Python Class 3: Errors, Exceptions and Testing

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Types of Errors

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  - Errors related to language structure.
  - Forgotten symbols, types, or confusing object names.
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```
>>> while True print 'Hello world'
>>> while True print : 'Hello world'
>>> class = "Advanced Computronics for Beginners"
Traceback (most recent call last):
  In line 1 of the code you submitted:
    class = "Advanced Computronics for Beginners"
            ^
SyntaxError: invalid syntax
```

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>>> print("you cannot add text and numbers" + 12)
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    print("you cannot add text and numbers" + 12)
TypeError: Can't convert 'int' object to str implicitly
```

A syntax error happens when Python can't understand what you are saying. A run-time error happens when Python understands what you are saying, but runs into trouble when following your instructions.

In English, a syntax error would be like the sentence:

Please cat dog monkey.

The grammar of this sentence does not make sense!

In English, a run-time error would be like the sentence:

Please eat the piano.

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  - Very common, very annoying and, unfortunately, without indication that they exist.
  - My deep and thoughtful advice: Debug, debug, debug! Test, test, test!

Debugging Tips

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```
>>>  x=1
>>>  if(x=1): print x
  File "<ipython-input-9-24daa00946ff>", line 1
    if(x=1): print x
         ^
SyntaxError: invalid syntax
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- Indentation is correct! Remember, even spaces in empty lines count.

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except TypeError:
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  ... # runs for other errors or exceptions
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- You can create your own exceptions using classes.
- Some examples: `InClass03.py`

Unit Testing

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- Test-driven development.

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- Find bugs quickly.
- Forces code structure.
- Allows easier integration of multiple functions.
- Much easier to return to code.
  - Write a test for what you want to implement next.
- Easier to make code changes.
- You can easily incorporate lots of these into your work flow.

Sample Test

```
import unittest #You need this module
import myscript #This is the script you want to test


class mytest(unittest.TestCase):

  def test_one(self):
    self.assertEqual("result I need", myscript.myfunction(myinput))

  def test_two(self)
    thing1=myscript.myfunction(myinput1)
    thing2=myscript.myfunction(myinput2)
    self.assertNotEqual(thing1, thing2)

if __name__ == '__main__': #Add this if you want to run the test with this script.
  unittest.main()
```

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Useful link: `https://docs.python.org/2/library/unittest.html`

```
import unittest

class TestStringMethods(unittest.TestCase):

    def test_upper(self):
        self.assertEqual('foo'.upper(), 'FOO')

    def test_isupper(self):
        self.assertTrue('FOO'.isupper())
        self.assertFalse('Foo'.isupper())

    def test_split(self):
        s = 'hello world'
        self.assertEqual(s.split(), ['hello', 'world'])
        # check that s.split fails when the separator is not a string
        with self.assertRaises(TypeError):
            s.split(2)

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```
>>> for n in range(2, 10):
...     for x in range(2, n):
...         if n % x == 0:
...             print(n, 'equals', x, '*', n//x)
...             break
...     else:
...         print(n, 'is a prime number')
...
```