Python: Day 01

Introduction

Objectives

Foster a Strong Foundation

Understand the fundamental components and how to use them correctly

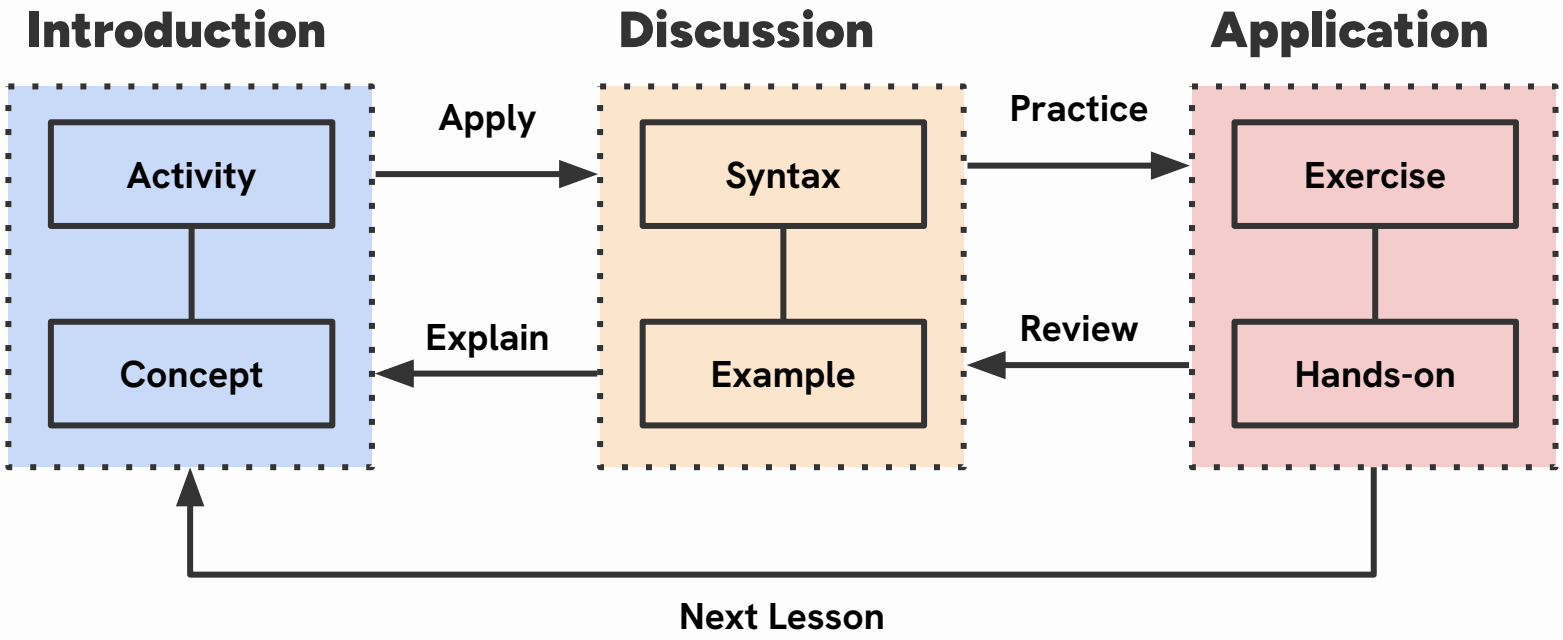
Develop Problem Solving Skills

Gain practical experience through activities, exercises, and lab sessions

Prepare for Specialization

Provide a preview on how Python can be used in various contexts

Structure


Introduction
Discussion
Application
Activity
Concept
Apply
Explain
Syntax
Example
Practice
Review
Exercise
Hands-on
Next Lesson

Agenda

01

Introduction

What is Python?

02

Basics

Input-Output Process

03

Control Flow

Logical Pathways

04

Functions

Code Shortcuts

05

Error Handling

Exceptional Cases

06

Lab Session

Culminating Activity

01

Introduction

Overview of Python and its potential

Key Features

Convenient

Simple and concise
for easier development

Modern

Constantly updated with
useful features

Active

Large community with a
rich ecosystem

Java

```java
class HelloWorld {
    public static void main(String args[]) {
        System.out.println("Hello, World");
    }
}
```

C++

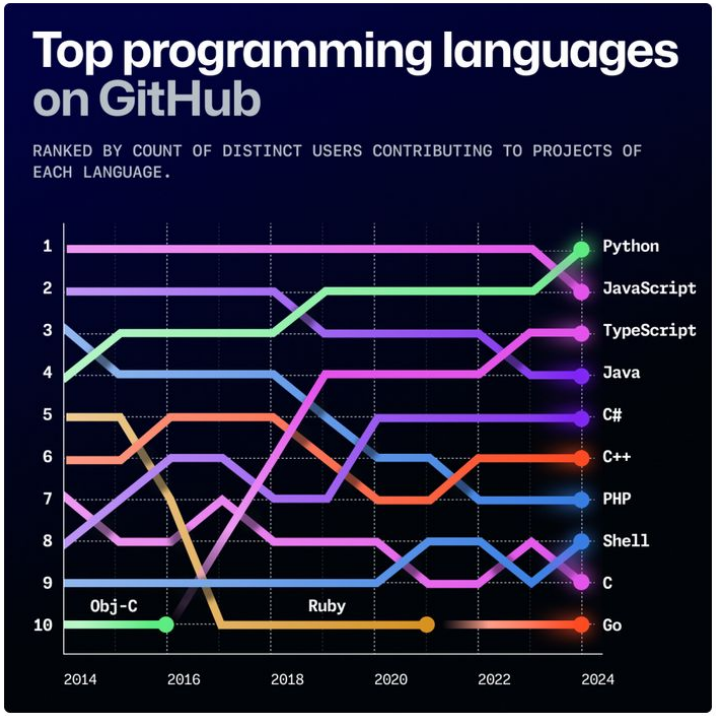
```cpp
#include <iostream>

int main() {
    std::cout << "Hello World" << std::endl;
}
```

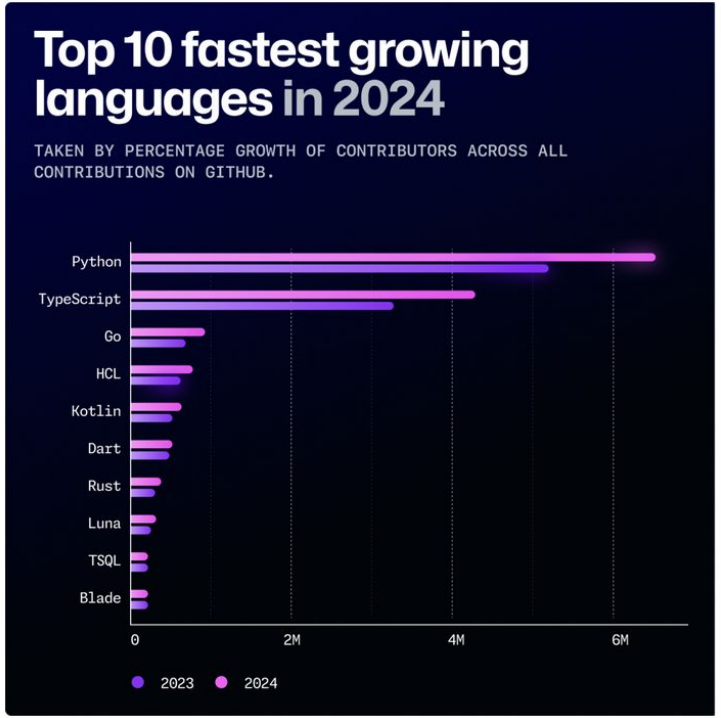
Python

```
1 print("Hello World")
```

Python Package Index (pypi.org)

Python Growth





Where can you use Python?

