Data Structures

ICDF 2021 PYTHON CLASS

2021-11-20
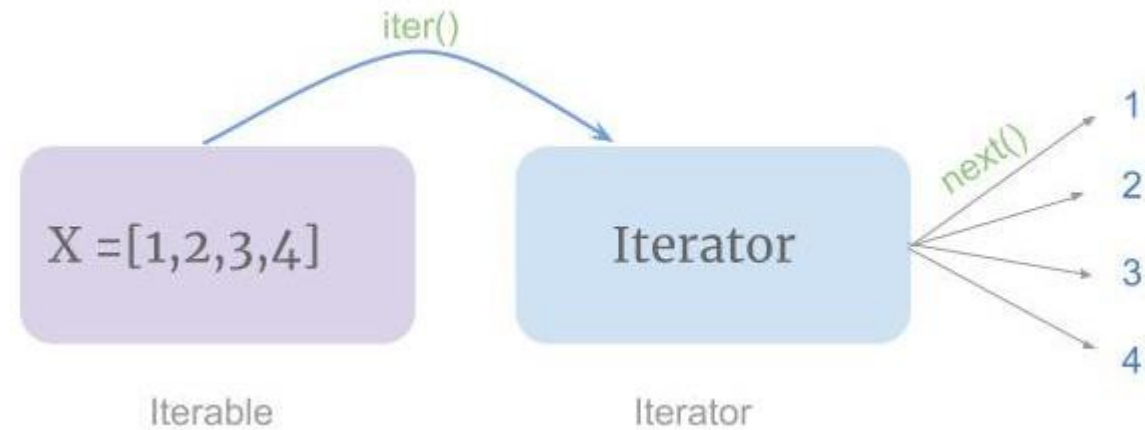
Content

- Lists and Tuples.

- Dictionaries.

- NumPy Arrays.

- N-dimensional arrays methods.

- Conditions.

- Loops.

Iterable Objects

- Return items one at a time.

- Can support indexing.
  - Lists
  - Tuples
  - Dictionaries
  - Arrays
  - Strings

Built-in Functions for Iterables

sum()

sorted()

reversed()

any()

all()
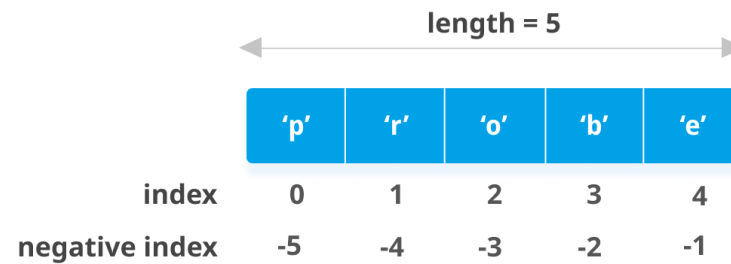
max()

min()

enumerate()**

zip()**

Lists vs. Tuples

Lists:

- Collection of items.

- Ordered.

- **Mutable:**
  - Change items.
  - Add items.
  - Remove items.

- Allows duplicates.

length = 5

'p'	'r'	'o'	'b'	'e'

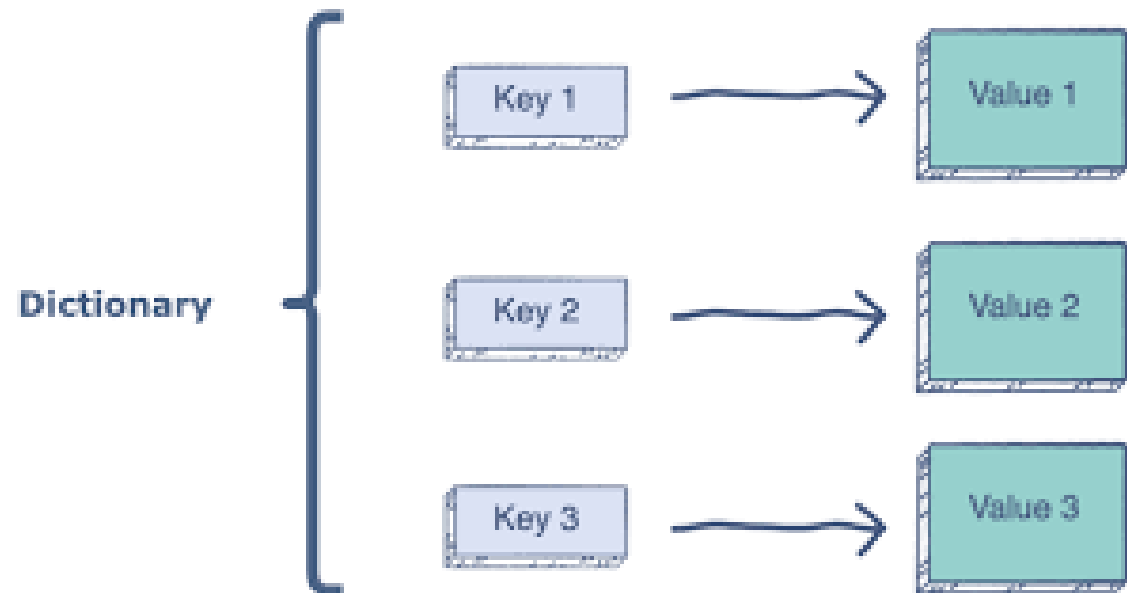| index	0	1	2	3	4
negative index	-5	-4	-3	-2	-1

