

Lecture

Objects in Memory





Objects in Memory

“Everything is an object”





Objects in Memory

```
>>> object
<class 'object'>
>>> isinstance(5, object)
True
>>> isinstance([1, 5, 2, 6], object)
True
>>> isinstance((6, 2, 5, 1), object)
True
>>> isinstance({"a": 5, "b": 6}, object)
True
>>> isinstance(False, object)
True
>>> def f(x):
        return x * 2

>>> isinstance(f, object)
True
```





Objects in Memory




```
>>> object
<class 'object'>
>>> isinstance(5, object)
True
>>> isinstance([1, 5, 2, 6], object)
True
>>> isinstance((6, 2, 5, 1), object)
True
>>> isinstance({"a": 5, "b": 6}, object)
True
>>> isinstance(False, object)
True
>>> def f(x):
        return x * 2

>>> isinstance(f, object)
True
```



Objects in Memory



```
>>> object
<class 'object'>
>>> isinstance(5, object)
True
>>> isinstance([1, 5, 2, 6], object)
True
>>> isinstance((6, 2, 5, 1), object)
True
>>> isinstance({"a": 5, "b": 6}, object)
True
>>> isinstance(False, object)
True
>>> def f(x):
        return x * 2

>>> isinstance(f, object)
True
```



Objects in Memory

```
>>> object
<class 'object'>
>>> isinstance(5, object)
True
→ >>> isinstance([1, 5, 2, 6], object)
True
>>> isinstance((6, 2, 5, 1), object)
True
>>> isinstance({"a": 5, "b": 6}, object)
True
>>> isinstance(False, object)
True
>>> def f(x):
        return x * 2

>>> isinstance(f, object)
True
```



Objects in Memory

```
>>> object
<class 'object'>
>>> isinstance(5, object)
True
>>> isinstance([1, 5, 2, 6], object)
True
→ >>> isinstance((6, 2, 5, 1), object)
True
>>> isinstance({"a": 5, "b": 6}, object)
True
>>> isinstance(False, object)
True
>>> def f(x):
        return x * 2

>>> isinstance(f, object)
True
```



Objects in Memory

```
>>> object
<class 'object'>
>>> isinstance(5, object)
True
>>> isinstance([1, 5, 2, 6], object)
True
>>> isinstance((6, 2, 5, 1), object)
True
→ >>> isinstance({"a": 5, "b": 6}, object)
True
>>> isinstance(False, object)
True
>>> def f(x):
        return x * 2

>>> isinstance(f, object)
True
```




Objects in Memory

```
>>> object
<class 'object'>
>>> isinstance(5, object)
True
>>> isinstance([1, 5, 2, 6], object)
True
>>> isinstance((6, 2, 5, 1), object)
True
>>> isinstance({"a": 5, "b": 6}, object)
True
→ >>> isinstance(False, object)
True
>>> def f(x):
        return x * 2

>>> isinstance(f, object)
True
```



Objects in Memory

```
>>> object
<class 'object'>
>>> isinstance(5, object)
True
>>> isinstance([1, 5, 2, 6], object)
True
>>> isinstance((6, 2, 5, 1), object)
True
>>> isinstance({"a": 5, "b": 6}, object)
True
>>> isinstance(False, object)
True
>>> def f(x):
        return x * 2
→ >>> isinstance(f, object)
True
```




Objects in Memory

```
>>> isinstance(f, object)
```

```
True
```

```
>>>
```



```
>>> isinstance("Hello", object)
```

```
True
```

```
>>> isinstance(0.5, object)
```

```
True
```

```
>>> isinstance(ValueError, object)
```

```
True
```



Objects in Memory

```
>>> isinstance(f, object)
```

```
True
```

```
>>>
```

```
>>> isinstance("Hello", object)
```

```
True
```



```
>>> isinstance(0.5, object)
```

```
True
```

```
>>> isinstance(ValueError, object)
```

```
True
```



Objects in Memory

```
>>> isinstance(f, object)
```

```
True
```

```
>>>
```

```
>>> isinstance("Hello", object)
```

```
True
```

```
>>> isinstance(0.5, object)
```

```
True
```

```
→ >>> isinstance(ValueError, object)
```

```
True
```



Objects in Memory

- ◆ Integers
- ◆ Floats
- ◆ Booleans
- ◆ Functions
- ◆ Lists
- ◆ Tuples
- ◆ Dictionaries
- ◆ Strings
- ◆ Exceptions
- ◆ More...



