Basics of Python Programming

Learn Python in 30 days (Beginners approach)

2nd Edition

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Dedicated to

Almighty God

My beloved parents

and

My beloved family

About the Author

Dr. Pratiyush Guleria has a Ph.D. in Computer Science. He has done an M.Tech in Computer Science and is a gold medalist at Himachal Pradesh University, Shimla, India. He has a consistent track record in academics throughout his career. He has also qualified for the State Level Eligibility Test (SLET). Dr. Pratiyush Guleria has more than 15+ years of experience in the IT industry and academics. He has research papers published in various peer-reviewed international journals and conferences. He has been a member of the Technical Program Committee and a reviewer for journals and international conferences. His research interests include Data Mining, Machine Learning, and Web Technologies.

About the Reviewers

- **Jyant**, a passionate Data Enthusiast with a Postgraduate degree in Artificial Intelligence from Great Lakes, embarked on his IT journey with *Accenture*, where he honed his skills in SAP BODS, SQL, PYTHON, and Excel, catering to US-based retail clients. Later, at *Impact Analytics*, he delved into a diverse tech stack, including R, Python, SQL, AWS, GCP, GUROBI, and more, refining his interpersonal skills.

  During his tenure at *Sapient*, Jyant led teams in delivering a spectrum of products, from price optimization to movie recommendations and Credit Scoring Models, employing a versatile toolkit encompassing Python, R, Advance SQL, Superset, Airflow, Git, Azure, Pyspark, and others.

  Currently, as a leader at *Zscaler*, Jyant spearheads the development of two pivotal models: an attrition model and an innovative chatbot powered by AWS LEX. His expertise extends to LLm, Rag, and ReAct Prompt integration, alongside utilizing SQLAlchemy to enhance the chatbot's capabilities.

  Throughout his journey, Jyant has consistently demonstrated a knack for addressing multifaceted challenges, from crafting Regression models for promotion optimization to wielding Seaborn and Matplotlib for comprehensive EDA, and even applying CNN and RESNET50 for image attribute tagging, NLP for data extraction, creating sophisticated Movie Recommendation Engines using Lightfm Neural Network models, as well as crafting Price Optimization and Credit Scoring Models using intricate bank and retail data.

- **Peyush Kumar** is an experienced IT professional, with a distinguished career that spans over 25 years. Graduating with a B.Tech in Computer Science from Punjabi University, his journey has been marked by impactful contributions to major tech players, including *Zensar*, *Wipro*, and *HCLTech*. This includes employment in global settings while residing for an extended period in the USA. Beyond showcasing prowess as a skilled programmer, Peyush proved himself as a proficient manager, steering software development teams towards success.

  Peyush's enthusiasm extends beyond coding; he is a passionate educator. His teaching legacy is witnessed in the diverse array of students, spanning from high school enthusiasts to seasoned graduates, who have benefitted from his insightful guidance.

  Residing in Noida with his family, Peyush balances his love for technology with an unwavering commitment to family values.

Acknowledgement

I want to express my deepest gratitude to my family and friends, especially my parents, for their unwavering support and encouragement throughout this book's writing.

I am also grateful to BPB Publications for their guidance and expertise in bringing this book to fruition. It was a long journey of revising this book, with valuable participation and collaboration of reviewers, technical experts, and editors.

I would also like to acknowledge the valuable contributions of my colleagues and co-workers during many years working in the tech industry, who have taught me so much and provided valuable feedback on my work.

Finally, I would like to thank all the readers who have taken an interest in my book and for their support in making it a reality. Your encouragement has been invaluable.

Preface

The author is optimistic that students who want to complete a thorough using Python will find relief in this work. This book provides a range of real-world examples, conceptual challenges, and methodically worked-out solutions to help readers understand programming ideas through clear explanations and examples. Additionally, it covers every topic necessary for students to gain a thorough understanding of the fundamentals of Python. This book is a great resource for anyone with programming knowledge and a great place for newbies to start.

The abilities needed to understand the fundamentals of Python at a beginner's level are taken into mind when writing this book. The book presents real-world Python examples in an approachable style that makes it easy for students to learn and comprehend.

To err is human, to forgive divine is a proverb. Although the book is written with honesty and sincerity, I hope that its flaws will be overlooked. However, the author is receptive to any form of helpful critiques and recommendations for additional development. All insightful recommendations are welcomed, and the author will do their utmost to include them in worthwhile additions to this work in future versions.

