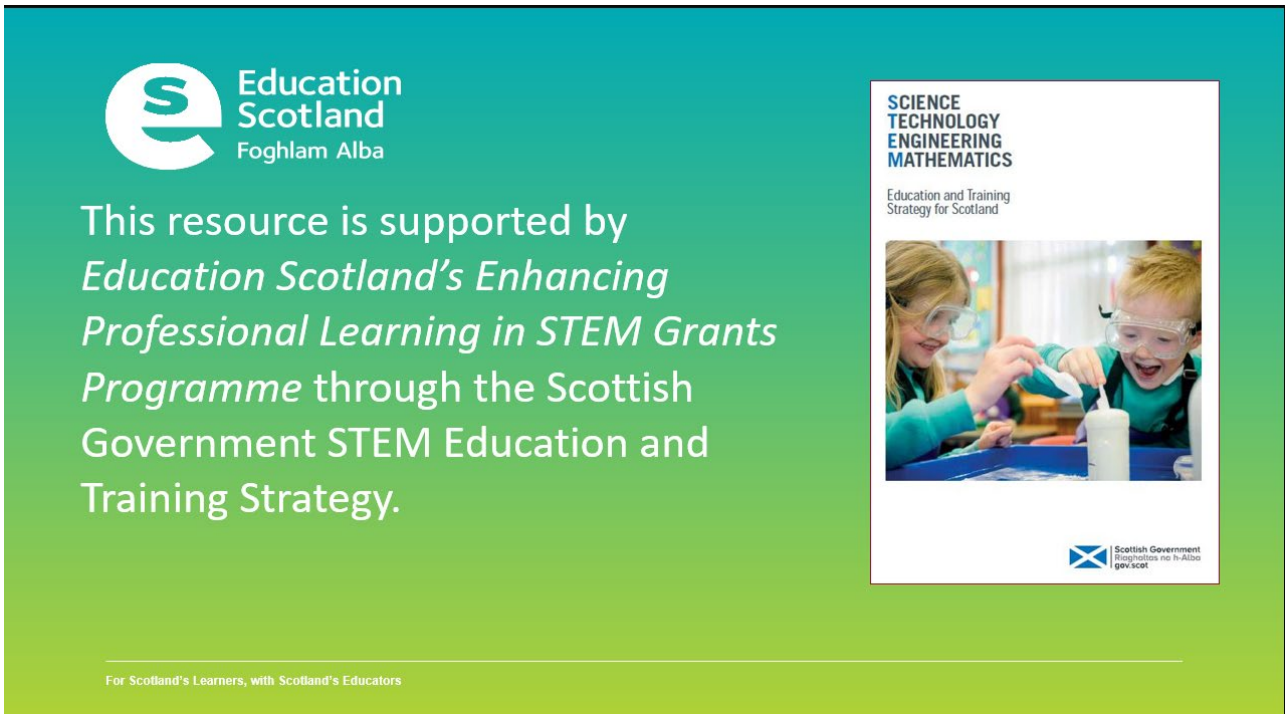


COMPUTING SCIENCE WORKBOOK IN PYTHON

CONTINUOUS LEARNING MATERIALS FOR COMPUTING SCIENCE TEACHERS FOLLOWING THE SCOTTISH CURRICULUM

Requirements:

Before making use of the materials described in this workbook, please make sure that you have done the following:

1. Access supporting service Documentation: https://noteable.edina.ac.uk/documentation/
2. Access supporting video playlists for Schools using Noteable: https://studio.youtube.com/channel/UCKhcyiuFyq8xTUlg_DpKIlA/playlists
3. Review the template Data Protection Impact Assessment available for teachers, schools and Local Authorities: https://blogs.glowscotland.org.uk/glowblogs/digilearn/2021/08/11/noteable-dpia-information/
4. Request access to Noteable by submitting a DPIA and any required compliance*
5. Once the request is approved, Noteable is available as an Application through the GLOW App Library.