Data Science

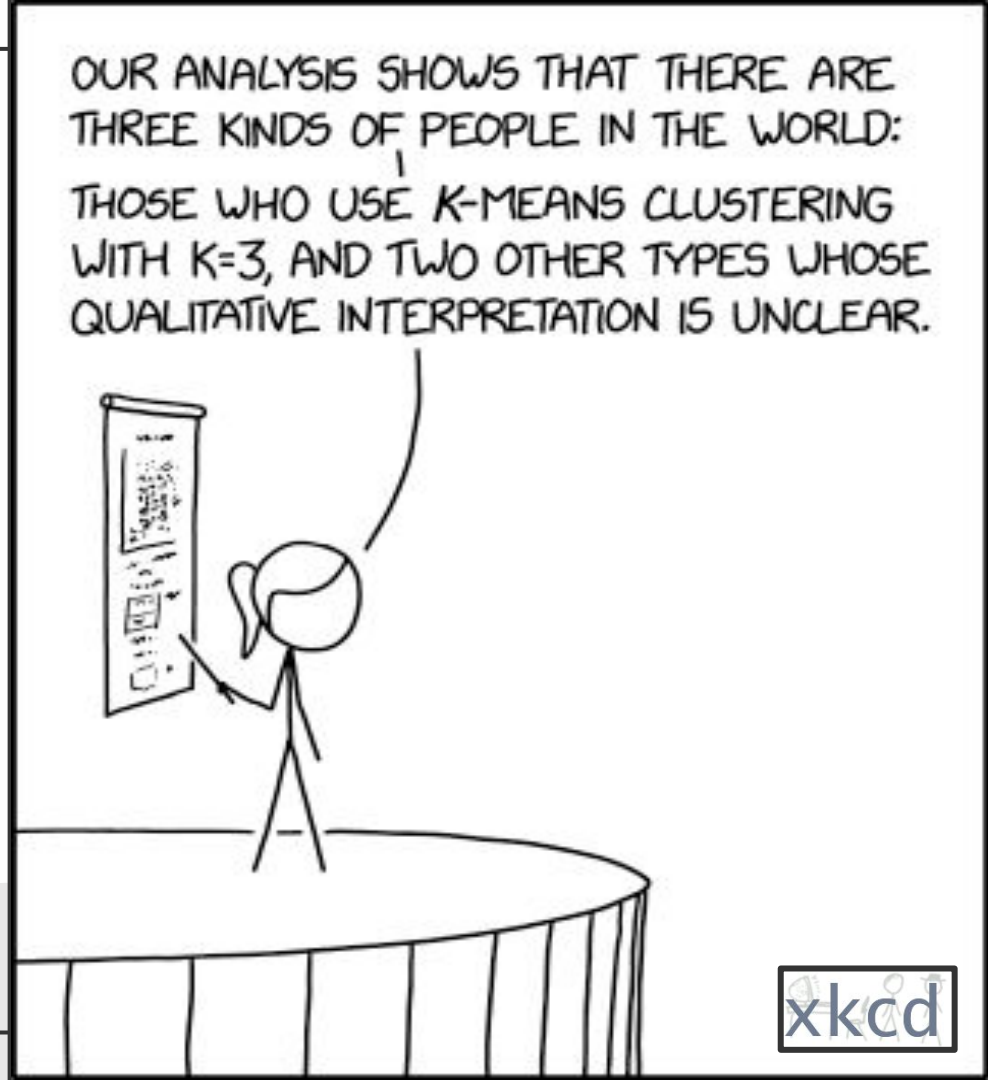
Python is famous for data science due to its mature yet widespread libraries on this field

pandas

scikit learn

seaborn

plotly



Machine Learning

Math-intensive processes in machine learning are often made in low-level languages and interfaced with Python

PyTorch

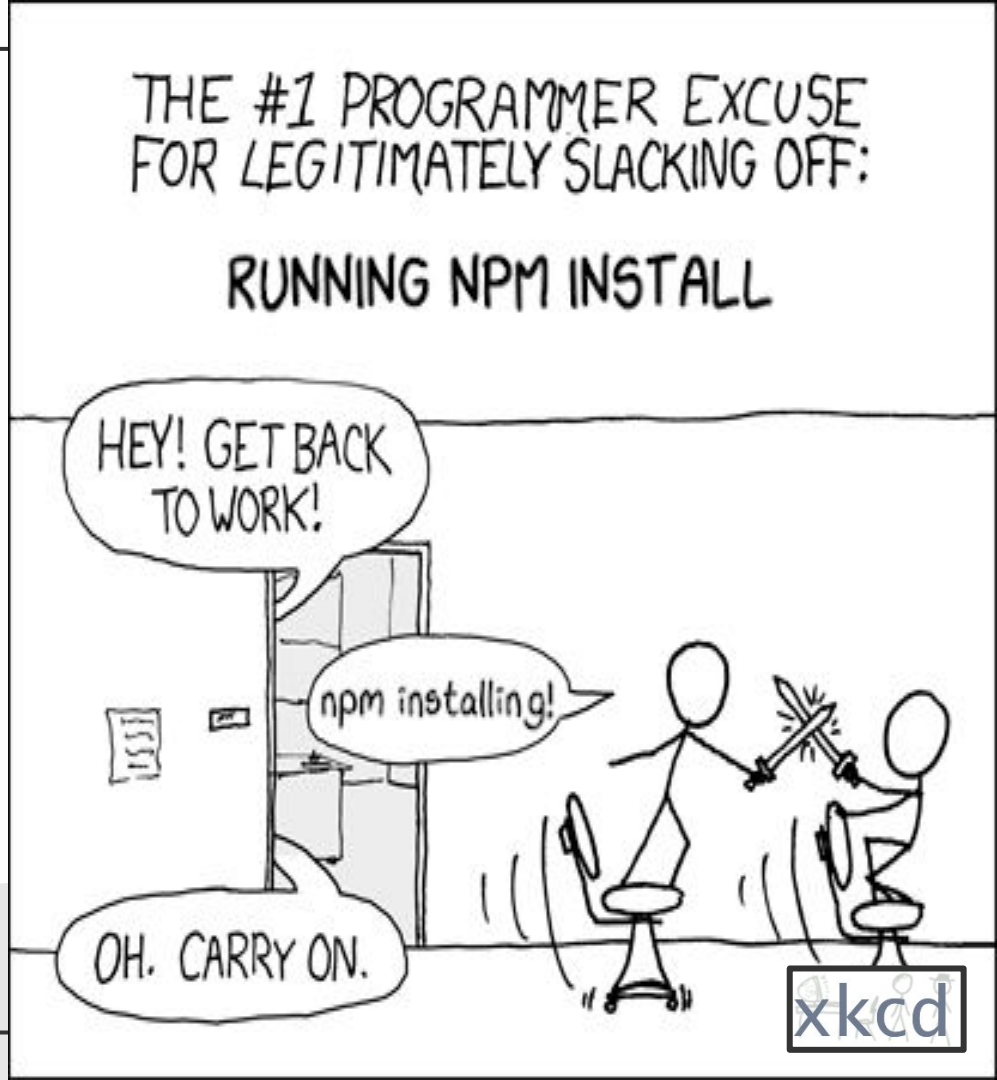
TensorFlow

spaCy

OpenCV

Web Development

Alternatives to the traditional web tech stack include libraries and frameworks that Python can also provide



