



PyQB

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Assignment
Basic operations

Programming in Python¹

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Lecture II: Control structures

Assignment



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This is the fundamental statement for imperative programming:

- A **name**, known as **variable**, is needed to refer to objects.

```
professor = "Mattia"
```

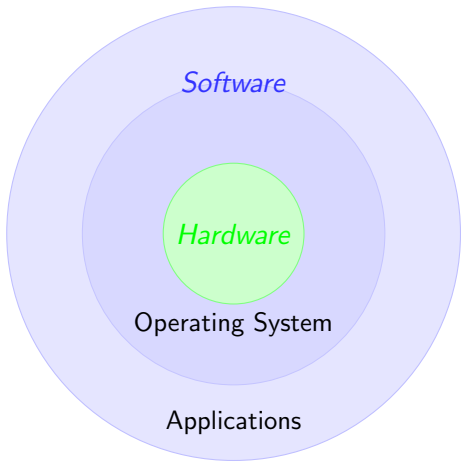
- = **is not symmetrical**, read it as **becomes**: Left-hand-side is always a variable, right-hand-side is an object, that can be either a **literal** or anything referred by another variable.

- A variable can change its value with another, following, assignment. Thus, the same variable may refer to different objects.

```
professor = "Violetta"
```

- Basic objects (numbers, strings, Boolean values) are **immutable** (the variable change, not the object; different objects have always different identity)
- **Tracking** a program means to track the values of all the variables of a program during its execution.

The onion model



- Operating System: it is the only program interpreted directly by the hardware; other pieces of software get interpreted by the virtual machine provided by it.
- Applications: programs (e.g., the python interpreter or python programs) executed within the protected environment created by the operating system.

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Basic operations

- **Binary operators:** $5 + 2$, they compute a new object by using the two objects on which they apply;
- **Unary operators:** $-(-5)$;
- **Functions:** `max`, they compute a new object by using an arbitrary number of objects (in general 0–..., `max` takes at least 1) **passed** as **parameters** (or **arguments**) when the function is **called** (`max(3, 6, something_else)`); sometimes the object computed is `None`;
- Syntactically appear as functions, but *commands* like `print("Hello!")` are actually used to request **side effects** in the executing environment.

Documentazione ufficiale di Python (3.9)

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Different approaches



Problem: exchange the name of two objects (Chapter 1, last exercise).

- Know the basic syntax of **variables** and **assignment** =
- Know the semantics of what you write: assigning an object to a variable delete any previous assignment;

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Different approaches



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- Natural strategy: use a temporary name to “save” the value during the exchange;

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- Natural strategy: use a temporary name to “save” the value during the exchange;
- “Fox” strategy: know language or library tricks For example Python has a “multiple assignment” construct $x, y = y, x$, or a special library function `swap(x, y)` could exist;

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Different approaches

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- Know the semantics of what you write: assigning an object to a variable delete any previous assignment;
- Natural strategy: use a temporary name to “save” the value during the exchange;
- “Fox” strategy: know language or library tricks For example Python has a “multiple assignment” construct $x, y = y, x$, or a special library function `swap(x, y)` could exist;
- “Hedgehog” strategy: study the problem in depth, e.g., if objects are numbers you can exploit arithmetic.

$$x = x + y$$

$$y = x - y$$

$$x = x - y$$

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Basic types

`bool` `False`, `True` Logical operations

`int` 1, -33, 1_000_000_000 ... Arithmetic operations, no upper or lower limit

`float` 1.0, .1, 1.2e34 ... Arithmetic operations, limited but you have `float('infinity')` (and `float('nan')`)

```
sys.float_info(max=1.7976931348623157e+308,
               ↪ , max_exp=1024, max_10_exp=308,
               ↪ min=2.2250738585072014e-308,
               ↪ min_exp=-1021, min_10_exp=-307,
               ↪ dig=15, mant_dig=53,
               ↪ epsilon=2.220446049250313e-16,
               ↪ radix=2, rounds=1)
```

`str` `'aaaa\nthis is on a new line'`,
`"bbb'b\"b"` ... Concatenation, alphabetical ordering, replication, ...

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