Inheritance

Announcements

Attributes

Methods and Functions

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Function: all arguments within parentheses

Method: One object before the dot and other arguments within parentheses

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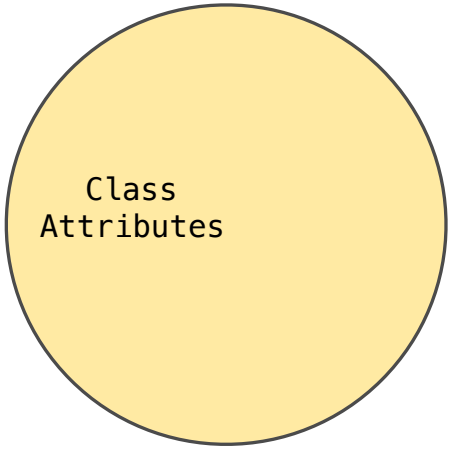

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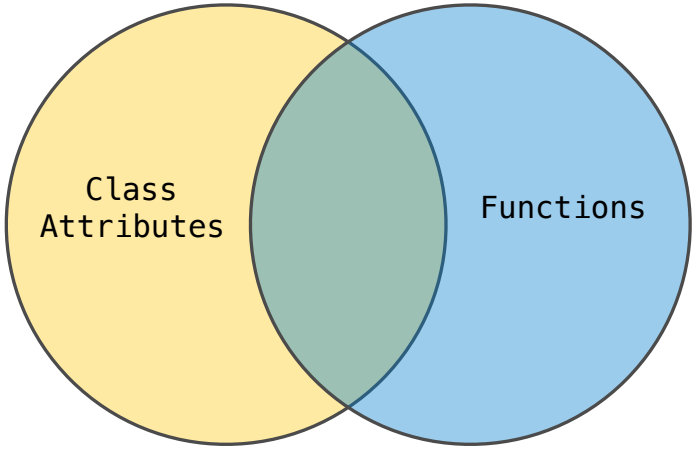

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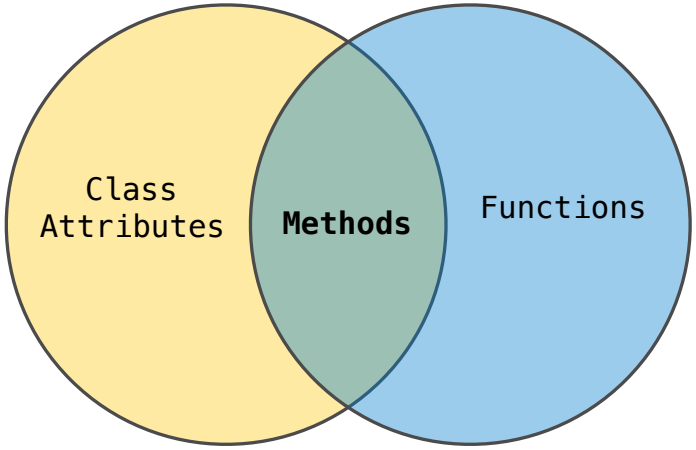

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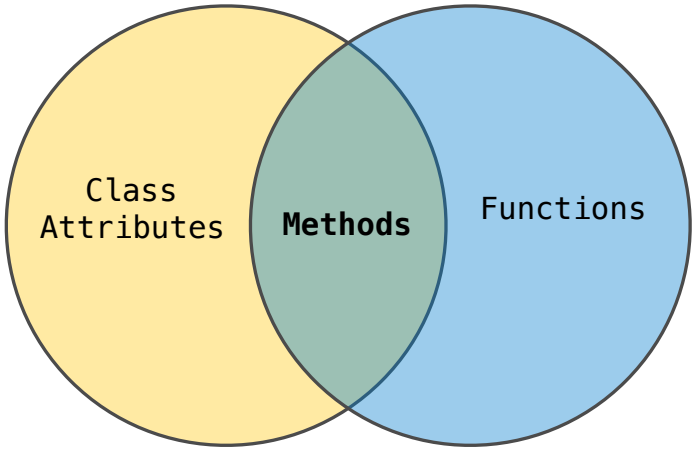

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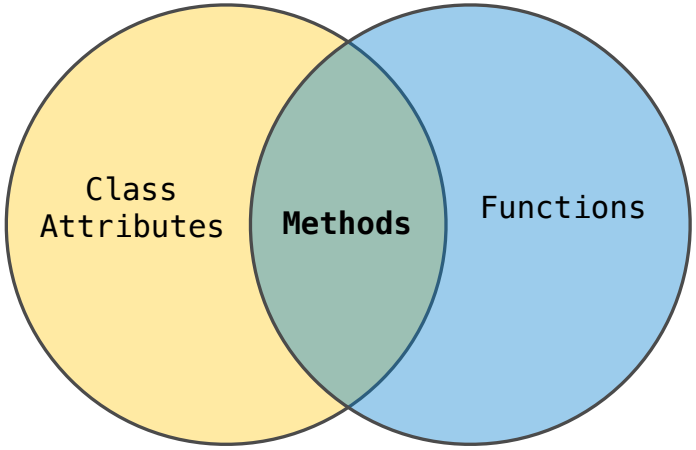

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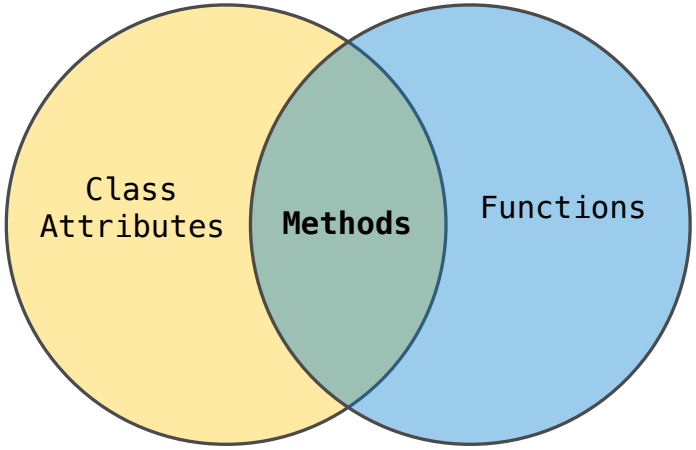

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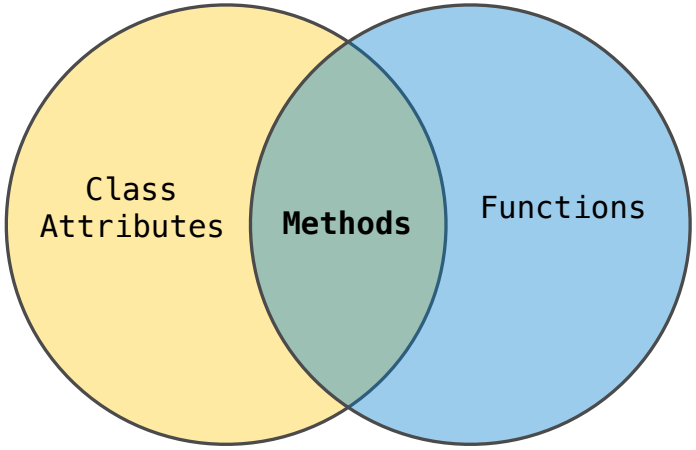

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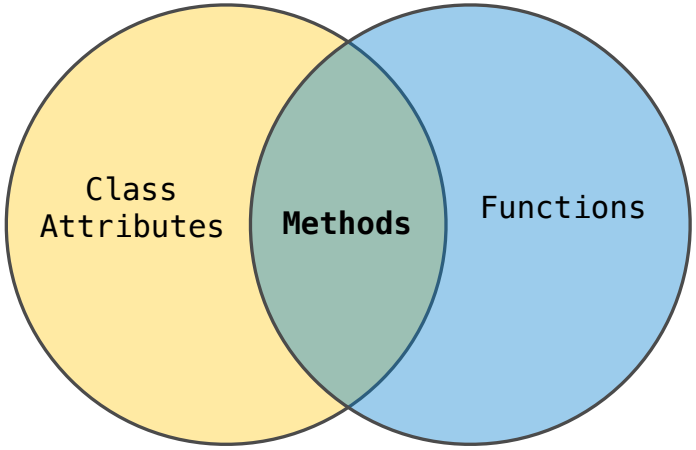

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<instance>.<method_name>

Looking Up Attributes by Name

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<expression> . <name>
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4. That value is returned unless it is a function, in which case a bound method is returned instead

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    def __init__(self, account_holder):
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    # Additional methods would be defined here
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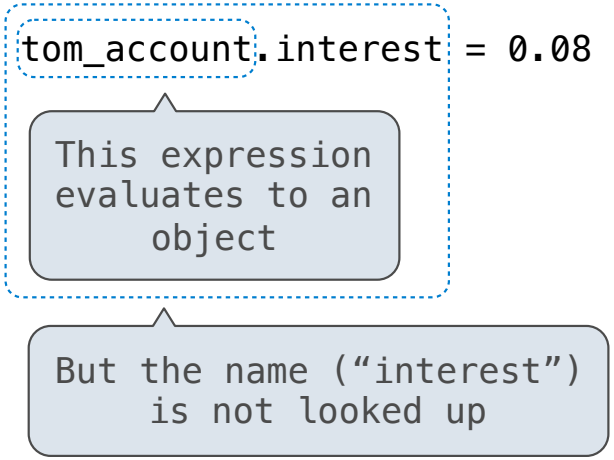

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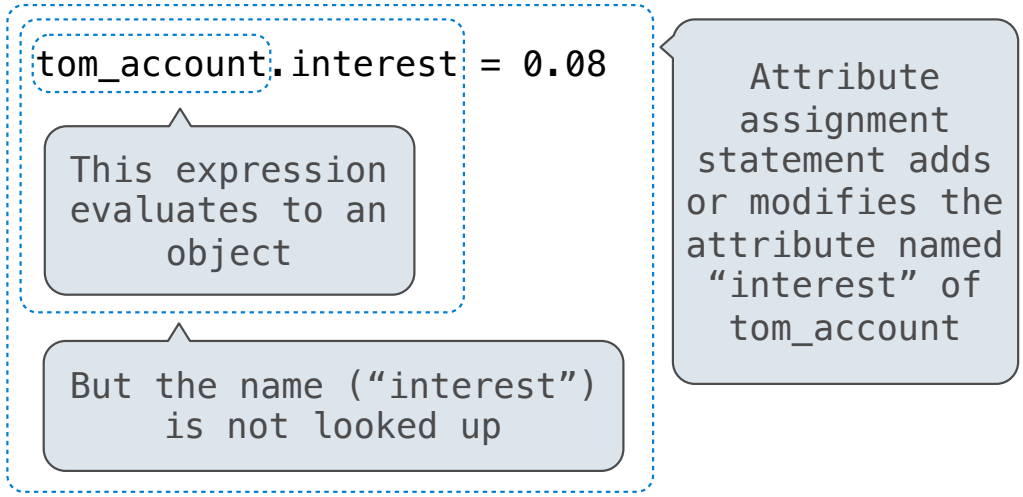

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This expression evaluates to an object

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Attribute assignment statement adds or modifies the attribute named "interest" of tom_account

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Class Attribute Assignment :