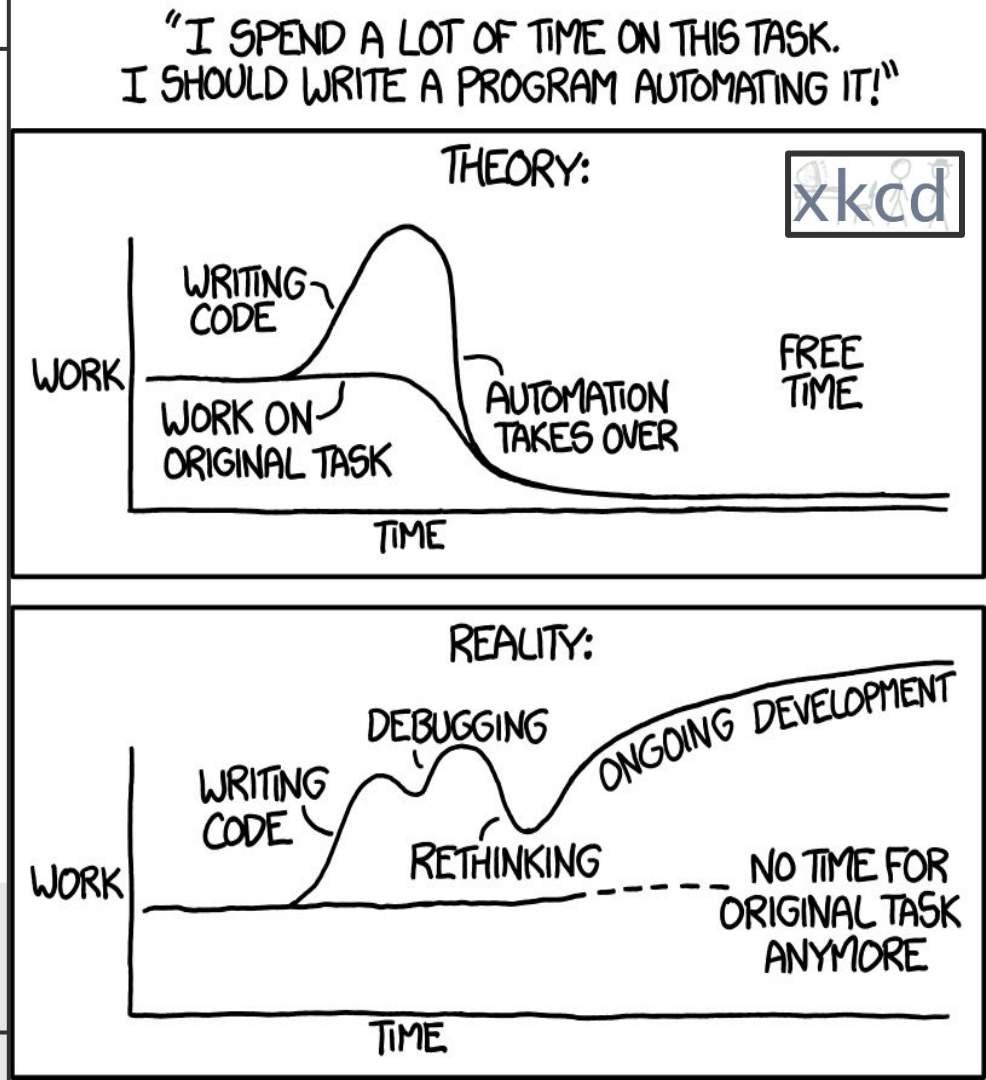
Automation

Python gained its initial footing as an easy to use tool to automate mundane tasks

Se openpyxl zapier

Beautiful Soup

Requests
http for humans



Specialist Fields

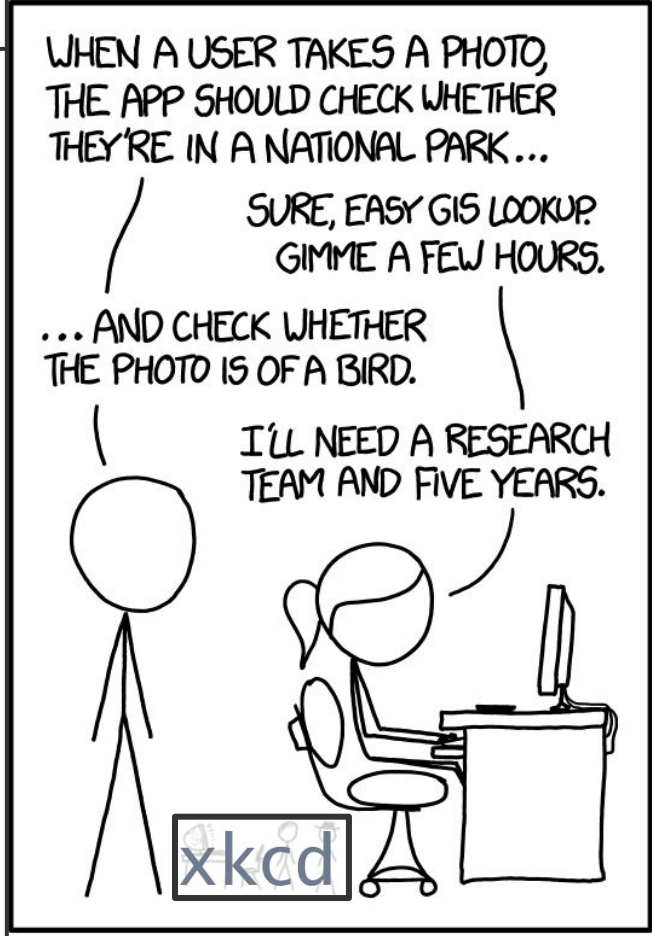
Python's simplified syntax makes adoption to specialized fields much easier compared to other languages

The Astropy Project

MicroPython

blender

biopython



Python History

Origins

Python was created by Guido van Rossum in 1991 and released in 1994 (version 1.0) when was working the ABC Programming Language Group at the National Research Institute for Math and Computer Science in the Netherlands.

Fun Fact # 1

The name Python was inspired by the BBC's TV Show: Monty Python's Flying Circus

Fun Fact #2

Java's first version was released in 1995 by James Gosling, making Python older.

Python History

Python 1.x

Development started in 1991, but was officially released in January 1994. It was a part of Rossum's Computer Programming for Everybody (CP4E) initiative.

Python 2.x

First instance released in October 2000, under a new license (Python Software Foundation License). This has been deprecated since January 2020.

Python 3.x

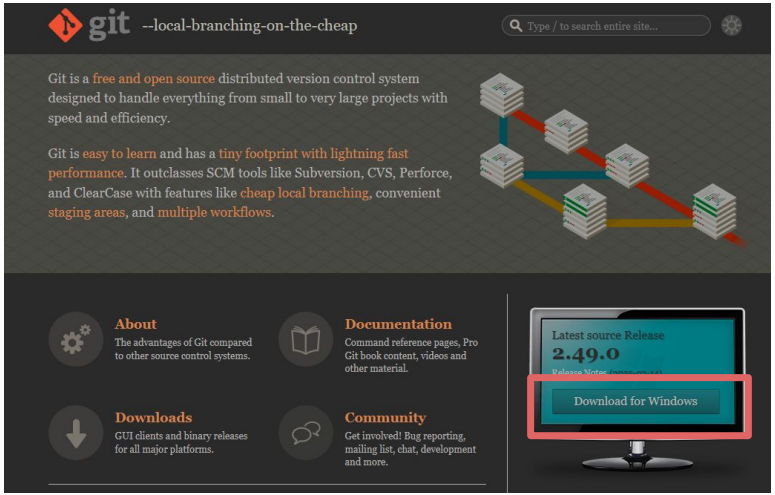
First version released in December 2008, made to upgrade performance, add extra features, and improve clarity without being backwards compatible

