

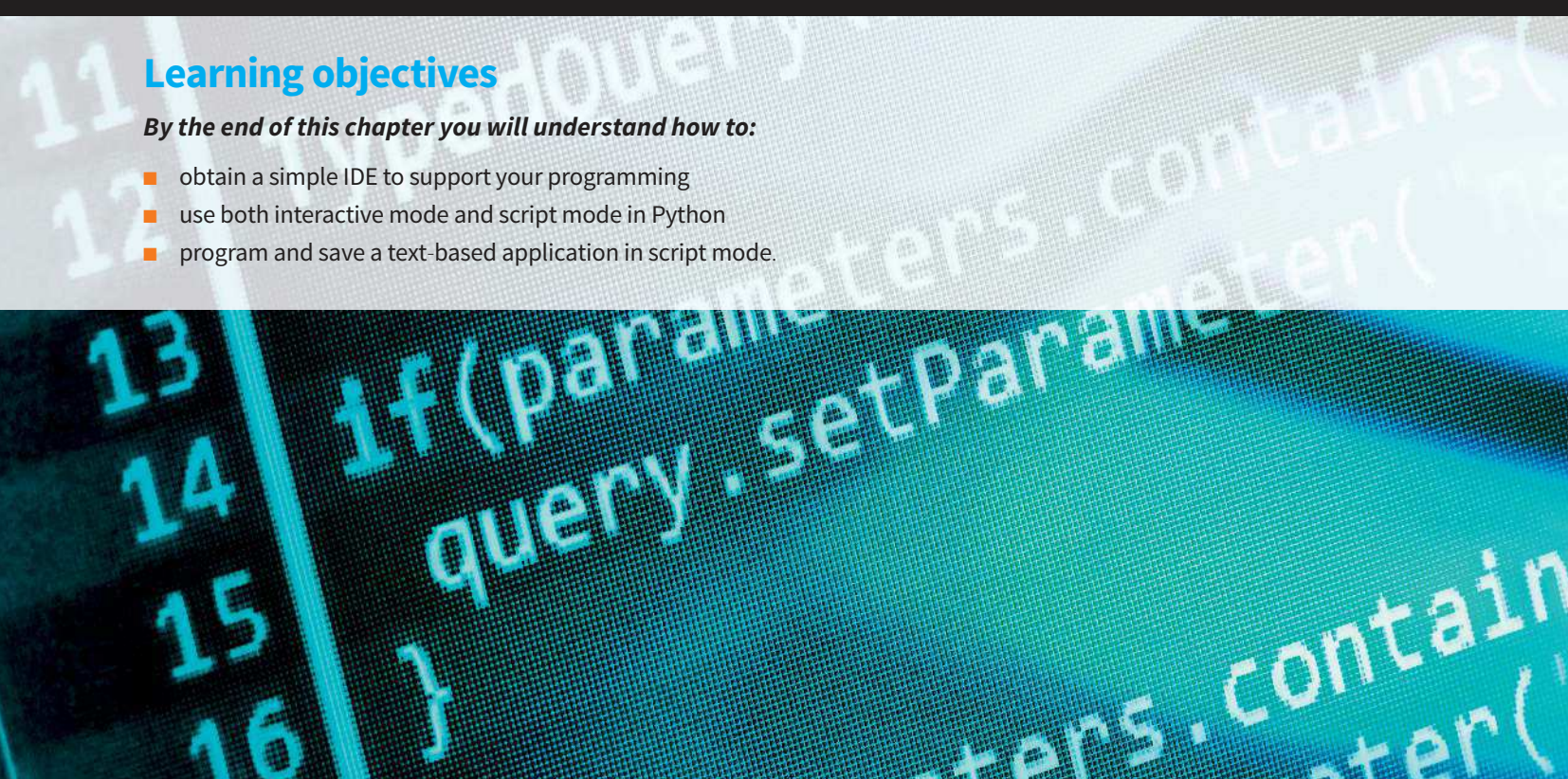
Chapter 1:

Python 3

Learning objectives

By the end of this chapter you will understand how to:

- obtain a simple IDE to support your programming
- use both interactive mode and script mode in Python
- program and save a text-based application in script mode.