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Account.interest = 0.04
```

Attribute Assignment Statements

Account class attributes

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interest: 0.02
(withdraw, deposit, __init__)
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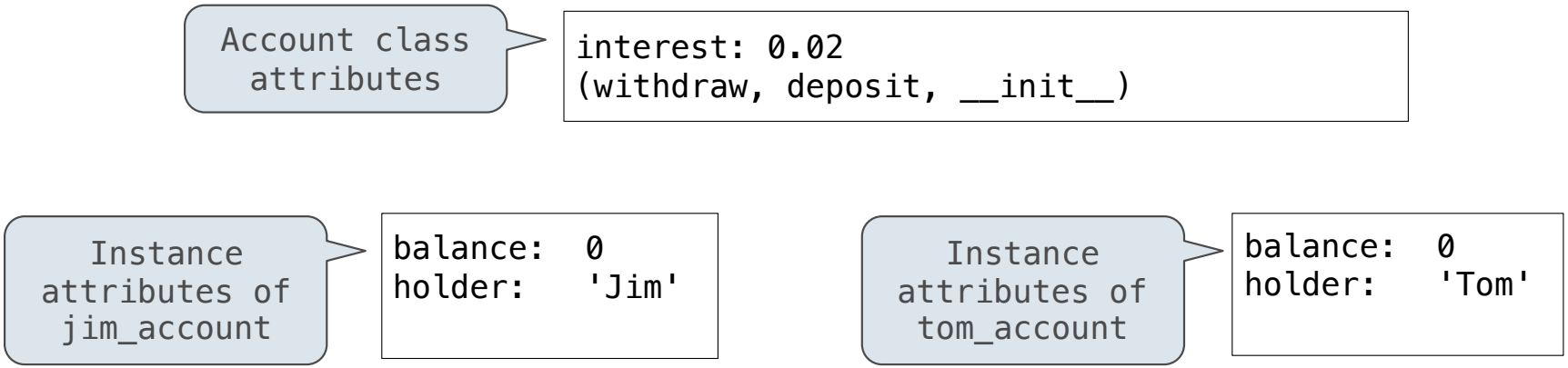


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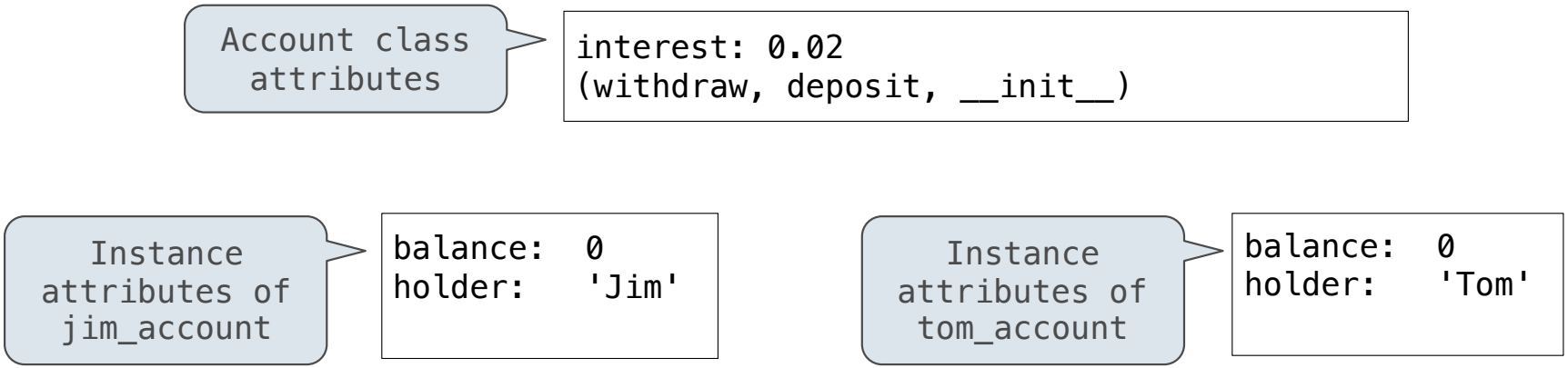


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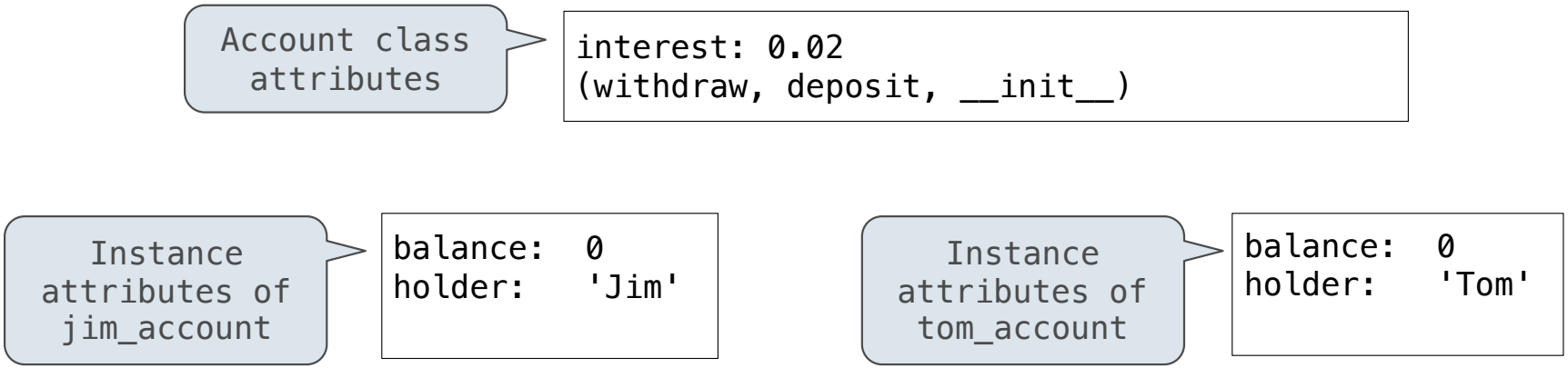


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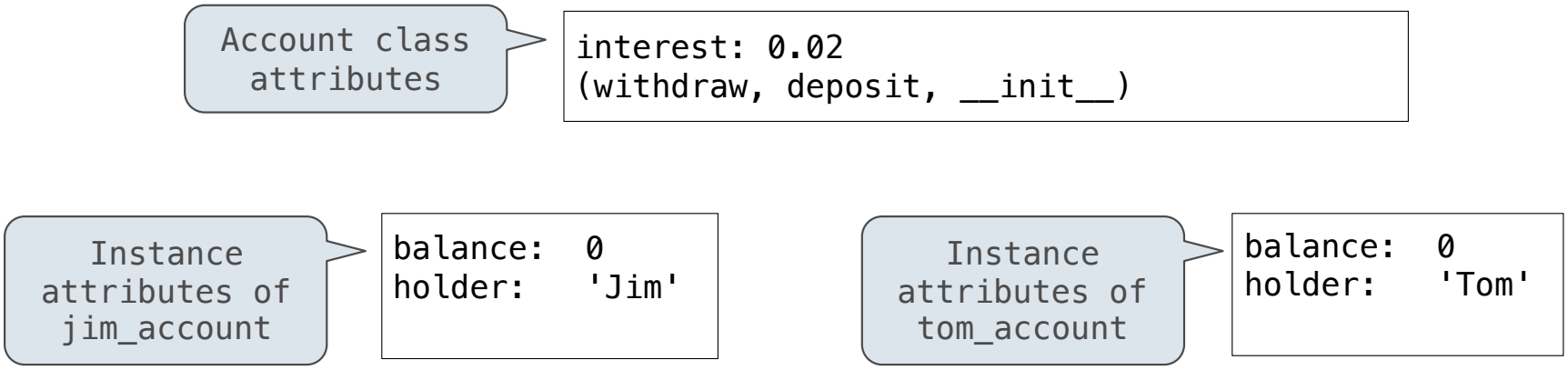


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>>> jim_account = Account('Jim')
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>>> Account.interest = 0.04
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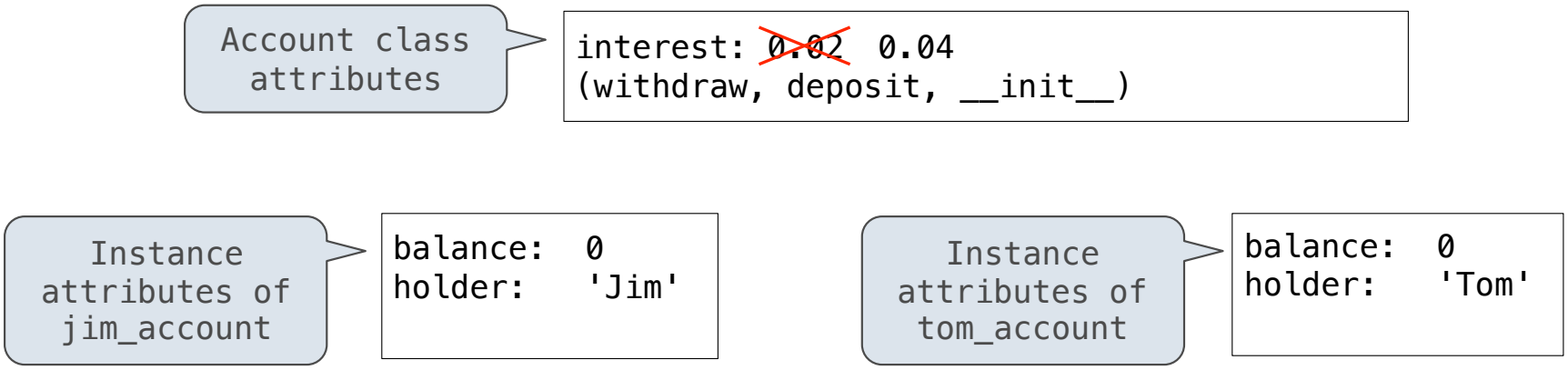
Attribute Assignment Statements

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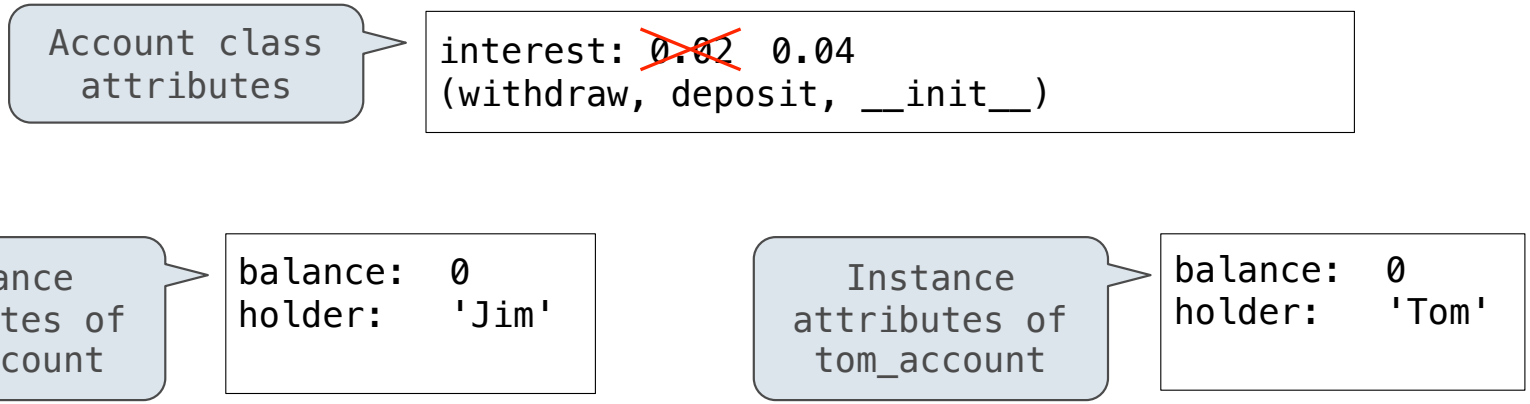


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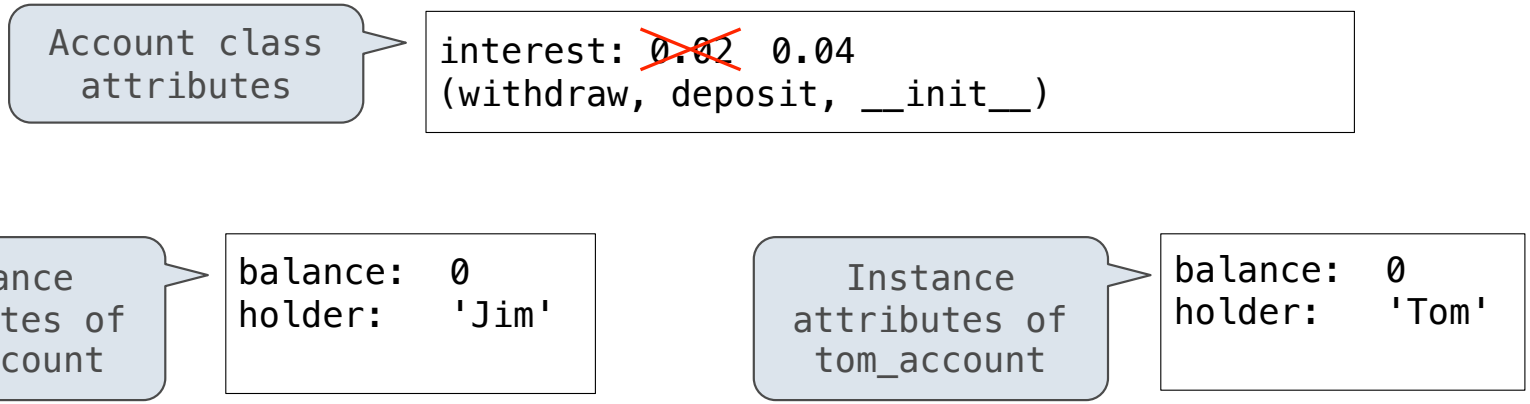


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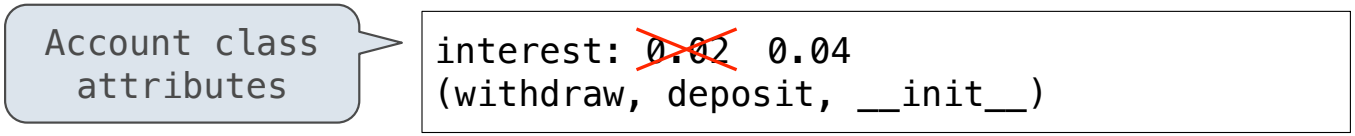

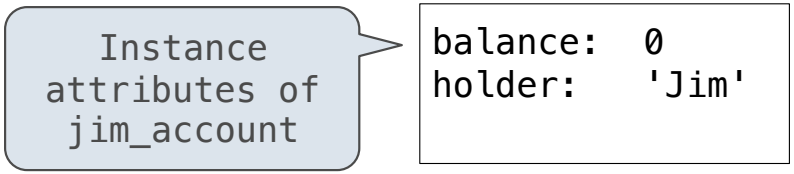

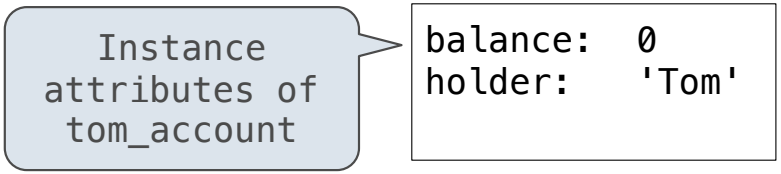


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(withdraw, deposit, __init__)
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Instance attributes of jim_account

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holder:   'Jim'
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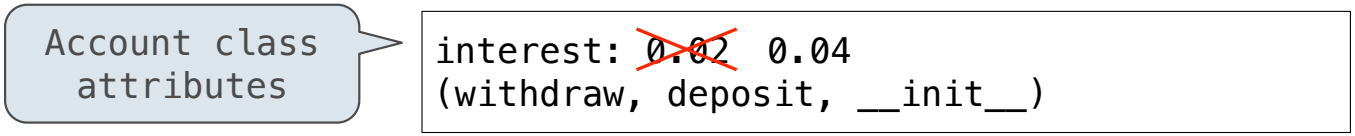

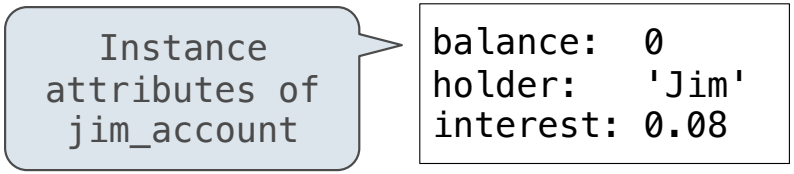

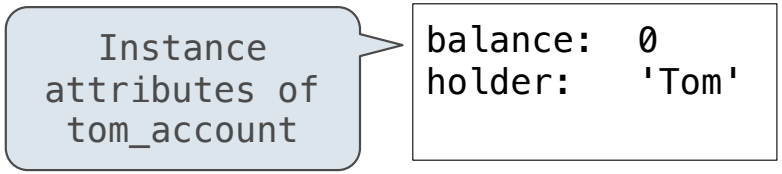


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>>> tom_account.interest
0.02
>>> jim_account.interest
0.02
>>> Account.interest = 0.04
>>> tom_account.interest
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```

```
>>> jim_account.interest = 0.08
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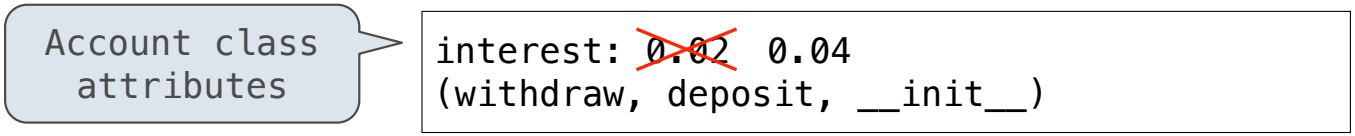
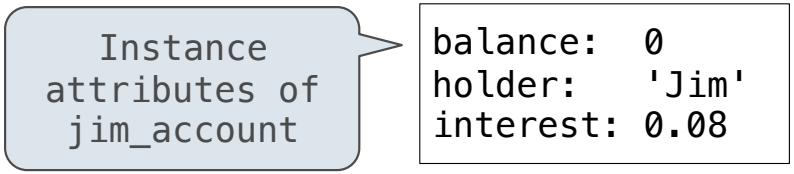
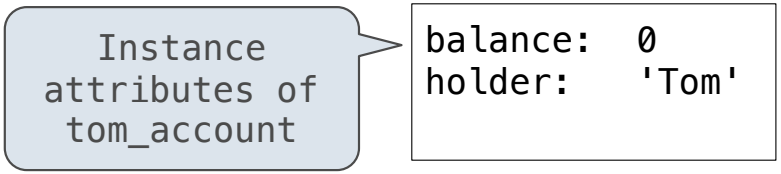
Attribute Assignment Statements





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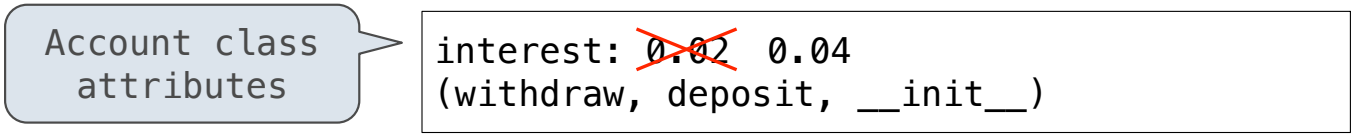

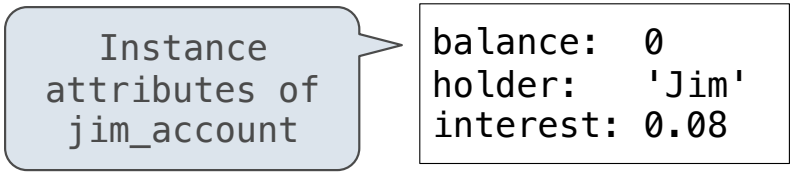

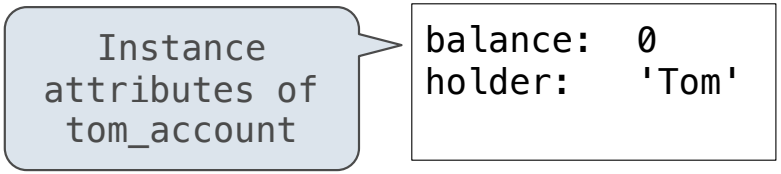


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Attribute Assignment Statements

Account class attributes

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interest: 0.02  0.04  0.05
(withdraw, deposit, __init__)
```

Instance attributes of jim_account

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balance:  0
holder:   'Jim'
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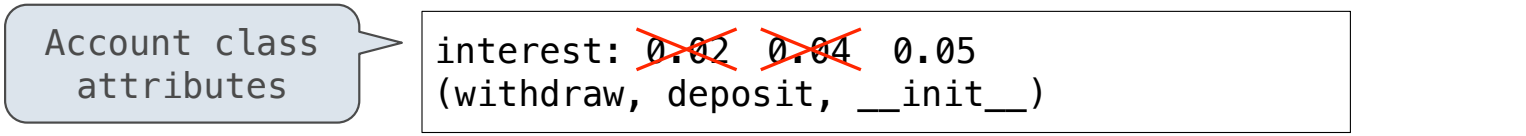

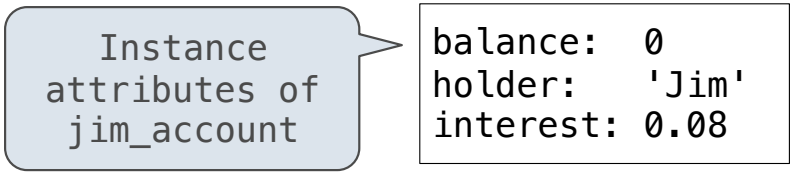

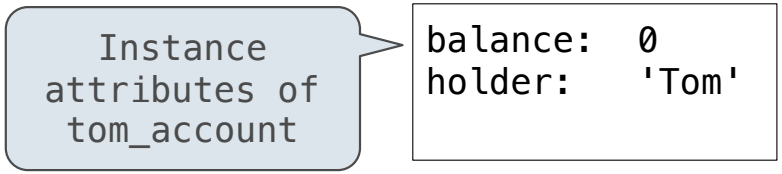


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Using inheritance, we implement a subclass by specifying its differences from the the base class

Inheritance Example

A `CheckingAccount` is a specialized type of `Account`

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>>> ch = CheckingAccount('Tom')
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(Demo)

Object-Oriented Design

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Preferred to CheckingAccount.withdraw_fee to allow for specialized accounts

Inheritance and Composition

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Attributes Lookup Practice

Inheritance and Attribute Lookup

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class A:
    z = -1
    def f(self, x):
        return B(x-1)

class B(A):
    n = 4
    def __init__(self, y):
        if y:
            self.z = self.f(y)
        else:
            self.z = C(y+1)

class C(B):
    def f(self, x):
        return x


a = A()
b = B(1)
b.n = 5
```

```
>>> C(2).n
    4

>>> a.z == C.z
    True


>>> a.z == b.z
```

Which evaluates to an integer?