**If you are an independent school, please contact your local GLOW officer or the Scottish Council for Independent School access to Noteable.*

Contents

This workbook serves to provide useful information, helpful links and activities that can be used in classroom with Noteable in Python.

Requirements:.....2

Contents.....2

Getting Organised:.....4

Coding with Python: Introduction to working with these materials.....6

Good-to-know information about Python.....7

Thinking Computationally: Alphabets and Coding.....9

Getting started setting up your notebook for teaching and learning.....11

Coding with Python in a Jupyter notebook on Noteable.....13

Licensing information.....14

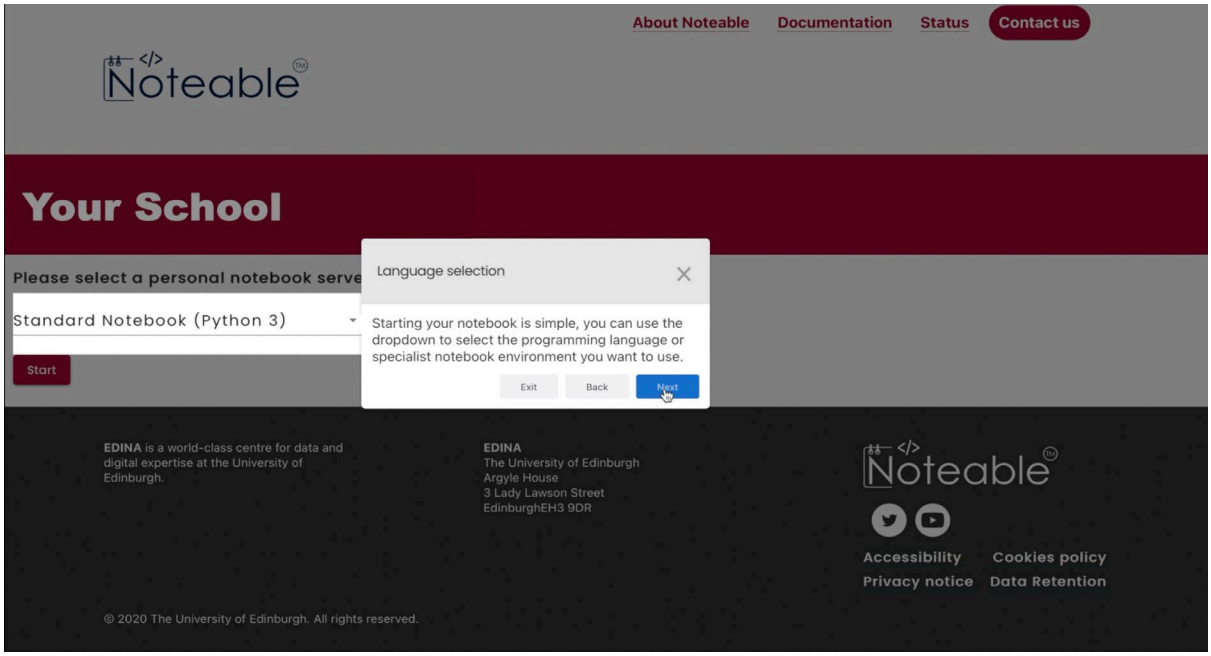

Noteable
glow
THE UNIVERSITY of EDINBURGH
EDINA

Getting Organised:

You can organise your classroom files, including files for teaching and learning coding in Python, and associated data files, with Noteable.

To do this, please access Noteable through the GLOW App Library.

When you have clicked on the Noteable App tile in the GLOW App Library, you will be taken to the launch page with the Noteable Guided Tour the first time you access, which will look like this:



*This workbook focusses on the Python programming language, so you will need to choose the 'Standard Notebook (Python 3)' from the drop-down menu when first logging in.

Once you have accessed Noteable, if it is the first time you access you will find an empty notebook list that will look like the image below:

To launch a new notebook, click on 'New' and then under the subheading ''Notebook' click on **Python 3.** This will launch a new Python 3 Jupyter notebook.

