Week 2

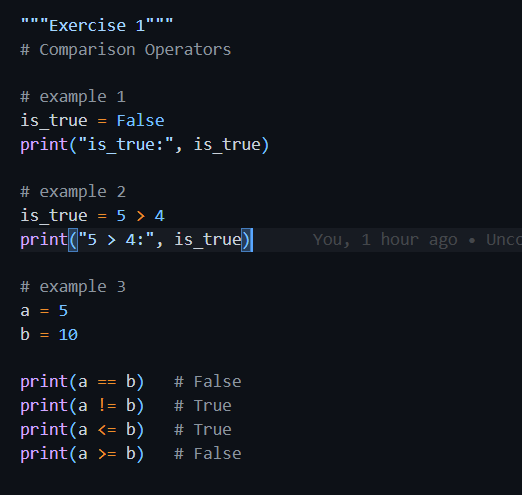
# Section 1. Comparisons and Conditionals

## Exercise 1: Comparison Operators

### Understanding the Task:

This exercise asked us to explore and practice **comparison operators**. We were expected to check how values or variables compare using operators like **==, !=, >, <, >=,** and **<=.** The main goal was to understand how these comparisons return either True or False.

### Source Code:



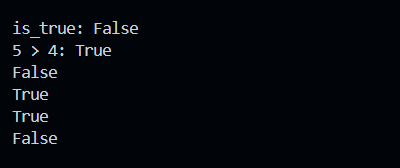
### Explanation

* In **Example 1**, I directly assigned a Boolean value ‘False’ to a variable and printed it.
* In **Example 2**, I used a comparison 5 > 4 which is True, and printed the result.
* In **Example 3**, I compared two variables a = 5 and b = 10 using all standard comparison operators to see which conditions are true.

### Time and Space Complexity

* **Time Complexity**: O(1) – All operations are constant-time comparisons.
* **Space Complexity**: O(1) – Only a few variables are stored in memory.

### Output

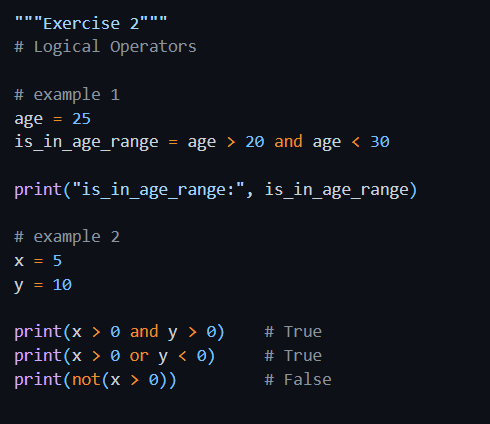


## Exercise 2: Logical Operators

### Understanding the Task

In this exercise, I was supposed to work with **logical operators**. These include **and**, **or**, and **not**. I needed to check how they behave when used with different conditions and see what kind of Boolean result they give, either True or False. The goal was to understand how we can combine multiple conditions using logic.

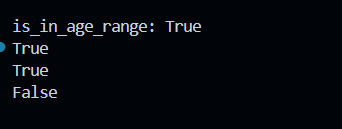
### Source Code



### Explanation

* In the first example, I checked if the age falls between 20 and 30. Since 25 is in that range, it returns True.
* In the second part, I used two variables x and y and tested them using different logical operators:
  + x > 0 and y > 0 checks if both values are positive — which they are.
  + x > 0 or y < 0 checks if **at least one** condition is true — which is also true.
  + not (x > 0) flips the result of x > 0. Since x is greater than 0, the original condition is True and not makes it False.

### Output

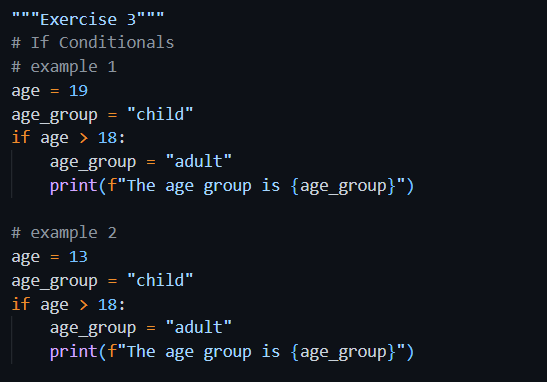


## Exercise 3: if – Conditionals

### Understanding the Task

In this task, I explored the basic use of **if statements** in Python. I had to check if a certain condition is true and then update a variable or display a message accordingly. The main idea was to learn how decisions are made in a program based on conditions.

### Source Code



### Explanation

* In the first example, the age was 19, which is greater than 18, so it updated age group from "child" to "adult" and printed it.
* In the second example, the age was 13, so the condition age > 18 was false and nothing was printed — the program skipped the if block.

### Time Complexity and Space Complexity

* **Time Complexity**: O(1) – A single condition is checked.
* **Space Complexity**: O(1) – Only a few variables are used.

### Output



## Exercise 4: if – else Conditionals

### Understanding the Task

This task was about using the **if-else** structure. I had to write code where the program chooses between two possible actions, one if a condition is true, and another if it's false.