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1.01 Getting Python 3 and IDLE For Your Computer

Python 3 is the latest version of the Python programming language. It is a loosely typed script language. Loosely typed means that it is usually not necessary to declare variable types; the interpreter looks after this. Script languages do not have a compiler. This means that, in general, Python programs cannot run as quickly as compiled languages; however, this brings numerous advantages, such as fast and agile development.

Python is a powerful, modern programming language used by many famous organisations such as YouTube and National Aeronautics and Space Administration (NASA) and it is one of the three programming languages that can be used to develop Google Apps.

There are installers for Windows and Apple computers available at <https://www.python.org/downloads/>. You should choose the latest stable version of Python 3 (Python 3.5.0 at time of writing). If you have a Raspberry Pi, then two versions of Python are already installed.

On the Raspberry Pi you can start programming in **interactive mode** straight away by selecting *Python 3* from *Programming* in the main *Menu* in the task bar (Figure 1.01).



Figure 1.01 Starting Python 3 on a Raspberry Pi

This opens IDLE which is the **IDE** (Integrated Development Environment) that comes packaged with Python (Figure 1.02).

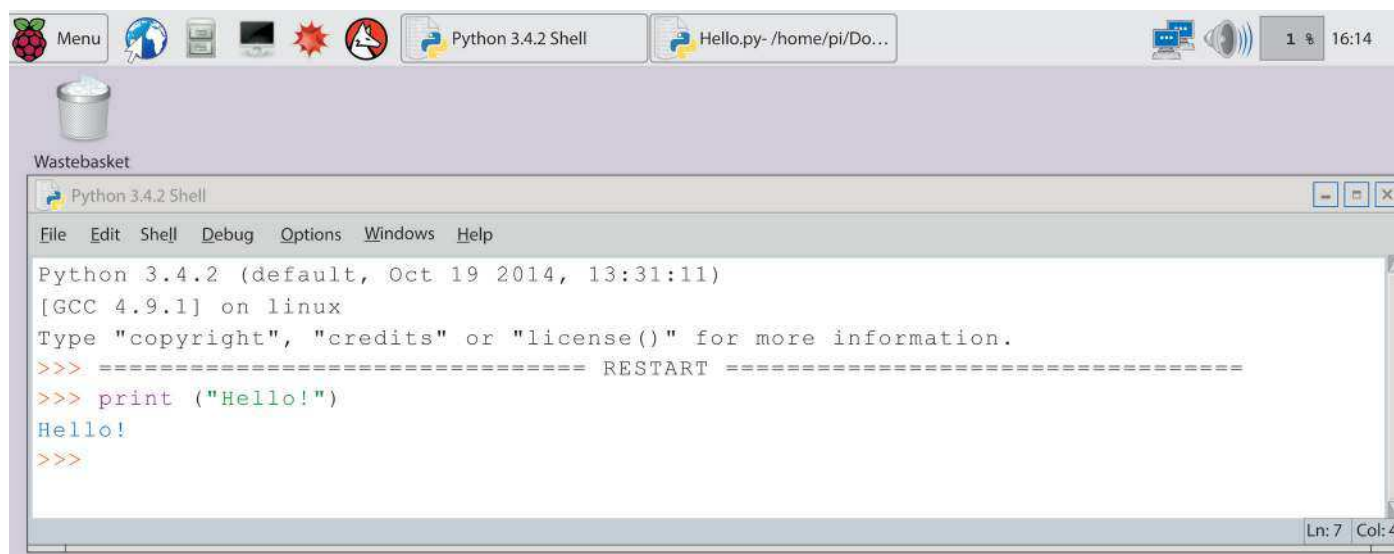


Figure 1.02 IDLE's Python Shell – working in interactive mode on a Raspberry Pi

KEY TERMS

Interactive mode: When writing and running code in the Python Shell window, interactive mode allows us to try out snippets of code without saving.