- b.z
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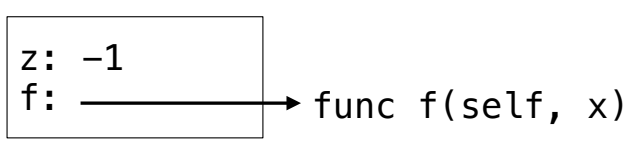

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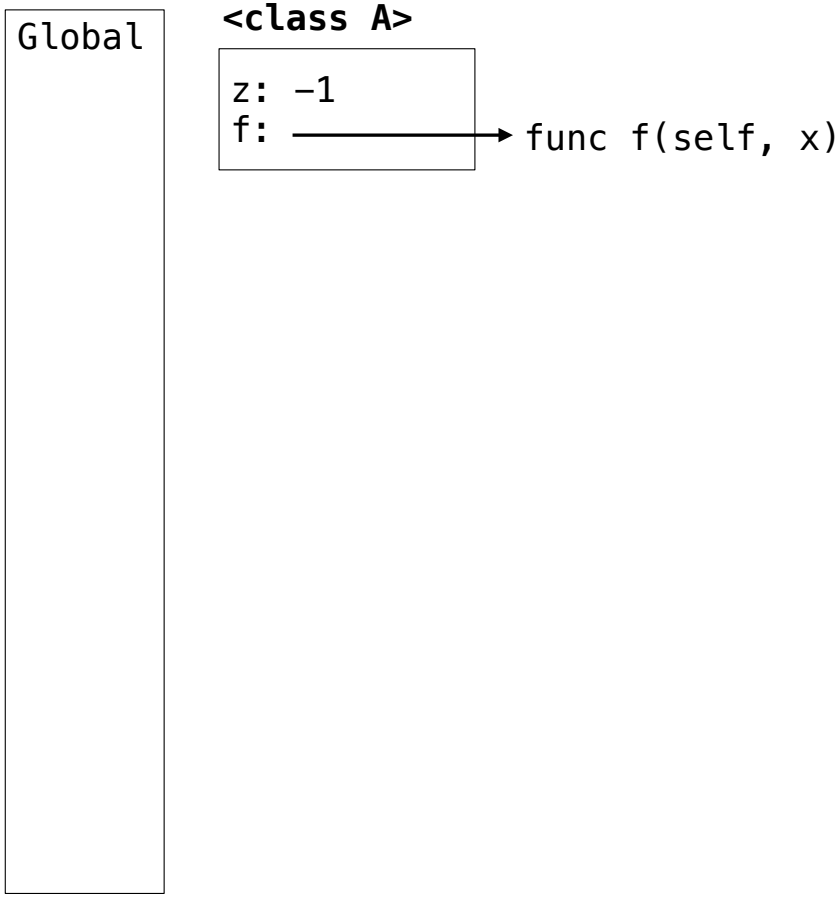

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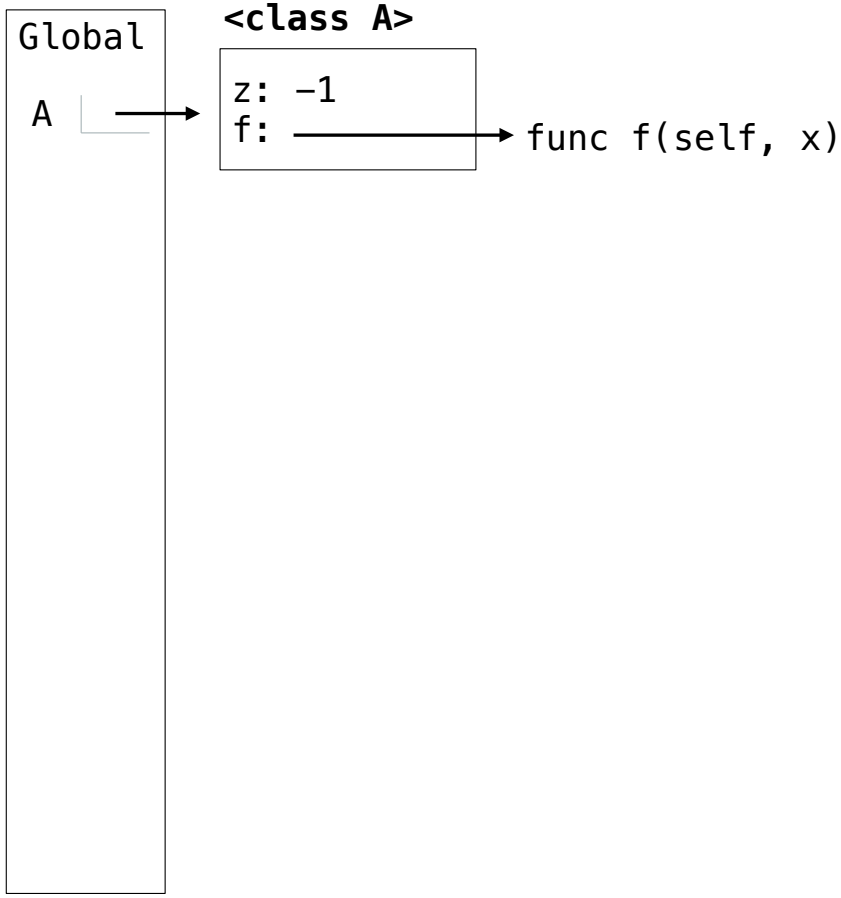

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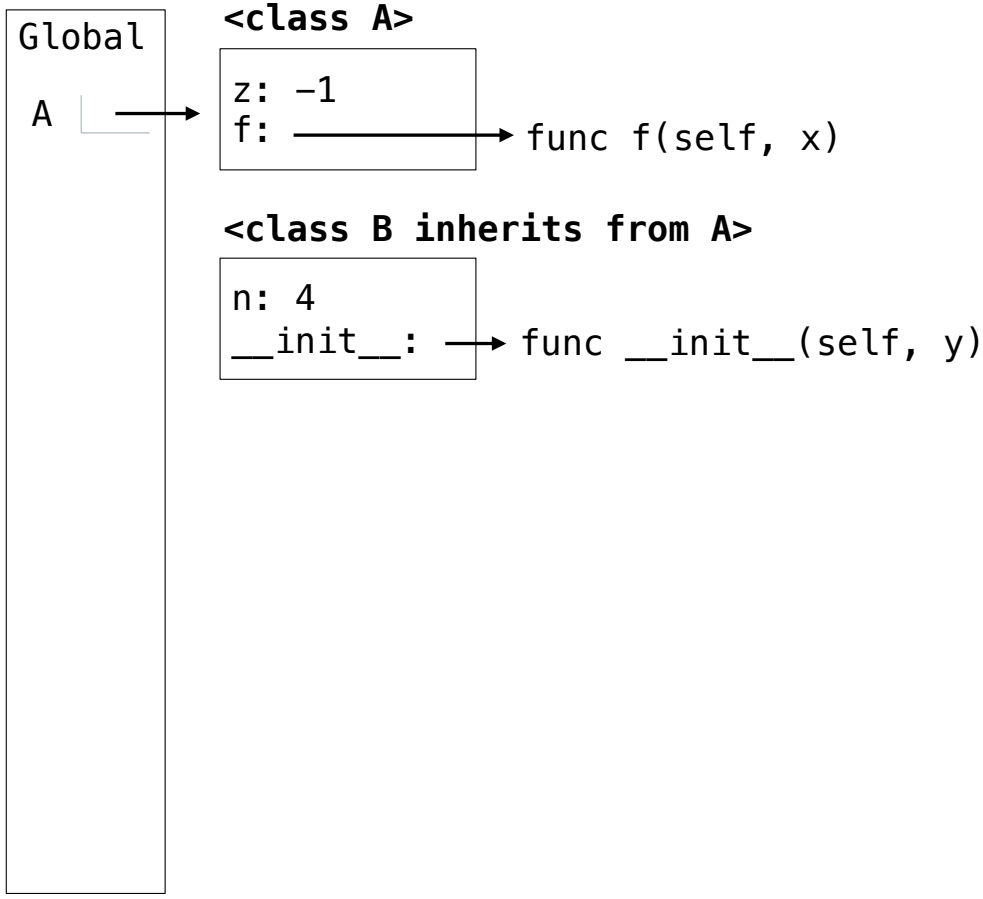

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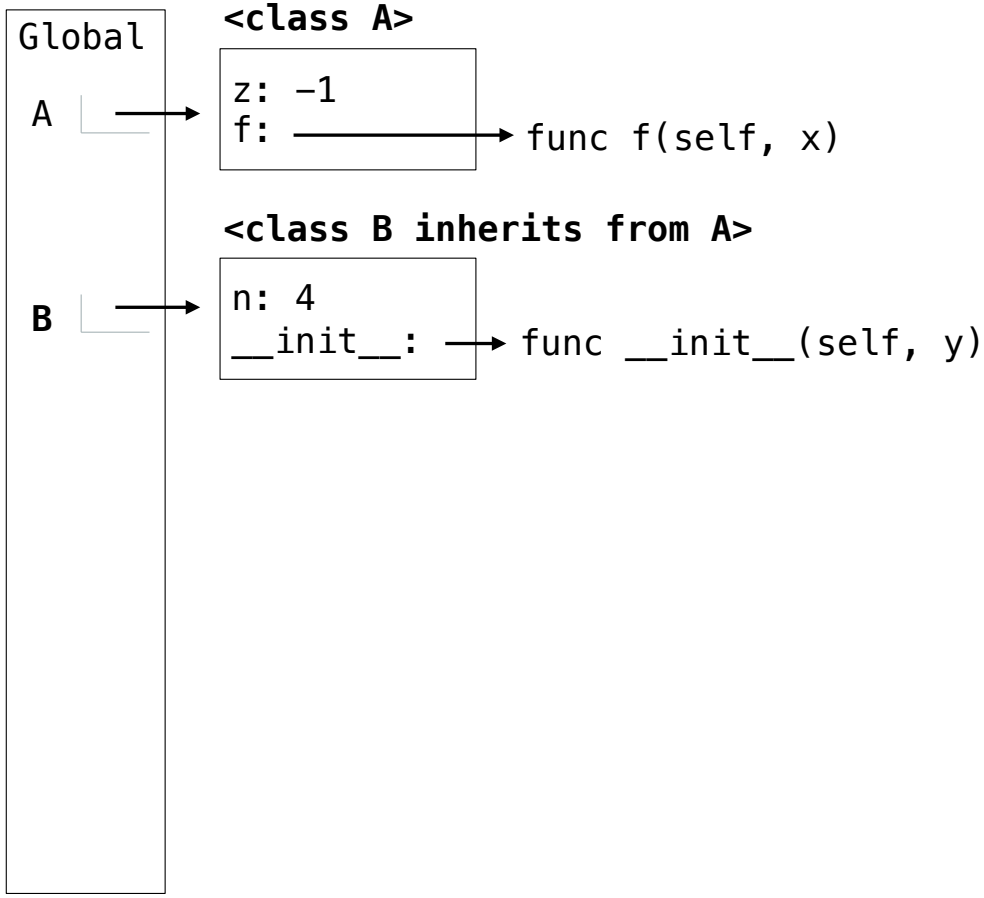

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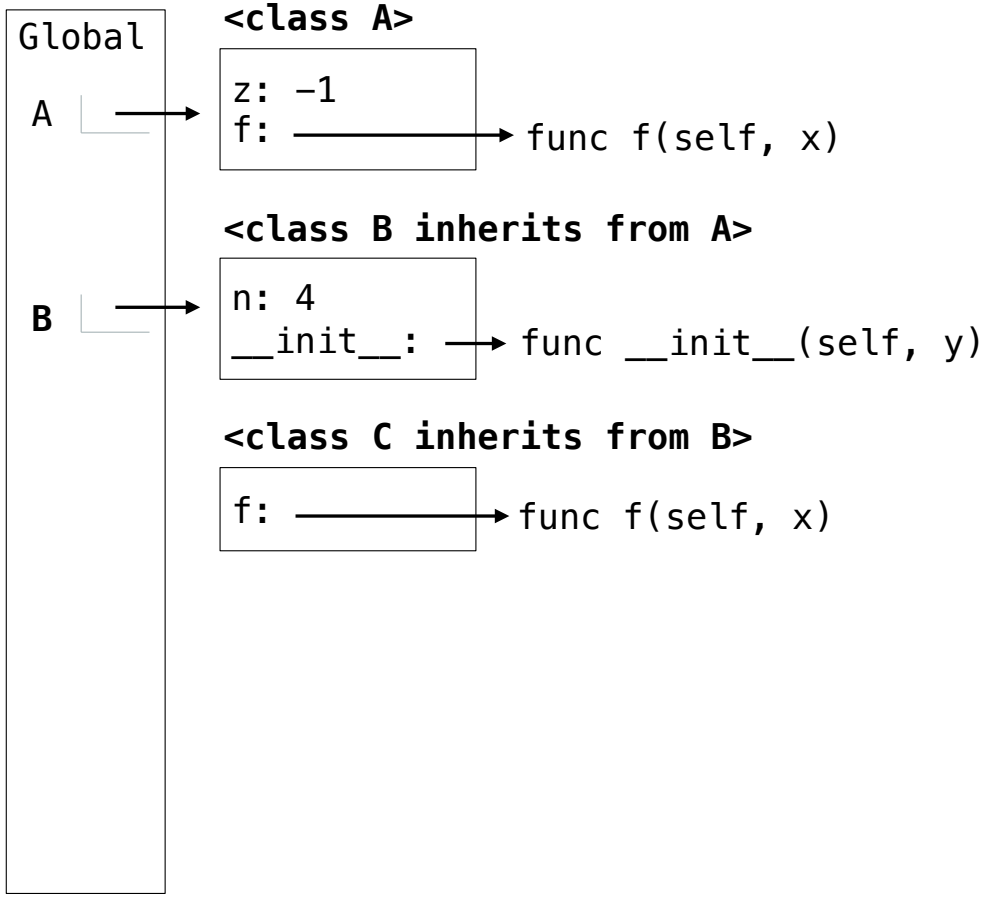

