HackerFrogs Afterschool
Python Programming Basics: Part 7

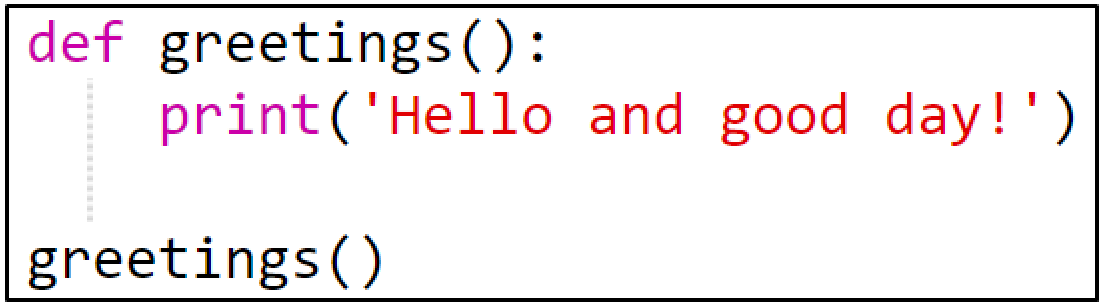
```
Class:
Programming (Python)

Workshop Number:
AS-PRO-PY-07

Document Version:
1.2

Special Requirements:
Completion of AS-PRO-PY-06
```

What We Learned Before

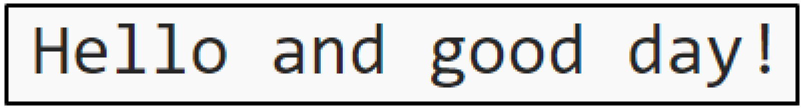
This workshop is the seventh class for intro Python programming.

During our last workshop, we learned about a few programming concepts through Python, including the following:

Functions



```python
def greetings():
    print('Hello and good day!')

greetings()
```



```
Hello and good day!
```

Functions are defined blocks of code that can be executed multiple times in the same program.

Functions

```python
def greetings():
    print('Hello and good day!')

greetings()
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Hello and good day!
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Executing a function is usually referred to as “calling a function”, or “a function call”.

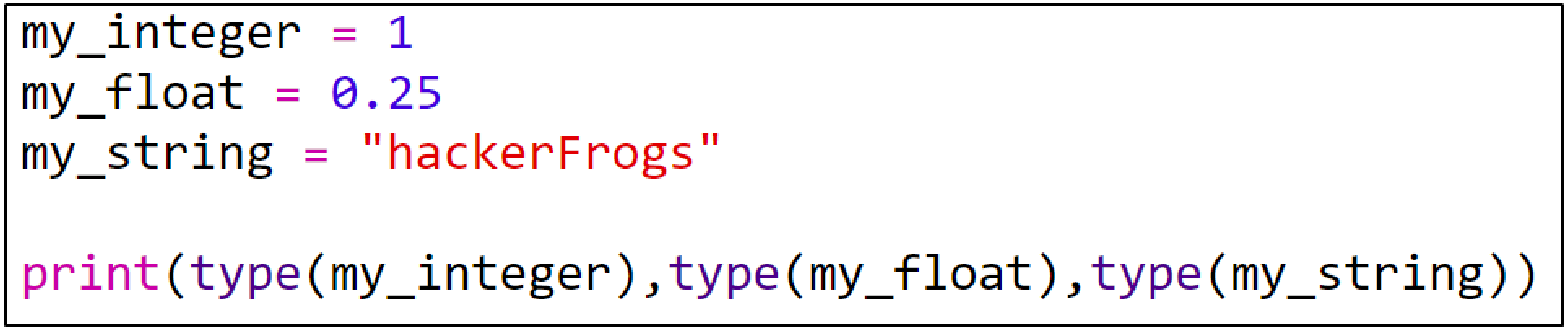
This Workshop's Topics

New topics for this session:

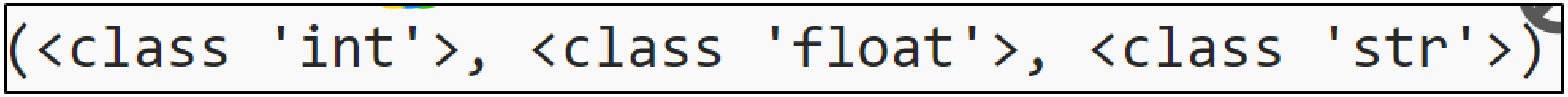
- Classes and Objects

- Dictionaries

Part 1: Objects and Classes



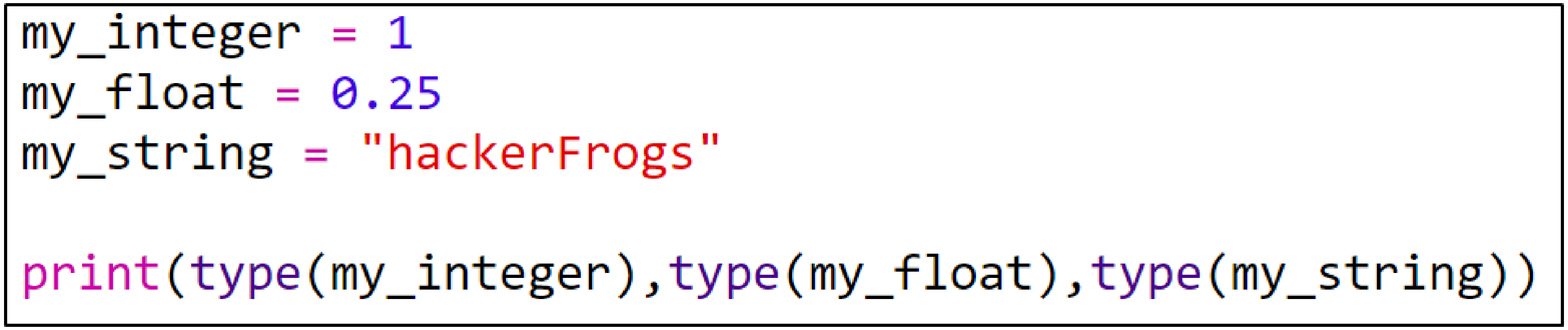
```python
my_integer = 1
my_float = 0.25
my_string = "hackerFrogs"