Chapter 1: Introduction to Python Variables, Datatypes and Operators - In this chapter, learners will understand Python software, its installation, and writing programs in IDLE. Going through this chapter, we will cover the fundamentals of variable declaration, datatypes, and so on. Apart from that, Python operators are illustrated with the help of suitable examples.

Chapter 2: Conditions and Loops - In this chapter, learners will be able to understand the fundamentals of control statements and implement the logic using if conditions and loops wherever it is necessary. Apart from that, readers will be able to learn the difference between break and continue statements. Learners will also grasp the concepts of the control statements, **`range()`** function with the help of examples. The concepts of conditions, loops, **`range()`** function, break and continue statements are discussed and illustrated with the help of suitable examples.

Chapter 3: Arrays and Functions - Arrays are the variables having similar data types. Arrays in Python contain values corresponding to the same data types, whereas lists, which are somewhat similar to arrays discussed in the next chapter, contain values corresponding to different data types. Arrays can contain more than one value at a time, and indexing is

used to refer to array elements. A function in Python is a block of a series of statements that carry out a single or several actions. Code is easier to read, comprehend, and maintain when it is divided into usable, modular chunks because of the use of functions. The ability to reuse code is one benefit of utilizing functions.

Chapter 4: Lists, Tuples, Iterators Generators, and Sets - In this chapter, we will discuss the concept of lists, tuples, iterators, and generators. Although all of these are data structures or constructs that are used to keep, iterate through, and modify collections of data, they each have distinctive characteristics.

Chapter 5: Dictionaries and Modules - In this chapter, we will learn about dictionaries and modules. A dictionary is a commonly used data structure that returns data as key-value pairs. Dictionaries use key-value pairs to store and retrieve data efficiently. Python uses modules to split code into individual files, which makes it easier to organize and reuse. Import statement is used for implementing modules.

Chapter 6: File Handling and Databases - This chapter will cover the topics related to file handling and databases. File handling in Python enables one to work with files using the built-in functions and libraries. In databases, we will discuss the concept of data definition language (DDL) and data manipulation language (DML) commands for database connections.

Chapter 7: Object-Oriented Programming - Python supports object-oriented programming (OOP) concepts. This chapter will cover the OOP concepts like classes, objects, inheritance, overriding, and so on. A class is a template for creating objects and is a collection of data members, and methods. An object is an instance of a class. In classes, methods that can perform actions on the object using dot notation are defined within a class.

Chapter 8: Regular Expressions, Date and Time - Regular expressions are used to identify patterns in a sequence of strings. To work with the regular expressions in Python, we need to import the `re` module. The regular expressions help us in searching, matching and manipulating strings based on specific patterns. The datetime module in Python is widely utilized for manipulating dates and times. The current date and time can be obtained using `datetime.now()` function. You may get the current date with `date.today()` function.

Chapter 9: Exception Handling - Exception is an error that occurs during the execution of the program, and Exception Handling provides a user-friendly interface to handle the exception and prompts a message to the user stating the reason for such unexpected exceptions, like dividing a number by zero.

Chapter 10: NumPy and TKinter - By going through this chapter, learners will acquire the knowledge of Numpy and perform operations on arrays using Numpy. Apart from that, you will be able to work with a GUI-based environment of Python known as Tkinter.

Appendix: Practice Exercises with Solutions - Learners will be presented with practical activities in the Appendix that include fill-in-the-blank questions, true/false questions, and more. A reader who gains an overview of Python essentials through the appendix will also be better equipped to face technical interviews and prepare for entrance-level examinations.

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Code Bundle and the ***Coloured Images*** of the book:

https://rebrand.ly/e0c1e2

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Chapter 1

Introduction to Python Variables, Datatypes and Operators

Introduction

Python is an interpreted and object-oriented high-level programming language. It was designed by *Guido Van Rossum* and released in 1991. The latest version of Python is Python 3.12.2.

Python itself is mainly written and implemented in the C programming language for flexibility and effectiveness. Python can also be translated into binary code like Java. Python is used in Mathematics and Machine Learning. Python has had tremendous growth across a wide range of industries, including web development, data science, AI, scientific computing, and so on. Since Python is an interpreted language, running your code does not require compiling it first. Python's line-by-line editing and execution capabilities make it ideal for quick development and experimentation. Because Python is dynamically typed, you do not need to explicitly declare variable types.

The type of a variable is decided by the interpreter at runtime, providing flexibility. With the aid of libraries like Tkinter, desktop applications can be made with Python.