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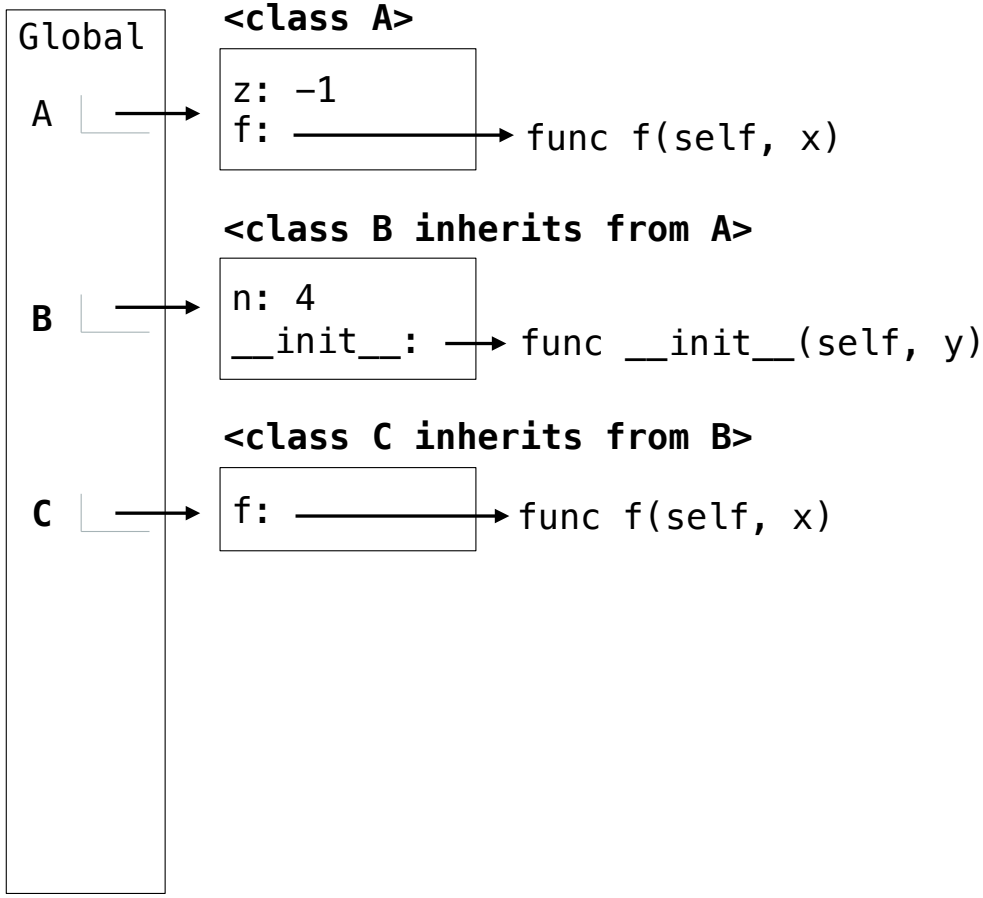

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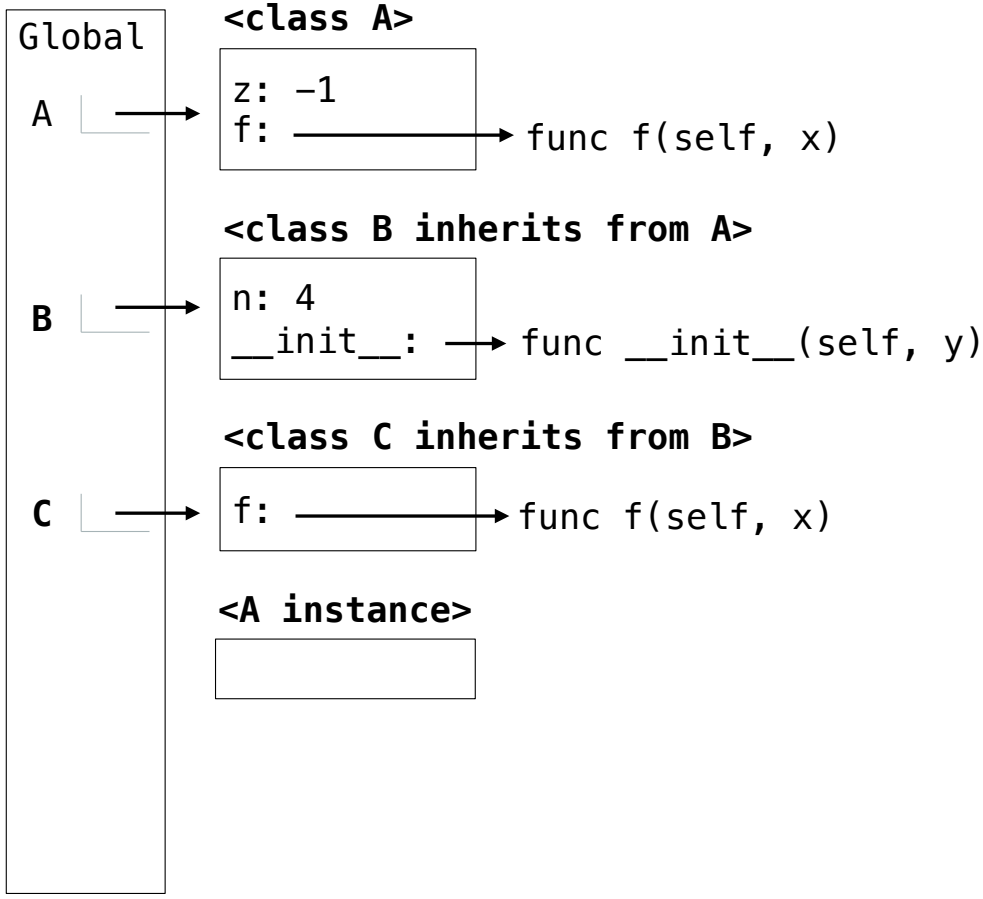

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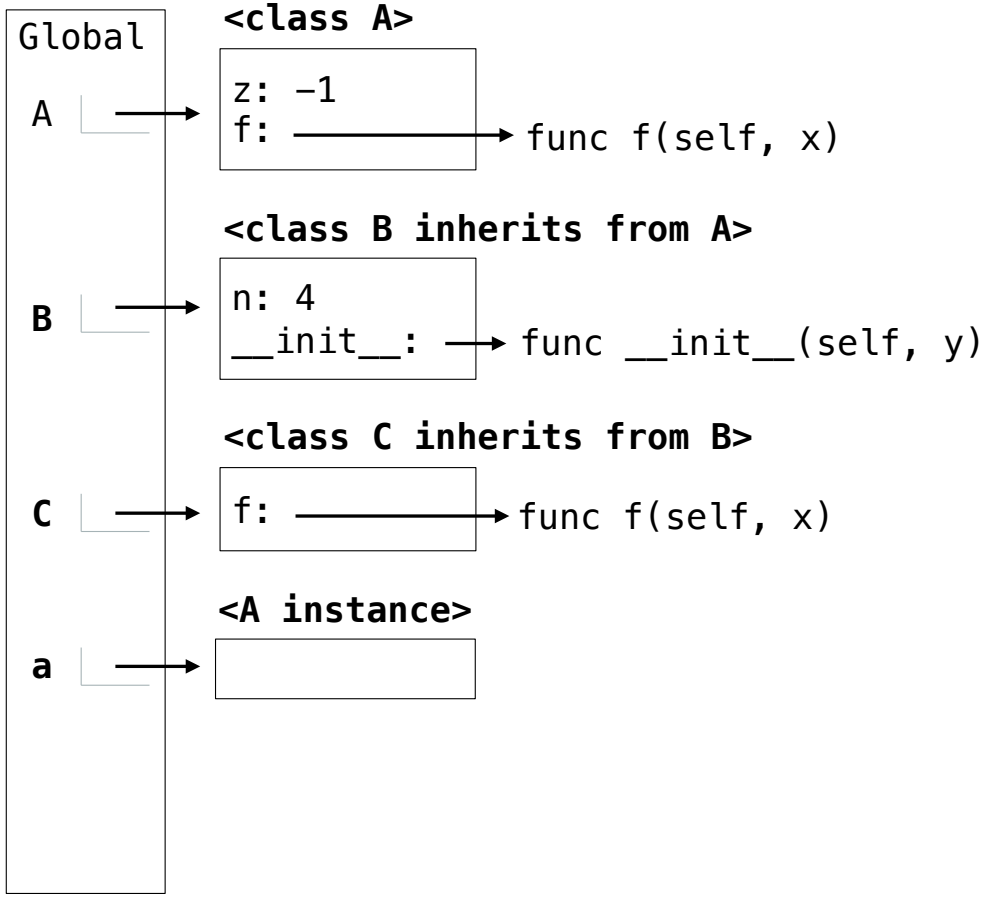

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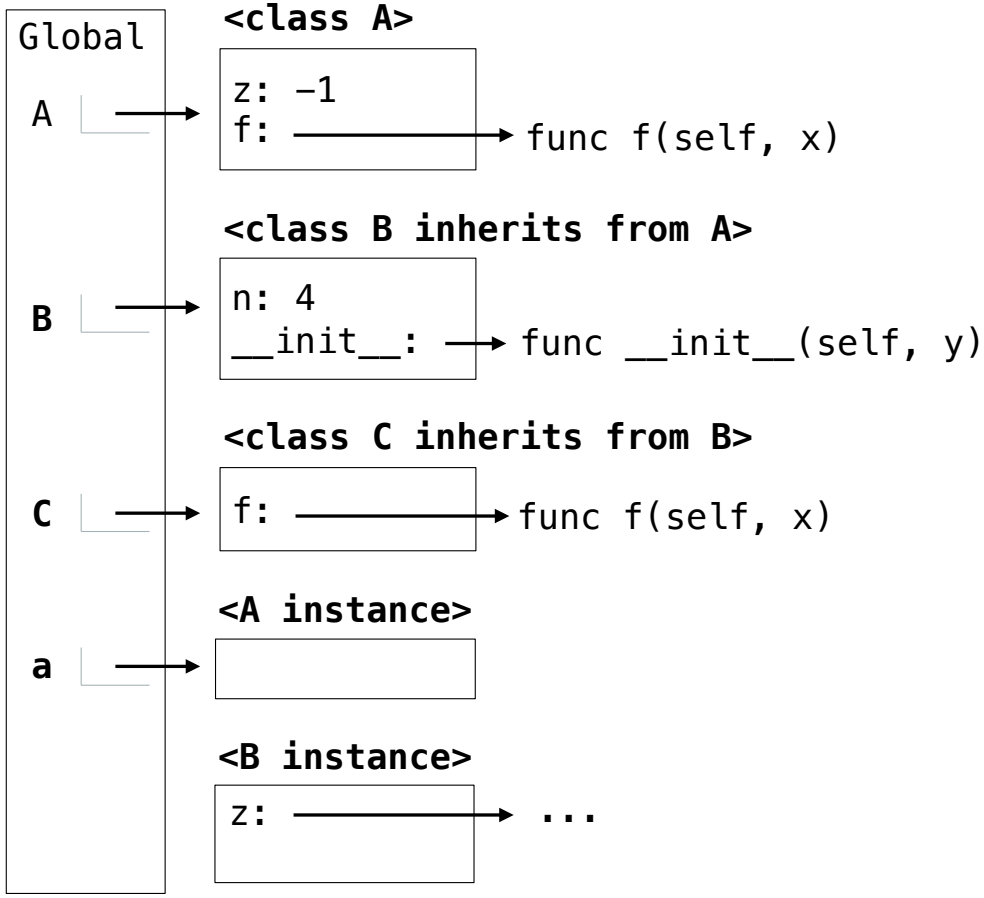

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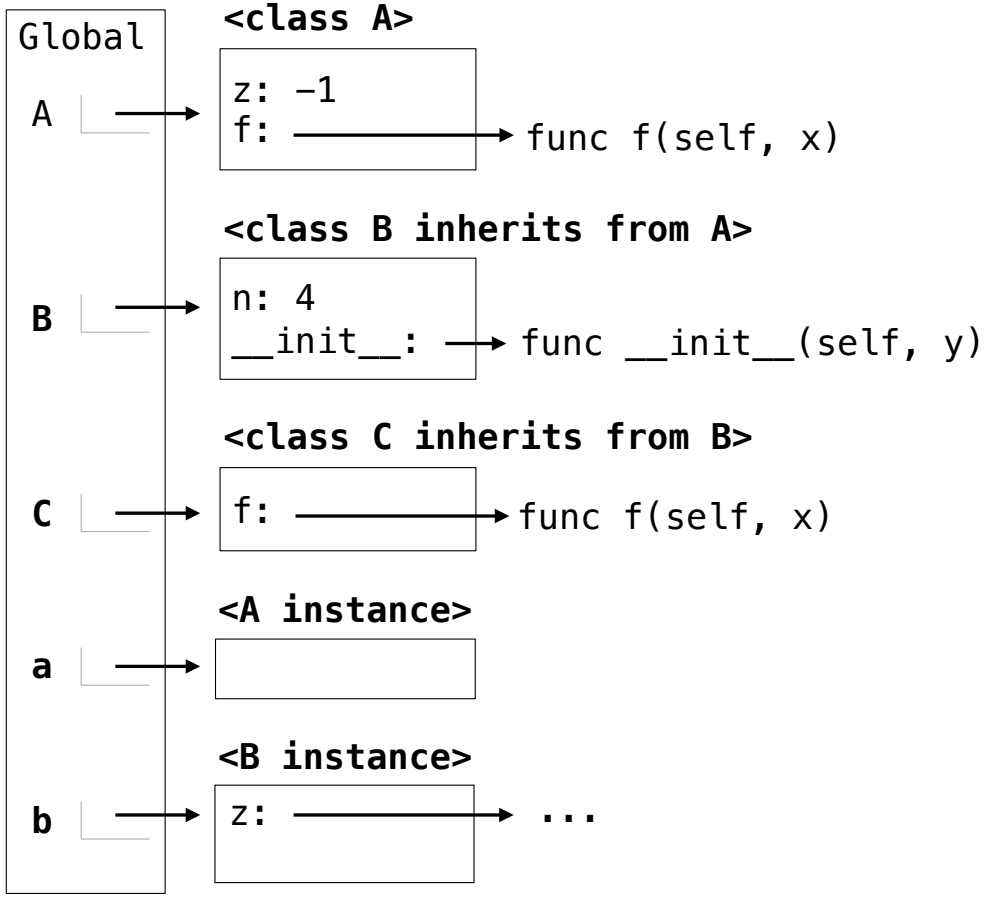

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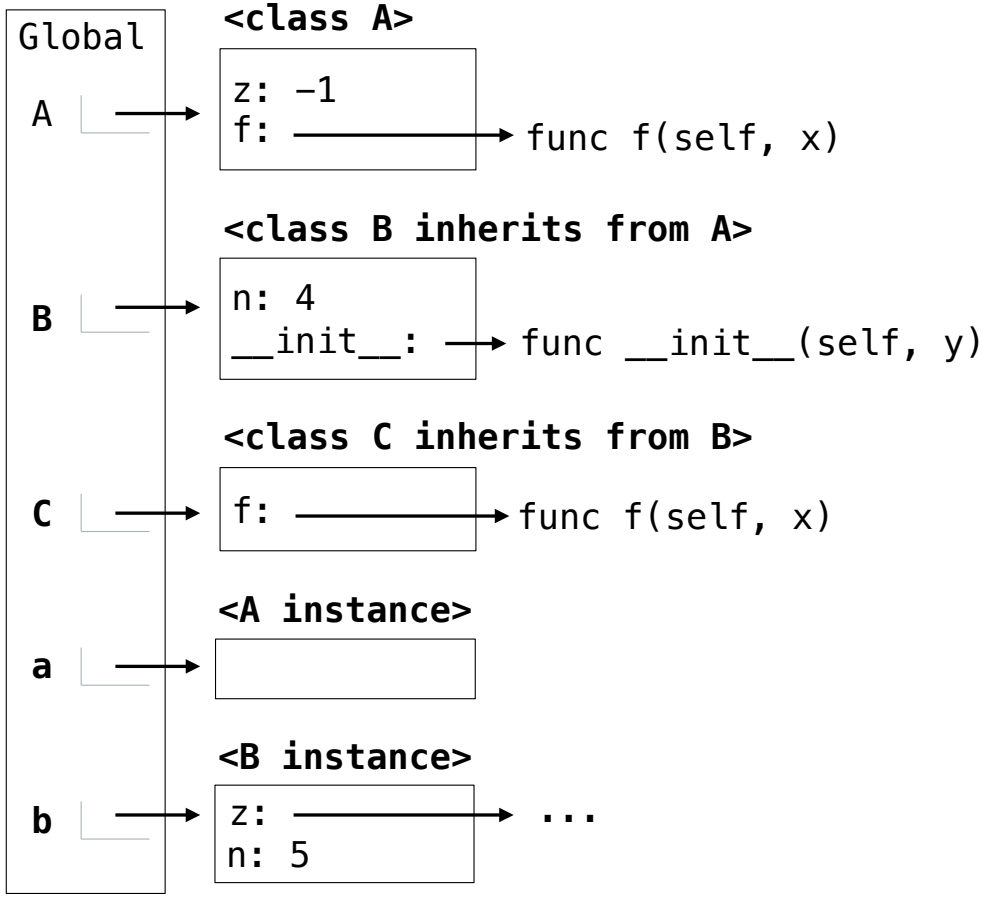