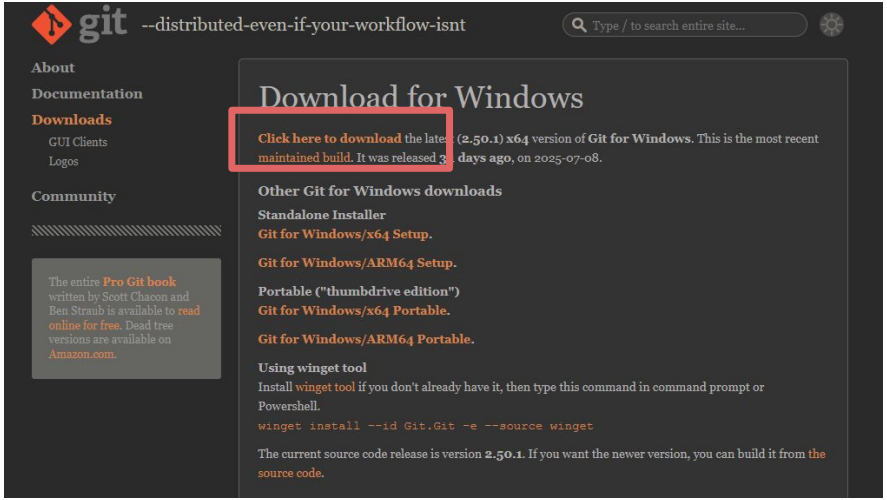
Setup Tools

Full instructions for your initial development setup

Step 1: Download Git

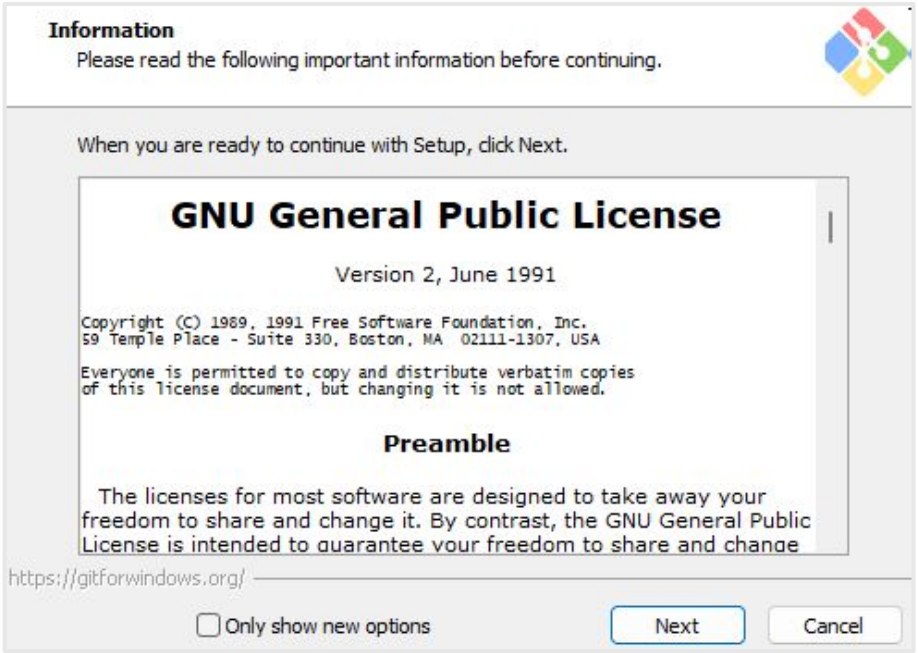
Go to **https://git-scm.com/** and select the download option





