

61A Lecture 14

Announcements

Object-Oriented Programming

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A method for organizing programs

Object-Oriented Programming

A method for organizing programs

- Data abstraction

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- Data abstraction
- Bundling together information and related behavior

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A metaphor for computation using distributed state

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- Each object has its own local state

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- Each object has its own local state
- Each object also knows how to manage its own local state, based on method calls

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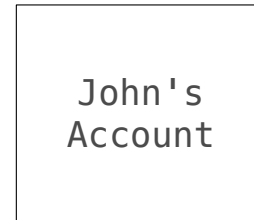
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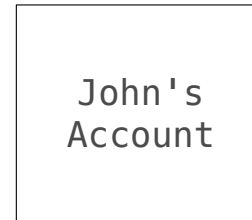
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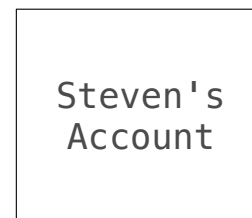
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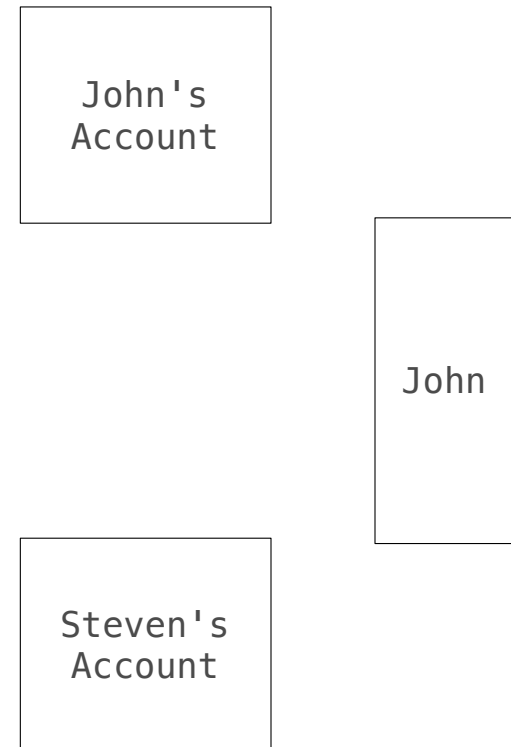
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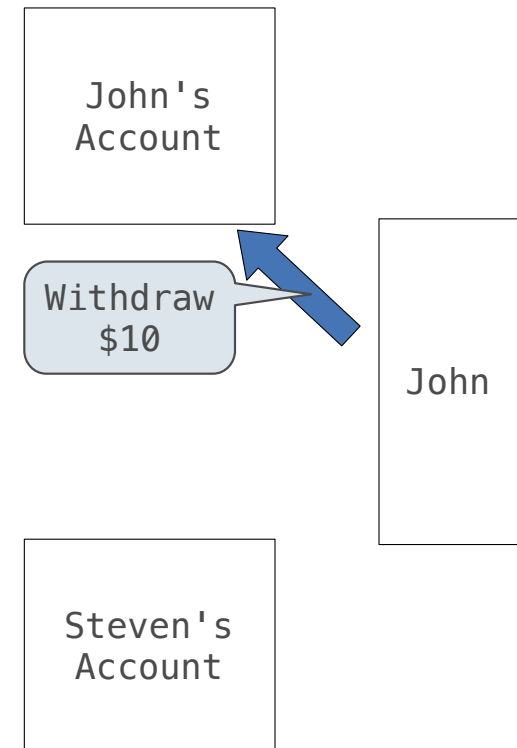
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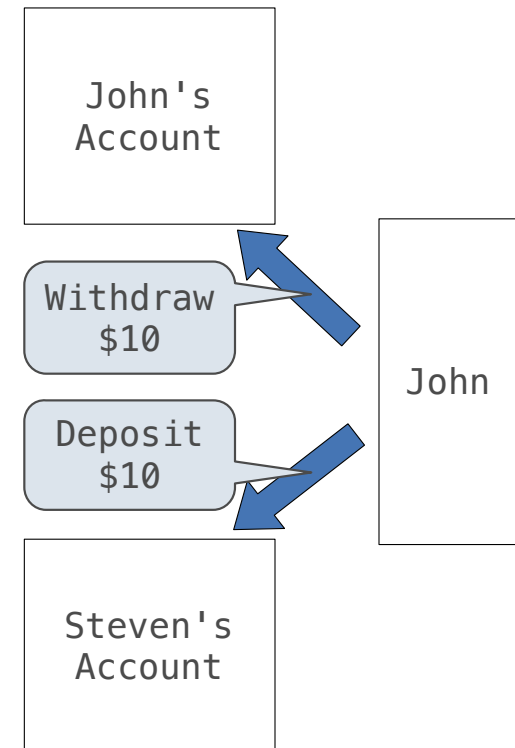
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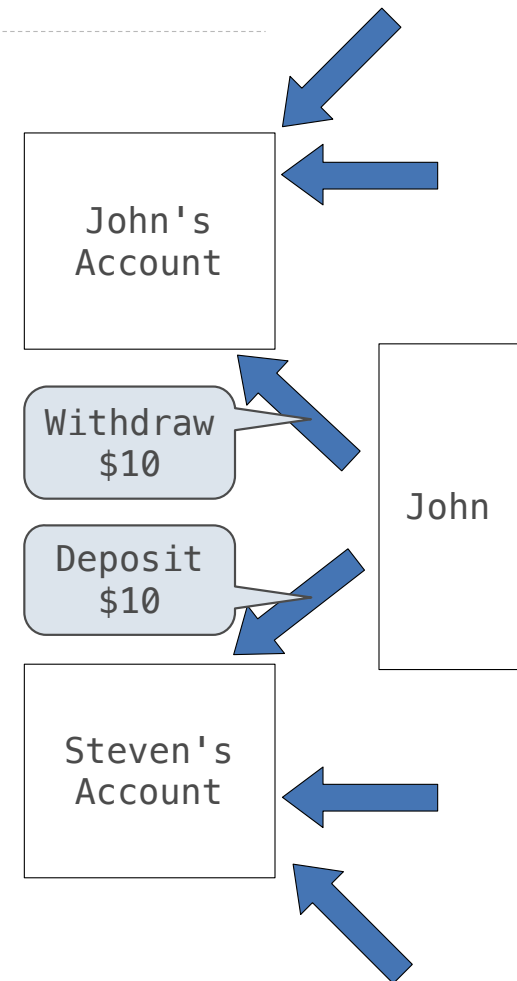
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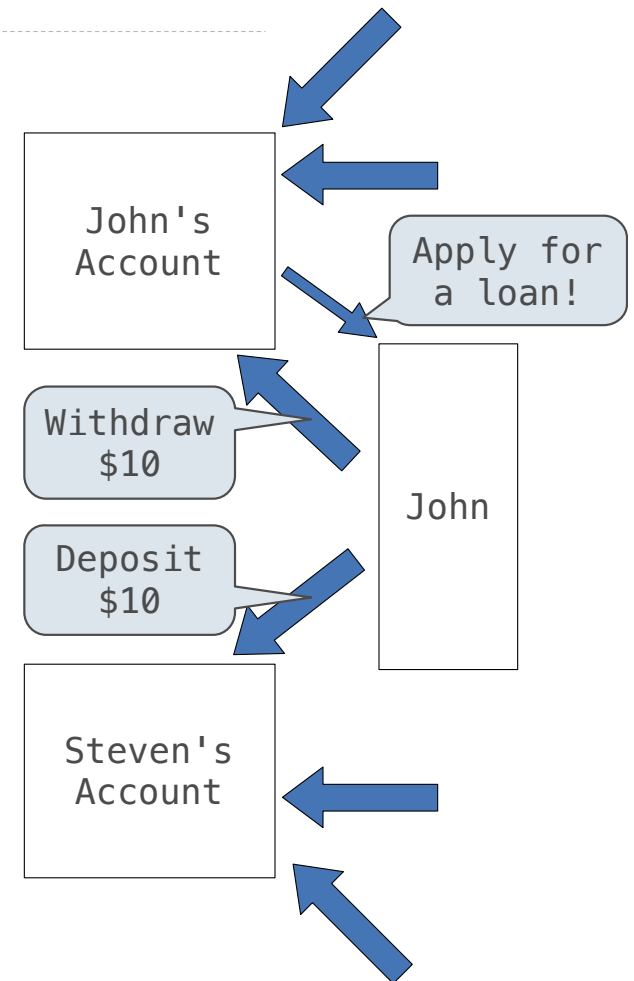
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Classes

