파이썬으로 배우는 데이터 구조

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학습 목표

Reference의 개념을 이해하고, 각 자료형을
mutable/immutable 객체로 구분해 활용할 수 있다

Data Structures in Python Chapter 1 - 1

- Introduction - Review Python
- **Objects and References**
- List Operations
- GitHub & Jupyter-Lab
- Markdown Tutorial

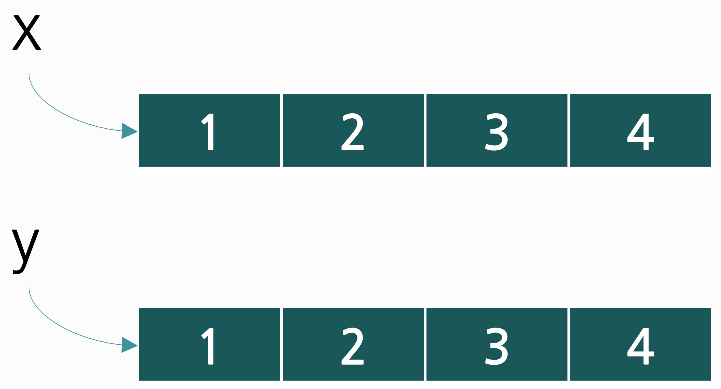
너는 청년의 때에 너의 창조주를 기억하라 곧 곤고한 날이 이르기 전에, 나는 아무 낙이 없다고 할 해들이 가깝기 전에 (전12:1)

Agenda

- Topics:
  - **Objects and References**
    - **Objects in memory**
    - **References**
    - **Equality**
    - **Mutability vs. Immutability**
  - List Operations
    - List operations (methods)
    - Shallow copy vs. Deep copy
- References:
  - DSpy: Chapter 1: Python Review
  - Problem Solving with Algorithms and Data Structures using Python
    - Chapter 1

Objects in memory

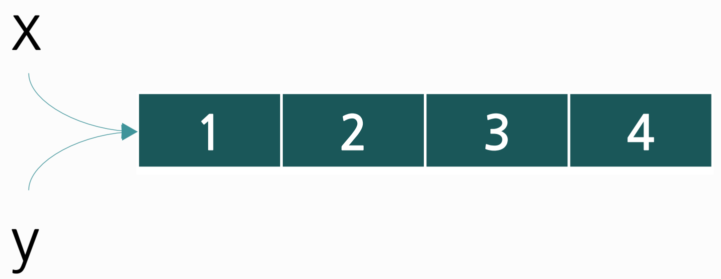
- Value equality



Two different objects that store the same information.

```
x = [1, 2, 3, 4]
y = [1, 2, 3, 4]
```

- Reference equality



Two different references (or names) for the same object.

```
x = [1, 2, 3, 4]
y = x
```

Different ways to compare equality

- ==
  - Calls a method of the object
  - Typically involves checking the contents of the objects.
  - We should always use this for literals.

- is
  - Checks the references of the objects.
  - Evaluates to True if they are the same object.

```
x = [1, 2, 3, 4]
y = [1, 2, 3, 4]
print(x == y)
print(x is y)
```

```
x = [1, 2, 3, 4]
y = x
print(x == y)
print(x is y)
```

String

- Every **UNIQUE string** you create will have it's own address space in memory

```
a = 'foo'
b = 'foo'
print(id(a))
print(id(b))
print(a == b)
print(a is b)
```

```
2026110321456
2026110321456
```

immutable object

```
x = [1, 2, 3, 4]
y = [1, 2, 3, 4]
print(id(x))
print(id(y))
print(x == y)
print(x is y)
```

```
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```

mutable object

Mutable and Immutable objects

- An immutable object is an object whose state cannot be modified after it is created.

- Examples of **immutable** objects:
  - **integer, boolean, float, string, tuple**

- Examples of **mutable** objects
  - **lists, dictionaries, sets,** most data structures studied in this course

```
a = 'hello'
b = 'hello'
print(id(a))
print(id(b))
```

```
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```

```
a = 'hello'
print(id(a))
a = 'jello'
print(id(b))
```

```
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```

Lists are mutable

- Lists are **mutable**
  - i.e. We can change lists in place, such as reassignment of a sequence slice, which will work for lists, but raise an error for tuples and strings.

- Example:
  - rgb = ['red', 'green', 'blue']
  - rgb[0] = 'RED'
  - rgb still points to the same memory when you are done.

```
rgb = ['red', 'green', 'blue']
print(id(rgb))
rgb[0] = 'RED'
print(id(rgb))
print(rgb)
```

```
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```

Tuples are immutable

- Strings and tuples are immutable sequence types: such objects cannot be modified **once created.**
  - i.e. you can't change a tuple.

- Example:

```
rgb = ('red', 'green', 'blue')
rgb[0] = 'RED'
```

```
TypeError: 'tuple' object does not
support item assignment
```

- The immutability of tuples means they are **faster** than lists.

Operations on Strings

- Whenever you call a method of an object, make sure you know if **changes** the contents of the object or **returns** a new object.

- Example:

```
truth = 'Sola Gratia'
print(id(truth))
truth = 'Sola Fide'
print(id(truth))
```

```
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```

a new String object is instantiated and given the data “Sola Gratia" during its construction.

- lower(), upper(), lstrip(), rstrip(), …
  - Return a new copy of the string

```
truth = 'Sola Gratia'
print(id(truth))
facts = truth.upper()
print(id(facts))
```

returns a new object.

Summary

- Variables store references to the objects, not the actual objects.
  - When you assign a variable, **a reference is copied**, not the object. Even it creates a new object and assigns its new reference to it in case of an immutable object.
- There are two kinds of equality.
  - Equality of content (value equality) can be tested with **==**
  - Equality of identity (reference equality) can be tested with is

학습 정리

1) 모든 객체는 각각 unique한 id(reference)를 가지고 있다

2) mutable한 객체는 lists, dictionaries, sets 등이 있고 immutable한 객체는 integer, boolean, float, string,tuple 등이 있다

3) mutable한 객체는 내용을 바꿀 수 있다는 장점이 있고, immutable한 객체는 보안성과 속도가 높다는 장점이 있다

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수고했습니다
곧 다음 시간에
다시 뵙겠습니
다