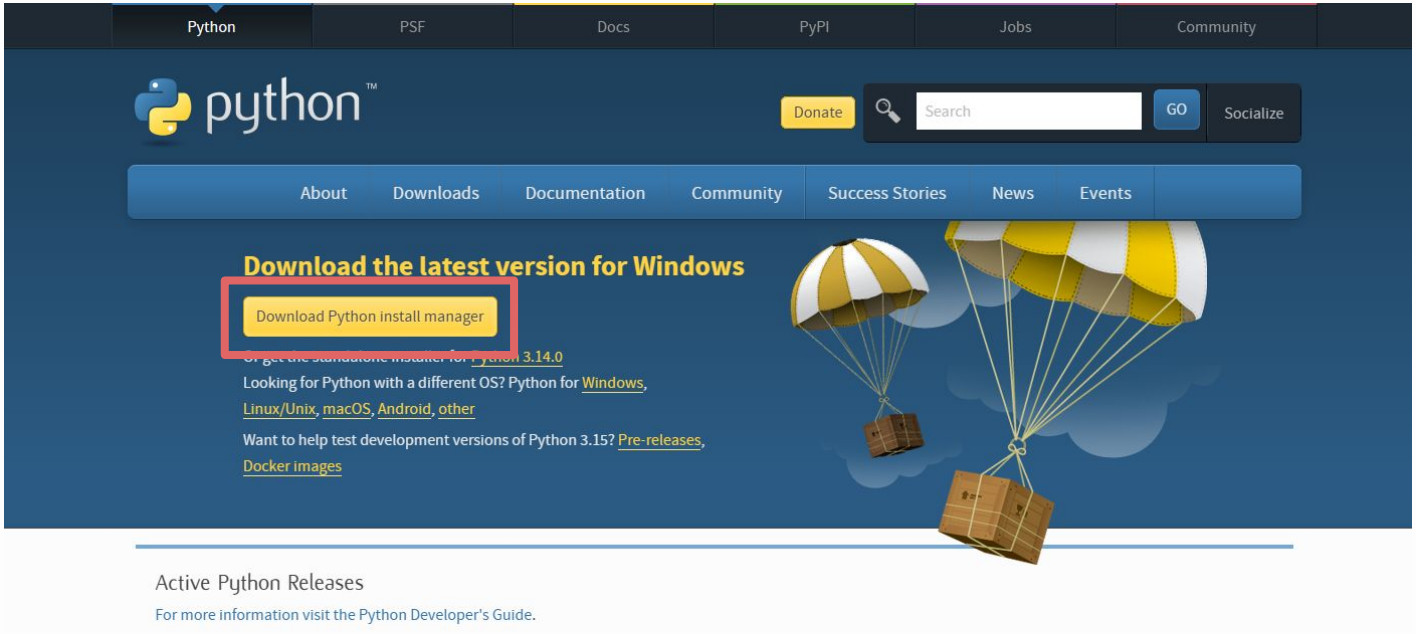
Step 2: Git Installation Setup

Run the git installer and ***use the default options***



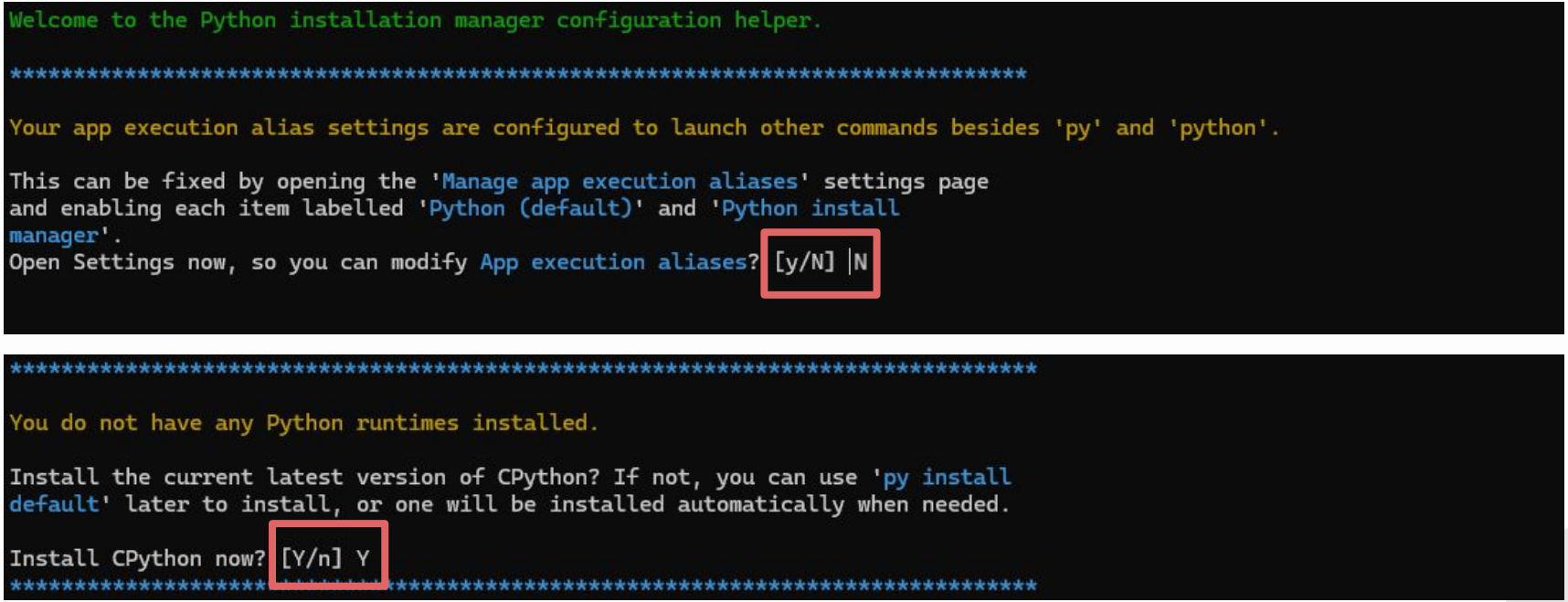
Step 3: Download Python Install Manager

Go to **https://www.python.org/downloads/** and click the first download button



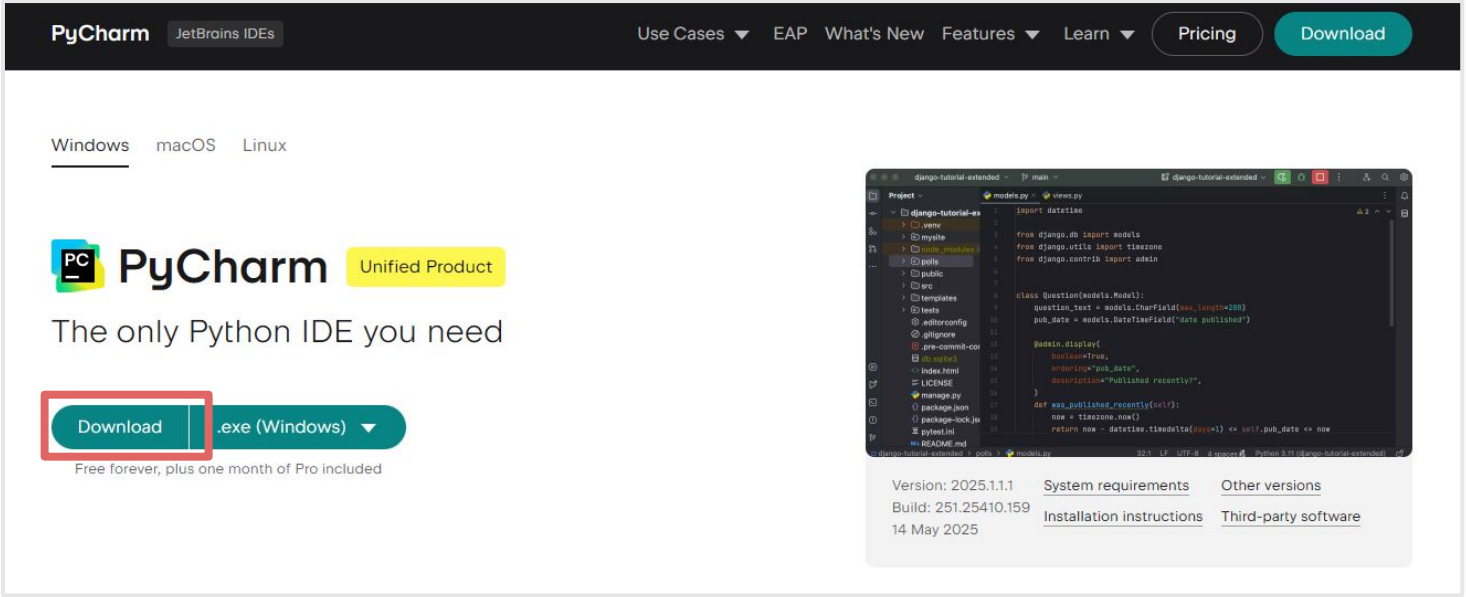
Step 4: Run the Python Install Manager

After downloading the Python Install Manager, run the Python Installation Manager



Step 5: Download and Run PyCharm Installer

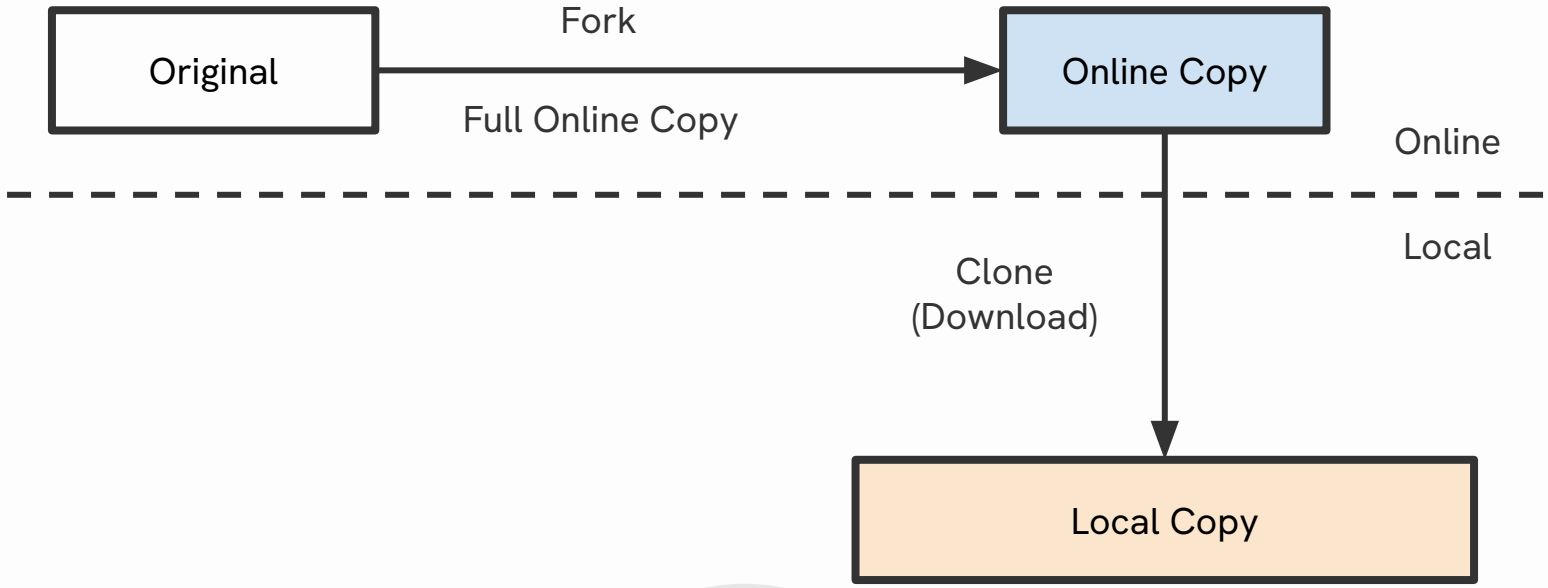
Go to **https://www.jetbrains.com/pycharm/download/** select ***Download***.
Afterwards, run the installer and ***use the default options.***