### Source Code

A screen shot of a computer program

AI-generated content may be incorrect.

### Explanation

* In the first example, wind\_speed was 30, which is not less than 10, so it printed "It is a windy day".
* In the second example, windspeed was 5, which is less than 10, so it printed "It is a calm day".

### Time Complexity and Space Complexity

* **Time Complexity**: O(1) – It just checks one condition.
* **Space Complexity**: O(1) – Minimum memory usage.

### Output

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## Exercise 5: if – elif - else Conditionals

### Understanding the Task

In this exercise, I practiced using **if-Elif-else** blocks to handle multiple conditions in a clean way. This helped in writing better decision-based logic where the program chooses the right option from several possibilities.

### Source Code

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A computer screen shot of a computer code

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### Explanation

* Four different grades were tested.
* The code checked each grade and printed a message:
  + Below 50 → “You failed”
  + Between 50–59 → “You passed”
  + Between 60–69 → “You got a good pass”
  + 70 and above → “You got an excellent pass”
* Each elif allows checking in sequence, and only one block runs depending on the value.

### Time Complexity and Space Complexity

* **Time Complexity**: O(1) – Constant time, since only a few checks are made.
* **Space Complexity**: O(1) – Few variables used.

### Output

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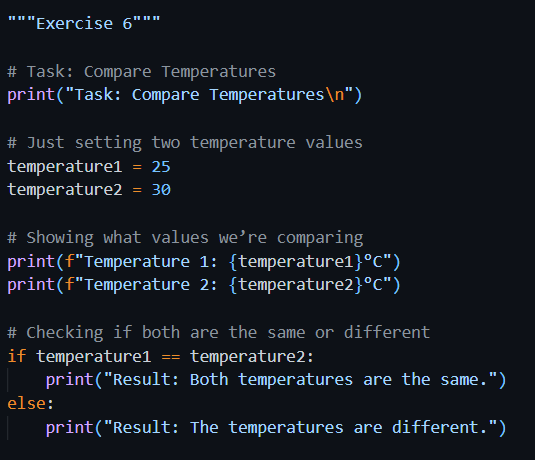
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## Exercise 6: Compare Temperatures

### Understanding the Task

This task was about comparing two temperature values. I had to check if they were equal or different and show the appropriate message using an if-else structure.

### Source Code



### Explanation

* The two temperatures were set to 25 and 30.
* The program displayed both values.
* Then it compared them: since 25 ≠ 30, it printed “The temperatures are different”.

### Time Complexity and Space Complexity

* **Time Complexity**: O(1) – One comparison is made.
* **Space Complexity**: O(1) – Two variables only.

### Output

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Øther tasks are remaining

Week 3

# Section 1. Functions and Scope

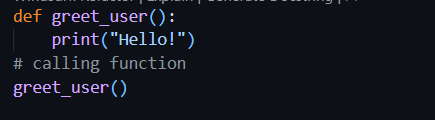
## Exercise 1: Functions in Python

### Understanding the Task

In this task, I learned how functions work in Python and how they help make code more reusable and organized. I explored different aspects like how to define a basic function, pass parameters to it, and use keyword arguments. I also practiced using default parameter values and learned how to return results from a function. Each small sub-topic helped me understand how functions behave in different scenarios and how we can control the inputs and outputs more efficiently. This exercise gave me a solid understanding of writing clean, functional code.

#### Creating Functions

##### Source Code



##### Explanation

Here, I created a simple function called greet\_user() that prints a greeting. I called the function after defining it to run the print statement. This shows how basic functions are defined and called in Python.

##### Output



#### Function Parameters

##### Source Code 1

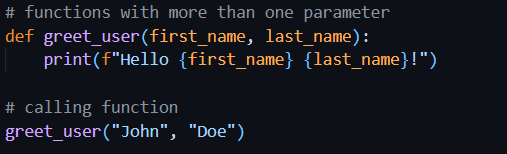
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##### Output 1



##### Source Code 2



##### Output 2

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AI-generated content may be incorrect.

##### Explanation

This version of the function takes a parameter called name. When I call greet\_user("John"), it prints "Hello John!". This shows how to pass input (variables) into a function and use it inside.

#### Keyword Arguments

##### Source Code

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##### Explanation

In this example, I called the same function using keyword arguments. I passed values by naming the parameters directly. This allows the arguments to be passed on in any order, which makes the code more readable.

##### Output

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#### Default Values

##### Source Code

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##### Explanation

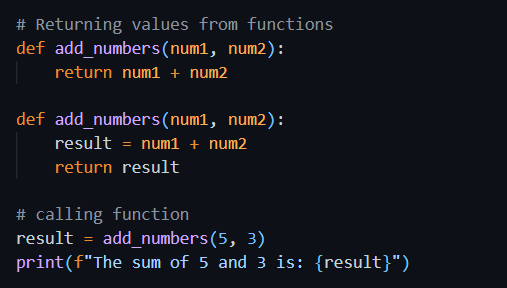
This function has a default value for the university parameter. If I don’t pass the value for it, it uses "UWS" by default. But I can also override it by giving a custom value like "UWS London". This is useful when some arguments usually have a common value.