IDE: An Interactive Development Environment is a special text editor with useful built-in tools for programmers.

After installing Python 3 on Apple computers, IDLE can be found in the main *Python 3* folder in your *Applications* folder.

On Windows computers, once installed, IDLE can be opened by looking for the *Python 3.5* folder found in *All Programs* when opening the *Start* menu. From the *Python 3.5* folder choose *IDLE*.

In all cases this opens a window containing the Python Shell. This can run simple programs at the `>>>` prompt. Executing small programs in the Shell window is referred to as working in interactive mode. It provides a very useful environment for running short code experiments when developing larger programs in **script mode**. Throughout this book you will be prompted to try out code snippets and run short experiments so that you get used to new functions and syntax in interactive sessions. These sessions can be accessed extremely quickly by opening IDLE and typing directly into the Shell window.

KEY TERMS

Script mode: When writing code in a new window in IDLE that will be saved in a file as a Python script.

To create a script that can contain more complex programs and, more significantly, can be saved and reused, you should obtain a new window by selecting *New File* from the *File* menu. This opens a blank script window into which you can type and save your code (always with

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the extension `.py`). IDLE provides help with code colouring and auto-indenting in whichever mode you are working.

In script mode, the Shell window takes on a new role as a console. Text output from your programs appears in this window (see Figure 1.03). It is also where users provide input, and error messages appear. The console is still available as a Shell window to use for quick experiments while developing your scripts.

To run your scripts, you should save your file to a sensibly named folder in your *Documents* folder and then select *Run Module* from the *Run* menu, or press F5 on your keyboard.

