PRG1

WEEK 2

NGEE ANN
SCHOOL OF INFOCOMM TECHNOLOGY

String Formatting & Debugging

Programming I (PRG1)

Diploma in Information Technology

Diploma in Financial Informatics

Diploma in Information Security & Forensics

Year 1 (2018/19), Semester 1

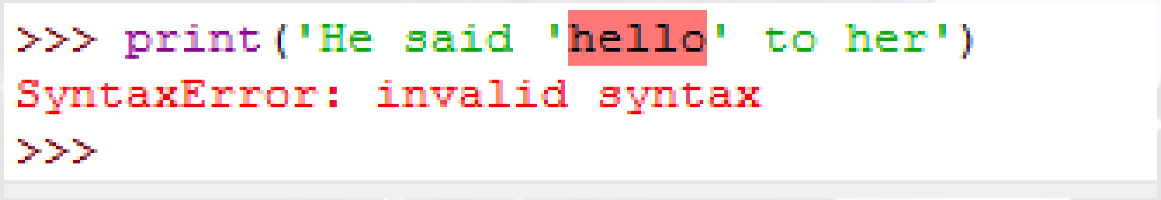
Objectives

At the end of this lecture, you will learn about….

- Escape Sequence
- String Formatting
- Math Functions
- Debugging

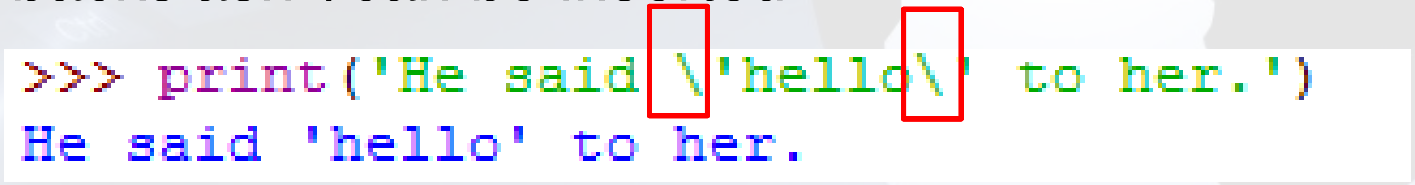
Escape Sequence

- Consider the case we wish to print out the literal quotes ‘ ‘ as part of a string. A syntax error will be produced.



```
>>> print('He said 'hello' to her')
SyntaxError: invalid syntax
>>>
```

- To help us ‘escape’ single quotes or double quotes, a backslash \ can be inserted.



```
>>> print('He said \'hello\' to her.')
He said 'hello' to her.
```

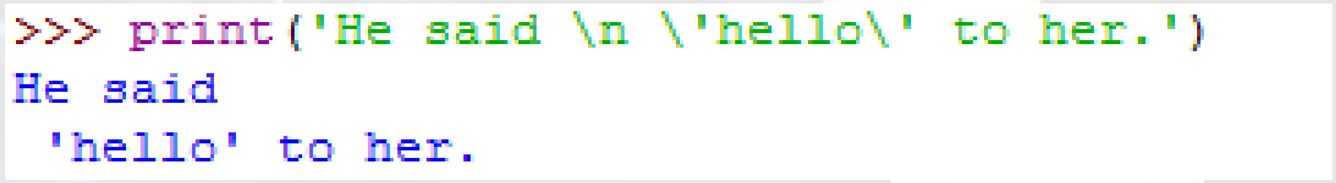
- The backslash character together with an ***escape character*** form an ***escape sequence***.

Escape Sequence

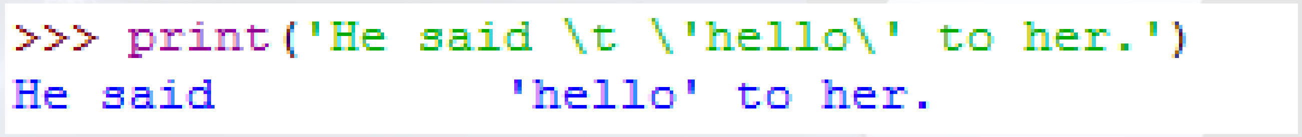
– There are other escape sequences but the two most commonly used are:

  \n ↲ new line

  \t ⇥ tab stop



```
>>> print('He said \n \'hello\' to her.')
He said
 'hello' to her.
```



```
>>> print('He said \t \'hello\' to her.')
He said                 'hello' to her.
```

Refer to: https://docs.python.org/3/reference/lexical_analysis.html for full table of escape sequences.

