, string

```
  int  783   0   -192
float  9.23  0.0  -1.7e-6
 bool  True  False
  str  "One\nTwo"   'I\'m'
```

10^{-6} (e-6)

new line (\n) — ' escaped (\')

multiline
```
"""X\tY\tZ
1\t2\t3"""
```
tab char (\t)

immutable, ordered sequence of chars (str)

Container Types

▪ ordered sequence, fast index access, repeatable values

```
 list  [1,5,9]   ["x",11,8.9]   ["word"]    []
tuple  (1,5,9)    11,"y",7.4    ("word",)   ()
```

immutable (tuple) — expression with just comas (11,"y",7.4)

immutable → `str` as an ordered sequence of chars

▪ no *a priori* order, unique key, fast key access ; keys = base types or tuples

```
dict {"key":"value"}                                   {}
     {1:"one",3:"three",2:"two",3.14:"π"}
```

dictionary — *key/value associations*

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

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`~~

Variables assignment

```
x = 1.2+8+sin(0)
```

$\underbrace{\texttt{1.2+8+sin(0)}}_{\text{value or calculation expression}}$

x: variable name (identifier)

```
y,z,r = 9.2,-7.6,"bad"
```

y,z,r: variables names — 9.2,-7.6,"bad": container with several values (here a tuple)

`x+=3` ← increment

decrement → `x-=2`

`x=None` « undefined » constant value

Conversions

`type(`*expression*`)`

`int("15")` can specify integer number base in 2nd parameter

`int(15.56)` truncate decimal part (`round(15.56)` for rounded integer)

`float("-11.24e8")`

`str(78.3)` and for litteral representation ⟶ `repr("Text")`

see other side for string formating allowing finer control

`bool` ⟶ use comparators (with `==`, `!=`, `<`, `>`, …), logical boolean result

`list("abc")` —*use each element from sequence*⟶ `['a','b','c']`

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

`set(["one","two"])` —*use each element from sequence*⟶ `{'one','two'}`

`":".join(['toto','12','pswd'])` ⟶ `'toto:12:pswd'`

`":"`: joining string — `['toto','12','pswd']`: sequence of strings

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

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

`","`: splitting string

Sequences indexing

for lists, tuples, strings, …

```
negative index   -6    -5     -4      -3     -2     -1
positive index    0     1      2       3      4      5
         lst=[11,   67,  "abc",  3.14,   42,  1968]
positive slice  0    1     2       3      4     5      6
negative slice -6   -5    -4      -3     -2    -1
```

```
lst[:-1]→[11,67,"abc",3.14,42]
lst[1:-1]→[67,"abc",3.14,42]
lst[::2]→[11,"abc",42]
lst[:]→[11,67,"abc",3.14,42,1968]
```

`len(lst)` ⟶ 6

individual access to items via `[`*index*`]`

```
lst[1]→67      lst[0]→11     first one
lst[-2]→42     lst[-1]→1968  last one
```

access to sub-sequences via `[`*start slice*`:`*end slice*`:`*step*`]`

```
lst[1:3]→[67,"abc"]
lst[-3:-1]→[3.14,42]
lst[:3]→[11,67,"abc"]
lst[4:]→[42,1968]
```

Missing slice indication → from start / up to end.

On mutable sequences, usable to remove `del lst[3:5]` *and to modify with assignment* `lst[1:4]=['hop',9]`

Boolean Logic

Comparators: `< > <= >= == !=`
≤ ≥ = ≠

`a and b` logical and
both simultaneously

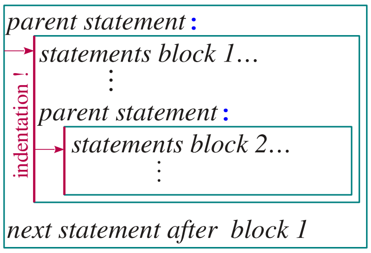
`a or b` logical or
one or other or both

`not a` logical not

`True` true constant value

`False` false constant value

Statements Blocks



parent statement`:`
statements block 1…
⋮
parent statement`:`
statements block 2…
⋮
next statement after block 1

Conditional Statement

statements block executed only if a condition is true

`if` *logical expression*`:`
→ *statements block*

can go with several elif, elif... and only one final else, example :

```
if x==42:
    # block if logical expression x==42 is true
    print("real truth")
elif x>0:
    # else block if logical expression x>0 is true
    print("be positive")
elif bFinished:
    # else block if boolean variable bFinished is true
    print("how, finished")
else:
    # else block for other cases
    print("when it's not")
```