##### Output

****

#### Return

##### Source Code

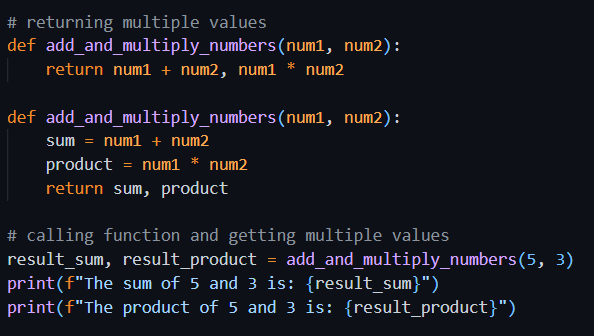


##### Output

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##### Source Code



##### Output

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##### Explanation

In this part, I created a function called add\_numbers() that takes two numbers and returns their sum. Instead of printing the result inside the function, it sends the result back using the return keyword. I stored that value in a variable called result and printed it. This makes the function more flexible since I can use the result anywhere else in the program too.

## Task: Greet each friend in the list

### Understanding the Task

In this task, I had to create a function that takes a list of friends' names and greets each one by printing a message. The main goal was to use a for loop to go through a list and apply the same action (printing a greeting) to every item.

### Source Code



### Explanation

I defined a function greet\_friends() that accepts one argument, a list of names. Inside the function, I used a for loop to iterate through the list and print "Hello" followed by each friend's name. When I called the function with a sample list like ["John", "Jane", "Jack"], it printed a greeting for each one. This is a good example of using functions and loops together.

### Time Complexity and Space Complexity

* **Time Complexity**: O(n) – because the loop runs once for each name in the list.
* **Space Complexity**: O(1) – no extra space is used other than a few variables.

### Output

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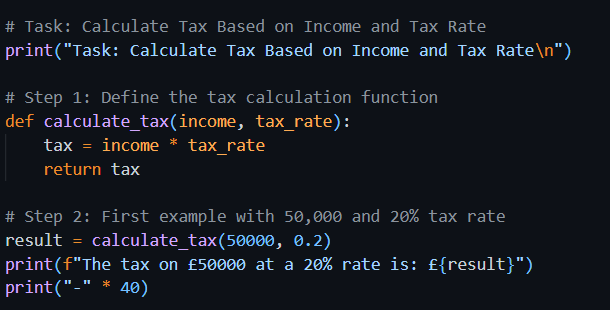
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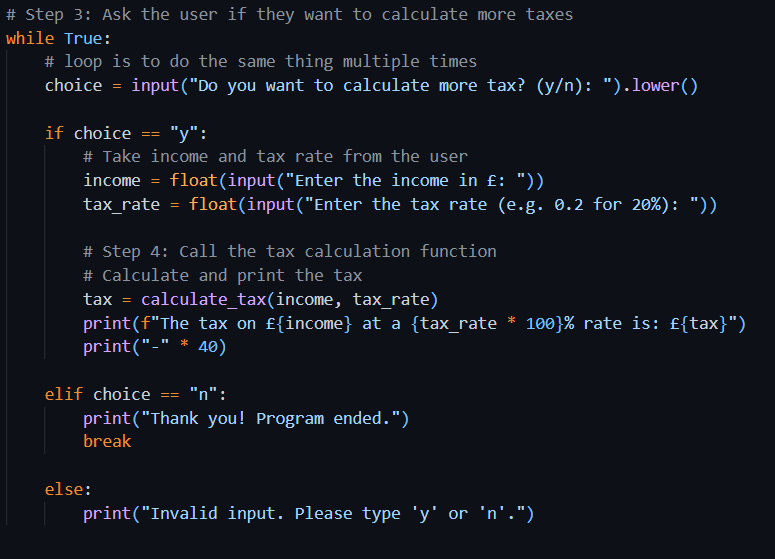
## Task: Calculate Tax Based on Income and Tax Rate

### Understanding the Task

In this task, I had to write a program that calculates tax based on a given income and tax rate. It starts by testing the function with fixed values, and then allows the user to enter their own income and tax rate multiple times. The goal was to use functions, input/output, loops, and basic arithmetic.

### Source Code





### Explanation

* First, I created a function called calculate\_tax that multiplies income by tax rate and returns the result.
* I tested the function with £50,000 income and a 20% tax rate, and it correctly returned the tax.
* Then I used a while loop to allow the user to calculate tax as many times as they want.
* If the user enters 'y', it asks for income and tax rate, then prints the calculated tax using the same function.
* If the user types 'n', the program ends with a thank-you message.
* It also handles invalid inputs like any character other than 'y' or 'n'.

