§1 Data Type

†a Object

Python is an **object-oriented** programing language. Everything is an **object** in Python:

$$\text{object} = \begin{cases} \text{identity}, \\ \text{type / class}, \\ \text{value / state}, \\ \text{methods / behaviors / operations}. \end{cases}$$

```
# print the identity, type, and the value for 4
print(id(4),type(4),4)
# type of any type is a type, the type itself is a type
print(type(type(4)))
print(type(type(type(4))))
```

```
140711773227544 <class 'int'> 4
<class 'type'>
<class 'type'>
```

• **Identity**: it guarantees that different objects have distinct identities at any given time.
• **Type**: objects of the same type support the same operations, and share the same properties.

†b String

†c Numeric

The following are numeric types:

$$\text{bool} \subset \text{int} \subset \text{float} \subset \text{complex}$$

```
# an example for the above data types
print(True,1,1.0,1+0j)
```

```
True 1 1.0 (1+0j)
```

§1.1 ***Lemma:***
If $f \in \{\text{bool}, \text{int}, \text{float}\}$