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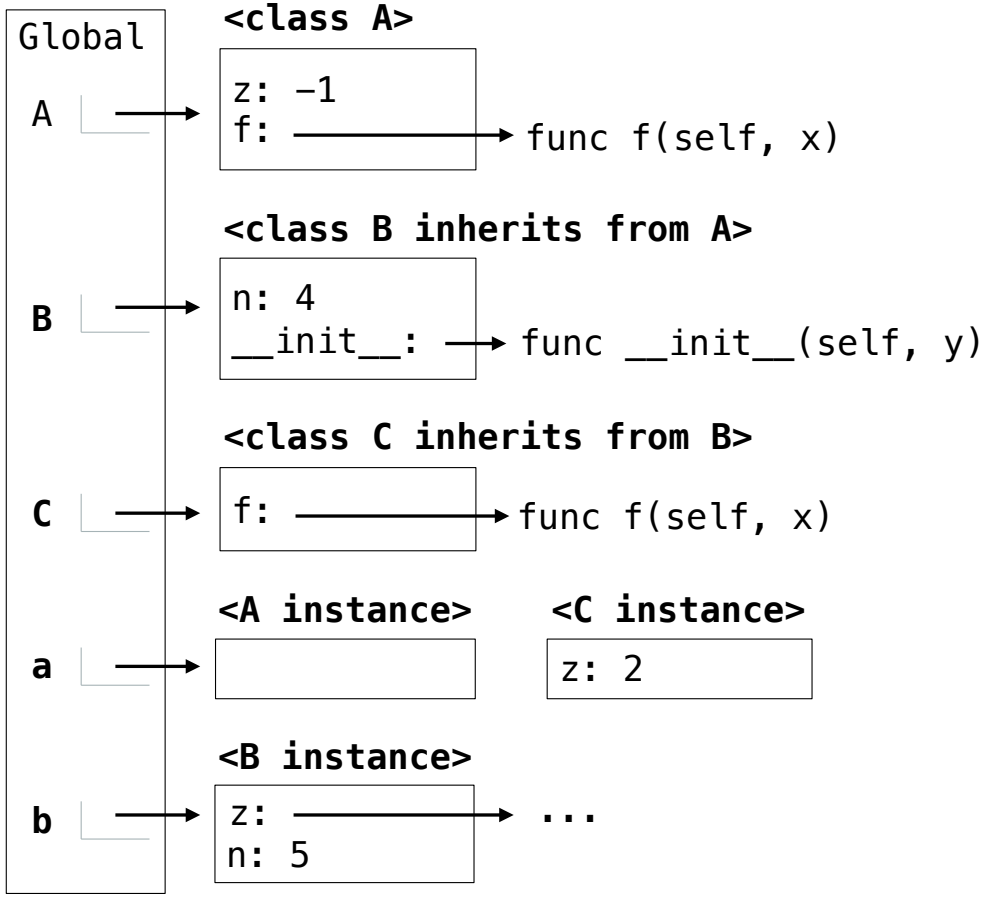

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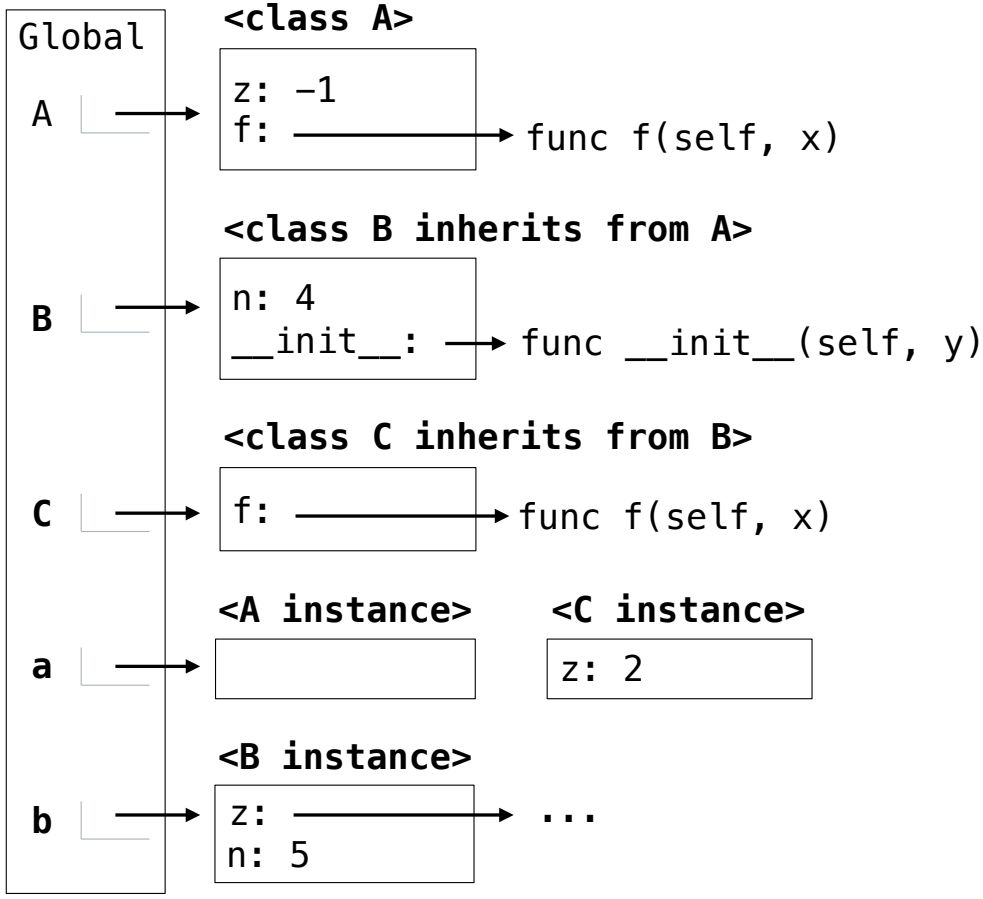

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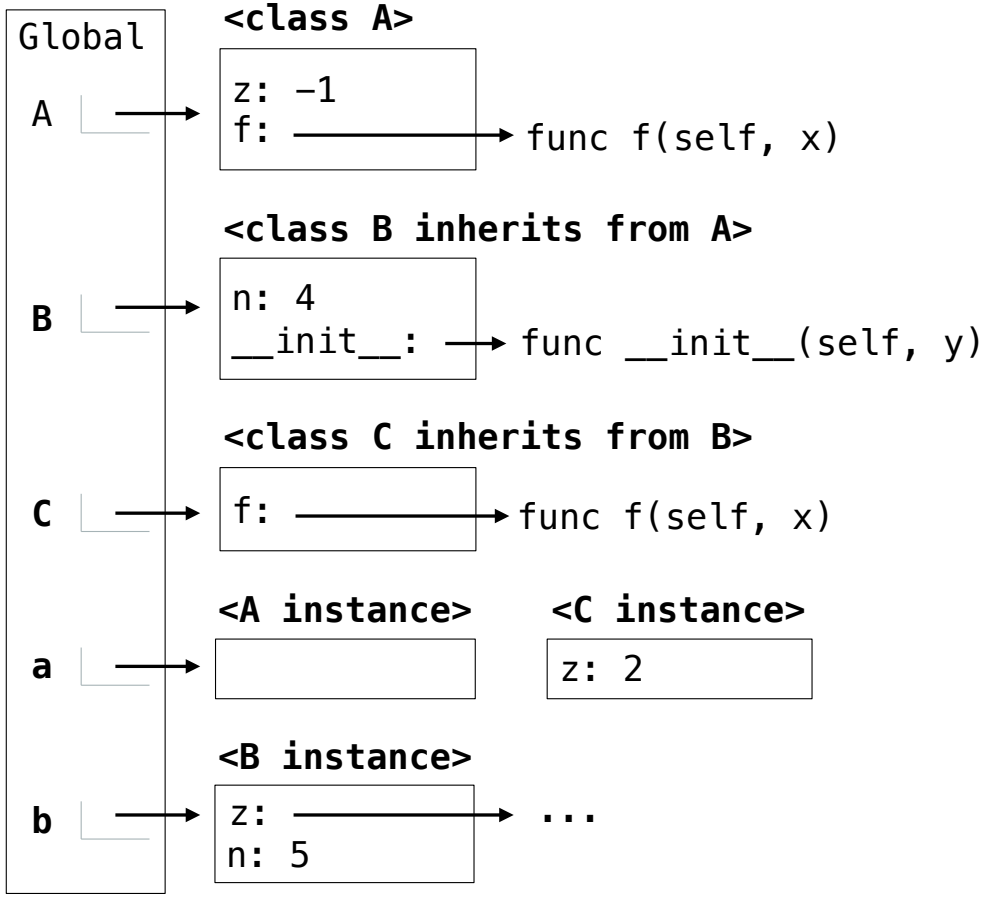

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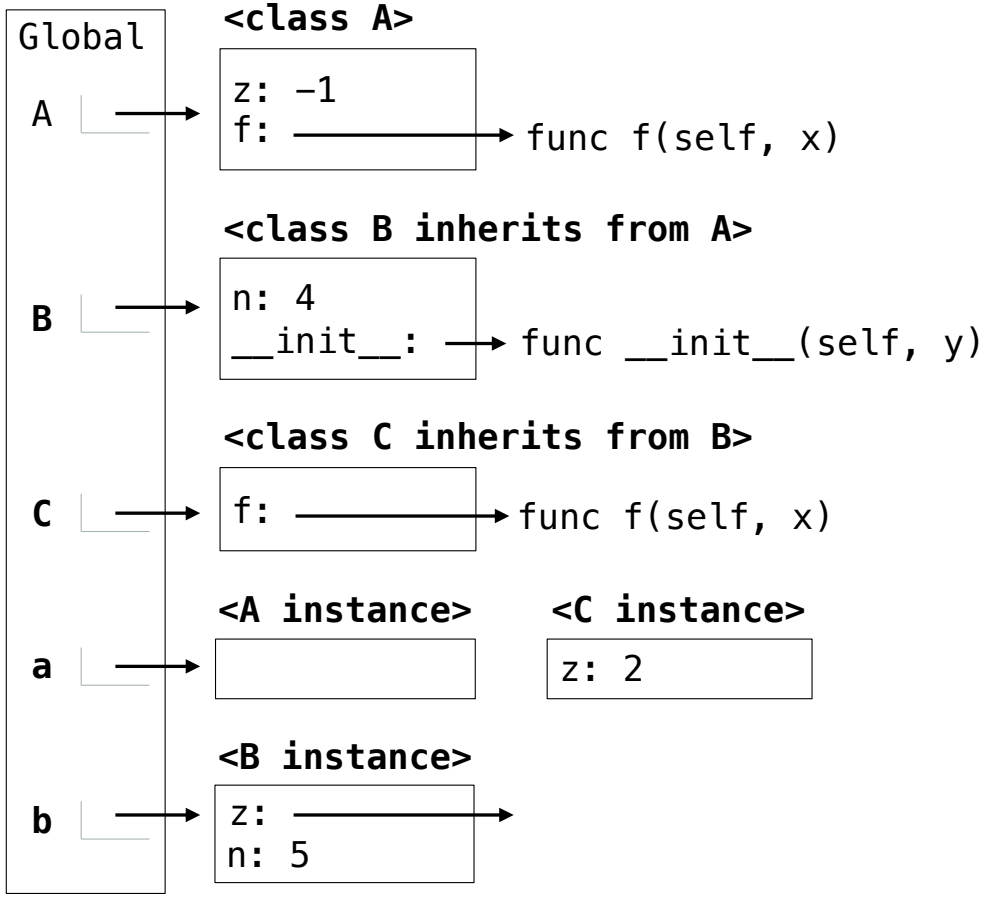

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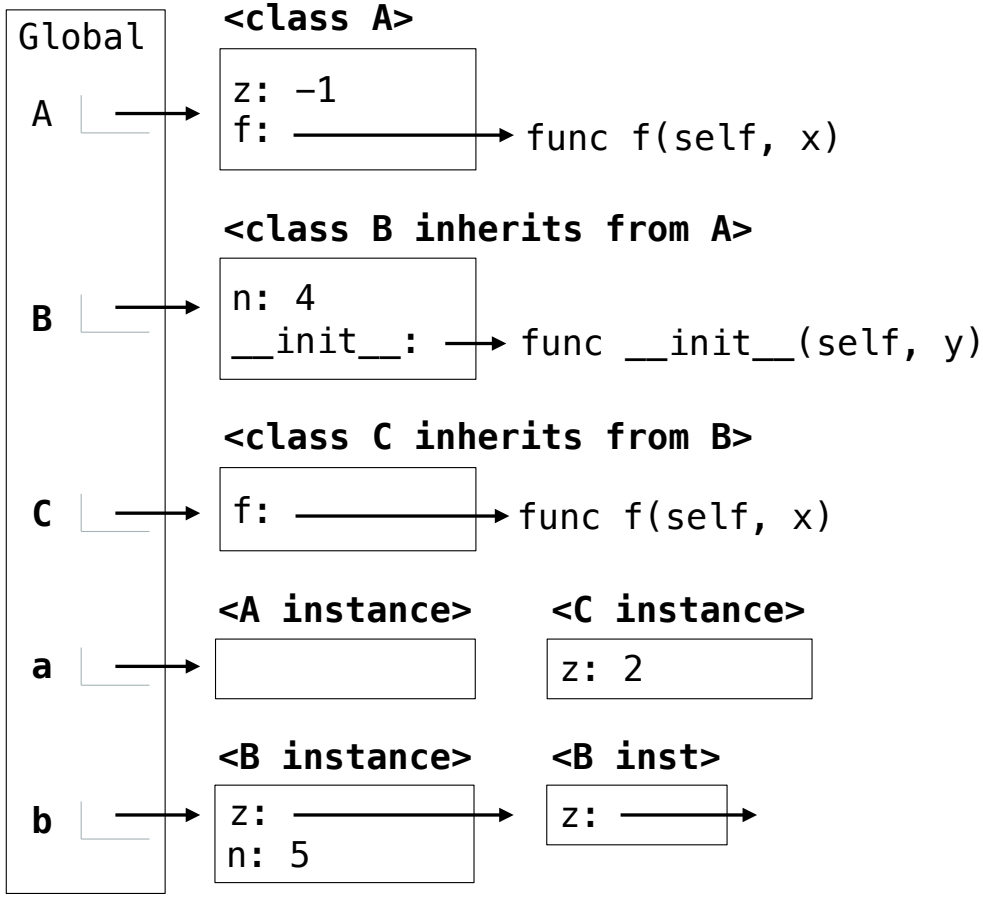

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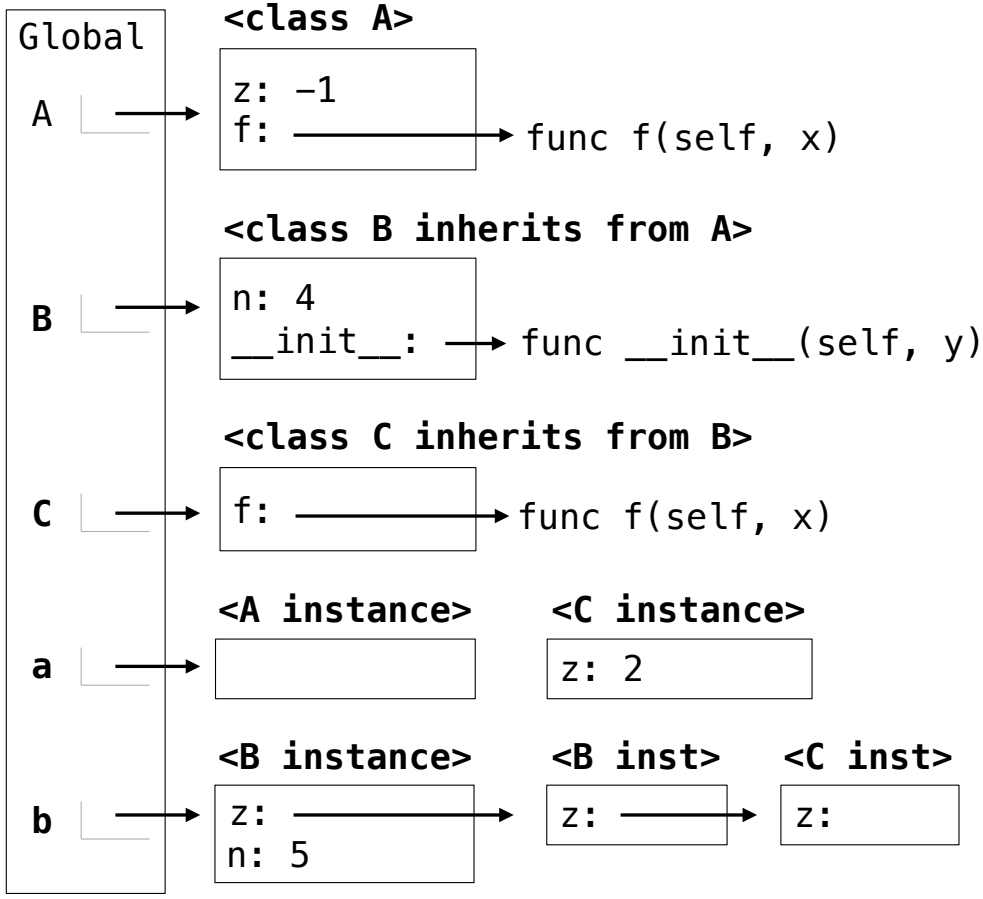