print(type(my_integer),type(my_float),type(my_string))
```



```
(<class 'int'>, <class 'float'>, <class 'str'>)
```

Python is an object-oriented programming (OOP) language, and as such, all pieces of data in Python code are considered objects.

Classes



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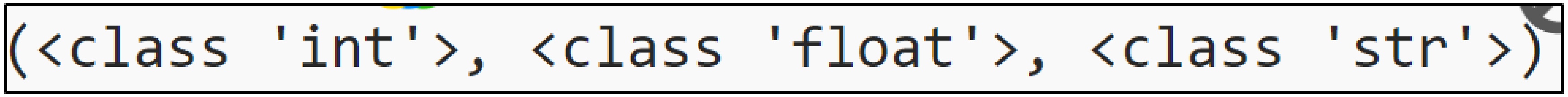


```
(<class 'int'>, <class 'float'>, <class 'str'>)
```

In addition, all objects in Python are separated into different classes. We see that the three variables here are in the **integer**, **float**, and **string** classes, respectively.

Classes

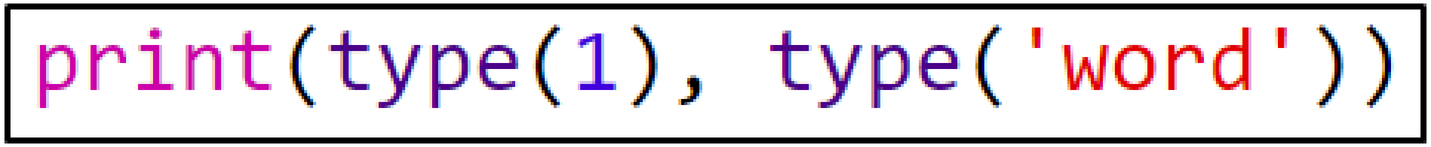
```python
my_string = "The hackerFrogs"

print(len(my_string))
print(my_string.upper())
```

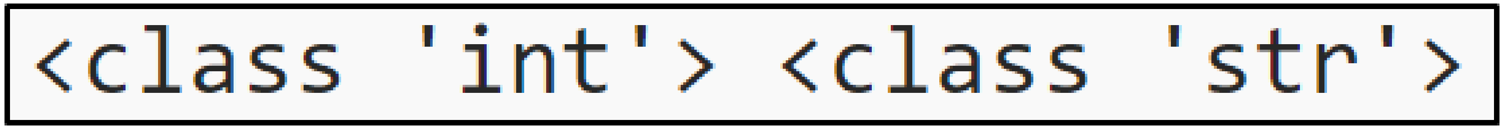
```
15
THE HACKERFROGS
```

An object's class indicates which built-in functions, methods and variables it has.

Classes & Objects



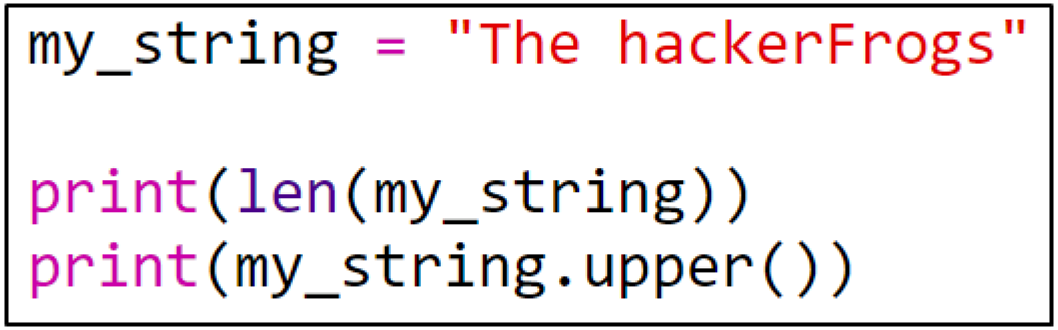
```python
print(type(1), type('word'))
```