Tuples

- Collection of items.

- Ordered.

- **Immutable:**
  - Items cannot be changed.
  - Cannot add items.
  - Cannot remove items.

- Allows duplicates.

Dictionaries

- Collection of items as *key:value.*

- Ordered.*

- Mutable.

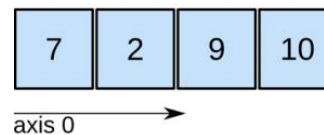- No duplicates!

NumPy (Numerical Python)

- Python library for arrays.

- Numerical computing tools:
  - Linear algebra.
  - Fourier transforms.

- Faster than lists.

- N-dimensional array object (*ndarray*).

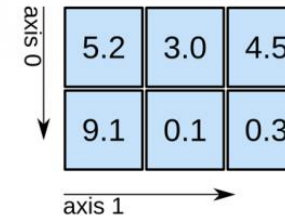- Broadcasting rules.**

N-dimensional Arrays

- Collection of items of the same type *(dtype):*
  - Basic types
  - General objects.

- Usually fixed-size.

- Optimized for mathematical operations.

- Attribute *shape*.

- Slicing and Indexing.

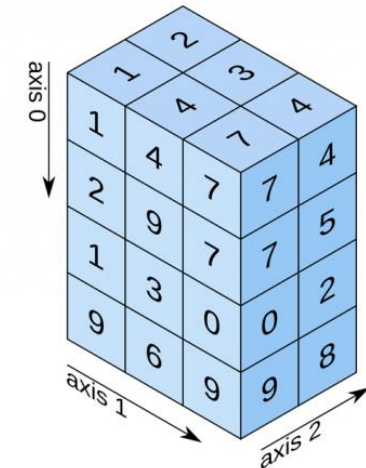### 3D array

2D array

1D array

| 7 | 2 | 9 | 10 |

axis 0

shape: (4,)

| 5.2 | 3.0 | 4.5 |
| 9.1 | 0.1 | 0.3 |

axis 0

axis 1

shape: (2, 3)

axis 0

axis 1

axis 2

shape: (4, 3, 2)

N-dimensional Arrays Methods

tolist()

reshape()

resize()

transpose()

flatten()

ravel()

take()

sort()

argsort()

N-dimensional Arrays Methods

nonzero()

diagonal()

max()

argmax()

min()

argmin()

clip()

round()

N-dimensional Arrays Methods

sum()

cumsum()

mean()

var()
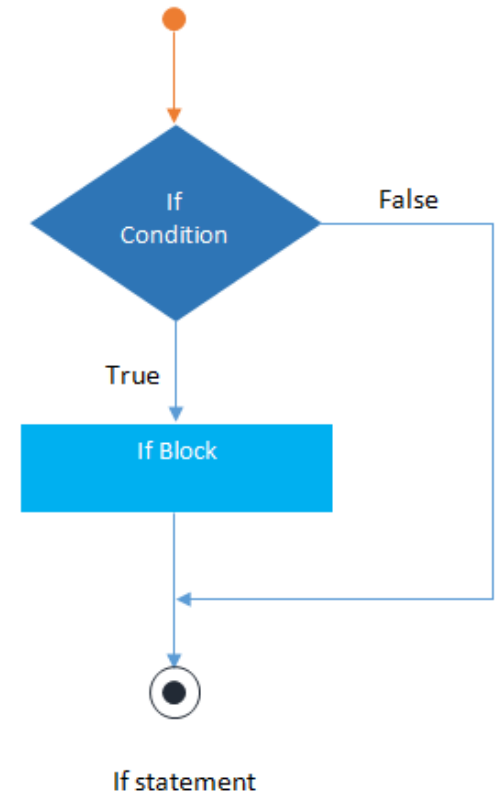
std()