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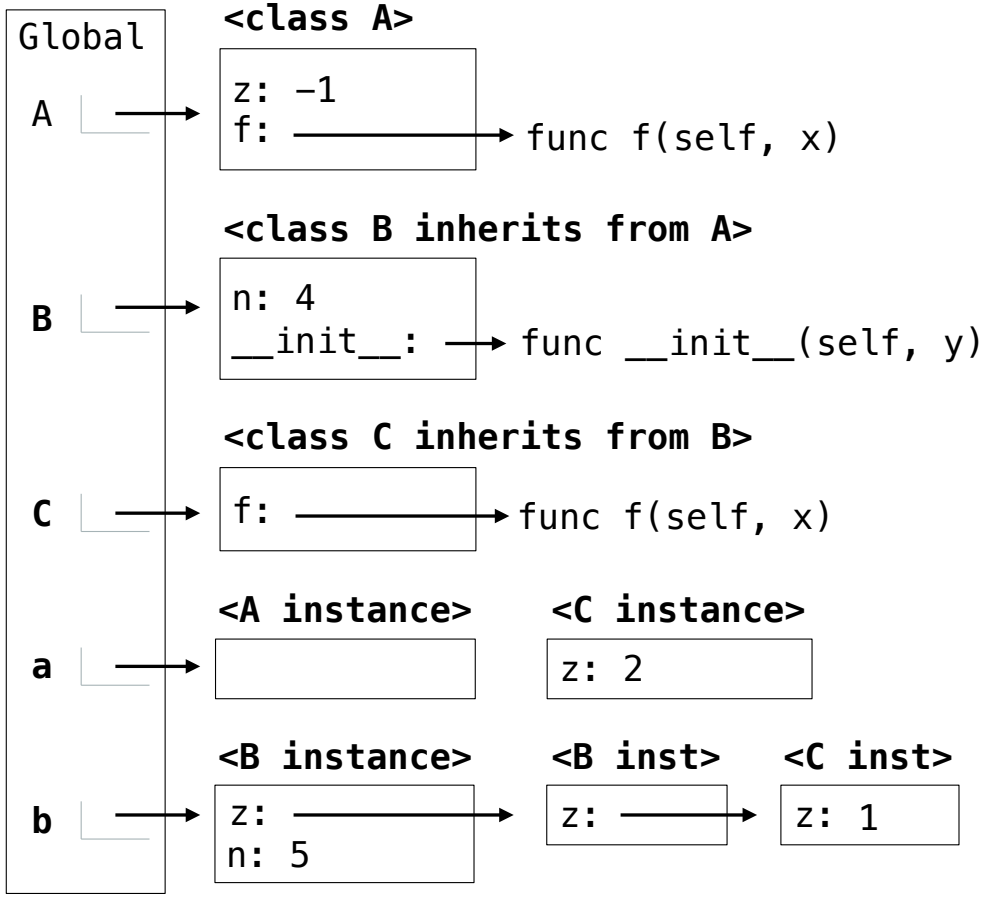

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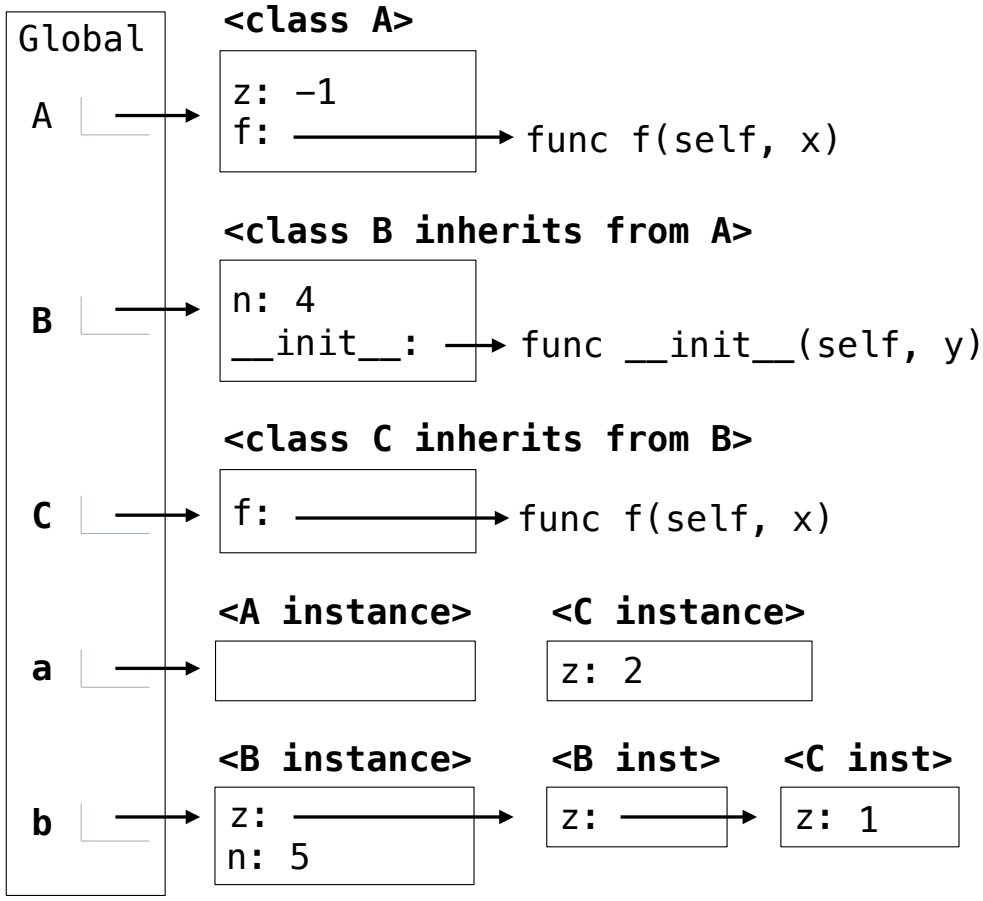

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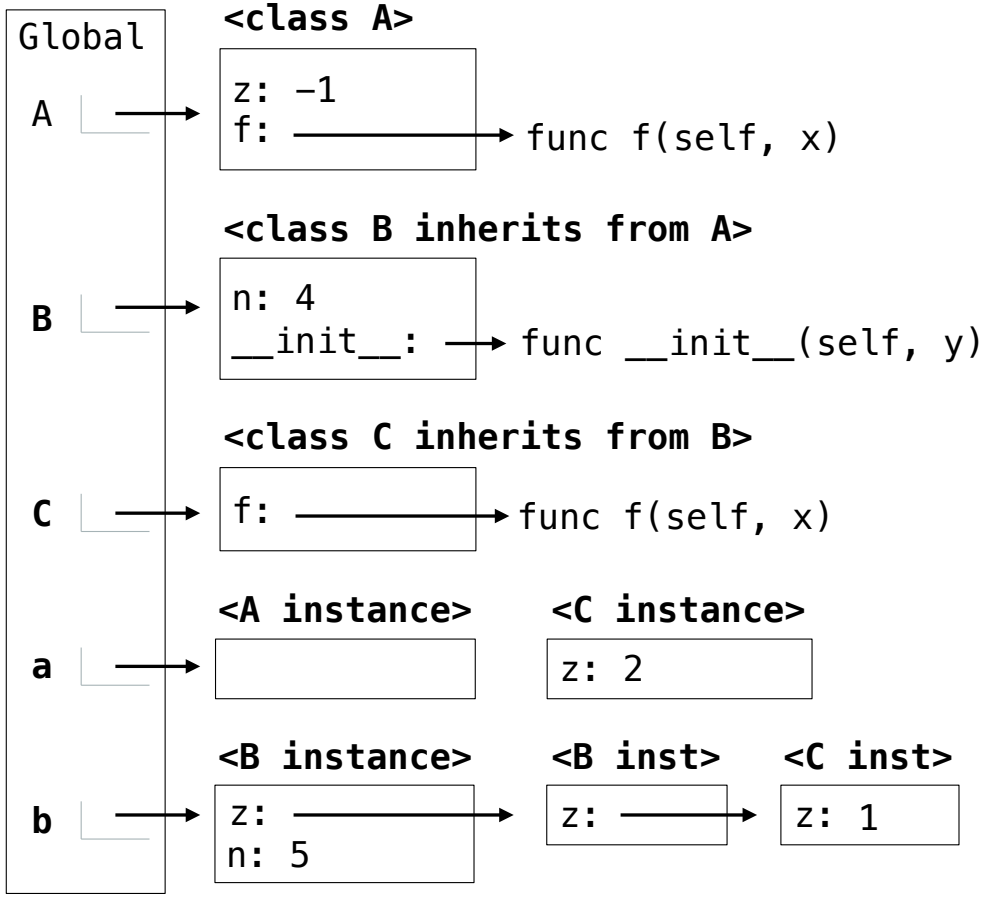

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        self.balance = 1                # A free dollar!
```


```
>>> such_a_deal = AsSeenOnTVAccount('John')
>>> such_a_deal.balance
1
```

Multiple Inheritance

A class may inherit from multiple base classes in Python.

```
class AsSeenOnTVAccount(CheckingAccount, SavingsAccount):
    def __init__(self, account_holder):
        self.holder = account_holder
        self.balance = 1                    # A free dollar!
```

Instance attribute

```
>>> such_a_deal = AsSeenOnTVAccount('John')
>>> such_a_deal.balance
1
>>> such_a_deal.deposit(20)
19
```

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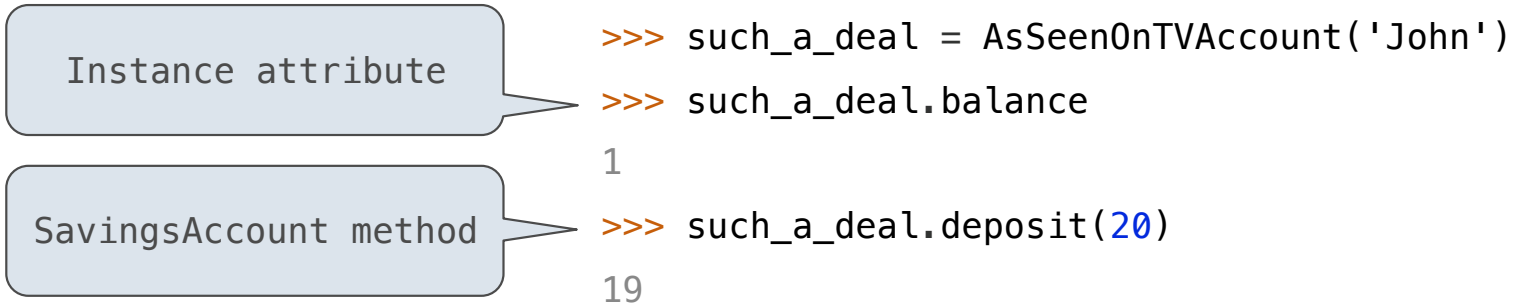
```



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```

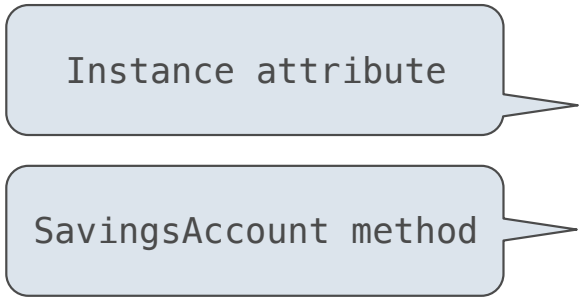


```
>>> such_a_deal = AsSeenOnTVAccount('John')
>>> such_a_deal.balance
1
>>> such_a_deal.deposit(20)
19
>>> such_a_deal.withdraw(5)
13
```

Multiple Inheritance

A class may inherit from multiple base classes in Python.

```
class AsSeenOnTVAccount(CheckingAccount, SavingsAccount):
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        self.holder = account_holder
        self.balance = 1                    # A free dollar!
```
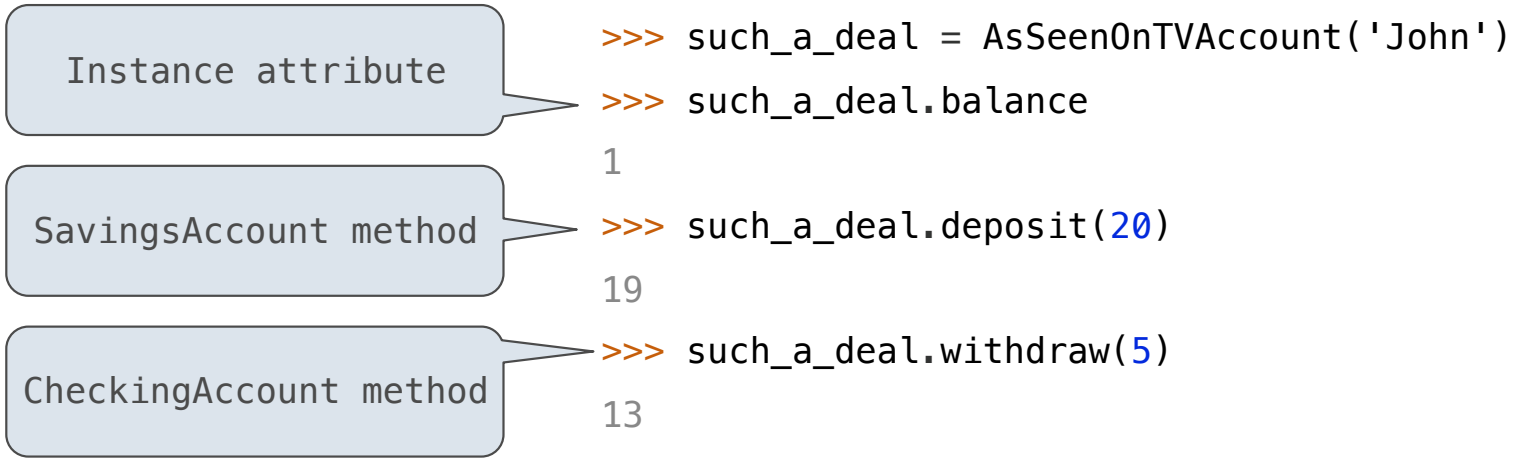
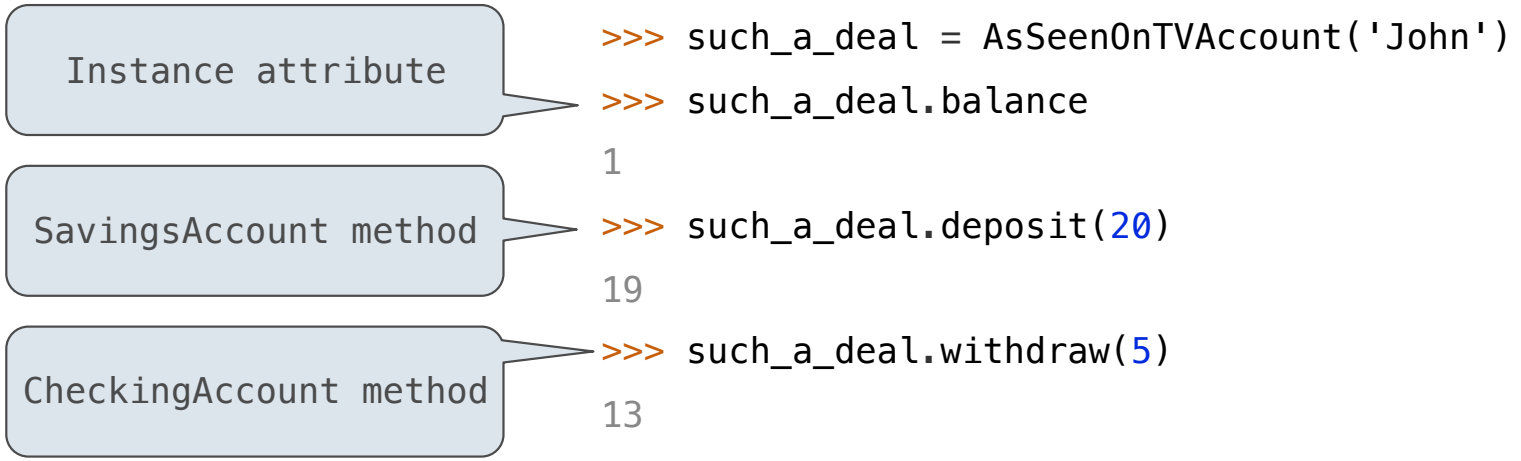
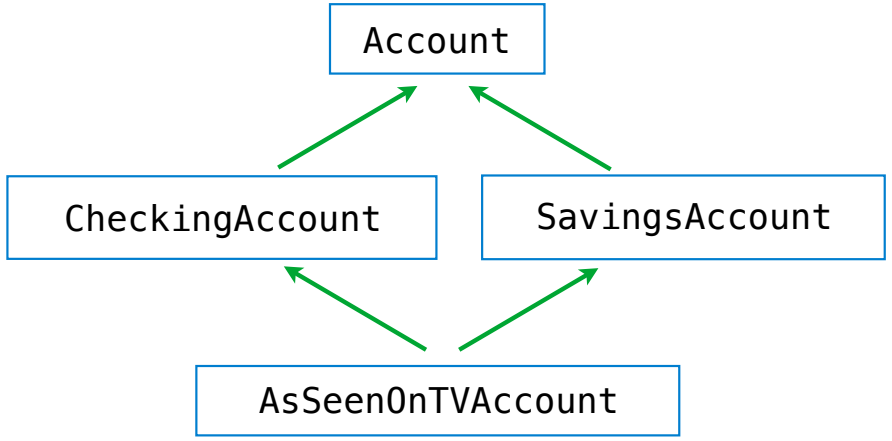