### Time Complexity and Space Complexity

* **Time Complexity**:
  + O(1) for each individual tax calculation
  + O(n) overall, where n is the number of times the user wants to calculate tax
* **Space Complexity**: O(1) – the program only uses a few variables regardless of input size

### Output

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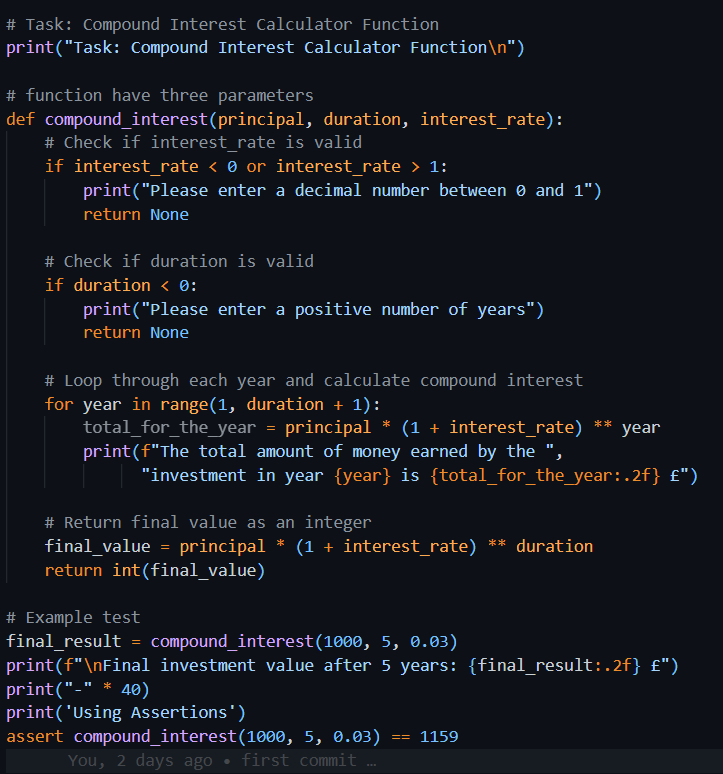
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## Task: Compound Interest Calculator Function

### Understanding the Task

This task was about writing a function that calculates compound interest over a number of years. The function needed to handle invalid inputs and print how the investment grows year by year. In the end, it returns the final value of the investment.

### Source Code



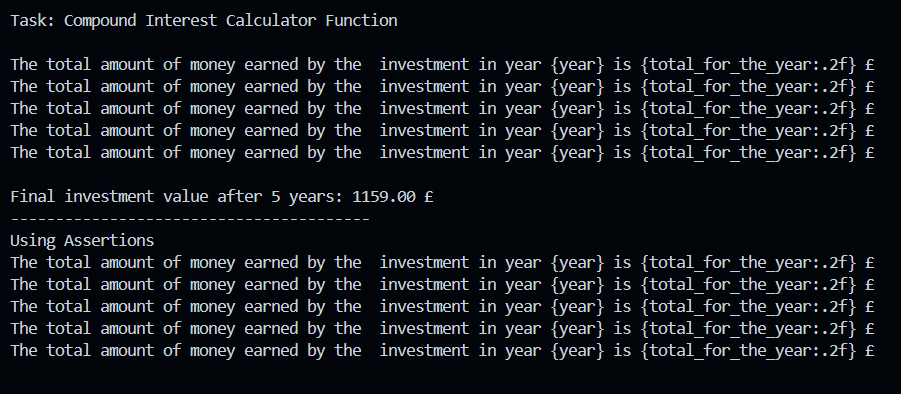
### Explanation

* The function compound\_interest takes three parameters: principal, duration, and interest\_rate.
* It first checks if the interest rate is between 0 and 1 and if the duration is positive. If not, it shows an error and exits early.
* Then, it uses a for loop to calculate and print the total amount at the end of each year using the compound interest formula:  
  (principal×(1+rate)year)(principal × (1 + rate) ^ year)(principal×(1+rate)year)
* Finally, it returns the total value at the end of the given duration, rounded to an integer.
* I tested the function with a £1000 investment for 5 years at 3% interest, and it correctly printed the values for each year and returned the final result.

### Time Complexity and Space Complexity

* **Time Complexity**: O(n) – The function loops once for each year (n = duration)
* **Space Complexity**: O(1) – It uses a fixed amount of memory regardless of the duration

### Output

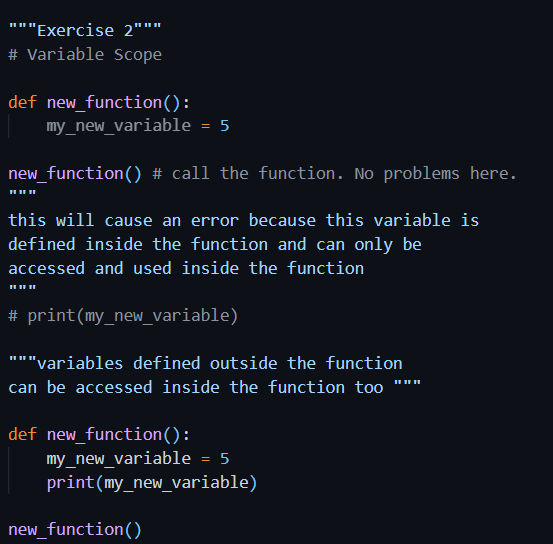


## Exercise 2: Variable Scope

### Understanding the Task

This task helped me understand how **variable scope** works in Python, especially in relation to functions. It showed the difference between variables defined inside a function (local scope) and those outside it (global scope).