<u>To get started with importing notebooks and data on Noteable, please refer to the 'Working with Data: the ABCs of Noteable' workbook. This workbook includes information on a set of Jupyter notebooks for the Scottish Computing Science curriculum that can be imported into Noteable using the '+GitClone' button.</u>


Noteable
glow
THE UNIVERSITY of EDINBURGH
EDINA

Coding with Python: Introduction to working with these materials

You may want to start with an introduction to Python as a programming language. Programming skills, including data analysis and coding, can help solve problems in a variety of subjects. These skills are also important when you're looking for a job. Data science skills also help you spot misinformation online, such as misleading graphs.

Introduction to Python as a programming language

Python is an increasingly popular programming language.

Python can be used to code for a variety of reasons, including on a server through web applications such as Noteable, or on a server to create web applications!

It was created by Guido van Rossum, and released in 1991.

Python can be used for:

- Learning general programming tenets,
- web development (server-side),
- software development,
- mathematics,
- system scripting.
-

Python works on different platforms (Windows, Mac, Linux, Raspberry Pi, etc) and has a simple syntax similar to the English language.

Python has syntax that allows developers to write programs with fewer lines than some other programming languages.

Python runs on an interpreter system, meaning that code can be executed as soon as it is written. This means that prototyping can be very quick.

Python can be treated in a procedural way, an object-oriented way or a functional way.

Good-to-know information about Python

The most recent major version of Python is Python 3, which will be the version used in this tutorial and following tutorials.

In this tutorial Python will be written on Noteable, a browser-based platform that supports Python and the Jupyter notebook file type for coding in Python. It is possible to write Python in an Integrated Development Environment, such as Thonny, Pycharm, Netbeans or Eclipse which can be particularly useful when managing larger collections of Python files.

Quick guide to Python Syntax on Noteable

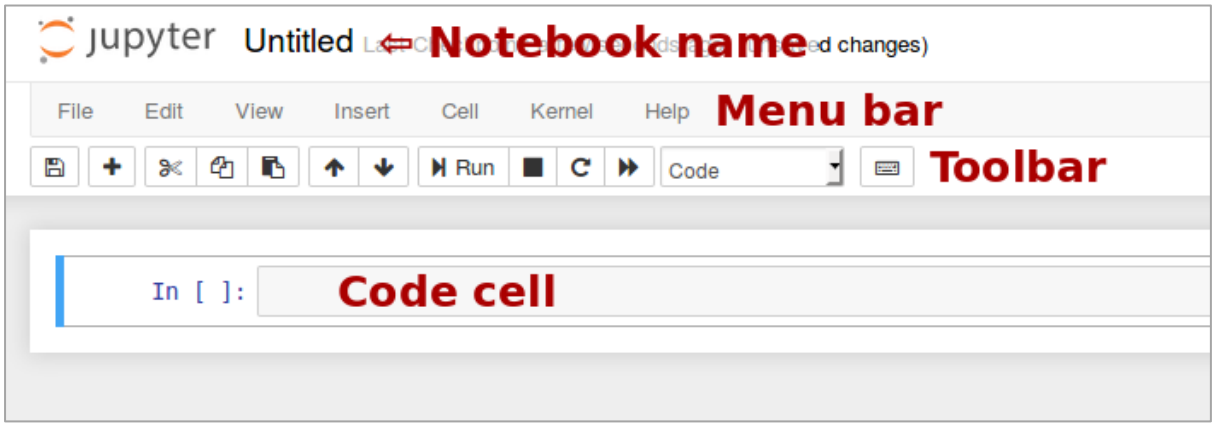
Python was designed for readability and interactivity between coders, and has some similarities to the English language, with influence from mathematics. This guide follows an approach to coding which aims to put Python in the historical context of languages more broadly. Python can be seen as a computer language, instead of a natural language such as spoken language which human beings have developed and are much more used to in day to day experience. A computer language is a language used to write instructions for the computer. It lets the programmer express data processing in a symbolic manner and includes a controlled vocabulary and set of grammatical rules designed to instruct a computer how to perform specific tasks.