Resolving Ambiguous Class Attribute Names



Resolving Ambiguous Class Attribute Names



Instance attribute

SavingsAccount method

CheckingAccount method

```
>>> such_a_deal = AsSeenOnTVAccount('John')
>>> such_a_deal.balance
1
>>> such_a_deal.deposit(20)
19
>>> such_a_deal.withdraw(5)
13
```

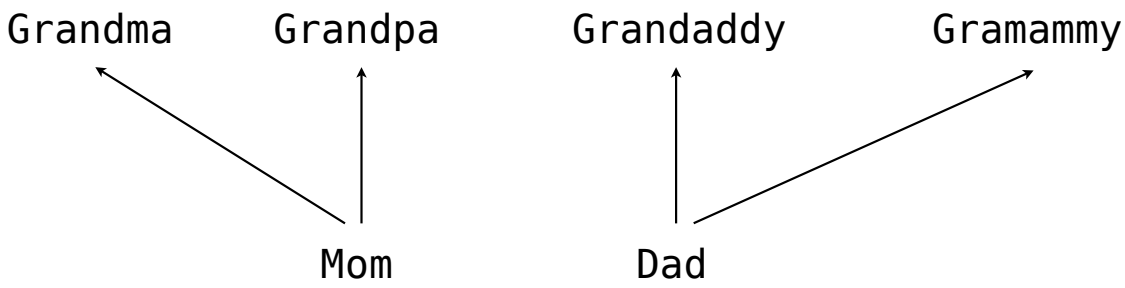
Complicated Inheritance

Biological Inheritance

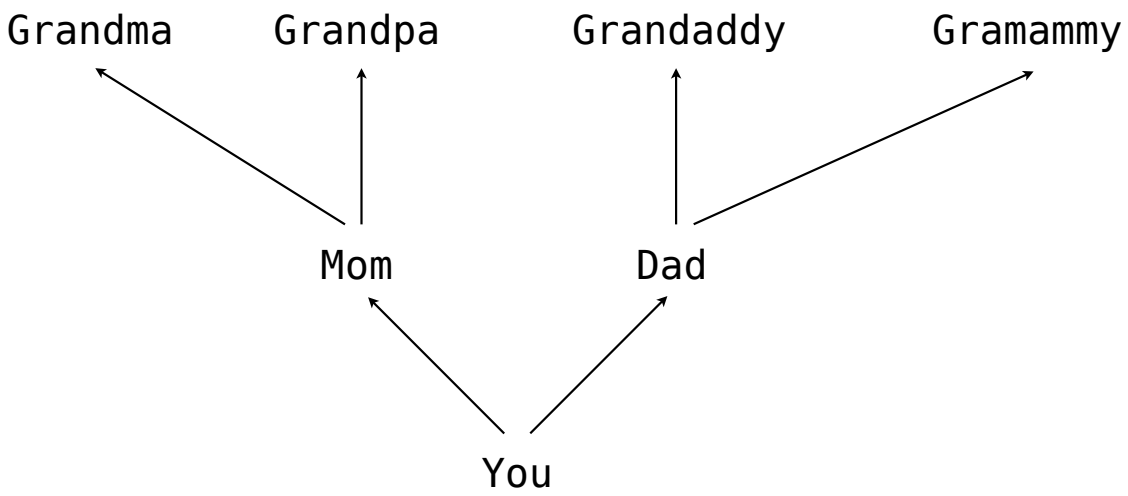
Biological Inheritance

```
Grandma      Grandpa      Grandaddy      Gramammy
```