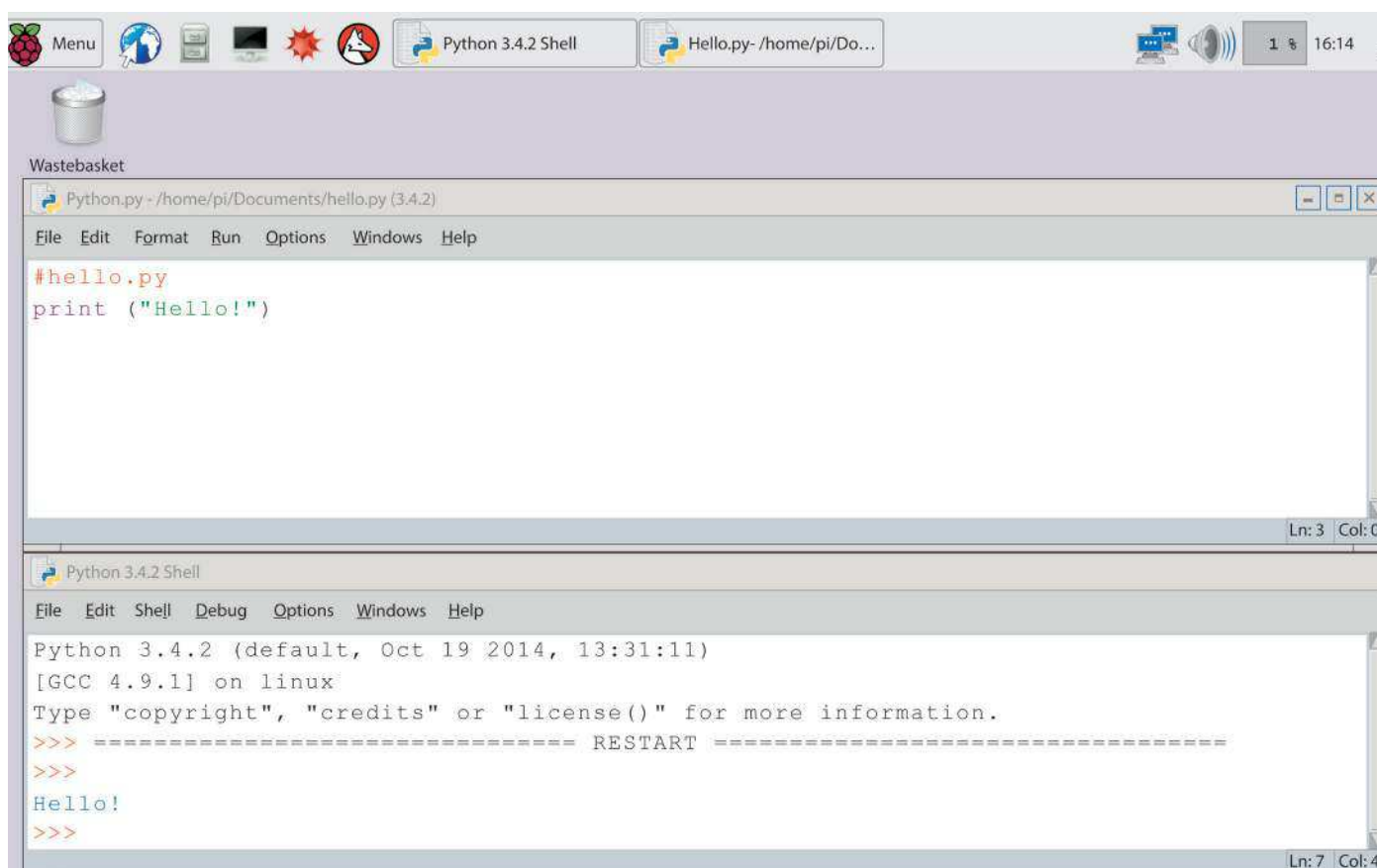


Figure 1.03 IDLE's Python Shell and a script window open on a Raspberry Pi

1.02 Other Integrated Development Environments

IDLE is perfectly adequate for performing all the tasks required in this book. However, if you have been programming with IDLE for a number of years, you might like to try one of the other many IDEs available.

The one that is used for the remainder of the screenshots in this chapter, and occasionally later in the book, is Wing IDE 101 (Figure 1.04). This is a free version of a commercial IDE that provides a carefully selected set of facilities that are useful for students. It can be downloaded from <http://wingware.com/downloads/wingide-101> where brief introductory videos and installation instructions are available. Please be aware that the Raspberry Pi is currently not powerful enough to run this or most other commercial IDEs satisfactorily. Wing IDE 101 is available for Windows, Apple computers, Ubuntu and other versions of Linux.