### Source Code



### Explanation

* In the first part, I defined a variable called my\_new\_variable **inside** a function and then tried to access it **outside** the function. This causes an error because the variable only exists within the function’s local scope.
* In the second part, I added a print() statement **inside** the function to access the same variable, and it worked perfectly. This proves that local variables can only be used within the function they’re defined in.
* The code also notes that **global variables** (defined outside the function) can still be accessed inside it — though this specific example doesn’t show that part in action.

### Time Complexity and Space Complexity

* **Time Complexity**: O(1) – The function runs once and does a simple assignment and print.
* **Space Complexity**: O(1) – Only one variable is stored.

### Output

#### Error

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#### Corrected Code Output



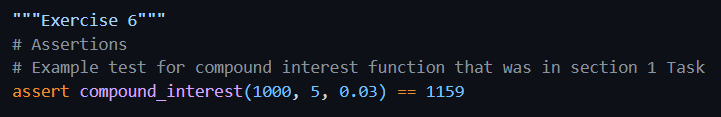
# Section 2: Assertions and Errors

## Exercise 6: Assertions

### Understanding the Task

This task was about using assert statements in Python to automatically check if a function gives the expected result. Assertions are used mainly for testing.

### Source Code



### Explanation

I used the assert keyword to test the output of the compound\_interest function. If the result is not exactly 1159, the program will raise an error. Since the actual return value matches, the code runs without any issues.

### Time Complexity and Space Complexity

* **Time Complexity**: O(n) – depends on the compound interest function’s loop
* **Space Complexity**: O(1) – no extra space used

### Output

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## Exercise 7: Identifying and Fixing Common Errors

### Understanding the Task

#### Syntax Error

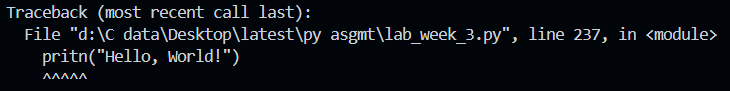
Occurs when Python code is written incorrectly and doesn't follow the proper rules — e.g., a typo like pritn() instead of print().

##### Source Code 1 – Has Error

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##### Output 1



##### Source Code – Corrected

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##### Output 2

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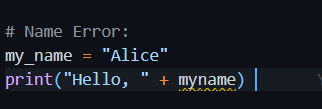
##### Explanation

The original line used pritn() which is incorrect. I fixed it by writing print("Hello, World!") correctly.

#### Name Error

Happens when you try to use a variable or function name that hasn’t been defined yet.

##### Source Code 1 - Has Error



##### Output 1

##### 

##### Source Code 2 – Corrected Code

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##### Output 2

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##### Explanation

Originally, myname was used without being defined. I fixed it by using a properly declared variable favorite\_color and printed it correctly.

#### Value Error

Occurs when a function gets the right type of data but the value is not acceptable — like converting "abc" to an integer.

##### Source Code 1 – Has Error

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##### Output 1

A screen shot of a computer

AI-generated content may be incorrect.

##### Source Code 2 – Corrected Code

A screen shot of a computer

AI-generated content may be incorrect.

##### Output 2



##### Explanation

Python can’t add a string and an integer directly. I fixed it by converting "5" to int using int("5") before adding.

#### Index Error

Happens when you try to access an index in a list that doesn’t exist — like accessing index 3 in a 3-item list.

##### Source Code 1 – Has Error

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##### Output 1

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##### Source Code 2 – Corrected Code

A screen shot of a computer

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##### Output 2



##### Explanation

The list only had 3 elements (index 0 to 2), but index 3 was used. I corrected it by accessing index 2, which is valid.

##### Output

#### Indentation Error

Occurs when the code isn't properly spaced. Python uses indentation to know what code belongs in loops, functions, etc.

##### Source Code 1 – Has Error

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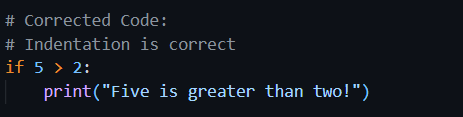
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##### Output 1

A screen shot of a computer

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##### Source Code 2 – Corrected Code



##### Output 2

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##### Explanation

Python expects code blocks to be indented. The original code wasn’t indented under if. I fixed it by indenting the print() line properly.

# Section 3. Larger scale python program

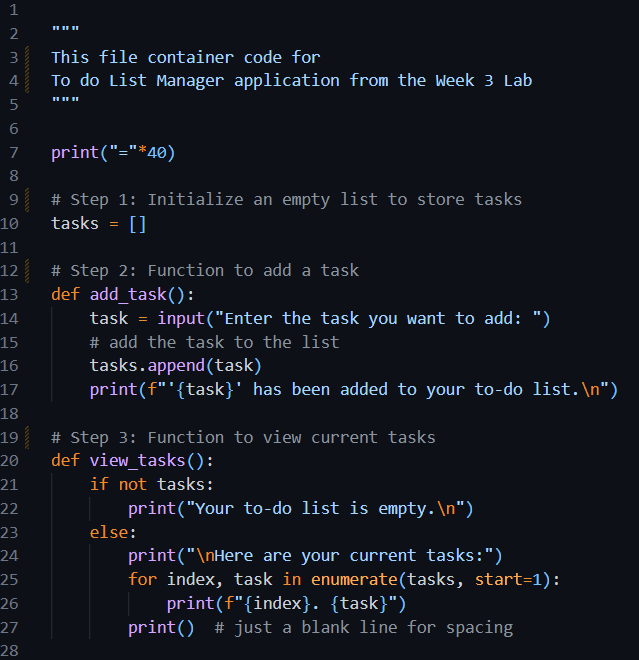
## Task: To-Do list manager:

### Understanding the Task

The purpose of this task was to create a simple **To-Do List application** using basic Python features like lists, functions, conditionals, and loops. The program should allow the user to manage their daily tasks by adding them, viewing the current list, removing any task, and exiting the program using a menu system.

The focus was on writing clean, functional code and understanding how to work with user input and list operations in Python.

### Source Code



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A screenshot of a computer program

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### Explanation

The program runs in a loop and offers four main options to the user:

#### 1. Initialize the Task List

At the top of the program, an empty list called tasks is created. This is where all the tasks entered by the user are stored.

#### 2. Adding a Task

The add\_task() function asks the user to type in a task. Once entered, the task is added to the list, and a confirmation message is displayed.

#### 3. Viewing All Tasks

The view\_tasks() function checks if the list is empty. If not, it shows all current tasks with numbers beside them for easy reference. This helps the user see what tasks they’ve added so far.

#### 4. Removing a Task

The remove\_task() function lets the user delete a task by entering its number. The task list is displayed first so the user knows the correct number. The function also handles invalid input or if the list is empty.

#### 5. Menu and Loop

The program uses a while loop to repeatedly show the menu:

* 1 to Add a task
* 2 to View tasks
* 3 to Remove a task
* 4 to Quit

The user can perform any action, and the loop keeps running until the user selects the quit option.

### Time and Space Complexity

* **Time Complexity**:
  + Add Task: O(1)
  + View Tasks: O(n)
  + Remove Task: O(n) — because removing an item shifts the rest of the list
* **Space Complexity**:
  + O(n), where n is the number of tasks added by the user

### Output

###### Choice 1

Choosing 1 to add a task (one by one)

A screenshot of a computer program

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###### Choice 2

Choosing 2 to view tasks.

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###### Choice 3

Choosing 3 to delete a task.

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###### Choice 4

Quitting the program

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Week 4

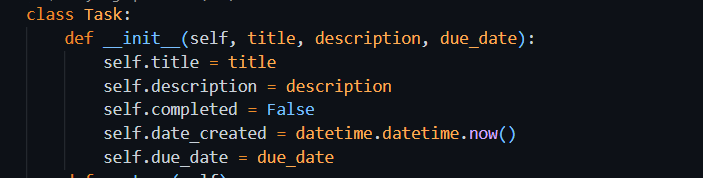
# Section 1. Python Classes

## Exercise 1: Creating Classes and Initializing Objects

### Understanding the Task

In this exercise, I was asked to create Task class which will have task details. I was also asked to define a class called TaskList that holds a list of tasks which are the objects of Tasks from the Task class and stores the owner’s name. I learned how to use the \_\_init\_\_ method to initialize class attributes.

### Source Code



### Explanation

This class is used to represent a single task in a to-do list. When a new Task object is created, it automatically stores:

* **title**: The name or heading of the task
* **description**: A short explanation about what the task is
* **completed**: A boolean value that shows whether the task is done (initially set to False)
* **date\_created**: The current date and time when the task is created
* **due\_date**: The deadline for the task

This helps organize all the important details of one task inside a single object.

### Source Code

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### Explanation

This class is used to manage a list of tasks for one user.

* **owner**: Stores the name of the person who owns the task list
* **tasks**: An empty list that will hold multiple Task objects

This class acts as a container for managing multiple tasks under one user.

#### Object Creation

For Task Class:



And for Task List class:

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## Exercise 2: Adding Methods

### Understanding the Task

In this task, I was asked to expand the Task class by adding useful methods that allow interacting with task data. The goal was to practice writing instance methods for updating task attributes, such as marking it as complete, changing the title, or changing the due date. This helped me understand how to define custom behaviors inside a class.

### Source Code

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### Explanation

#### mark\_completed() Method

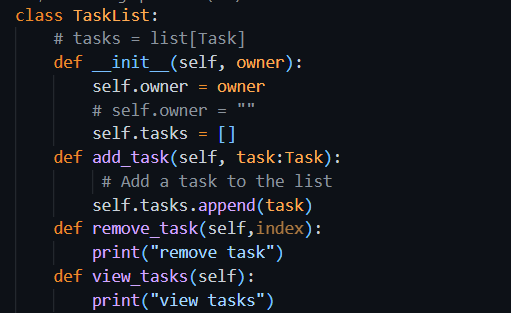
* This method is intended to mark the task as completed.
* Currently, it just prints a message, but in a full version, it would update the completed status to True.

#### change\_title(new\_title) Method

* This method is designed to change the title of the task.
* It prints a message as a placeholder, but normally it would update the self.title.