Repository

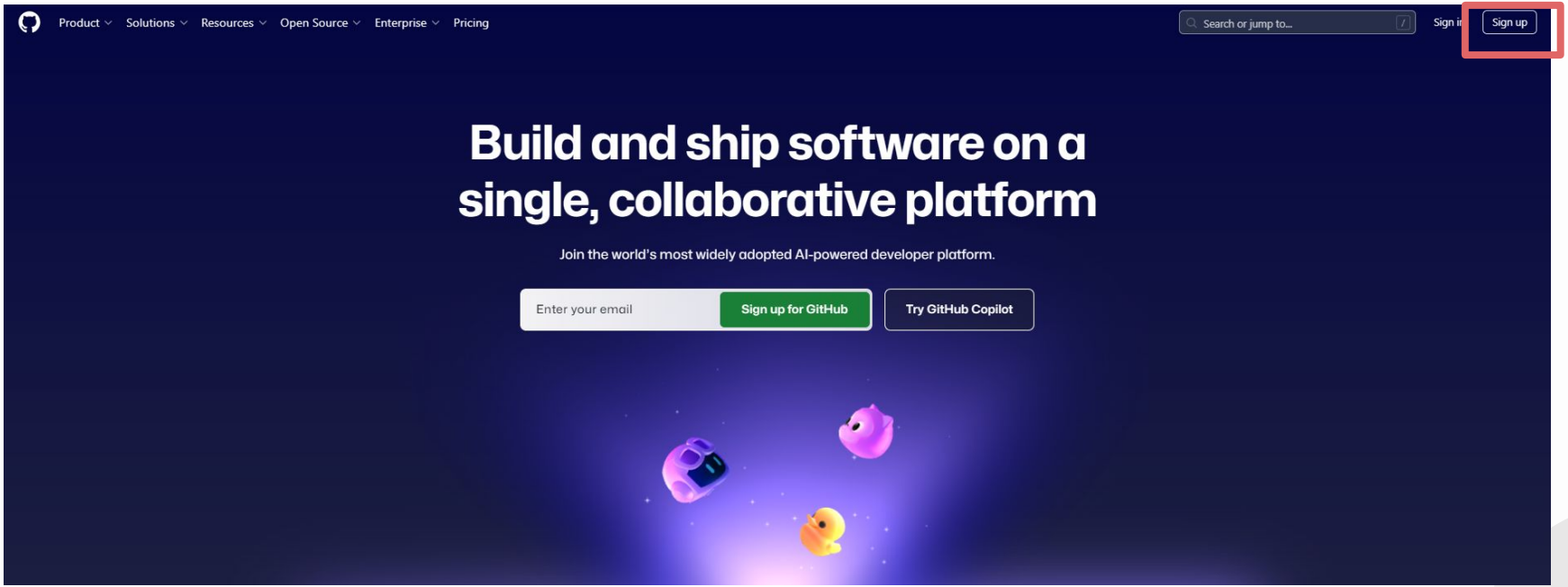
Securing access to the course materials

Repository System



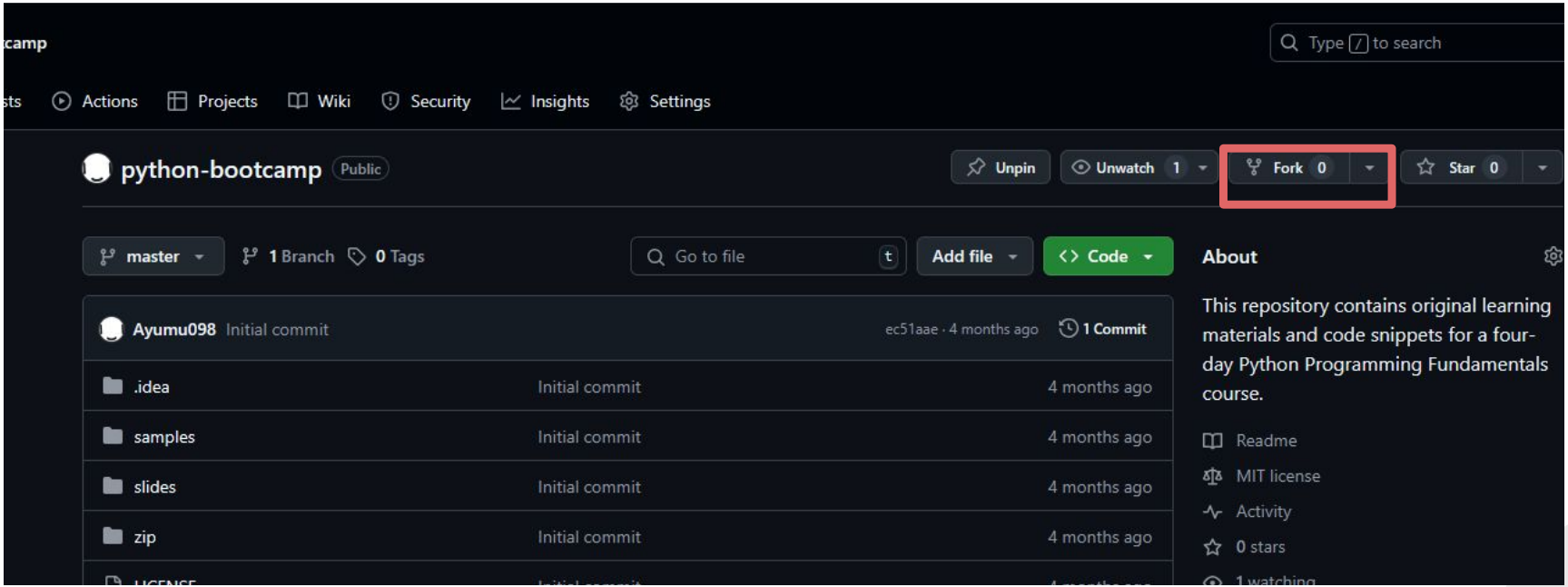
Step 1: Setup Github Account

Go to **github.com** and ***Sign In*** if you already have an account or ***Sign Up*** for a new account