```
<class 'int'> <class 'str'>
```

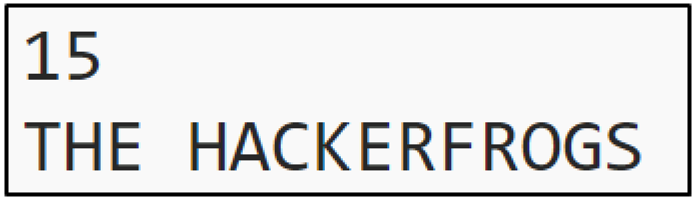
All objects belong to a class, and an object's class indicates which built-in functions, methods, and variables it has.

Classes



```
my_string = "The hackerFrogs"

print(len(my_string))
print(my_string.upper())
```



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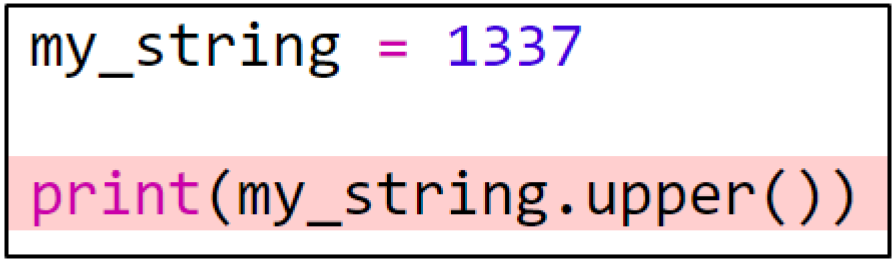
15
THE HACKERFROGS
```

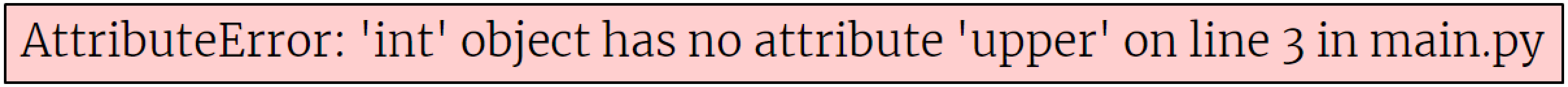
Here we've executed a function and method on the **my_string** variable. Both the **len** function and **upper** method are unique to the string class.

Classes



```
my_string = 1337

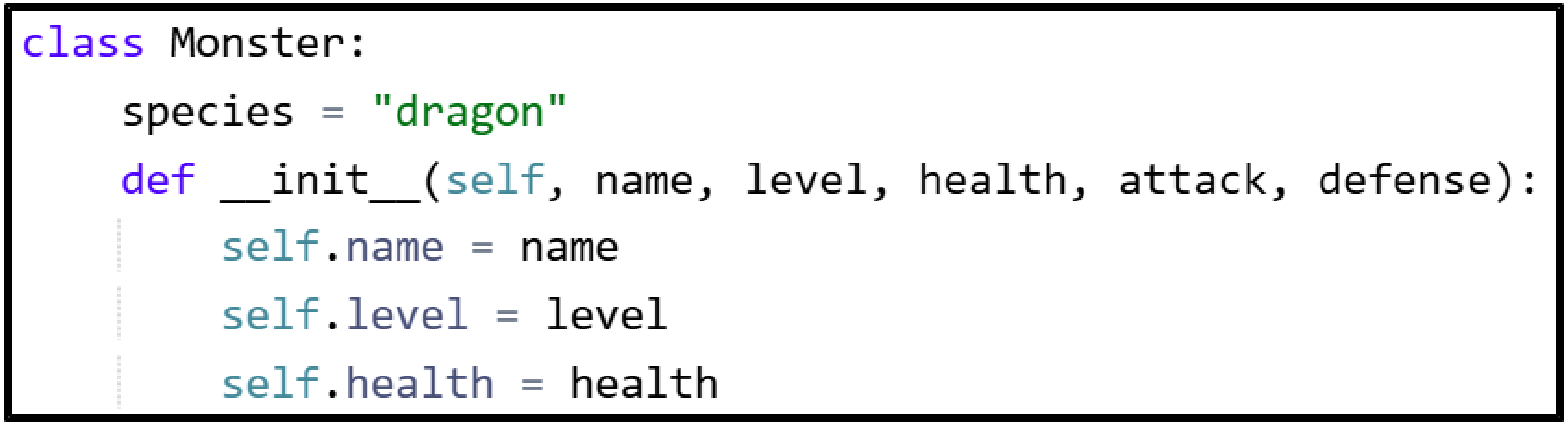
print(my_string.upper())
```



```
AttributeError: 'int' object has no attribute 'upper' on line 3 in main.py
```