Python uses new lines to complete a command, as opposed to other programming languages which often use semicolons or parentheses.

Python relies on indentation, using whitespace, to define scope; such as the scope of loops, functions and classes. Other programming languages often use curly-brackets for this purpose.

Noteable provides access to a Python coding environment with the additional Jupyter Notebook interface, which follows the standard Python syntax and also includes **cell type distinctions** so that you can add natural language explanations and text using **Markdown**, and **create assignments.**

When you first access a new Python 3 Jupyter notebook with Noteable, you will see these cell distinctions in the header, including a Notebook name, a Menu Bar including menus to navigate the formatting and management of the notebook file, the Toolbar to work through cells and content in the notebook, and an example of a blank Code cell ready for input from the user.



The code cell is where you will be able to code in Python straightaway, and you will see a blinking cursor in the code cell.

Thinking Computationally: Alphabets and Coding

When you think about programming generally, and about coding specifically with the Python programming language, the first thing to note is that coding languages aren't like human languages. There are no vocabularies, alphabets or dialects. Instead, each coding language is unique and uses special commands and abbreviations in order to work.

Learning how to code at a young age can truly set your child up for a lifetime of success. But just like anything that captures the imagination, it still has to be fun!

Coding teaches kids how to find a logical solution to a problem using a sequence of steps, actions or instructions. It helps your child to develop problem solving skills and learn the importance of perseverance. It challenges them to think creatively and to pursue innovative ideas and solutions in the face of adversity.

Before we start exploring how Python becomes even more useful and interactive when used in a Jupyter notebook and with Noteable, here are a few more facts about Python as a coding language, happy programming!

- Python was used to create some of our favourite social platforms including Instagram, YouTube, and Spotify, and is frequently used by companies including Google and Disney.
- In addition to creating video games and web frameworks, Python is also used in more complex fields such as cybersecurity and artificial intelligence!

Jupyter notebooks, Noteable and creating class materials

A Jupyter notebook is the file where your code and explanations will go. This file can then be saved and accessed from Noteable.

Noteable supports Jupyter notebooks and packages and libraries for Python and R, both by preinstalling some of the most popular and useful ones and by giving you tools to add packages and

libraries. Noteable supports installing additional coding language packages and libraries using Anaconda and Pip installs.

- Conda is an open source package management system. Conda helps you quickly install, run and update packages and their dependencies. Conda was created for Python programs, but it can package and distribute software for other languages too.

To install a package using Conda with Noteable, you will have to input the following code inside of a code cell in a Python notebook:

```
!conda install <package>
```

- Pip is a standard package manager used to install and maintain packages for Python. The Python standard library comes with a collection of built-in functions and built-in packages, but data science packages like scikit-learn and statsmodel are not part of the Python standard library. They can be installed through pip using the following code inside of a code in a Python notebook:

```
!pip install <package
```

Getting started setting up your notebook for teaching and learning

Using Markdown

You can use Markdown to format documentation you add to Markdown cells in your Jupyter notebook. When you have a notebook open, you will be able to choose between a Code cell and a Markdown cell in the Toolbar.

Here's how to format Markdown cells in Jupyter notebooks:

