

The Blue Marble Academy Intermediate Python Program

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The Blue Marble Academy Inc.

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## *Program Overview*

**Duration of course:** 30 hours

**Number of sessions:** 30

**Suggested grade range:** 4+

**Suggested age range:** 9+

**Prerequisite courses:** The Blue Marble Academy Beginner Python Program

This Intermediate Python Curriculum is designed to build on foundational programming skills and apply them in game building. Over the course of 30 hours and 30 sessions, students will dive into more advanced Python concepts through hands-on, project-based learning. They'll develop and refine their skills by creating exciting games like Tic Tac Toe, Snake, and Zombie Attack, all while exploring key programming principles in depth.

The curriculum offers an in-depth exploration of:

* *Game Development with Pygame:* Learning to use Pygame for creating engaging and interactive games.
* *Saving and Loading Data:* Understanding how to manage and store game data effectively.
* *Classes and Objects:* Grasping object-oriented programming by creating and working with classes.

Through these engaging projects, students will not only enhance their technical abilities but also strengthen their problem-solving and creative thinking skills. By the end of the program, they’ll be well-prepared to tackle more complex programming challenges or explore new coding languages and platforms.

**Prerequisite skills:**

* Mathematical Operations (Addition, Multiplication, Subtraction, Division)
* Creativity

**Program projects:** Tic Tac Toe, Snake, and Zombie Attack

**Resources**: All documentation that corresponds to the following curriculum is saved on OneDrive under Programs → Coding Programs → PYTHON → Intermediate Python

**Curriculum links**: Gr. 4 - 8 Science and Technology:

A2.1 write and execute code in investigations and when modeling concepts, with a focus on producing different types of output for a variety of purposes

A2.2 identify and describe impacts of coding and of emerging technologies on everyday life, including skilled trades

**Libraries:** Pygame

**Teaching approach:** This curriculum is structured around building projects and practicing editing existing code. The teaching style is to be inquiry-based and not lecture based so as to support the students’ critical thinking skills and facilitate a learning space of conversation between instructors and students. While this lesson plan is written as 1-hour lessons, it can be done in two-hour blocks (1,2 and 2,3 etc.). Lessons rely on concept exploration mostly through assignments, as it can be difficult to interpret an idea like recursion in a vacuum.

For students and teachers, each lesson has a corresponding python file. Use this as a guide to create your own file from scratch to practice the key concepts. Focus understanding and altering the existing code to facilitate learning.

Colored in purple are segments focused on exploration of new topics. Colored in orange are projects, based on writing your own code (though students will be given a basic pre-written version of the more sophisticated code, and encouraged to modify and expand on it).

**Options when program is completed:** After completing this program, the student has two options: the first is to move onto the advanced Python program which is a program with multiple modules. The second is to expand their language knowledge by enrolling in the beginner Roblox program.