If we changed the **my_string** value to an integer, executing either the **len** function or **upper** method would result in an error message.

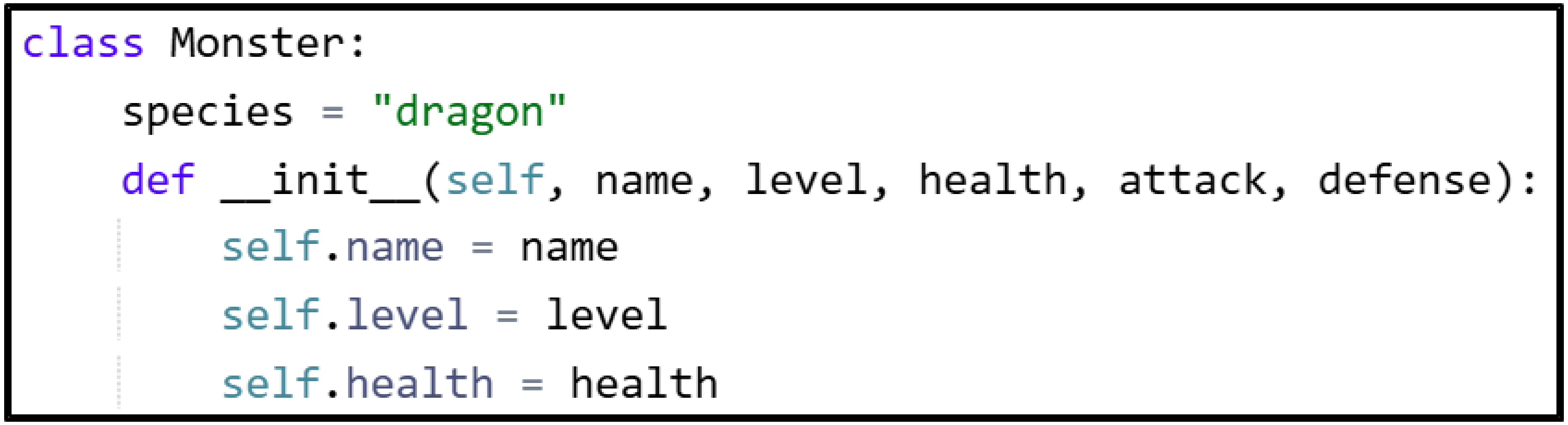
Creating New Classes



```python
class Monster:
    species = "dragon"
    def __init__(self, name, level, health, attack, defense):
        self.name = name
        self.level = level
        self.health = health
```

Programmers often create new classes in their code to give the new class of objects common attributes, methods and functions.

Creating New Classes



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Programmers often create new classes in their code to give the new class of objects common attributes, methods and functions.

Creating Classes

```
class Student:
    def __init__(self, name, fave_subject):
        self.name = name
        self.fave_subject = fave_subject
```