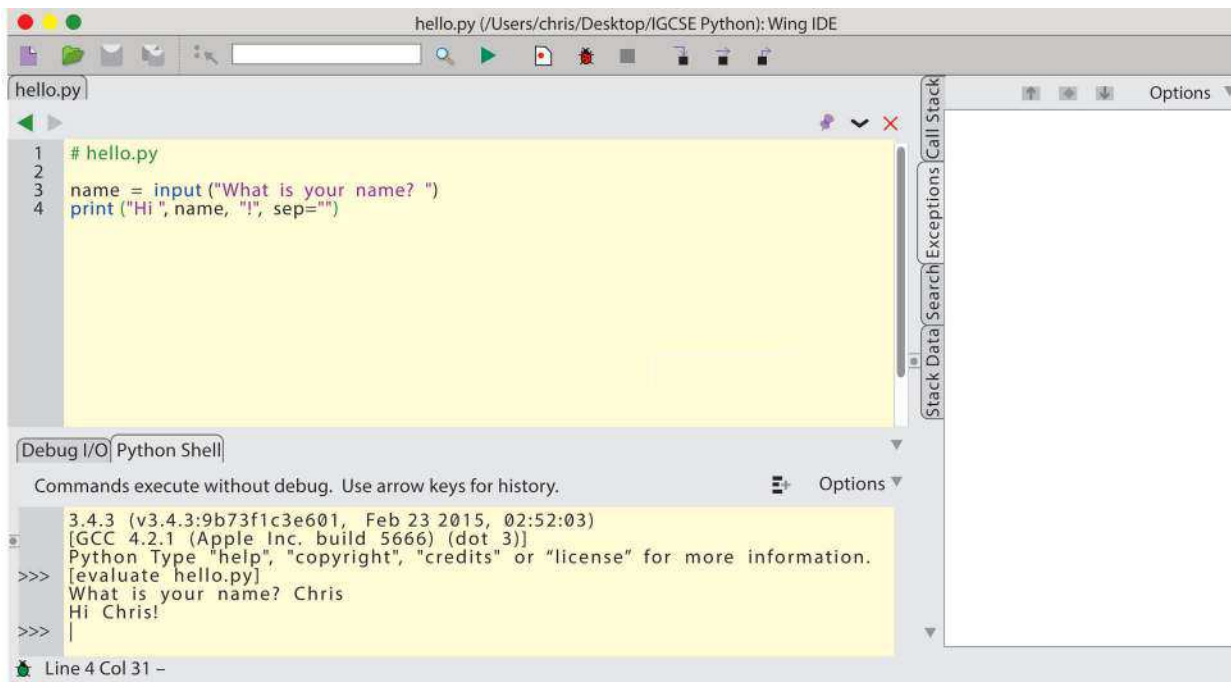


Figure 1.04 Wing IDE 101 Integrated Development Environment.

The large panel in the middle of the application is where you write your scripts. Interactive sessions can be run in the Shell tab below this window.

There are two ways to run a program in Wing IDE. Clicking the run button (▶) will access the Python Shell as shown in Figure 1.04. An alternative – and recommended – way of running your scripts is to click on the bug (🐛) to the right of the run button (Figure 1.05). This opens the Debug I/O panel and now provides error messages in the Exceptions tab on the right.