String Formatting

- Python provides 2 advanced ways to do ***String Formatting*** – allowing multiple substitutions in a string
  - Using **string formatting operator %**

    '…%s…'%(arguments)

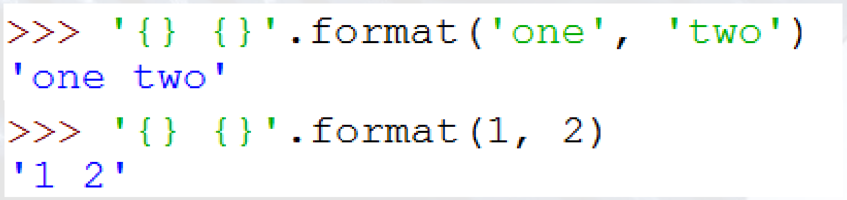
  - Follows C language's printf model. The %s are the placeholders to replaced by the arguments.
- Using **string formatting method call format()**

    '…{}…'.format(arguments)

  - { } in original string serve as placeholders to be replaced by respective arguments.
- We will only cover the 2nd method which is the preferred standard in Python 3 (https://docs.python.org/2/library/stdtypes.html#str.format)

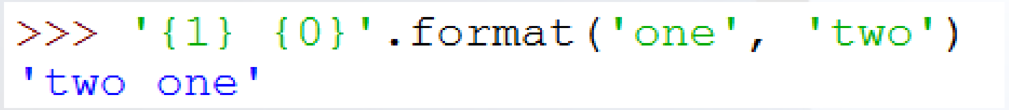
String Formatting

Basic Formatting

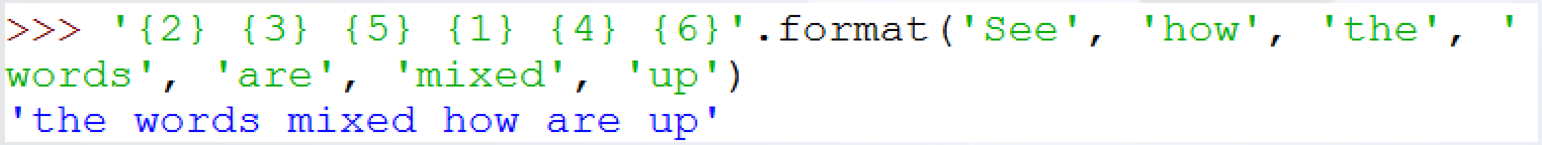


```
>>> '{} {}'.format('one', 'two')
'one two'
>>> '{} {}'.format(1, 2)
'1 2'
```

- format() method allows <u>rearrangement</u> in output without changing order of arguments:



```
>>> '{1} {0}'.format('one', 'two')
'two one'
```



```
>>> '{2} {3} {5} {1} {4} {6}'.format('See', 'how', 'the', '
words', 'are', 'mixed', 'up')
'the words mixed how are up'
```

String Formatting

Integers

```
>>> '{:d}'.format(16)
'16'
```

```
>>> 'My age is {:d}'.format(48)
'My age is 48'
```

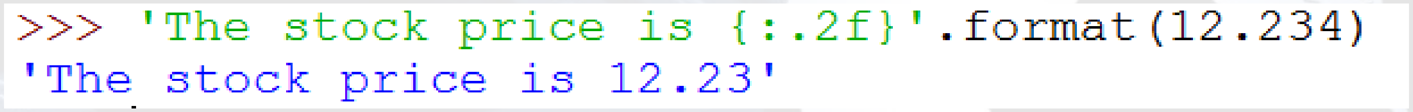
Floating Point

```
>>> '{:f}'.format(3.142)
'3.142000'
```

```
>>> 'The stock price is {:f}'.format(12.234)
'The stock price is 12.234000'
```