#### change\_due\_date(new\_date) Method

* This is meant to update the due date of the task.
* Right now, it prints a confirmation message, but ideally it would modify self.due\_date.



#### add\_task(self, task: Task):

Adds a new Task object to the tasks list using the .append() method.

*remove\_task(self, index):*

This function is meant to remove a task using a user-provided index. However, the actual deletion line (del self.tasks[index - 1]) is commented out. Instead, it only prints debug information like the task's position and name. This shows that the logic was still under development or being tested.

*view\_tasks(self):*

Displays all tasks in the list. If the list is empty, it shows a message saying there are no tasks. Otherwise, it loops through the list and prints each task with a number.

This structure shows how methods can be added to a class to make it more dynamic and interactive.

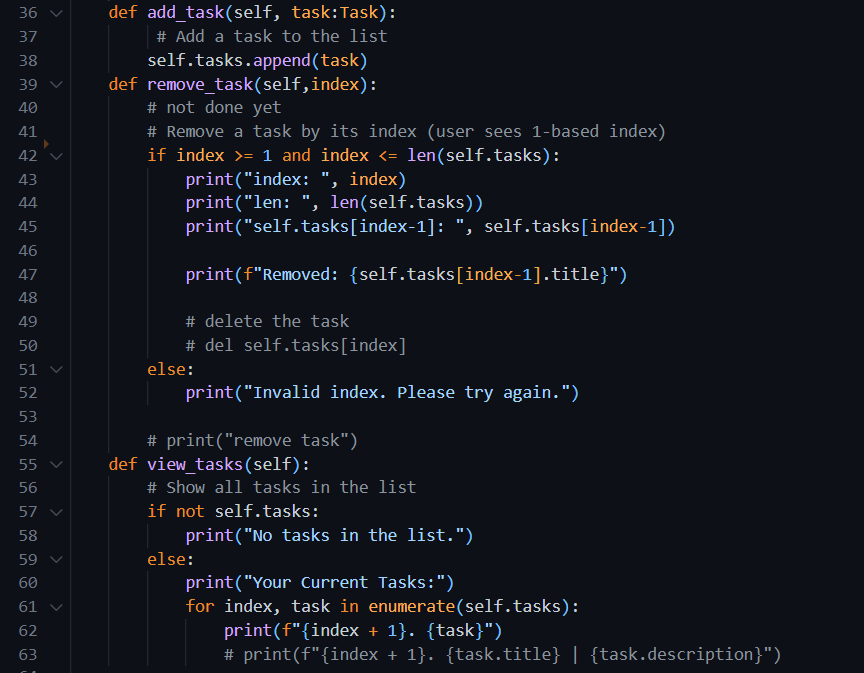
## Task: Add logic to methods defined

In Task Class, I have implemented logic of functions e.g. mark\_completed(), change\_title(), change\_due\_date(). When any of these details will be required to be changed of specific task, these methods will be called respectively

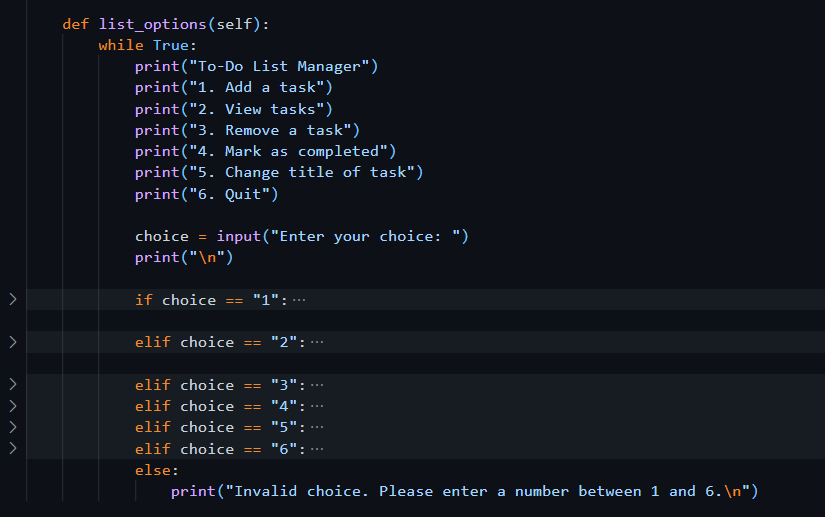
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In TaskList Class, I have implemented logic of methods e.g. add\_task(), view\_tasks(), remove\_task(). These methods will modify the tasks\_list accordingly.



List\_options() method will be calling for showing menu to the user and then calling the respective methods according to the choice.



## Exercise 3: Testing the Functionality

Testing is done to check whether the code is working correctly or not.

### 

### Output

A screenshot of a computer

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### Code

Choosing one option lets us add one new task to the list at a time. Its working correctly

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### Output

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AI-generated content may be incorrect.

### Code

Choosing option 2 to view all the tasks. Its working correctly

A blue circle in the dark

AI-generated content may be incorrect.