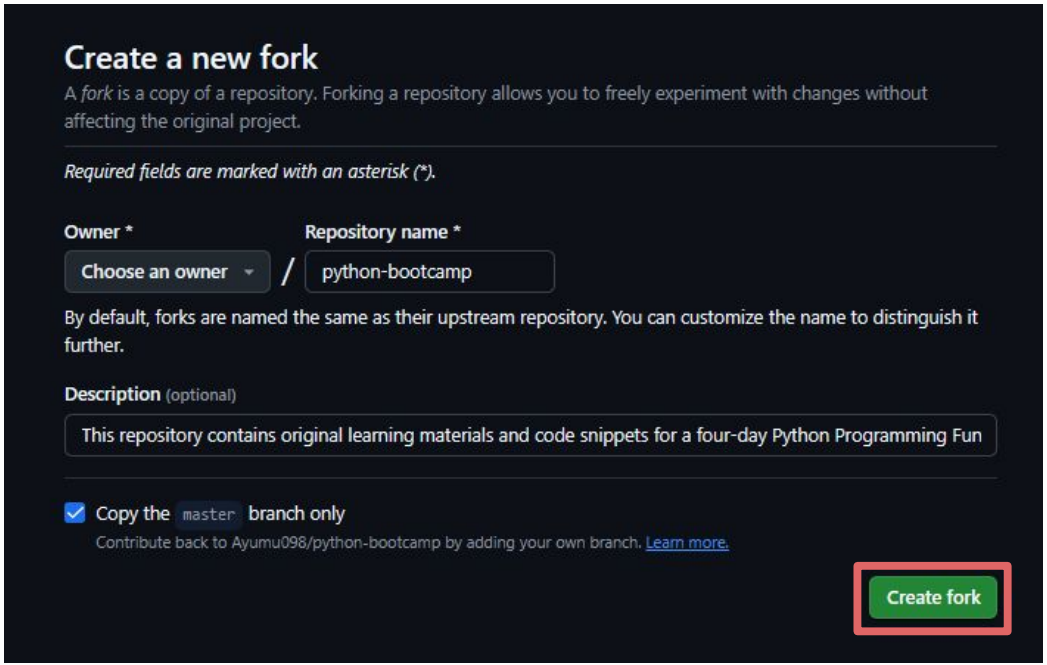
Step 2: Fork python-bootcamp repository

Go to **tinyurl.com/pyboot** and select the ***Fork*** button on the upper right



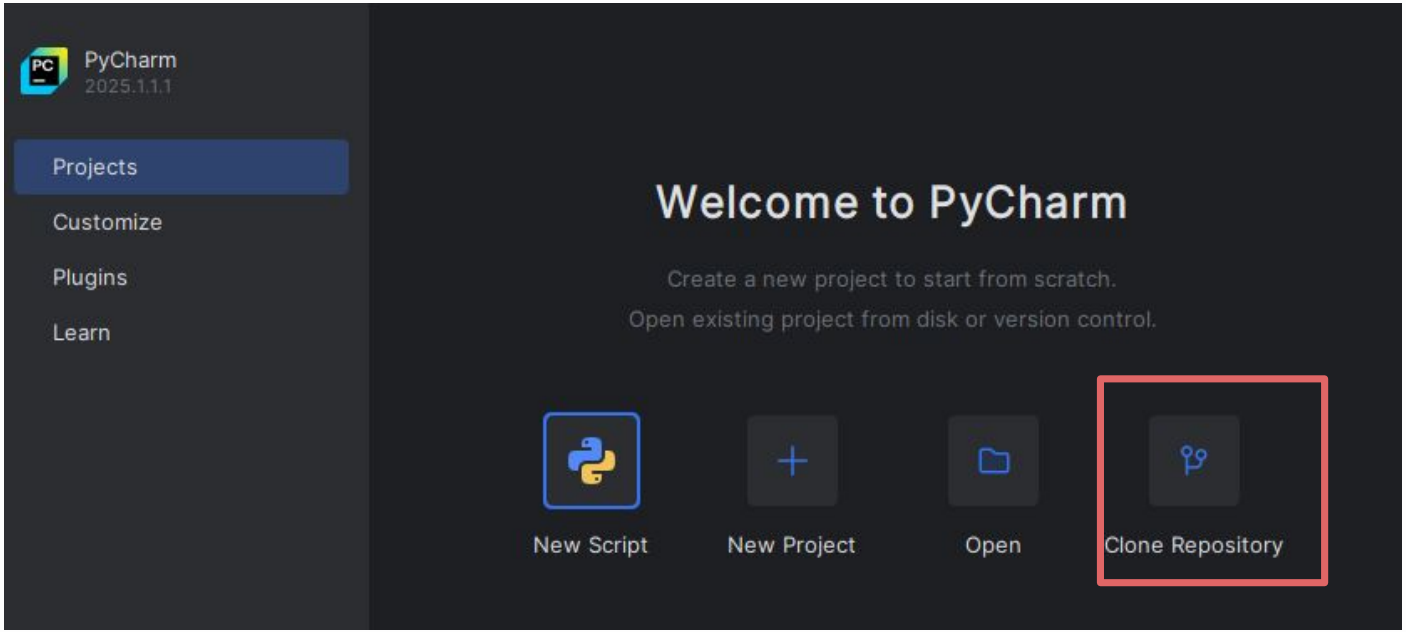
Step 3: Setup Fork Settings

Select the **Create Fork** button



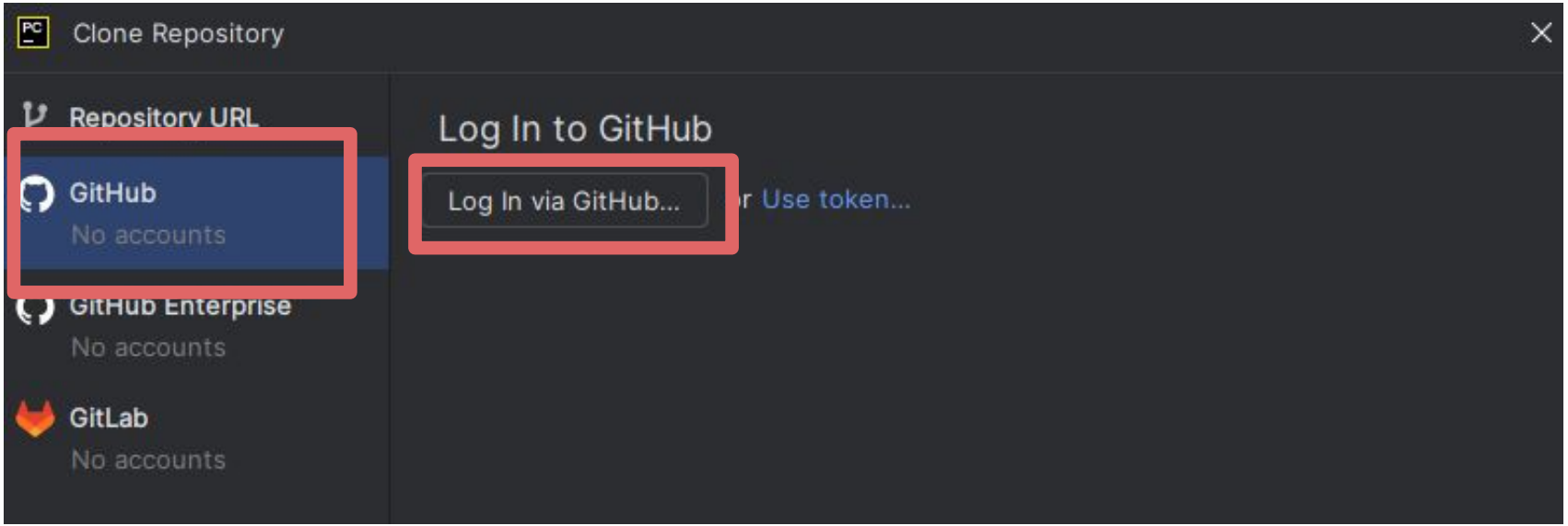
Step 4: Clone Repository

Run PyCharm Community and select the ***Clone Repository***



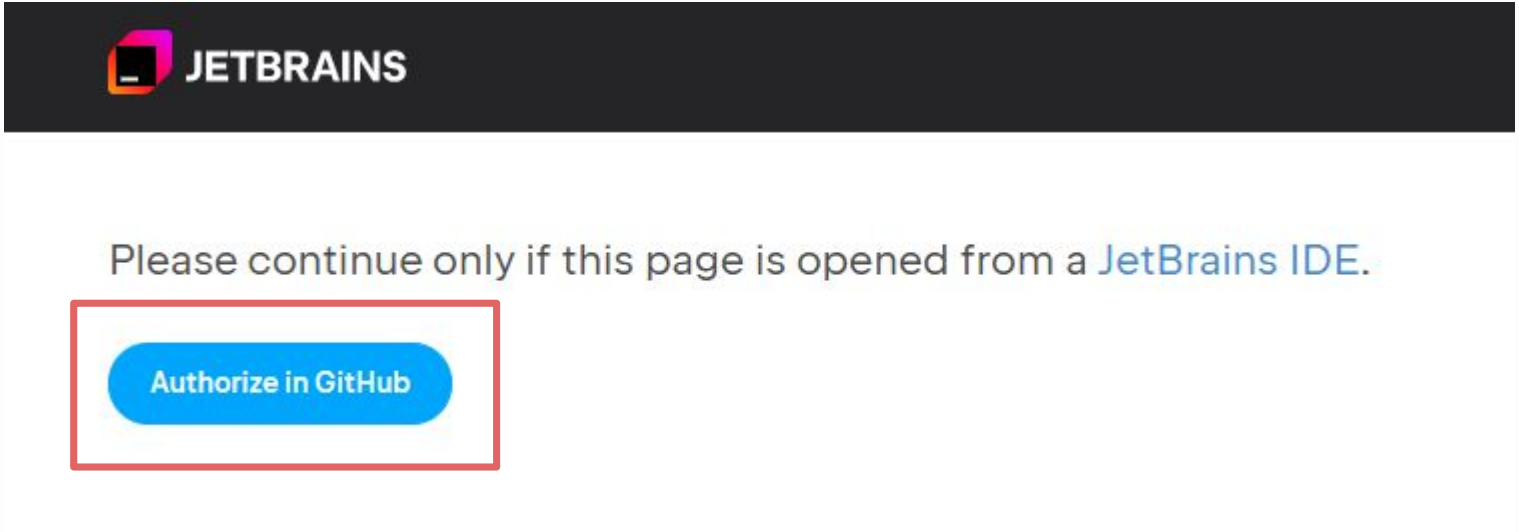
Step 5: Login GitHub for PyCharm

On prompt, select ***GitHub*** on the upper left and ***Log In via GitHub***. This will open the browser.



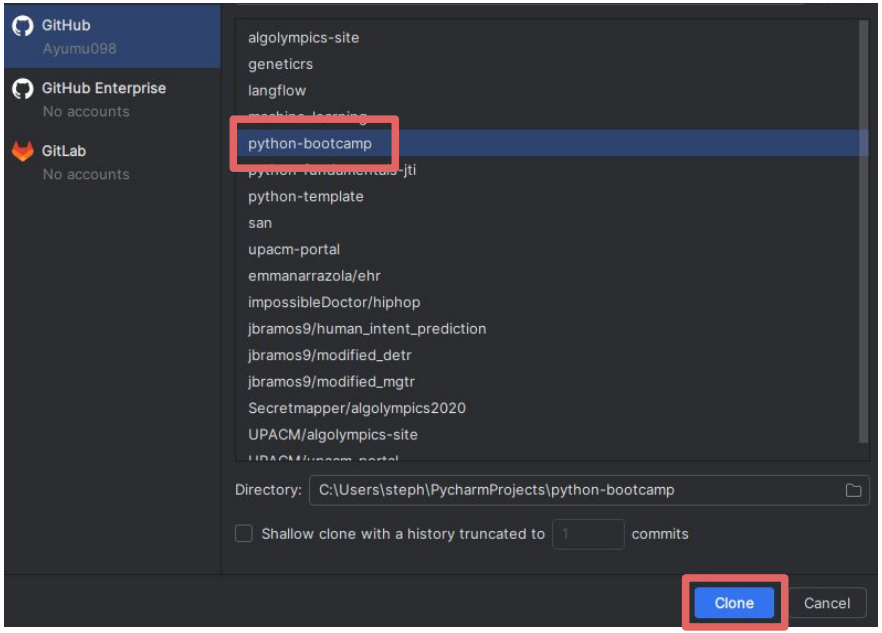
Step 6: Authorize GitHub - PyCharm connection

A new tab will open in the browser. Select ***Authorize in Github***



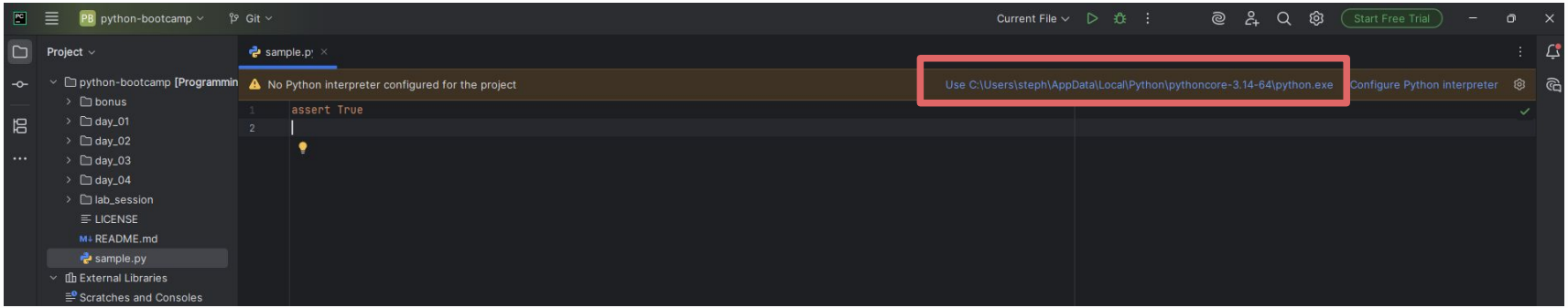
Step 7: Select Repository

The window shows all your repositories. Select ***python-bootcamp*** and ***Clone***.