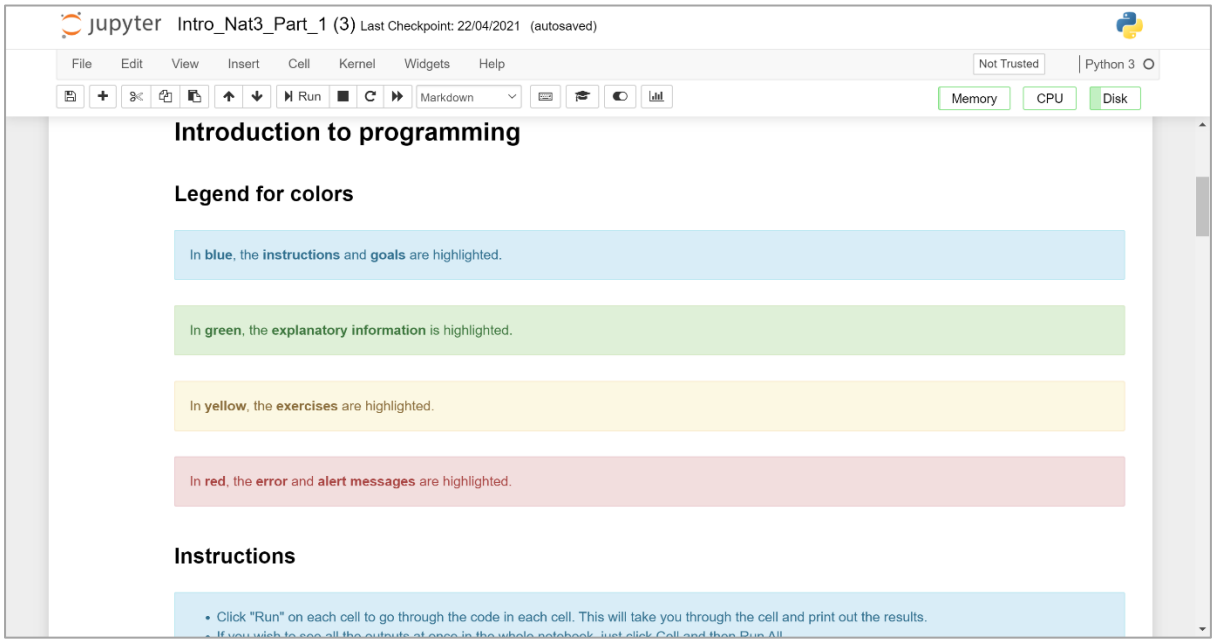
Headings

Use the number sign (#) followed by a blank space for notebook titles and section headings:

- # for titles
- ## for major headings
- ### for subheadings
- #### for 4th level subheadings
- Emphasis
- Use the following code to emphasize text:
- Bold text: __string__ or **string**
- Italic text: _string_ or *string*

The above provide options for changing the format and look of your notebooks with Markdown, you can also colour code cells to create a notebook that can look like the one below and colour-code sections within it.

More information on how to add coloured markdown cells is available here: https://www.ibm.com/docs/en/watson-studio-local/1.2.3?topic=notebooks-markdown-jupyter-cheatsheet


jupyter Intro_Nat3_Part_1 (3) Last Checkpoint: 22/04/2021 (autosaved)
File Edit View Insert Cell Kernel Widgets Help
Not Trusted
Python 3
Run
Markdown
Memory
CPU
Disk
Introduction to programming
Legend for colors
In blue, the instructions and goals are highlighted.
In green, the explanatory information is highlighted.
In yellow, the exercises are highlighted.
In red, the error and alert messages are highlighted.
Instructions
Click "Run" on each cell to go through the code in each cell. This will take you through the cell and print out the results.

Coding with Python in a Jupyter notebook on Noteable

There are a number of particular benefits in coding Python with Jupyter notebooks, including:

- Python in Jupyter notebooks is great for showcasing your work. You can see both the code and the results on the same page.
- It's easy to see and use a student's work as a starting point for learning. You can run cell by cell to better get an understanding of what the code does.
- Noteable includes the Nbgrader extension for managing coding assignments. Nbgrader provides a tool that facilitates creating and grading assignments in the Jupyter notebook. It allows instructors to easily create notebook-based assignments that include both coding exercises and written free-responses. nbgrader then also provides a streamlined interface for quickly grading completed assignments.

For further information, including guidance on using Noteable and Jupyter notebooks, please access the workbook titled *Working with Data: the ABCs of Noteable.*

Licensing information