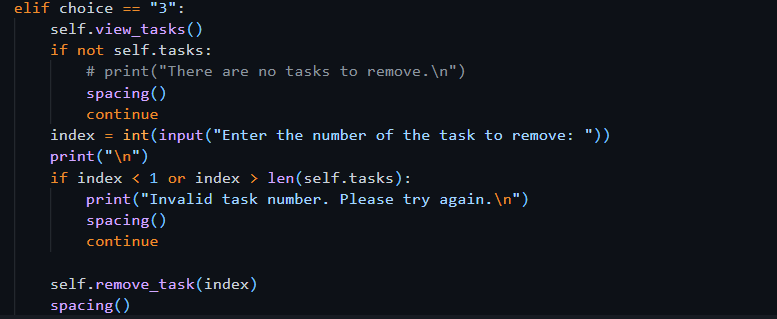
### Output

A black screen with white text

AI-generated content may be incorrect.

### Code

Choosing option 3 to delete the task



### Output

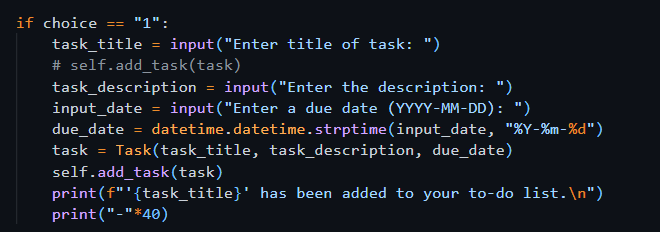
A computer screen with white text

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## Exercise 4: Composition

**Composition** is an object-oriented programming concept where one class is made up of or contains objects of another class.

### Source Code



### Explanation

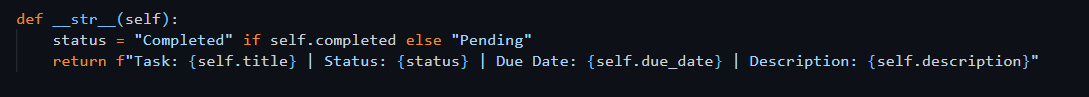
This code is taking title, desc and due date of a task as input from user. It then saves information using object of Task Class. It then adds that object to the Task List class using add\_task() method. In this way TaskList can have many Tasks

## \_str\_ method

If we simply print the Task object , it will show something like



But we want to see the details of Task e.g. title, description, etc. For this purpose, we use \_str\_ method, which will convert the object into string and then will show it to user in readable format.

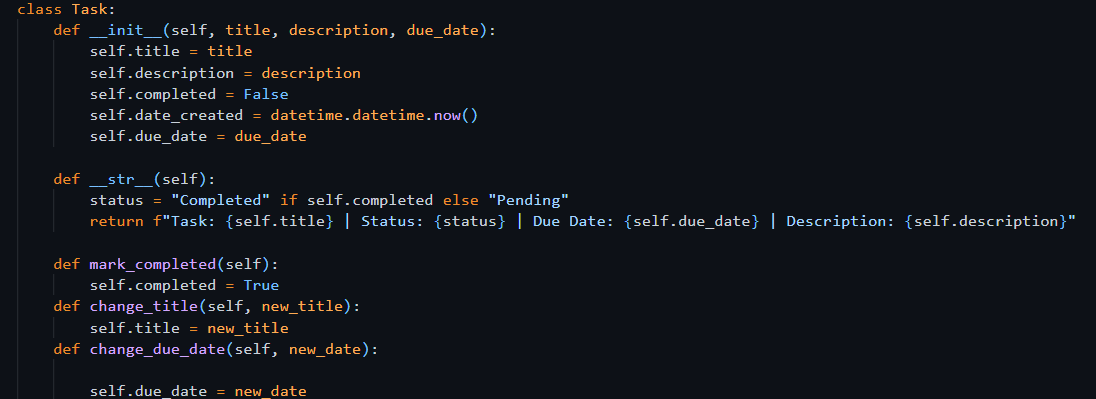


## Task: Change code in the Task Class

### Understanding the Task

‘**completed’** attribute is to be added to the class to mark the status of the task. First, it should be false to show that the task is not completed yet. There should be a function **mark\_completed()** to update the status of the task. **change\_title()** method will change the title of the respective task. All these details will be shown to the user by **\_str\_** method.

### Source Code



## Task: Update list\_options() method

The options mark\_completed(), change\_title(), change\_due\_date() should be added to the menu items to show to the user to operate.

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AI-generated content may be incorrect.

If Elif statements

A computer screen shot of a program code

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A computer screen shot of text

AI-generated content may be incorrect.

# Section 2. Python Libraries

Libraries are collections of functions and methods that allow you to perform actions, without having written the code yourself.

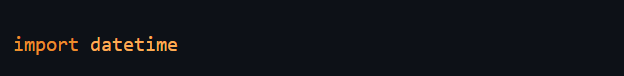
## Exercise 1: Adding Dates

### Understanding the Task

It is important for each task to have both the date it was created and the due date. To handle this, I used Python’s built-in **datetime** library. A method called **change\_due\_date** was also added so that the due date can be updated later if needed.

### Source Code

It is required to import the library, mostly at the top of the file.



In this program, it is required to convert the string date (input from user) into datetime object and then save it to the Task.

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AI-generated content may be incorrect.

Or getting the present date and time