all()
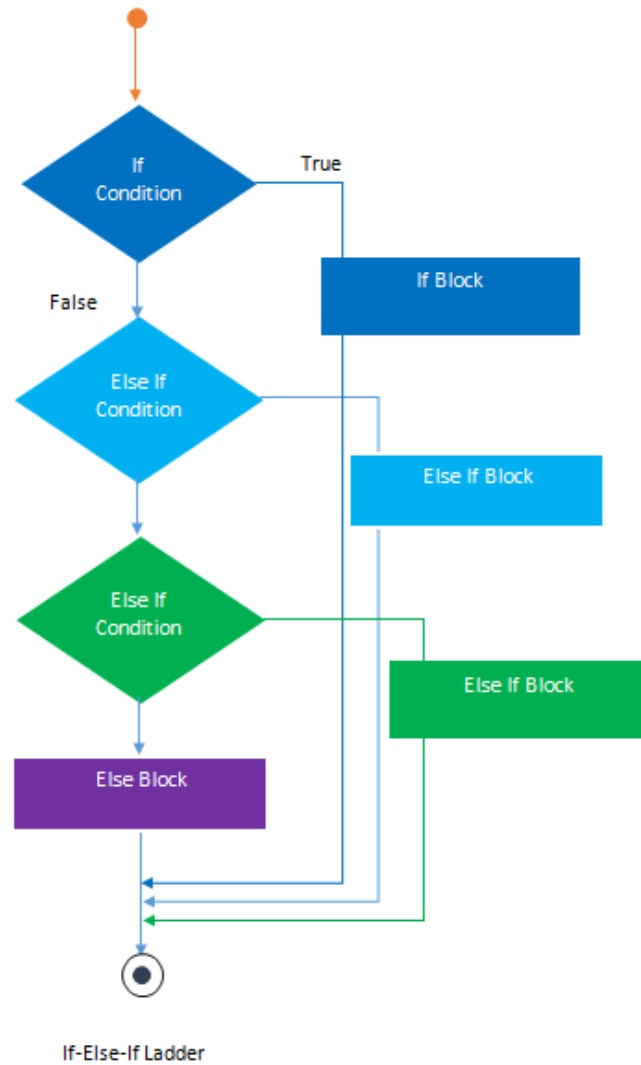
any()
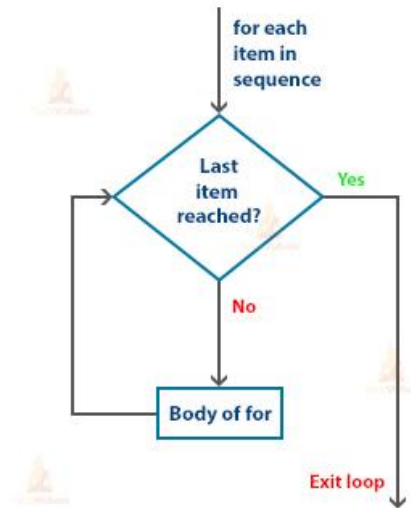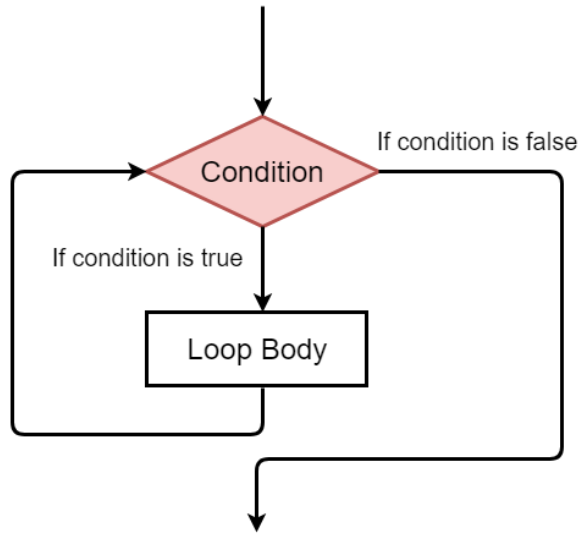
Conditions (if... else)

- Logical conditioning:
  - Equals: $a == b$
  - Not equals: $a \mathrel{!=} b$
  - Less than (or equal to): $a <= b$
  - Greater than (or equal to): $a >= b$

- Returns *True* or *False*.

- Indentation is key!!!!

If-Else-If Ladder

Conditions
(if... elif... else)

Loops

- While loop:
  - Executes the block as long as a condition is true.

- For loop:
  - Iterates through a sequence (iterable).