

Python Inheritance

Python Inheritance

Inheritance allows us to define a class that inherits all the methods and properties from another class.

Parent class is the class being inherited from, also called base class.

Child class is the class that inherits from another class, also called derived class.

Create a Parent Class

Any class can be a parent class, so the syntax is the same as creating any other class:

Example

Create a class named Person, with firstname and lastname properties, and a printname method:

```
class Person:
    def __init__(self, fname, lname):
        self.firstname = fname
        self.lastname = lname

    def printname(self):
        print(self.firstname, self.lastname)
```

#Use the Person class to create an object, and then execute the printname method:

```
x = Person("John", "Doe")
x.printname()
```

Create a Child Class

To create a class that inherits the functionality from another class, send the parent class as a parameter when creating the child class:

Example

Create a class named Student, which will inherit the properties and methods from the Person class:

```
class Student(Person):  
    pass
```

Note: Use the pass keyword when you do not want to add any other properties or methods to the class.

Now the Student class has the same properties and methods as the Person class.

Example

Use the Student class to create an object, and then execute the printname method:

```
x = Student("Mike", "Olsen")  
x.printname()
```

Add the __init__() Function

So far we have created a child class that inherits the properties and methods from its parent.

We want to add the __init__() function to the child class (instead of the pass keyword).

Note: The __init__() function is called automatically every time the class is being used to create a new object.

Example

Add the __init__() function to the Student class:

```
class Student(Person):  
    def __init__(self, fname, lname):  
        #add properties etc.
```

When you add the __init__() function, the child class will no longer inherit the parent's __init__() function.

Note: The child's __init__() function **overrides** the inheritance of the parent's __init__() function.

To keep the inheritance of the parent's __init__() function, add a call to the parent's __init__() function:

Example

```
class Student(Person):  
    def __init__(self, fname, lname):  
        Person.__init__(self, fname, lname)
```

Now we have successfully added the `__init__()` function, and kept the inheritance of the parent class, and we are ready to add functionality in the `__init__()` function.

Use the `super()` Function

Python also has a `super()` function that will make the child class inherit all the methods and properties from its parent:

Example

```
class Student(Person):
    def __init__(self, fname, lname):
        super().__init__(fname, lname)
```

By using the `super()` function, you do not have to use the name of the parent element, it will automatically inherit the methods and properties from its parent.

Add Properties

Example

Add a property called `graduationyear` to the `Student` class:

```
class Student(Person):
    def __init__(self, fname, lname):
        super().__init__(fname, lname)
        self.graduationyear = 2019
```

In the example below, the year 2019 should be a variable, and passed into the `Student` class when creating student objects. To do so, add another parameter in the `__init__()` function:

Example

Add a year parameter, and pass the correct year when creating objects:

```
class Student(Person):
    def __init__(self, fname, lname, year):
        super().__init__(fname, lname)
        self.graduationyear = year
```

```
x = Student("Mike", "Olsen", 2019)
```

Add Methods

Example

Add a method called `welcome` to the `Student` class:

```
class Student(Person):  
    def __init__(self, fname, lname, year):  
        super().__init__(fname, lname)  
        self.graduationyear = year  
  
    def welcome(self):  
        print("Welcome", self.firstname, self.lastname, "to the class of", self.graduationyear)
```

If you add a method in the child class with the same name as a function in the parent class, the inheritance of the parent method will be overridden.

Python Iterators

Python Iterators

An iterator is an object that contains a countable number of values.

An iterator is an object that can be iterated upon, meaning that you can traverse through all the values.

Technically, in Python, an iterator is an object which implements the iterator protocol, which consist of the methods `__iter__()` and `__next__()`.

Iterator vs Iterable

Lists, tuples, dictionaries, and sets are all iterable objects. They are iterable *containers* which you can get an iterator from.

All these objects have a `iter()` method which is used to get an iterator:

Example

Return an iterator from a tuple, and print each value:

```
mytuple = ("apple", "banana", "cherry")
myit = iter(mytuple)
```

```
print(next(myit))
print(next(myit))
print(next(myit))
```

Even strings are iterable objects, and can return an iterator:

Example

Strings are also iterable objects, containing a sequence of characters:

```
mystr = "banana"
myit = iter(mystr)
```

```
print(next(myit))
print(next(myit))
print(next(myit))
print(next(myit))
print(next(myit))
print(next(myit))
```

Looping Through an Iterator

We can also use a for loop to iterate through an iterable object:

Example

Iterate the values of a tuple:

```
mytuple = ("apple", "banana", "cherry")
```

```
for x in mytuple:
    print(x)
```

Example

Iterate the characters of a string:

```
mystr = "banana"
```

```
for x in mystr:
    print(x)
```

The for loop actually creates an iterator object and executes the next() method for each loop.

StopIteration

The example above would continue forever if you had enough next() statements, or if it was used in a for loop.

To prevent the iteration from going on forever, we can use the StopIteration statement.

In the __next__() method, we can add a terminating condition to raise an error if the iteration is done a specified number of times:

Example

Stop after 20 iterations:

```
class MyNumbers:
    def __iter__(self):
        self.a = 1
        return self

    def __next__(self):
        if self.a <= 20:
            x = self.a
            self.a += 1
            return x
        else:
            raise StopIteration

myclass = MyNumbers()
myiter = iter(myclass)

for x in myiter:
    print(x)
```