String Formatting

- The default is to have **six decimal points of *precision*** for float.
- The precision can be changed as follows:



```
>>> 'The stock price is {:.2f}'.format(12.234)
'The stock price is 12.23'
```

String Formatting

Strings

```
>>> name = 'Mandy'
>>> greeting = 'How are you?'
>>> 'Hello {:s}, {:s}'.format(name, greeting)
'Hello Mandy, How are you?'
```

Padding and Alignment

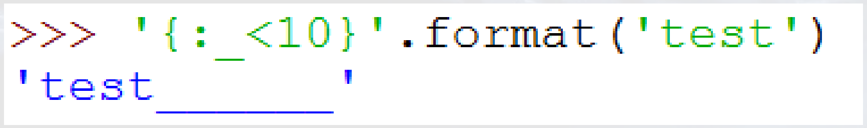
- By default, values will take up as many characters as needed to represent the content.
- However it is possible to pad a value to a certain length.

```
>>> '{:10}'.format('test')
'test      '
>>> '{:>10}'.format('test')
'      test'
```

format() defaults alignment to left for strings.
(Note: alignment to right for other types)
Format() allows using < or > to denote direction of alignment

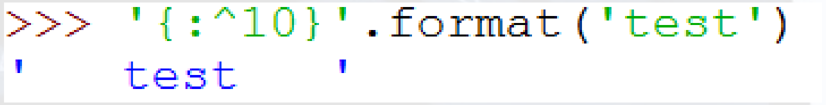
String Formatting

- format() allows choosing of character to do the padding:

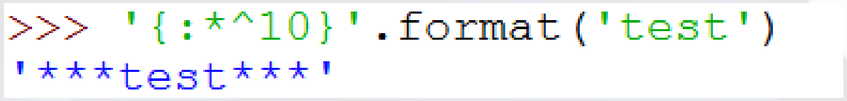


```
>>> '{:_<10}'.format('test')
'test______'
```

- format() allows specifying of center alignment:



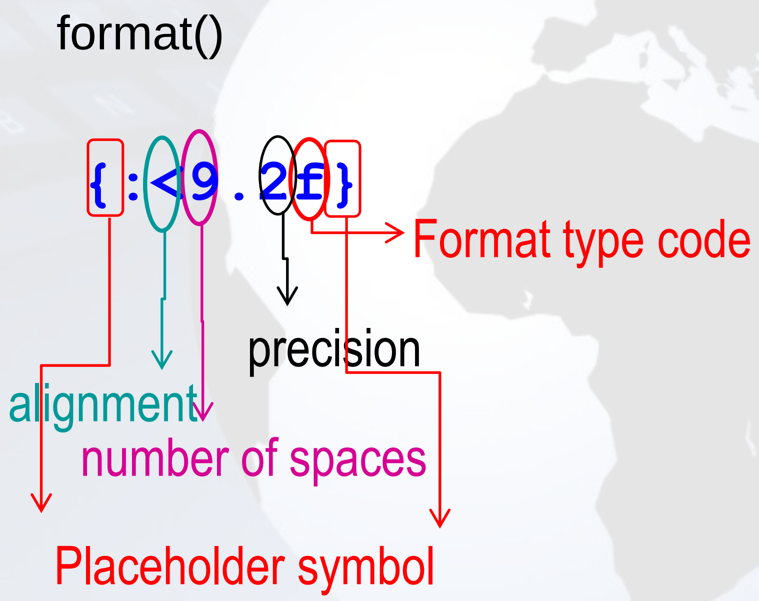
```
>>> '{:^10}'.format('test')
'   test   '
```



```
>>> '{:*^10}'.format('test')
'***test***'
```