## *Curriculum*

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| **Python Beginners**  **(1 Hour Lessons)** | **Coding Concepts** | **Resources** |
| Lesson 1:  Beginner Program Review | * Review Worksheet   *(60 mins)* | “Review*.py”*  *Programs > Coding Programs Python > Intermediate - Python > Intermediate – Learning Checkpoints*   * 45 more minutes are allocated to complete the worksheet in the next session. * Also, remind the student about bringing in their parent/guardian for the next session to give the beginner certificate. (Last 15 minutes). |
| Lesson 2:  Beginner Program Review Continued + Certificate Show and Tell | * Complete Review worksheet   *(45 mins)*   * Beginner Certificate + Project Show and Tell with Parents   *(15 mins)* | “Review*.py”*  *Programs > Coding Programs Python > Intermediate - Python > Intermediate – Topics*   * The last 15 minutes should be spent showing the parents the beginner projects + giving the beginner certificate. |
| Lesson 3:  Recursion | * What is a recursion?   *(10 mins)*   * Examples   *(15 mins)*   * Exercises   *(35 mins)* | “*Lesson3 - Recursion.py”*  *Programs > Coding Programs Python > Intermediate - Python > Intermediate – Topics* |
| Lesson 4:  Pygame – Basics and Event Handling | * Import and Initialize Pygame   *(3 mins)*   * Create screen   *(5 mins)*   * Creating a Rectangle   *(10 mins)*   * Create the Game Loop   (*2 mins)*   * Change the Colour of the Screen   *(5 mins)*   * Add the event to quit the game   *(10 mins)*   * Blitting an Image   *(25 mins)* | * Install pygame if the student is working on their own laptop. The installation instructions are “Downloading User Made Modules.py”   “*Lesson3.py”*  *“Mario.png”*  *Programs > Coding Programs Python > Intermediate - Python > Intermediate – Topics*   * The python file corresponding to this lesson is in OneDrive. Use the file as a learning guide, there are exercises after each section. Create a new python file to complete them. * Also download Mario.png, found in Intermediate – Topics, it is the image being uploaded in the python file. |
| Lesson 5:  Pygame – Text, Mouse Clicks, and Drawing Lines + Circles | * Mouse Clicks   *(15 minutes)*   * Drawing Lines   *(10 minutes)*   * Drawing Circles   *(5 minutes)*   * Displaying Text   *(15 minutes)*   * Keyboard Input   *(15 minutes)* | “*Lesson4.py”*  *Programs > Coding Programs Python > Intermediate - Python > Intermediate – Topics*   * The python file corresponding to this lesson is in OneDrive. Use the file as a learning guide, each section has exercises. Create a new python file to complete them. |
| Lesson 6 - 8:  Tic, Tac, Toe | * Project # 1- Tic, Tac, Toe   *(3 hours)* | *“TicTacToe.py”*  *Programs > Coding Programs Python > Intermediate - Python > Intermediate – Projects*   * The completed tic, tac, toe game can be found in projects. Feel free to begin from scratch or delete some functions, depending on the student skill set. There are 3 sessions/hours allocated for this project. |
| Lesson 9:  Pygame - Movement and Sounds | * Movement Using Keys   *(15 minutes)*   * Creating Buttons   *(15 minutes)*   * Collision Detection   *(15 minutes)*   * Adding Sound   *(15 minutes)* | “*Lesson8.py”*  “button\_click.mp3”  *Programs > Coding Programs Python > Intermediate - Python > Intermediate – Topics*   * The python file corresponding to this lesson is in OneDrive. Use the file as a learning guide, try to begin from scratch with the student by creating your own python file. * Also download button\_click.mp3, found in Intermediate – Topics, it is the sound being uploaded in the python file. |
| Lesson 10:  Pygame – Save and Loading | * Creating a txt File   *(3 minutes)*   * Opening a File   *(15 minutes)*   * Reading and Writing Mode   *(7 minutes)*   * Reading a File   *(10 minutes)*   * Writing to a File   *(15 minutes)*   * Closing a File   *(10 minutes)* | “*Lesson9.py”*  *Programs > Coding Programs Python > Intermediate - Python > Intermediate – Topics*   * The python file corresponding to this lesson is in OneDrive. Use the file as a learning guide, try to begin from scratch with the student by creating your own python file. |
| Lesson 11:  Pygame – Boundary Checking and Connecting Screens | * Boundary Checking   *(10 minutes)*   * Creating Multiple Screens   *(20 minutes)*   * Connecting the Screens Together   *(15 minutes)*   * Sending Information from one File to Another   *(15 minutes)* | “*Lesson10.py”*  “*Lesson10\_Screen2.py”*  *Programs > Coding Programs Python > Intermediate - Python > Intermediate – Topics*   * The python files corresponding to this lesson are in OneDrive. Use the files as a learning guide, try to begin from scratch with the student by creating your own python file. |
| Lessons 12 - 16:  Snake Game | * Project # 2- Snake Game   *(4 hours)* | *“Snake.py”*  *Programs > Coding Programs Python > Intermediate - Python > Intermediate – Projects*   * The completed snake game can be found in projects. Feel free to begin from scratch or delete some functions, depending on the student skill set. There are 3 sessions/hours allocated for this project. |
| Lesson 17:  Classes | * What is a Class + their Purpose   *(15 minutes)*   * Syntax of Classes   *(15 minutes)*   * Methods   *(15 minutes)*   * Calling on a Class's variables + methods   *(15 minutes)* | *“Lesson16.py”*  *Programs > Coding Programs Python > Intermediate - Python > Intermediate – Topics*   * The python files corresponding to this lesson are in OneDrive. Use the files as a learning guide, try to begin from scratch with the student by creating your own python file. |
| Lesson 18:  Sprites | * Using Sprites   *(10 minutes)*   * Creating Character Sprites   *(30 minutes)*   * Practice   *(20 minutes)* | *“Lesson18.py”*  *Programs > Coding Programs Python > Intermediate - Python > Intermediate – Topics*   * The python files corresponding to this lesson are in OneDrive. Use the files as a learning guide, try to begin from scratch with the student by creating your own python file. |
| Lesson 19 - 29:  Final Project | * Final Project   *(240 min)*    *This portion is meant to be a little more hands-off, give students room to breathe and work on their own, help is offered if needed* | * The assignment will begin from scratch without any starter code. * Use the review slot if more time is needed to complete the project. * Upload the assignment in the student work folder once completed! |
| Lesson 30:  Open/Review Slot | * Review slot * Move around to earlier lessons if needed (i.e.: if student is struggling in week 2, don’t advance yet!) |  |