Maths

☝ *floating point numbers… approximated values!* — *angles in radians*

Operators: `+ - * / // % **`
× ÷ (for * /) — integer ÷ (//) — ÷ remainder (%) — a^b (**)

```
(1+5.3)*2→12.6
abs(-3.2)→3.2
round(3.57,1)→3.6
```

```
from math import sin,pi…
sin(pi/4)→0.707…
cos(2*pi/3)→-0.4999…
acos(0.5)→1.0471…
sqrt(81)→9.0      √
log(e**2)→2.0
```

etc. (cf doc)

Conditional loop statement

statements block executed as long as condition is true

```
while logical expression:
    statements block
```

```
s = 0
i = 1
```
initializations **before** the loop

condition with at least one variable value (here **i***)*

```
while i <= 100:
    # statement executed as long as i ≤ 100
    s = s + i**2
    i = i + 1
```
☝ *make condition variable change*

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

```
print("sum:",s)
```
computed result after the loop

☝ *be careful of inifinite loops !*

Loop control

`break` *immediat exit*

`continue` *next iteration*

Display / Input

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

items to display: litteral values, variables, expressions

`print` options:

- □ `sep=" "` (items separator, default space)
- □ `end="\n"` (end of print, default new line)
- □ `file=f` (print to file, default standard output)

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

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

Operations on containers

`len(c)` → items count

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

`sorted(c)` → sorted copy

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

```
for idx,val in enumerate(c):
    statements block
```
Boucle directe sur index et valeur en même temps

`val in c` → boolean, membersihp operator `in` (absence `not in`)

Special for ***sequence containeurs*** *(lists, tuples, strings) :*

`reversed(c)`→ reverse *iterator* `c*5` → duplicate `c+c2` → concatenate

`c.index(val)` → position `c.count(val)`→ events count

Operations on lists

☝ modify original list

`lst.append(item)`	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
`lst.pop(idx)`	remove item at index and return its value
`lst.sort()` `lst.reverse()`	sort / reverse list *in place*

Operations on dictionaries

`d[`*key*`]=`*value* `d.clear()`

`d[`*key*`]`→*value* `del d[`*clé*`]`

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

`d.keys()`
`d.values()`
`d.items()`
views on keys, values associations

`d.pop(`*clé*`)`

Operations on sets

Operators:

`|` → union (vertical bar char)

`&` → intersection

`-` `^` → difference/symetric diff

`<` `<=` `>` `>=` → inclusion relations

`s.update(s2)`

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

`s.discard(`*key*`)`

Files

storing data on disk, and reading it back

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

file variable for operations

name of file on disk (+path…)

opening **mode**
- □ `'r'` read
- □ `'w'` write
- □ `'a'` append…

encoding of chars for text files:
`uft8` `ascii` `latin1` …

cf functions in modules `os` and `os.path`

writing

```
f.write("hello")
```

☝ *text file → read /write only* ***strings****, convert from/to required type.*

reading

```
s = f.read(4)
```
empty string if end of file

if char count not specified, read whole file

read next line

```
s = f.readline()
```

```
f.close()
```
☝ don't forget to close file after use

Pythonic automatic close : `with f as open(…):`

very common: iterative loop reading lines of a text file

```
for line in f :
    # line processing block
```

Iterative loop statement

statements block executed for each item of a sequence of values or an iterator

```
for variable in sequence:
    statements block
```

Go over sequence's **values**

```
s = "Some text"
cnt = 0
```
initializations ***before*** *the loop*

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

```
for c in s:
    if c == "e":
        cnt = cnt + 1
print("found",cnt,"'e'")
```
Count number of ***e*** *in the string*

loop on dict/set = loop on sequence of keys

use slices to go over a subset of the 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,"-lost:",lost)
```
Limit values greater than 15, memorization of lost values.

Generator of int sequences

frequently used in ***for*** *iterative loops*

default 0 / not included

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

```
range(5)        → 0 1 2 3 4
range(3,8)      → 3 4 5 6 7
range(2,12,3)   →   2 5 8 11
```

`range` returns a « generator », converts it to list to see the values, example:

`print(list(range(4)))`

Function definition

function name (identifier)

named parameters

```
def fctname(p_x,p_y,p_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 of this bloc only exist *in* the block and *during* the function call *("black box")*

Function call

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

one argument per parameter

retrieve returned result (if necessary)

Strings formating

formating directives / values to format

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

□ **Selection** :

```
2
x
0.nom
4[key]
0[2]
```

Examples

```
"{:+2.3f}".format(45.7273)
→'+45.727'
"{1:>10s}".format(8,"toto")
→'      toto'
"{!r}".format("I'm")
→'"I\'m"'
```

□ **Formating** :

fillchar *alignment* *sign* *minwidth*.*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` (litteral representation)