String Formatting

- format() make use of a format instruction called ***Format Specifier***



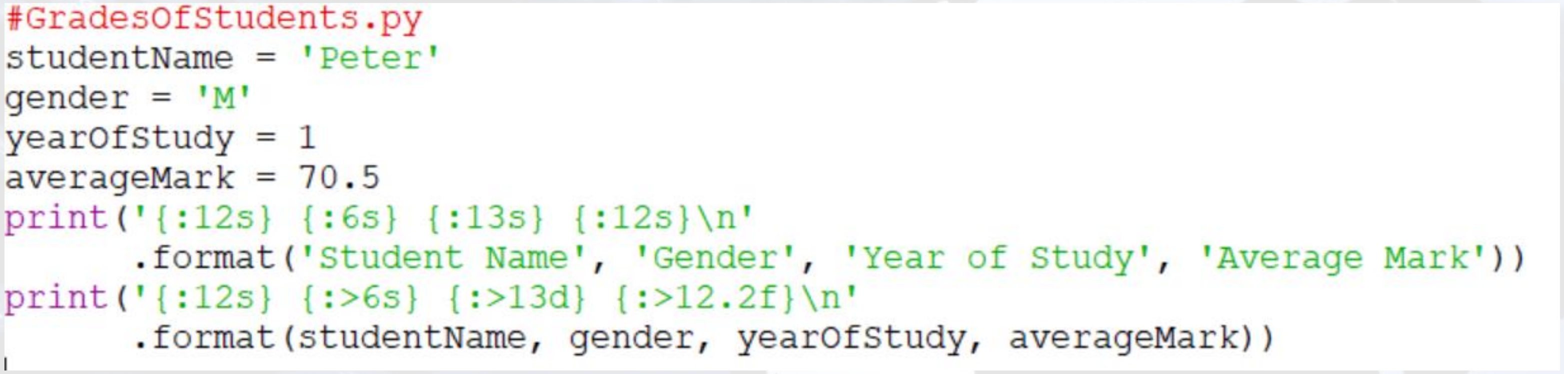
String Formatting

Commonly used Format Type Codes:

Format type code	Description
`s`	string
`c`	character
`d`	decimal (base 10) integer
`o`	octal integer
`x`	hex integer
`X`	same as x, but uppercase
`f`	floating point real numbers
`e`	exponent notation

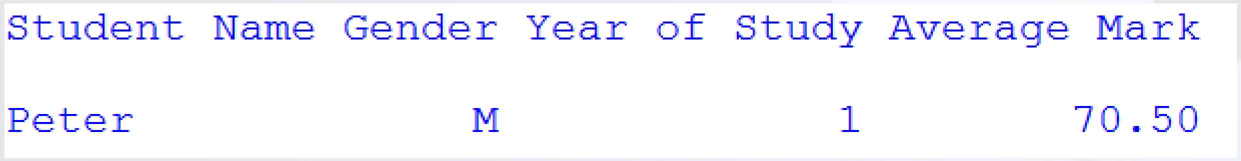
String Formatting

Application:



```python
#GradesOfStudents.py
studentName = 'Peter'
gender = 'M'
yearOfStudy = 1
averageMark = 70.5
print('{:12s} {:6s} {:13s} {:12s}\n'
      .format('Student Name', 'Gender', 'Year of Study', 'Average Mark'))
print('{:12s} {:>6s} {:>13d} {:>12.2f}\n'
      .format(studentName, gender, yearOfStudy, averageMark))
```

Output:

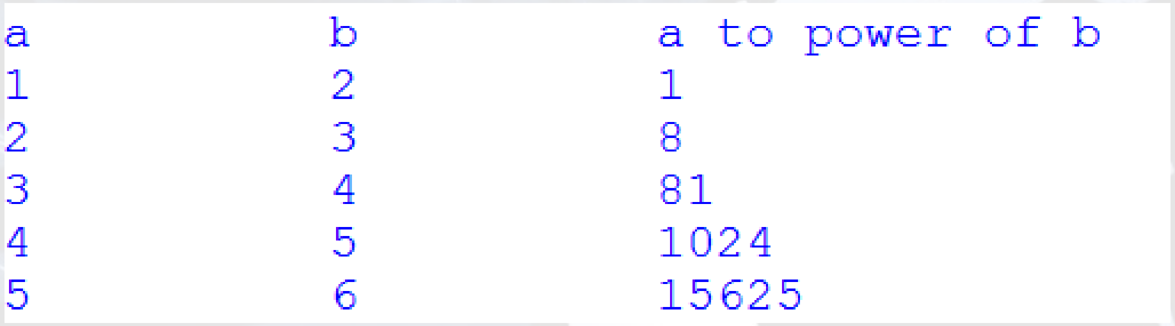


```
Student Name Gender Year of Study Average Mark

Peter             M             1        70.50
```

