

## 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
str "One\nTwo"
  escaped new line
  'I\'m'
  escaped '
bytes b"toto\xfe\775"
      hexadecimal octal
```

Multiline string:  
"""X\tY\tZ  
1\t2\t3"""  
escaped tab

⚡ immutables

## Container Types

- ordered sequences, fast index access, repeatable values
  - list** [1, 5, 9] ["x", 11, 8.9] ["mot"]
  - tuple** (1, 5, 9) 11, "y", 7.4 ("mot", )

Non modifiable values (immutables) ⚡ expression with only commas → tuple
- key containers, no a priori order, fast key access, each key is unique
  - dict** {"key": "value"} dict(a=3, b=4, k="v")
  - (key/value associations) {1: "one", 3: "three", 2: "two", 3.14: "pi"}
  - 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

- evaluation of right side expression value
- 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 unpacking of sequence in
*a, b=seq item and list
x+=3 increment ⇔ x=x+3
x-=2 decrement ⇔ x=x-2
x=None « undefined » constant value
del x remove name x
```

## Conversions

**type** (expression)

can specify integer number base in 2<sup>nd</sup> parameter

```
int("15") → 15
int("3f", 16) → 63
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: -1] → [20, 30, 40]
lst[: 2] → [10, 30, 50]
lst[1: 3] → [20, 30]
lst[-3: -1] → [30, 40]
lst[3: ] → [40, 50]
```

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

```
parent statement:
├── statement block 1...
├── ...
└── statement block 2...
    ├── ...
    └── ...
next statement after block 1
```

⚡ 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.

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

⚡ with a var **x**:  
if bool(x) == True: ⇔ if x:  
if bool(x) == False: ⇔ if not x:

## Maths

floating numbers... approximated values

Operators: + - \* / // % \*\*

Priority (...)

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

angles in radians

```
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 processing block  
**except Exception as e:**  
→ error processing block

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

```
normal
raise X()
error processing
error
raise
```