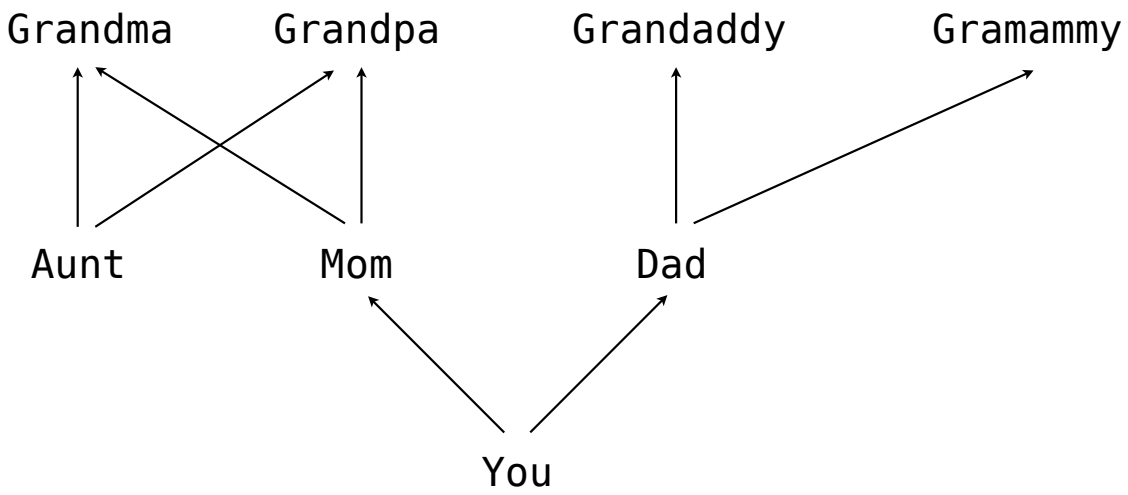
Biological Inheritance



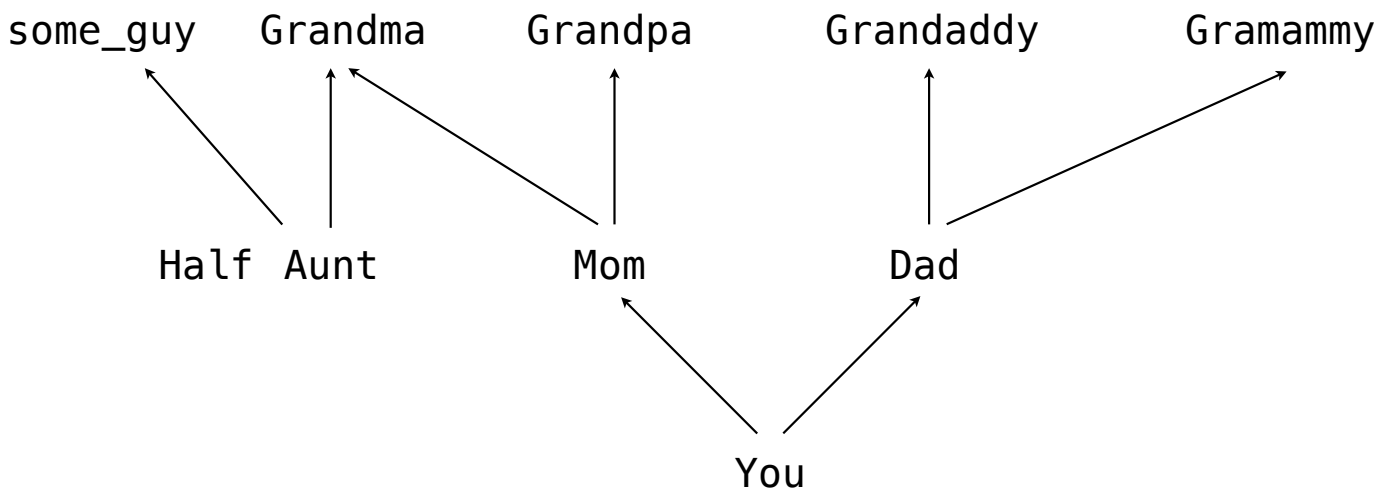
Biological Inheritance



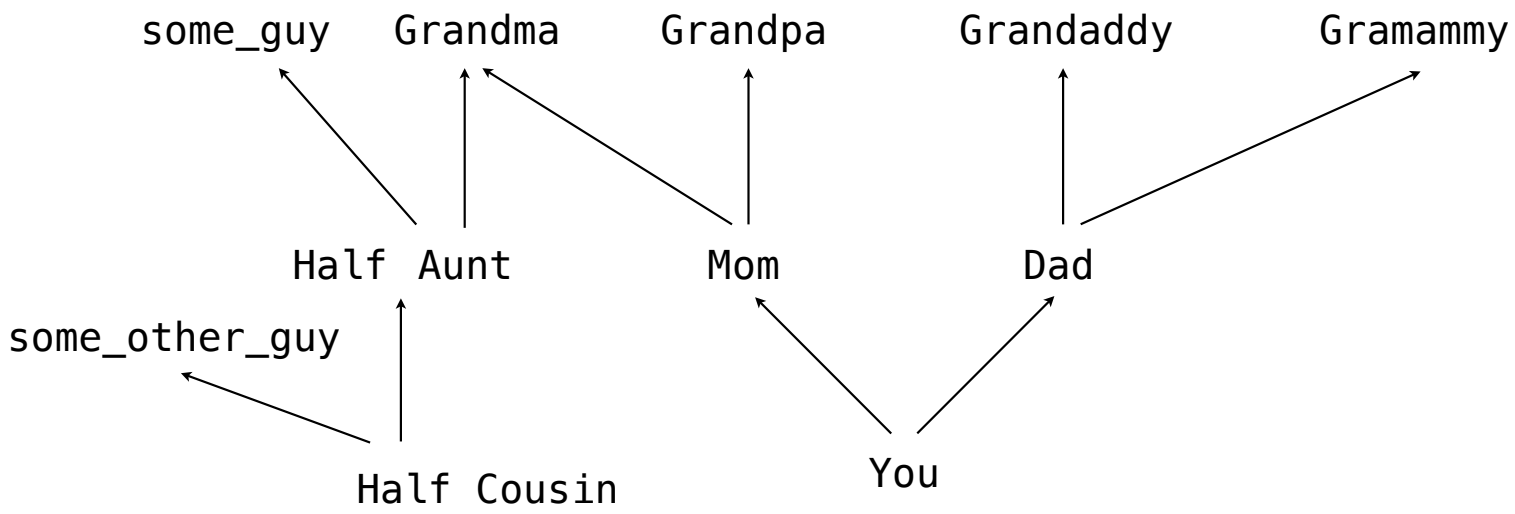
Biological Inheritance



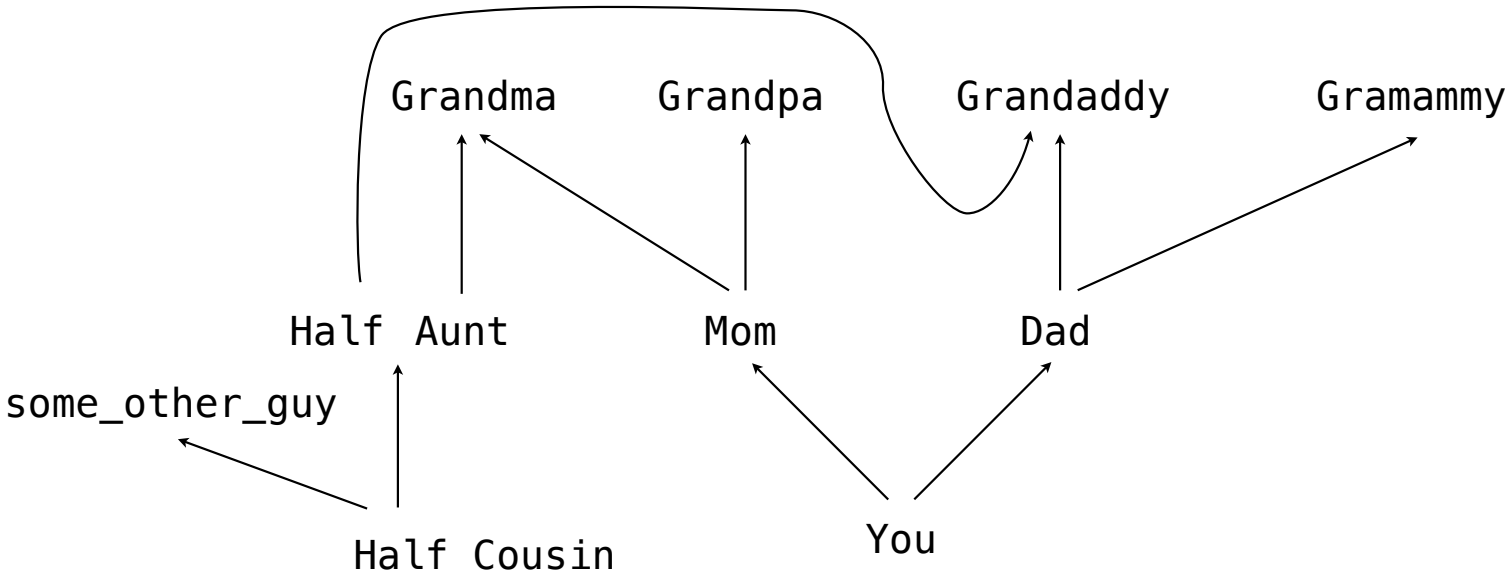
Biological Inheritance



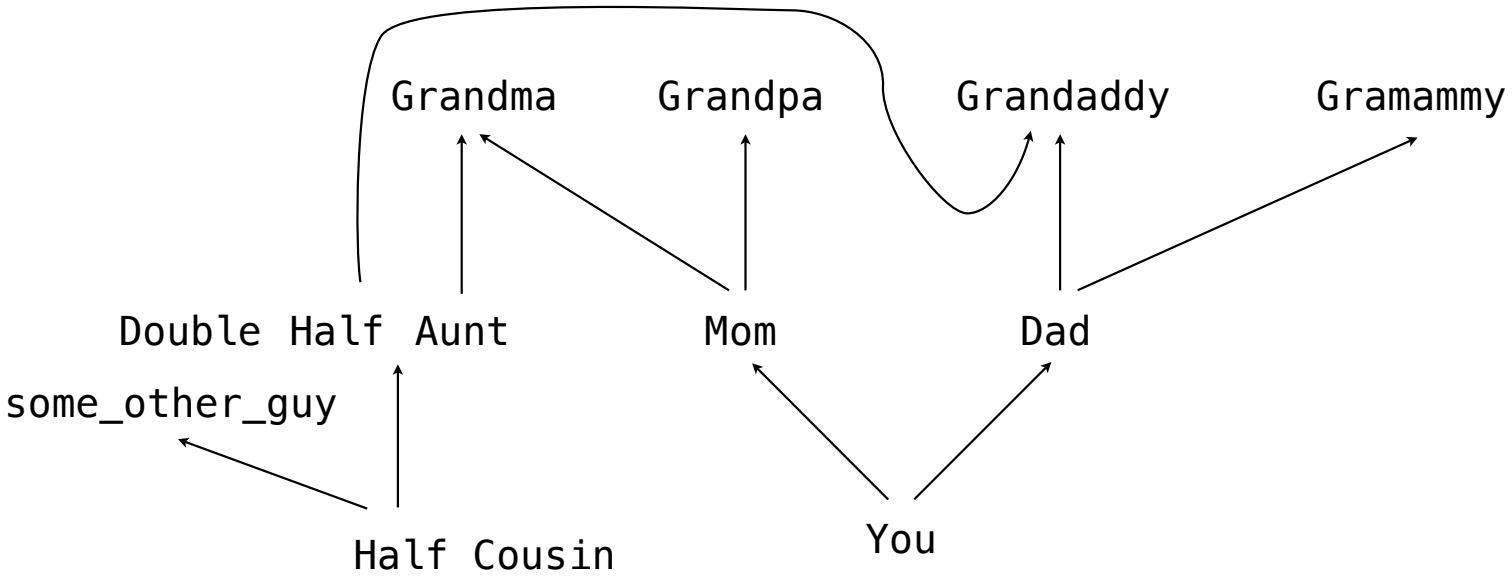
Biological Inheritance



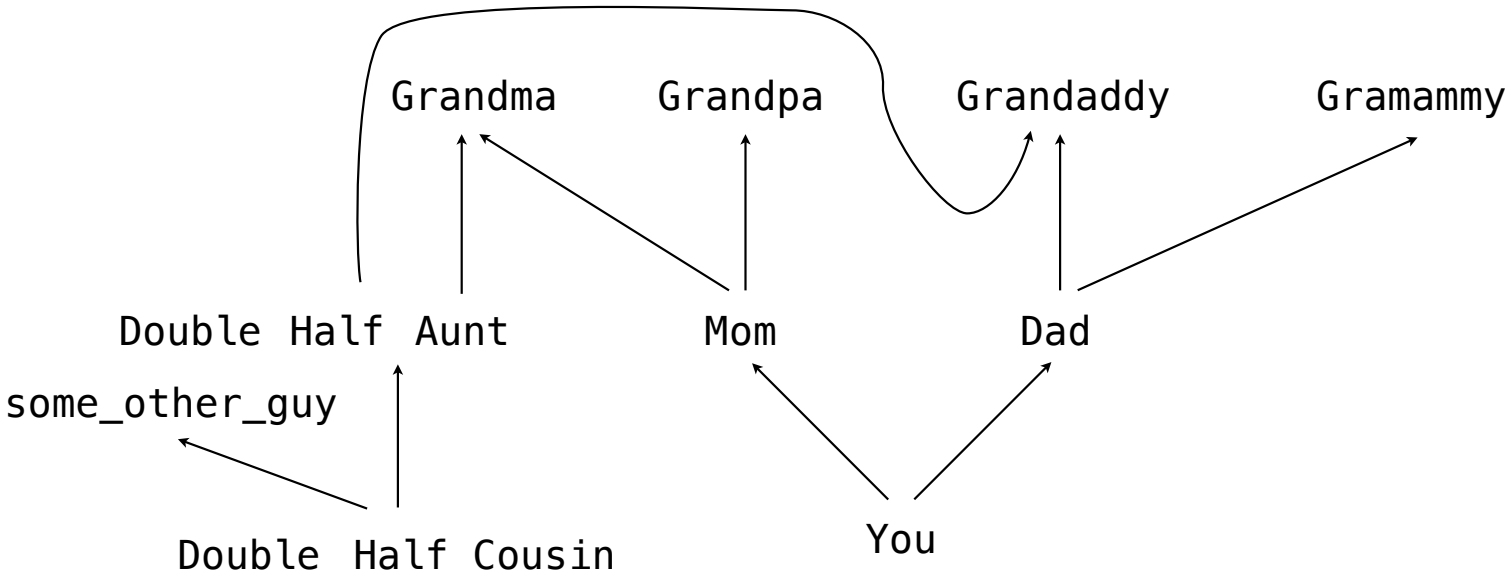
Biological Inheritance



Biological Inheritance



Biological Inheritance



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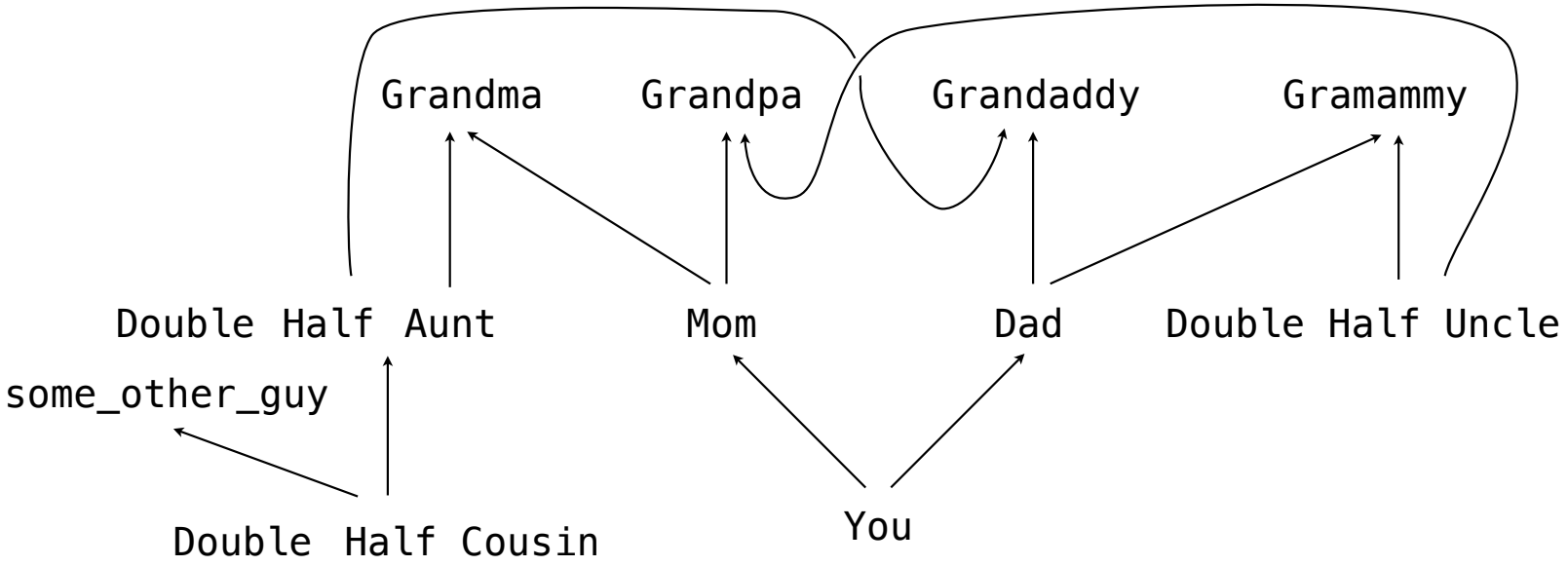
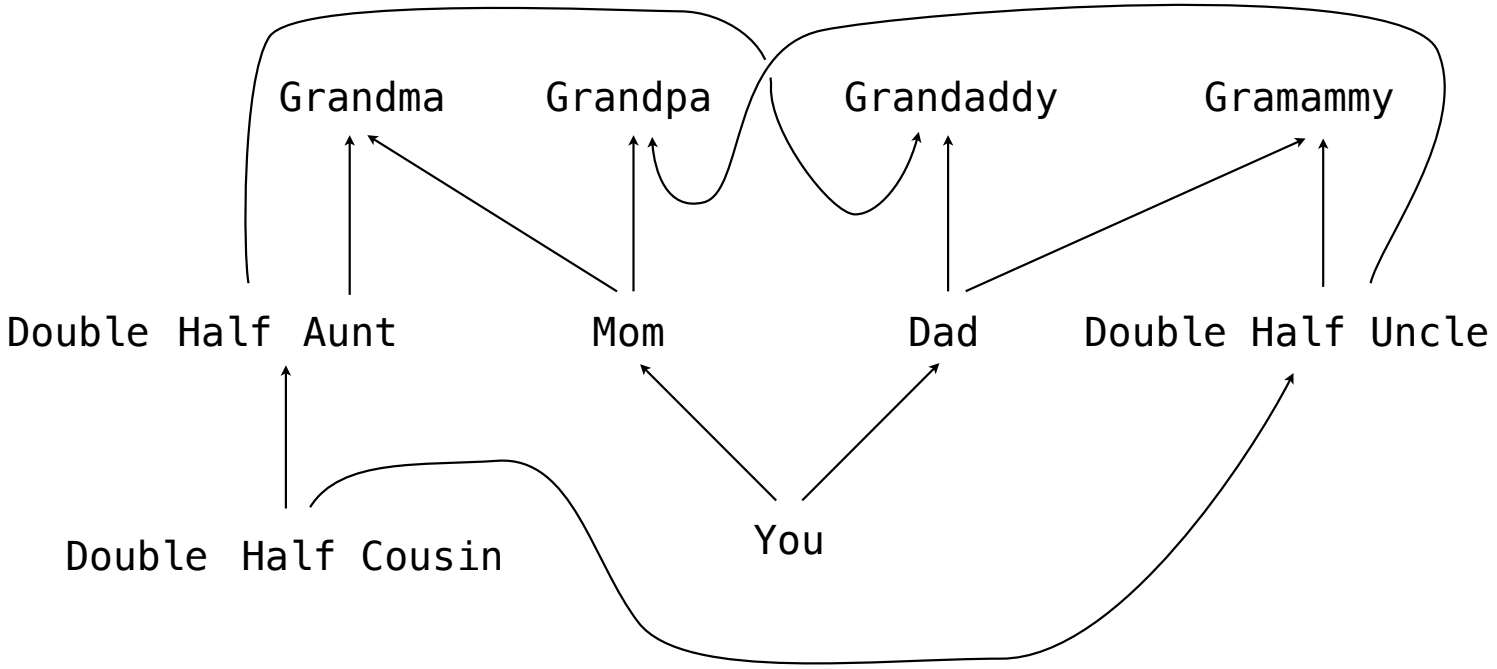


Biological Inheritance



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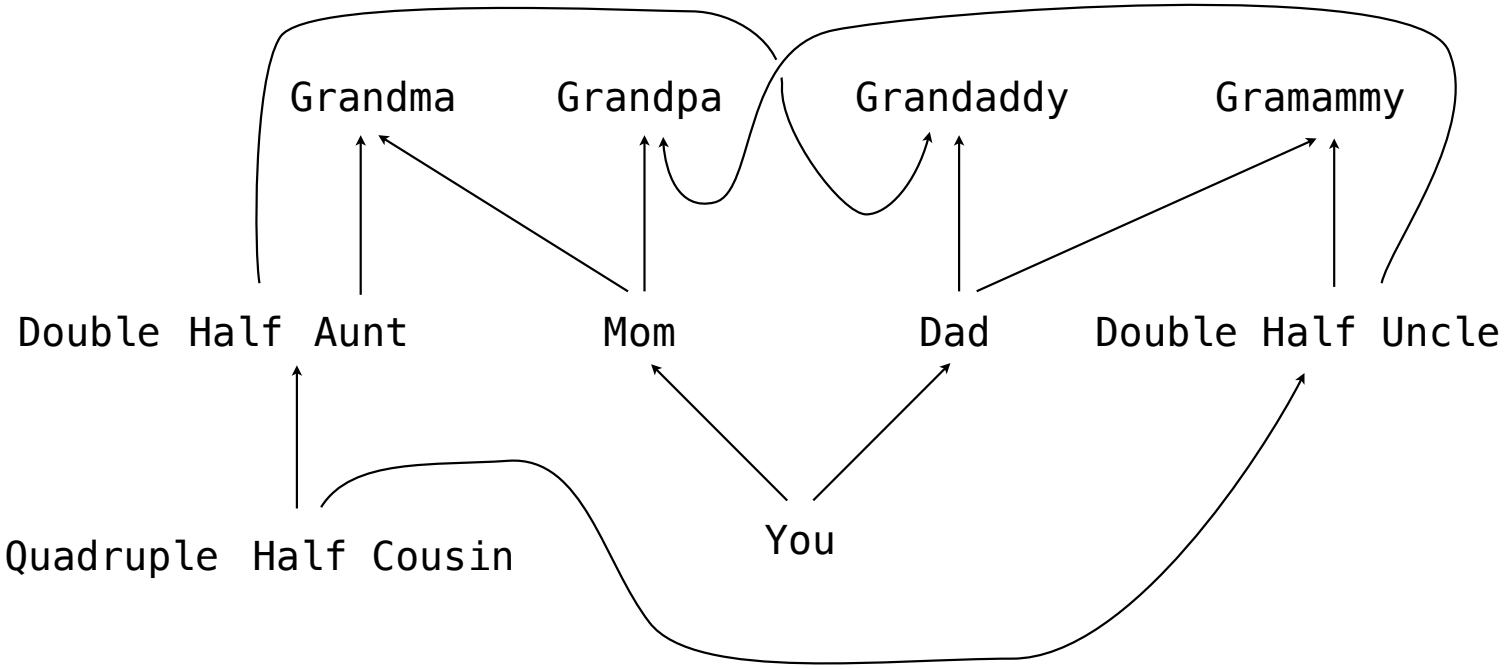
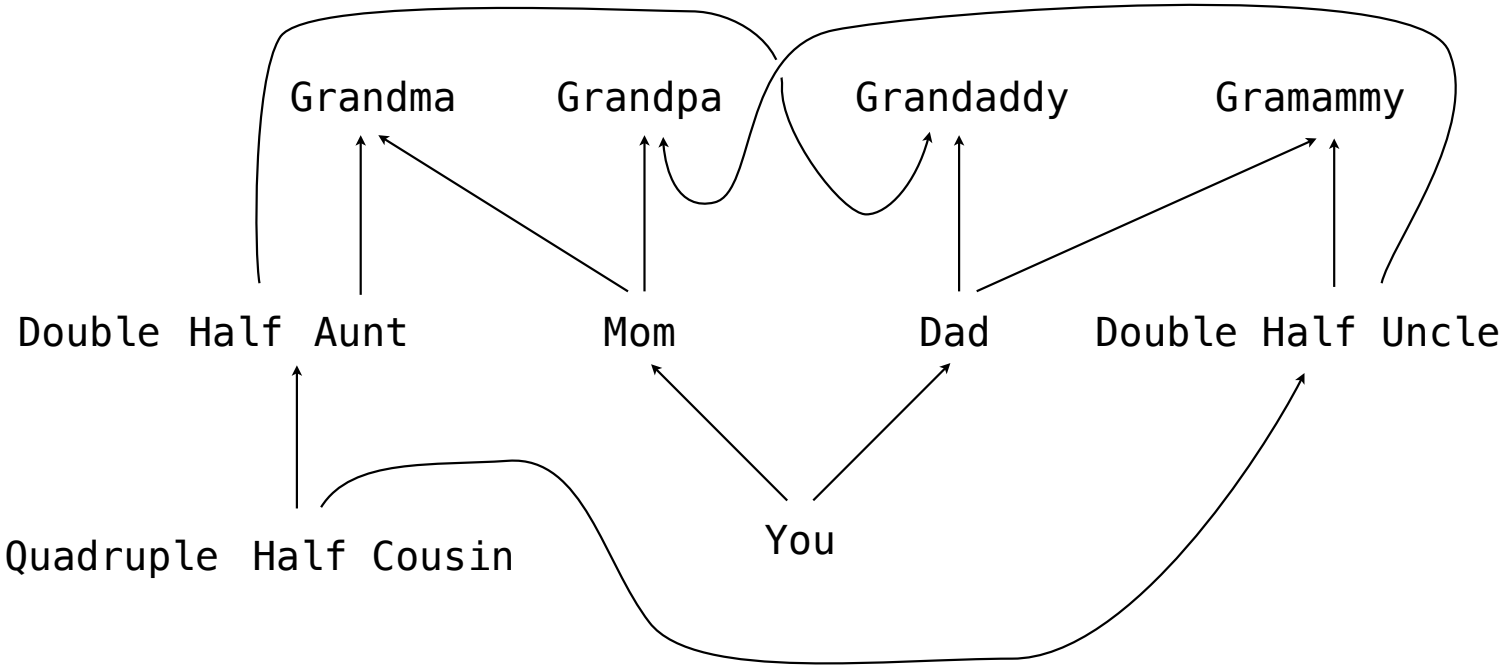


Biological Inheritance



Moral of the story: Inheritance can be complicated, so don't overuse it!