Objects in Memory

```
>>> a = [5, 1, 3, 7, 3]
>>> a.append(0)
>>> a
[5, 1, 3, 7, 3, 0]
```



Objects in Memory

```
>>> a = [5, 1, 3, 7, 3]
>>> a.append(0)
>>> a
[5, 1, 3, 7, 3, 0]
```




Objects in Memory

```
>>> a = [5, 1, 3, 7, 3]
```

```
>>> a.append(0) ← <obj>.<method>(<args>)
```

```
>>> a
```

```
[5, 1, 3, 7, 3, 0]
```



Objects in Memory

```
>>> a = [5, 1, 3, 7, 3]
>>> a.append(0)
>>> a
[5, 1, 3, 7, 3, 0]
```



Objects in Memory

```
>>> a = [5, 1, 3, 7, 3]
>>> a.append(0)
>>> a
[5, 1, 3, 7, 3, 0]
```



Objects in Memory

```
>>> a = [5, 1, 3, 7, 3]
>>> a.append(0)
>>> a
[5, 1, 3, 7, 3, 0]
```



Objects in Memory

```
>>> a = [5, 1, 3, 7, 3]
```

Memory





Objects in Memory

```
>>> a = [5, 1, 3, 7, 3]
```

Memory





Objects in Memory

```
>>> a = [5, 1, 3, 7, 3]
```

```
>>> b = [5, 1, 3, 7, 3]
```

Memory



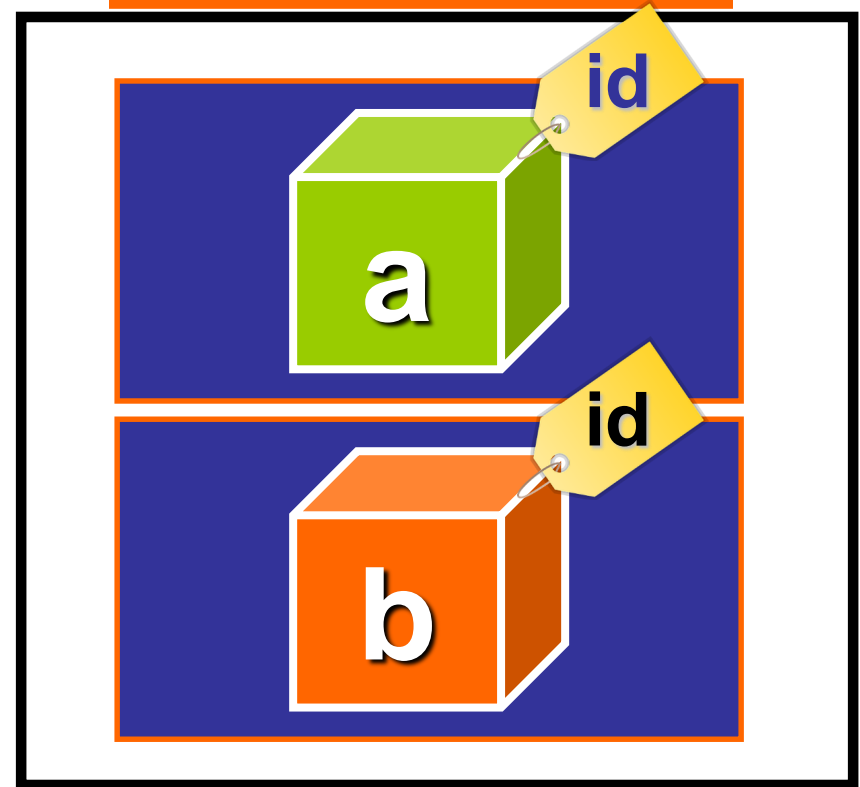


Objects in Memory

```
>>> a = [5, 1, 3, 7, 3]
```

```
>>> b = [5, 1, 3, 7, 3]
```