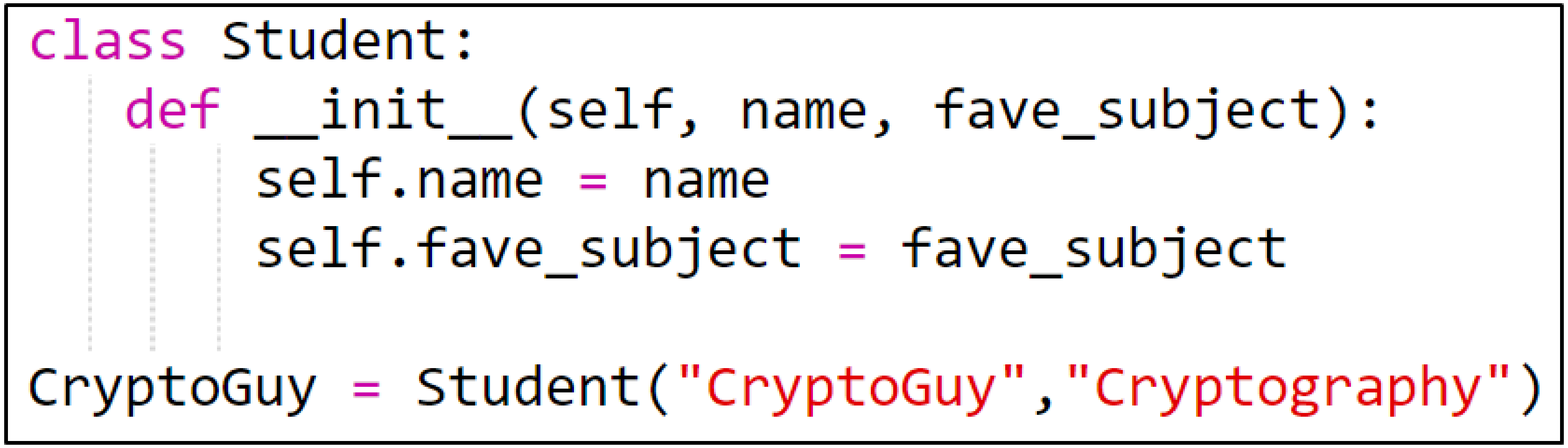
To create a class, we begin with class, then the name of the class, then a colon. The first letter of the class name is capitalized.

Creating Classes

```
class Student:
    def __init__(self, name, fave_subject):
        self.name = name
        self.fave_subject = fave_subject
```

On the next line, indent (4 spaces), then def, then __init__, a pair of parentheses, then inside the parentheses, self, then any other attributes the class requires, then a colon.

The __init__ Function

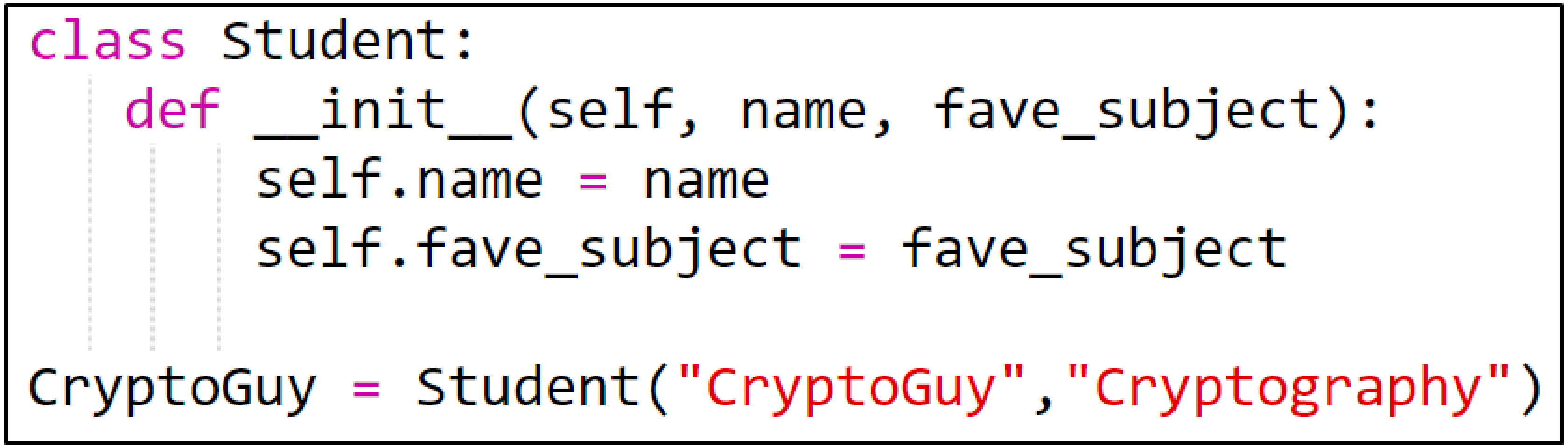


```python
class Student:
    def __init__(self, name, fave_subject):
        self.name = name
        self.fave_subject = fave_subject

CryptoGuy = Student("CryptoGuy","Cryptography")
```

One important feature of class creation is defining the **__init__** function, which specifies the attributes of the class.