Lists, tuples, and dictionaries are the three basic data structures used in Python to store and manage collections of data. Besides that, topics like modules, object-oriented programming features, databases, file handling, and Numpy are addressed in this book with the help of simple and illustrative examples.

Structure

In this chapter, we will cover the following topics:

- Know about Python installation
- Writing a program in IDLE shell
- Variable declaration
- Data types
- Operators
- type() function

Objectives

In this chapter, learners will come to know about Python software, its installation and writing programs in IDLE. Going through this chapter, we will cover the fundamentals of variable declaration, datatypes and so on. Apart from it, Python operators are illustrated with the help of suitable examples.

Python installation

Python is an open-source software and can be downloaded from its official website, as shown in *Figure 1.1*. The most recent versions of Python are available for download at **https://www.python.org/downloads/**.

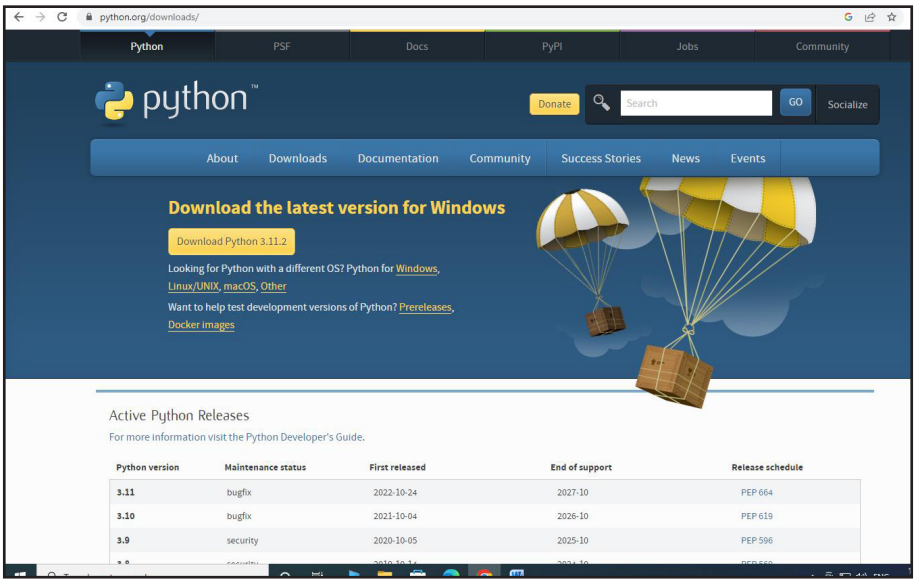

Figure 1.1: *Download the Python software*

After downloading the software, execute it as shown in *Figure 1.2:*

Figure 1.2: *Execution of the Python software*

After executing the Python software, the setup of the software starts its installation progress and finally displays the completion message of the installation, as shown in *Figure 1.3*:

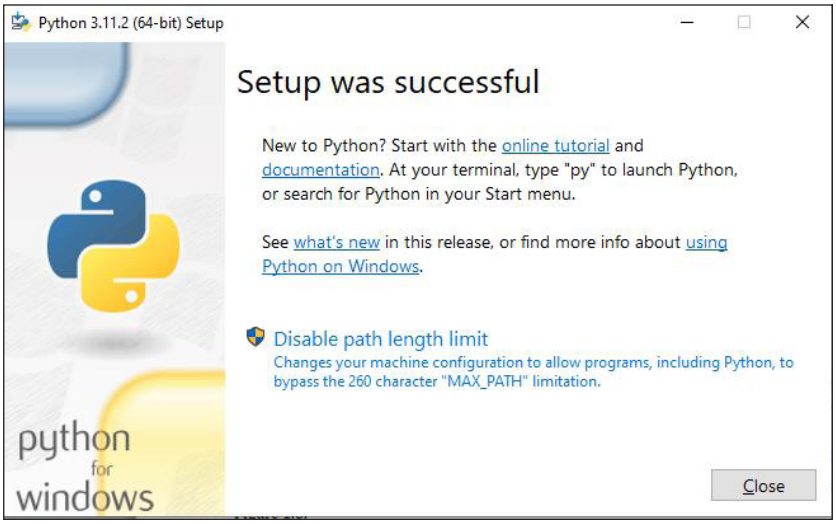

Figure 1.3: *Setup installed successfully*

After the Python setup is completed successfully, the Python IDLE 3.11 environment for writing programs is shown in *Figure 1.4* and *Figure 1.5*. The IDLE is known as the **integrated development learning environment.** It is a Graphical user interface for writing Python programs. Take a look at the following figure:

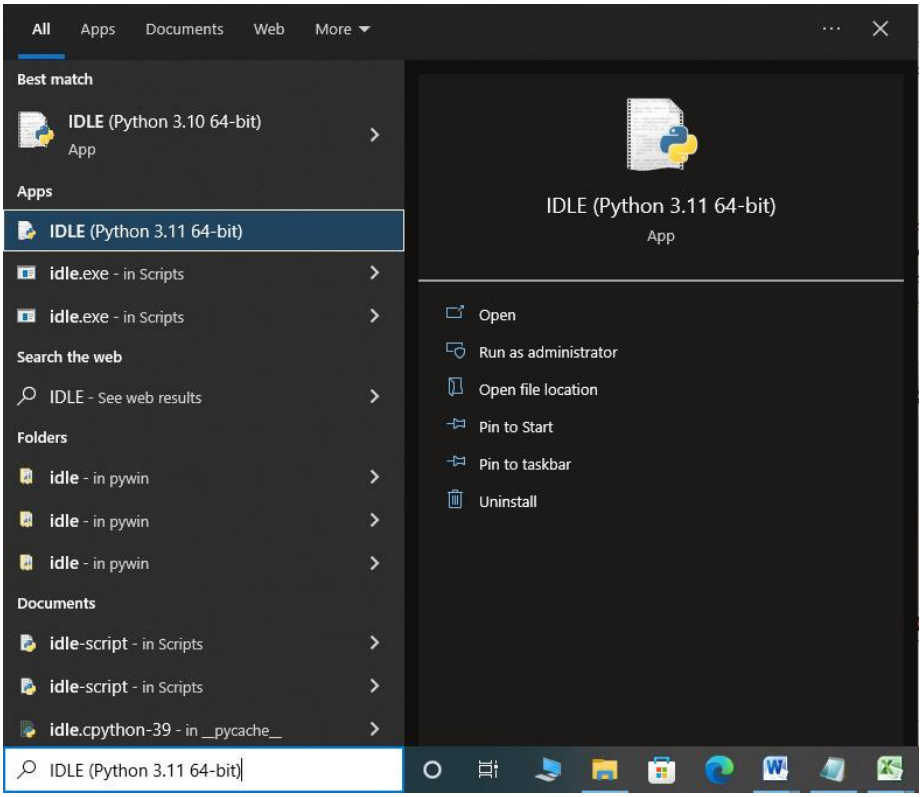

Figure 1.4: *Opening IDLE (Python 3.11)*

IDLE Python 3.11 Shell is illustrated in the following figure:

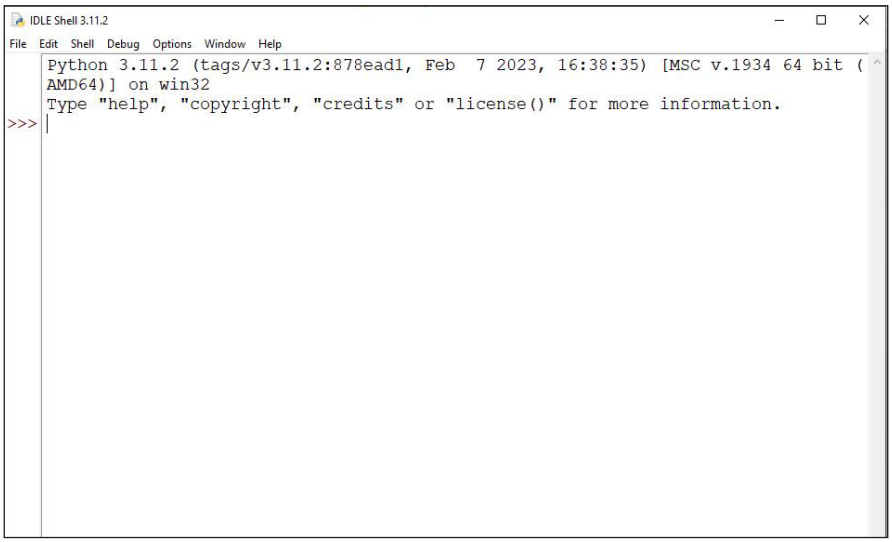

Figure 1.5: *IDLE Python 3.11 Shell*