Memory



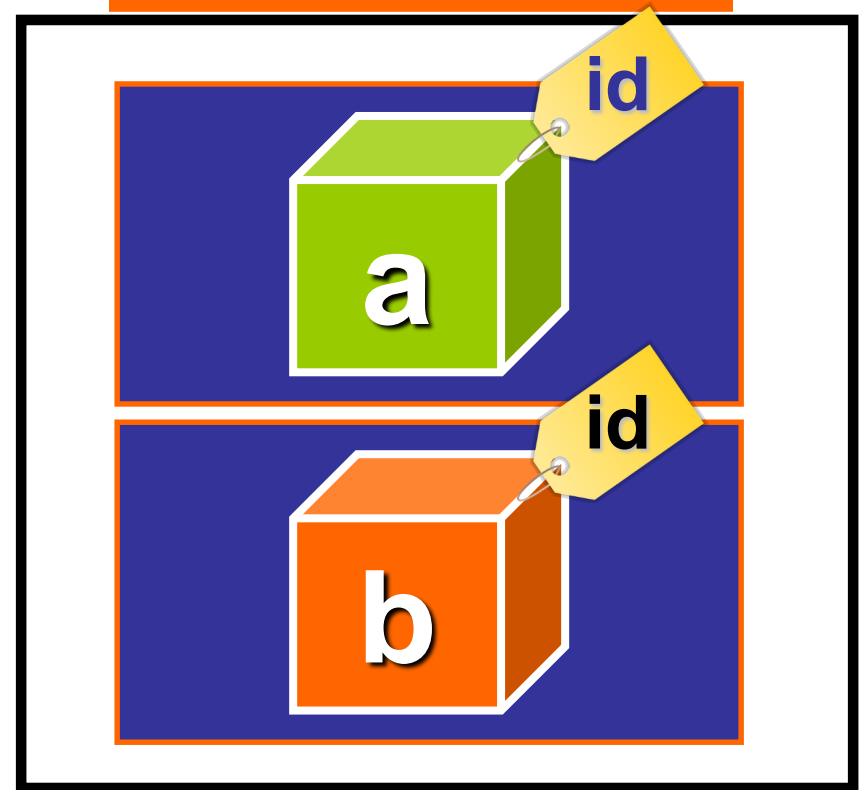


Objects in Memory

```
>>> a = "Hello, World"
```

```
>>> b = "Hello, World"
```