Activity 1

Write a program that displays the following table:

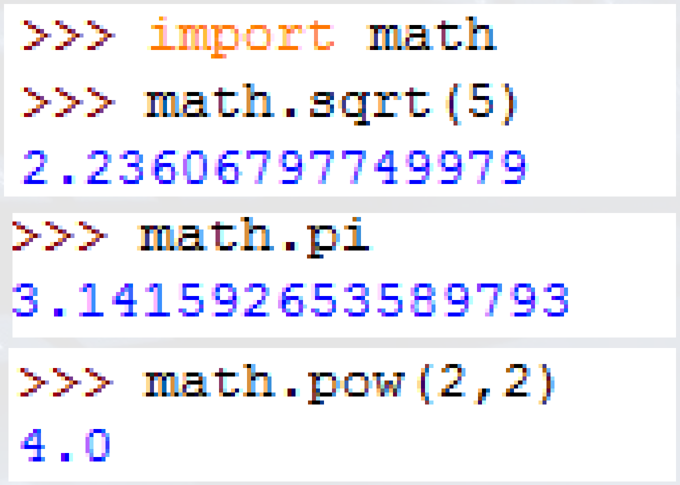


```
a          b          a to power of b
1          2          1
2          3          8
3          4          81
4          5          1024
5          6          15625
```

Math Functions

- Python has facilities to do much more than we have seen so far. The trick is that Python comes with a large number of ***modules*** of its own which have **functions** for performing no end of useful things.
- This philosophy is called "**batteries included**".
- The most common module is **math for mathematical computation**.
- Usage: **import math**
- Useful mathematical functions included: math.pow(x, y), math.sqrt(x), math.log10(x), math.cos(x), math.sin(x) and so on

Math Functions



```
>>> import math
>>> math.sqrt(5)
2.23606797749979
>>> math.pi
3.141592653589793
>>> math.pow(2,2)
4.0
```

Refer to: https://docs.python.org/3/library/math.html for other math functions

Different Types of Errors

- Different types of errors can occur – popularly known as ***bugs*** in a computer program.
- It is important for programmers to know how to ***debug*** and solve those problems in the program.

Different Types of Errors

- ***Syntax*** Errors – bugs due to **violation of the language syntax**
    - Python program with syntax error **will not run**.

  E.g. missing end quote for string, missing: after if statement (in further topic)
- ***Runtime/Execution*** Errors – bugs that occur during **running/execution of program**.
    - Python program will **run until code with error**, then program will terminate with error msg.

Different Types of Errors

- ***Logic/Semantic*** Errors – bugs that **give wrong results**
  - Python program will **usually run to completion**.
  - But results/output are wrong.

  E.g. wrong formula, forgetting precedence of operators in expression, wrong condition (in further topic)

Use Debugger to solve Errors

- It is very hard to figure out the bugs in your program by eye inspection.
- Programmers usually make use of a ***Debugger***, a program that allows
  - **stepping through code** line by line in same order of execution
  - showing what **values are stored in variables** each step

Activity 2

Go through the step-by-step guide to find out more about debugger tool in IDLE. After that, you will have some practice to debug erroneous programs.

Reading Reference

- How to Think Like a Computer Scientist: Learning with Python 3
  - Chapter 2

    http://openbookproject.net/thinkcs/python/english3e/variables_expressions_statements.html
- PolyMall – Problem Solving and Programming

  https://polymall.polytechnic.edu.sg/

Summary

- String Formatting
- Math Module
- Program Errors and Debugger