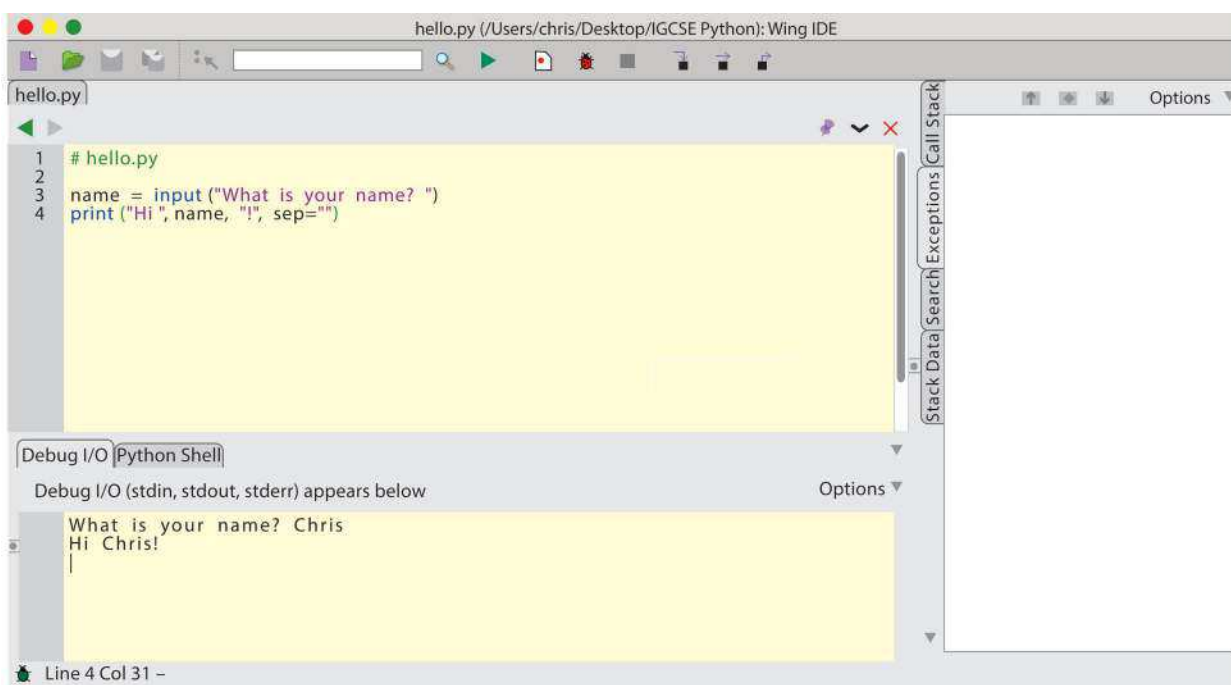


Figure 1.05 Wing IDE 101 showing input and output after pressing the bug button

1.03 Make Your First Program Using Interactive Mode

In IDLE's interactive mode window or in the Python Shell tab in Wing IDE, type out the following line of code at the `>>>` prompt and then press return.

INTERACTIVE SESSION

```
>>> print('Hello world!')
```

You have now run your first interactive mode program. Your code told the computer to print the text 'Hello world!' to the screen. It executed your code when you pressed the return key on your keyboard. You can also use interactive mode as a simple calculator. Try entering this sum and press return:

INTERACTIVE SESSION

```
>>> 3*4
```



TIP

Interactive sessions are used to illustrate simple concepts or to show the correct use of some new syntax. It is a good idea to start your own interactive session and try the code yourself. You may well want to experiment further to deepen your understanding.

1.04 Make Your First Program Using Script Mode

Working in IDLE select *New File* from the *File* menu to open a new window into which you can type your code and then save it as a script. In Wing IDE, simply type into the main script panel. Whichever IDE you are using, copy the following code and then save your file as `hello.py` to a new folder called *Python Code* in your *Documents* folder.

```
# hello.py  
print('Hello world!')
```

If using IDLE, run the script by selecting *Run Module* from the *Run* menu or by pressing F5. In Wing IDE click the bug button.

Any code preceded by a hash symbol (#) is called a comment. This is ignored by the computer when executing the script and is purely for the programmer. It can be useful to include the file name in its own comment at the top of a script.

1.05 Graphical user interface Applications

Although not required by the syllabus, your Python scripts are not limited to text-based applications. By importing the **tkinter** module, it is easy to produce visually rich **graphical user interfaces (GUIs)** and attach your algorithms to buttons in windows.

Producing GUI based applications is outside the syllabus.



KEY TERMS

tkinter: An example of a GUI toolkit which is provided as part of the standard library when you install Python.

graphical user interface (GUI): Graphical user interfaces contain items like buttons, text entry boxes and radio buttons.

Chapter 5, GUI applications, is an optional chapter included in this book. In it, you will learn how to build your own GUIs and how to repurpose your algorithm solutions to work with them. From Chapter 5 onwards, there will be some tasks provided that include making GUIs. Although these are not required by the Cambridge IGCSE and O Level Computer Science syllabus, repurposing your solutions to work with GUIs will make you a more flexible programmer and allow you to produce more professional looking applications.

1.06 Additional Support

The intention of this book is to introduce programming concepts that make use of the non-language-specific formats included in the syllabus. Python 3 is used to provide the opportunity for you to use a real programming language to develop your understanding of these concepts. The official documentation for the Python programming language can be accessed at <https://docs.python.org/3/>.

A simple syntax reference guide that can be printed out and fits in your pocket is available from the Coding Club website at <http://codingclub.co.uk/codecards/>.

This textbook also has its own companion website at [\[companion website URL\]](#).

Summary

- Python 3 is a loosely typed programming language that is designed to encourage easily read code.
- Python 3 comes with a simple Integrated Development Environment called IDLE.
- There are many other IDEs available, such as Wing IDE 101, which is specifically designed for students.
- There are three main styles of programming in Python 3:
 - interactive mode: quick tests and trials that can be programmed in the Python Shell
 - text-based: in script mode, text-based scripts can be saved so that your applications can be reused
 - GUI applications: full, visually rich applications that can be produced in script mode.