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```
>>> a = Account('Jim')
>>> a.holder
'Jim'
```

Classes

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Idea: All bank accounts have a `balance` and an account `holder`; the `Account` class should add those attributes to each newly created instance

```
>>> a = Account('Jim')
>>> a.holder
'Jim'
>>> a.balance
0
```

Classes

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Idea: All bank accounts have a `balance` and an account `holder`; the `Account` class should add those attributes to each newly created instance

```
>>> a = Account('Jim')
>>> a.holder
'Jim'
>>> a.balance
0
```

Idea: All bank accounts should have `withdraw` and `deposit` behaviors that all work in the same way

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>>> a.holder
'Jim'
>>> a.balance
0
```

Idea: All bank accounts should have `withdraw` and `deposit` behaviors that all work in the same way

```
>>> a.deposit(15)
15
```

Classes

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```
>>> a = Account('Jim')
>>> a.holder
'Jim'
>>> a.balance
0

>>> a.deposit(15)
15
>>> a.withdraw(10)
5
```


Classes

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Idea: All bank accounts have a `balance` and an account `holder`; the `Account` class should add those attributes to each newly created instance

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```
>>> a = Account('Jim')
>>> a.holder
'Jim'
>>> a.balance
0
```

```
>>> a.deposit(15)
15
>>> a.withdraw(10)
5
>>> a.balance
5
```

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```
>>> a = Account('Jim')
>>> a.holder
'Jim'
>>> a.balance
0

>>> a.deposit(15)
15
>>> a.withdraw(10)
5
>>> a.balance
5
>>> a.withdraw(10)
'Insufficient funds'
```

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```
>>> a = Account('Jim')
>>> a.holder
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>>> a.balance
0
```

Idea: All bank accounts should have `withdraw` and `deposit` behaviors that all work in the same way

```
>>> a.deposit(15)
15
>>> a.withdraw(10)
5
>>> a.balance
5
```

Better idea: All bank accounts share a `withdraw` method and a `deposit` method

```
>>> a.withdraw(10)
'Insufficient funds'
```

Class Statements

The Class Statement

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```
class <name>:  
    <suite>
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A class statement creates a new class and binds that class to <name> in the first frame of the current environment

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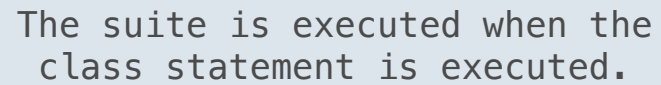
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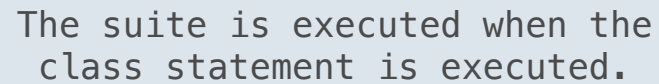
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>>> class Clown:  
...     nose = 'big and red'  
...     def dance():  
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>>> Clown.nose  
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2. The `__init__` method of the class is called with the new object as its first argument (named `self`), along with any additional arguments provided in the call expression

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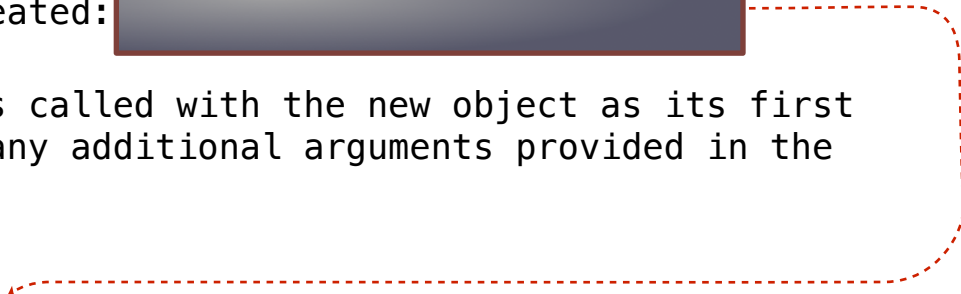
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`__init__` is called
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>>> a.balance
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Every call to Account creates a new Account instance. There is only one Account class.