Memory



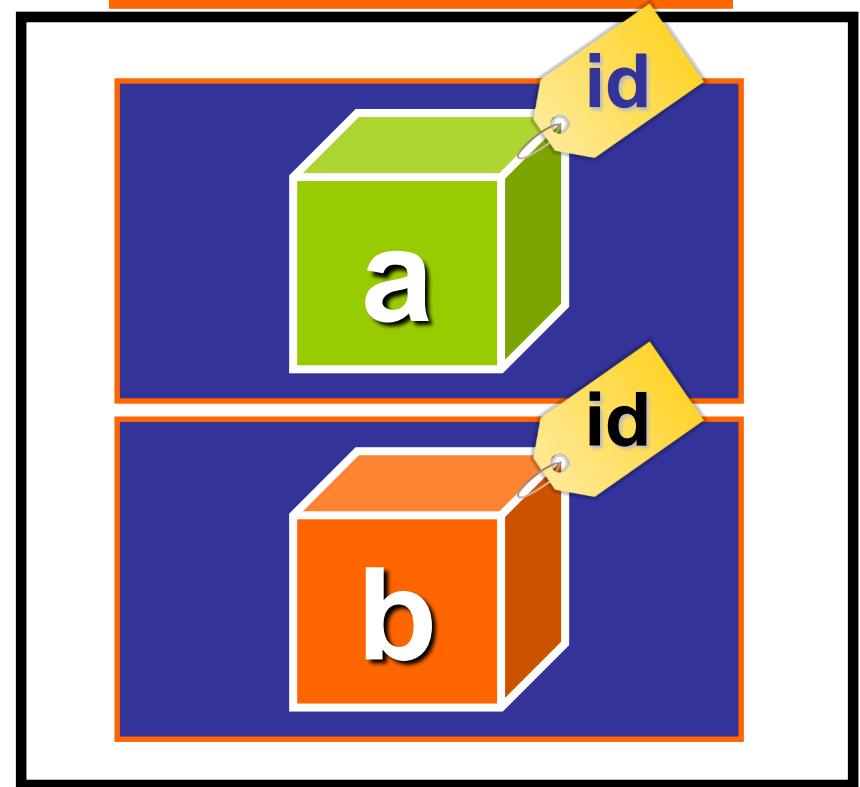


Objects in Memory

```
>>> a = (4, 2, 7, 2)
```

```
>>> b = (4, 2, 7, 2)
```

Memory



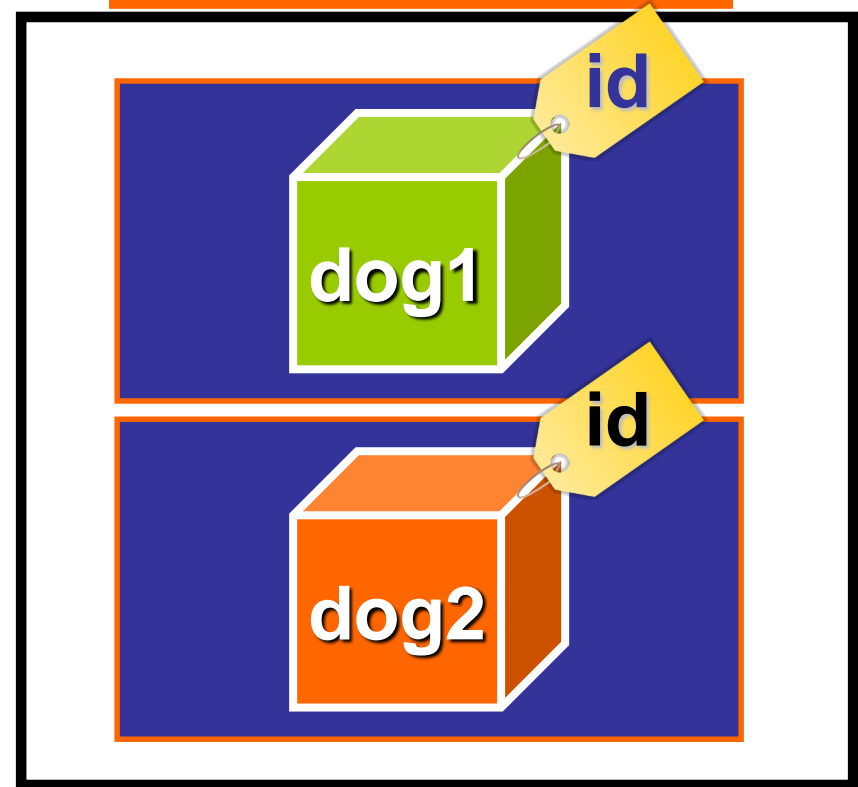


Objects in Memory

```
dog1 = Dog("Nora", 13)
```

```
dog2 = Dog("Gino", 5)
```

Memory





Object vs. Instance