The Class Self Attribute



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class Student:
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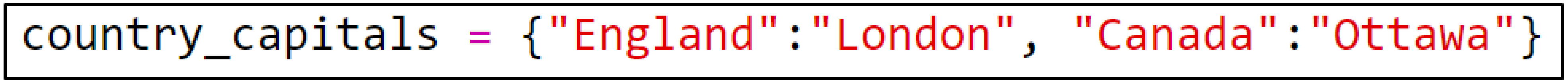
CryptoGuy = Student("CryptoGuy","Cryptography")
```

One attribute which all classes share is the **self** attribute, which is used to access other attributes and methods of the class in the code.

Part 2: Dictionaries



```
country_capitals = {"England":"London", "Canada":"Ottawa"}
```

Dictionaries in Python are similar to other container objects, such as lists, except that data stored in dictionaries are pairs of keys / values, as opposed to individual items.

Dictionaries

```
country_capitals = {"England":
"London", "Canada": "Ottawa"}
```

Dictionaries can be identified by a pair of curly braces, within which are pairs of keys / values, each pair separated by commas. The key and value are themselves separated by a colon.

Dictionaries

```
country_capitals = {
  "England": "London",
  "Canada": "Ottawa"
}
```

Dictionaries can also be initialized in the format above, which is easier-to-read.

Iterating Over Dictionaries

```
country_capitals = {"England": "London", "Canada": "Ottawa"}

for i, j in country_capitals.items():
  print(i, j)
```

```
England London
Canada Ottawa
```

Items in a dictionary can be iterated over using a for loop, but we must use the **items** method, which renders the dictionary as a list with tuples as the content, which hold the key / value pairs.

Adding Keys / Values

```
friend_city = {'Carl': 'Toronto', 'Rachel': 'New York'}
friend_city['Bobby'] = 'Texas'
print(friend_city)
```

```
{'Carl': 'Toronto', 'Rachel':
'New York', 'Bobby': 'Texas'}
```

To add entries to an existing dictionary, simply define the dictionary's index with the name of the key, then supply the value on the other side of the equals sign, as shown above.

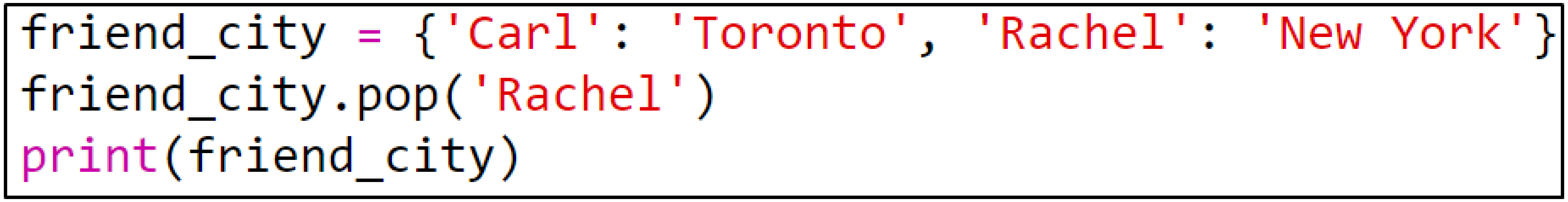
Removing Keys / Values

```python
friend_city = {'Carl': 'Toronto', 'Rachel': 'New York'}
del friend_city['Carl']
print(friend_city)
```

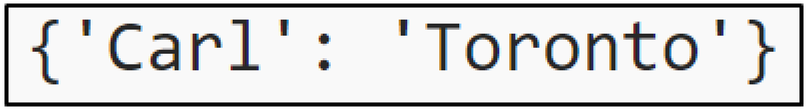
```
{'Rachel': 'New York'}
```

To remove entries from a dictionary, there are two ways. The first way is to use the **del** keyword along with the dictionary key as the index name.

Removing Keys / Values



```
friend_city = {'Carl': 'Toronto', 'Rachel': 'New York'}
friend_city.pop('Rachel')
print(friend_city)
```



```
{'Carl': 'Toronto'}
```

The other way of removing entries from dictionaries is to the **pop** dictionary method, as illustrated above.

Dictionary Keys are Immutable

```python
friend_city = {'Carl': 'Toronto', 'Rachel': 'New York'}
friend_city['Carl'] = 'Kelly'
print(friend_city)
```