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Identity operators "is" and "is not" test if two expressions evaluate to the same object:

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```
>>> a is a
True
>>> a is not b
True
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```
>>> c = a
>>> c is a
True
```

Methods

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Methods are functions defined in the suite of a class statement

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```
class Account:
```

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```
def __init__(self, account_holder):
```

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```
self.balance = 0
```

Methods

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```
self.holder = account_holder
```

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```
def deposit(self, amount):
```

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```
self.balance = self.balance + amount
```

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`self` should always be bound to an instance of the `Account` class

```
return self.balance
```


Methods

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```
def withdraw(self, amount):
```

Methods

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```
if amount > self.balance:
```

Methods

Methods are functions defined in the suite of a class statement

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```
return 'Insufficient funds'
```

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```
self.balance = self.balance - amount
```

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return self.balance
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These `def` statements create function objects as always,
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Invoking Methods

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class Account:  
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        return self.balance
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Invoking Methods

All invoked methods have access to the object via the `self` parameter, and so they can all access and manipulate the object's state

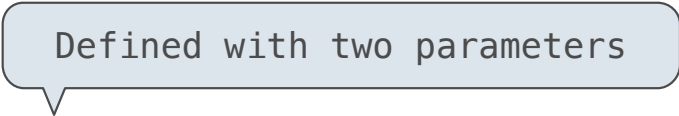
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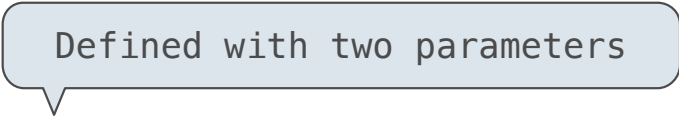


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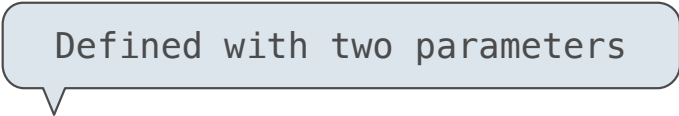
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Invoked with one argument

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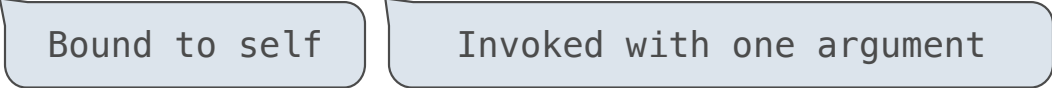
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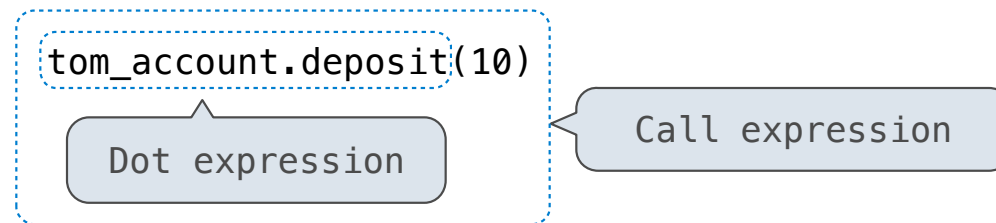
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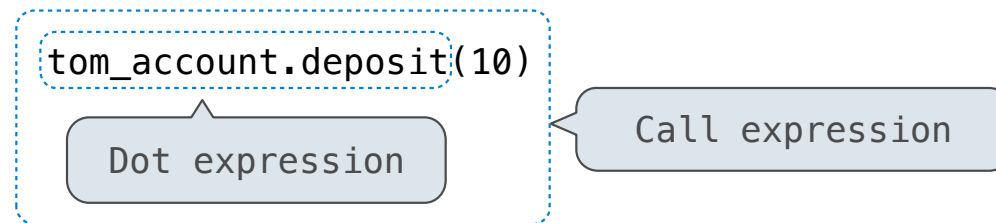
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(Demo)

Attributes

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