```
{'Carl': 'Kelly', 'Rachel': 'New York'}
```

The names of keys cannot be changed after they've been created. One the key's value can be changed.

Dictionaries Exercise

Let's practice using Python dictionaries at the following URL:

https://learnpython.org/en/Dictionaries

Dictionaries Quiz - Q1

Which of the following statements about Python dictionaries is true?

A) A dictionary is a mutable, ordered collection of items.
B) A dictionary can have duplicate keys.
C) Dictionary keys must be immutable and unique.
D) Dictionary values must be unique.

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Dictionaries Quiz - Q2

Which of the following methods could be used to delete a key-value pair from a dictionary?

A) the del keyword
B) the pop method
C) A + B
D) None of the above

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Workshop Review Exercise

Before we finish, let's a write a program which features many of the concepts we learned in this workshop.

A game developer wants to write a program that keeps track of a game character's statistics, as well as function that adjusts one of those statistics.

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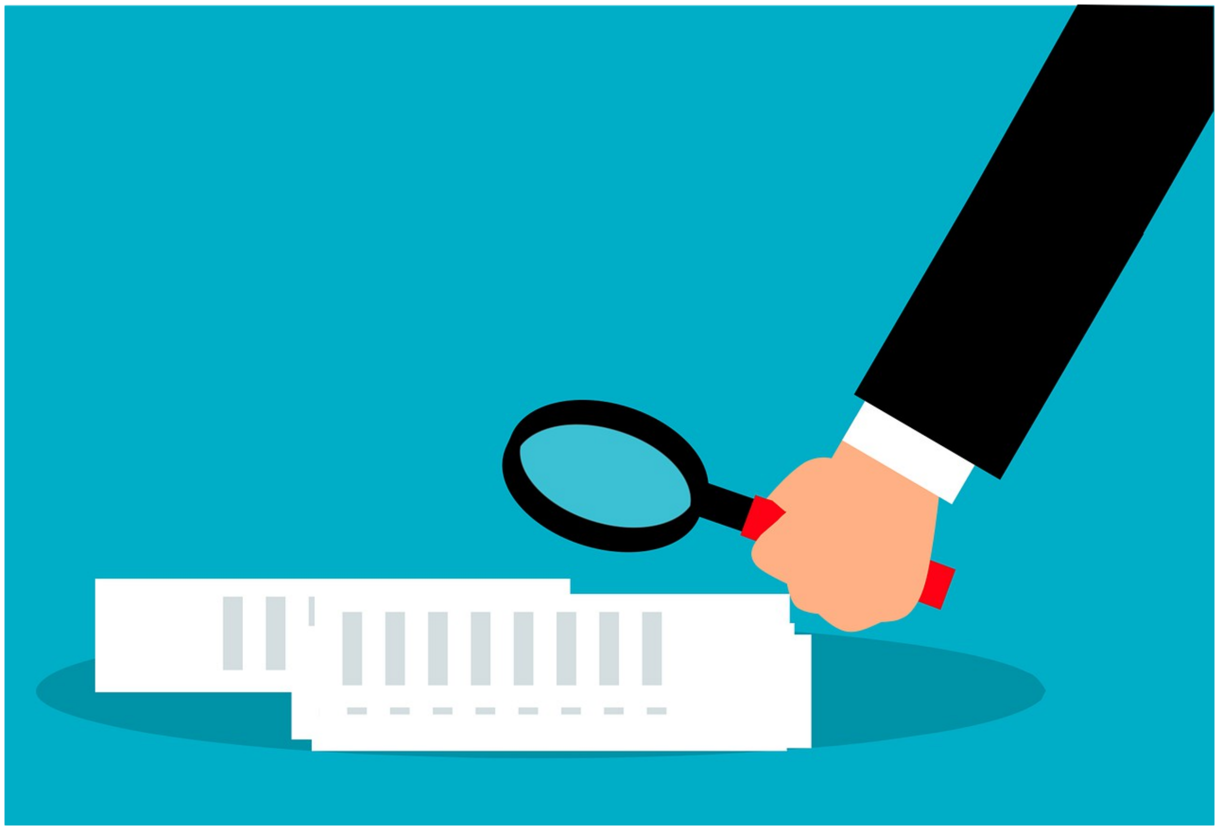
Workshop Review Exercise

The program should have a function named “Damage” which updates the dictionary's Health key, decreasing it by 20 when the function is called.

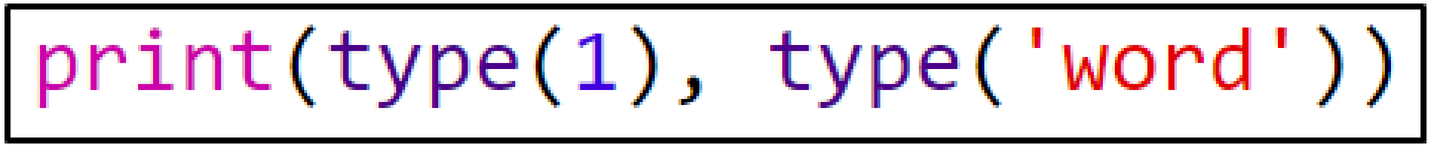
The Damage function should be called, then the dictionary should be printed to the console, showing the newly updated Health key.

Summary



Let's review the programming concepts we learned in this workshop:

Classes & Objects



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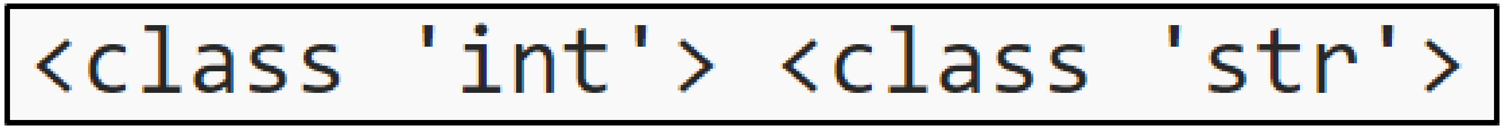

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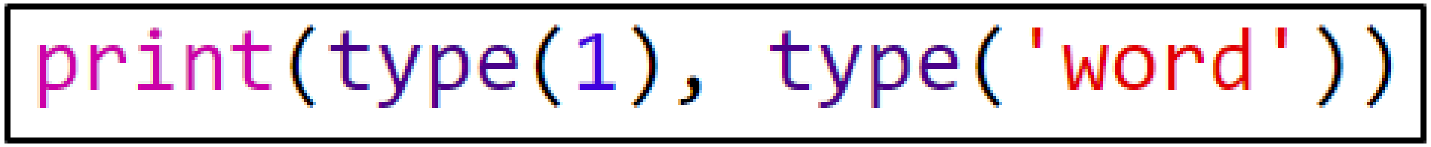
Classes & Objects



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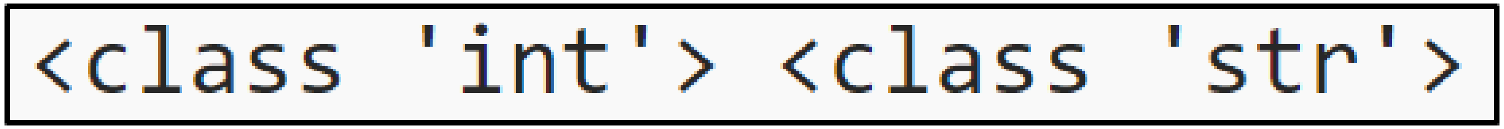

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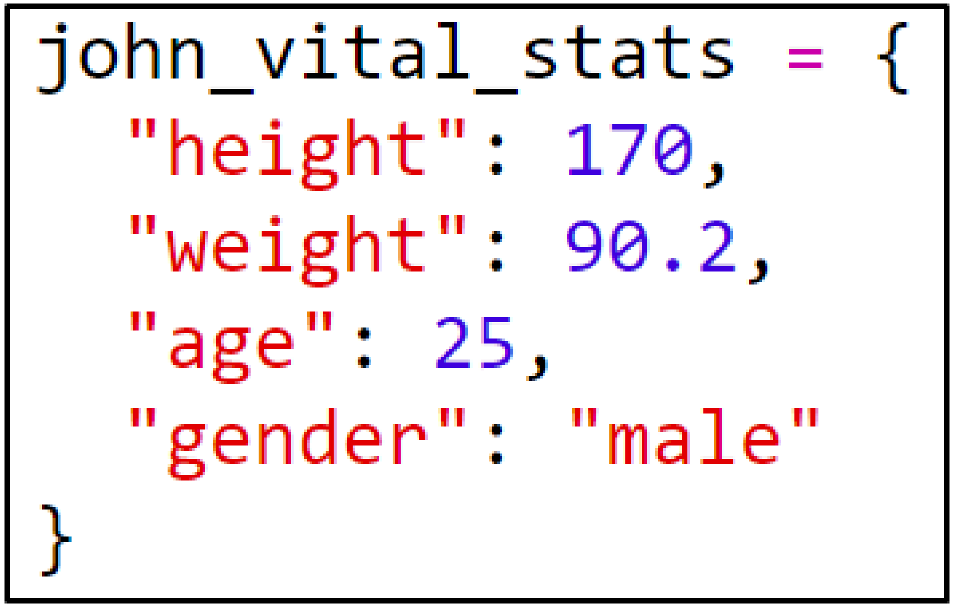

```
john_vital_stats = {
  "height": 170,
  "weight": 90.2,
  "age": 25,
  "gender": "male"
}
```

Dictionaries are useful for recording different key / value pairs that all pertain to one subject, or one common value across a number of subjects.

What's Next?

In the next HackerFrogs AfterSchool Python programming basics session, we'll wrap up our time with Python by writing scripts to solve CTF challenges!

Extra Credit

Looking for more study material on this workshop's topics?

See this video's description for links to supplemental documents and exercises!

Until Next Time, HackerFrogs!