Step 8: Add Python Interpreter

Go to ***sample.py***. A yellow warning will appear when the file is opened. Select the left option

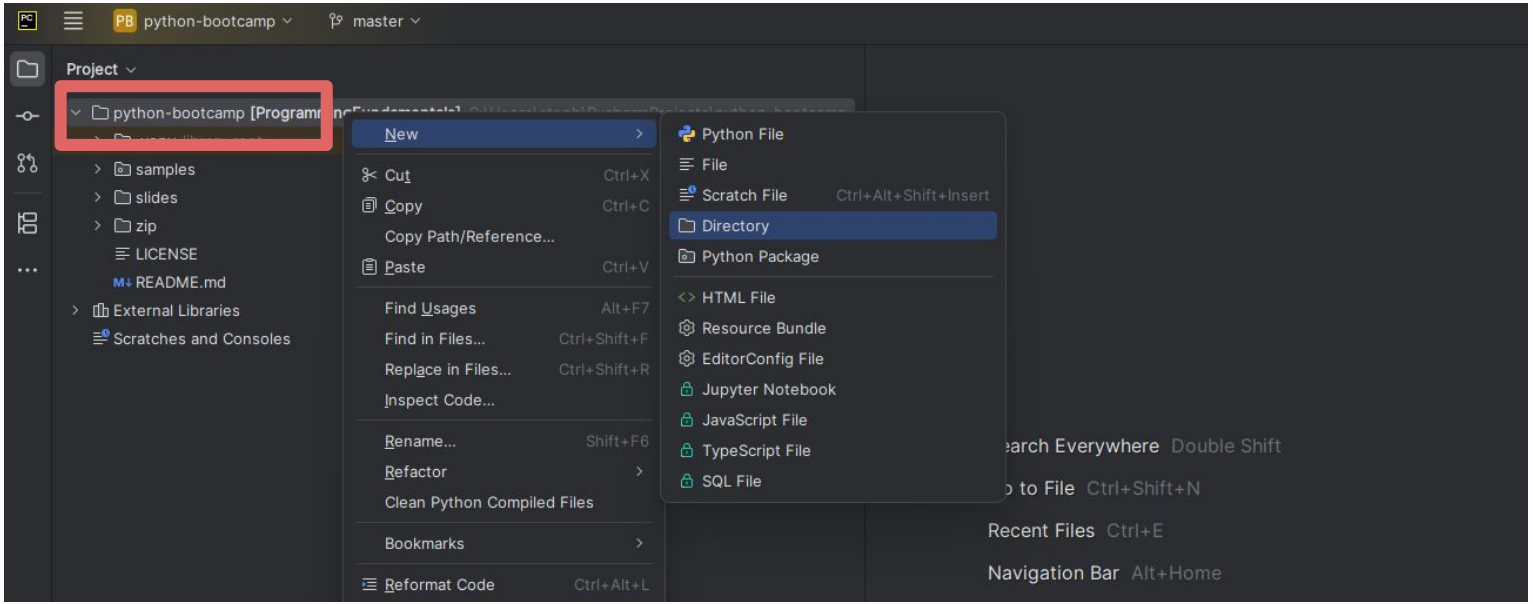


Hello World

A journey of a thousand miles begins with a single step

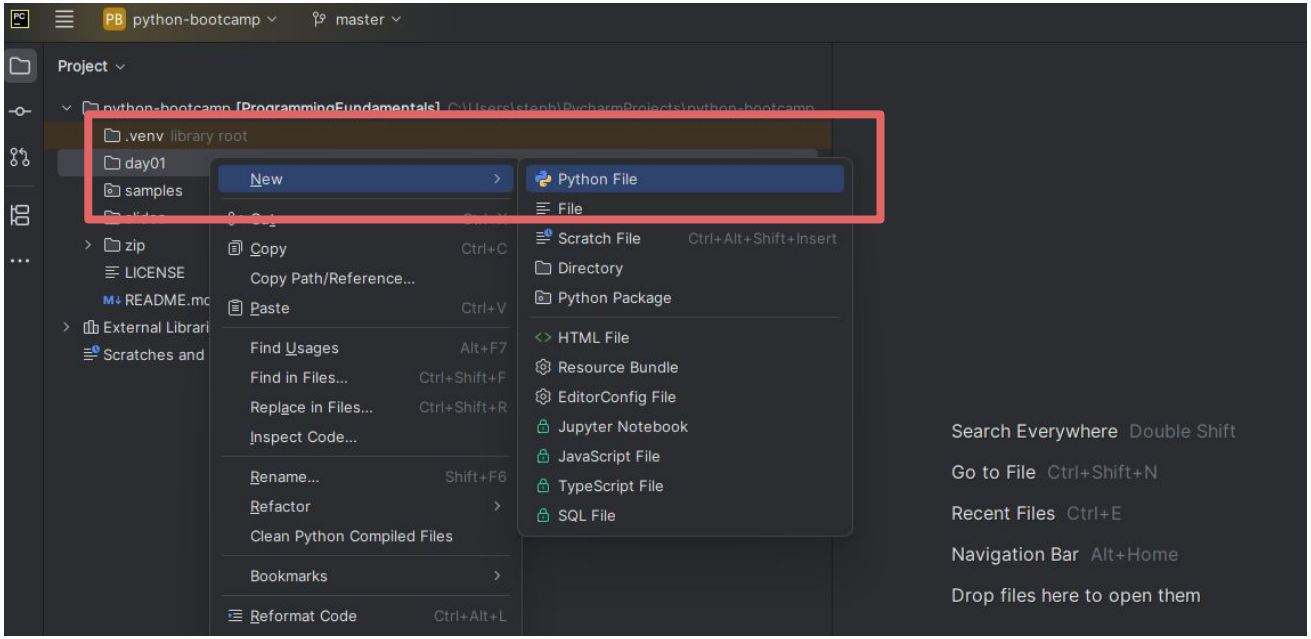
Create a New Folder

Right click the current project folder name, select **`New > Directory`**.



Create New Python File

Right click the new folder name, select **`New > Python File`**.



Writing your First Code

print ()

Function	Predefined commands or actions
Parentheses	Marker where `function input` starts and ends

Writing your First Code

```
print (Hello World )
```

Function	Predefined commands or actions
Parentheses	Marker where `function input` starts and ends
Text	

Writing your First Code

```
print ("Hello World" )
```

Function	Predefined commands or actions
Parentheses	Marker where `function input` starts and ends
Text	
Double Quote	Marker where the `text` starts and ends

Multi-line Printing

```
print("Hello World" )
print("Hello Again!" )
```

Single-line Printing

```
print("I", "am", "happy")
```

Quick Exercise: Hello World

Print the following in the console:

01_hello.py

```
Hello! My name is your name
I am learning Python
```

Comments for Documentation

Comments are usually used to describe, explain, or justify code

```
1  # Practice for printing in multiple lines
2  print("Hello, I am new to Python")
3  print("Let's learn together!")
```

Multiple-Line Comment

To write multiple lines without being detected as code, use triple quotes at the start and end

```
"""
This is a very simple application to test the print function.
Remember that strings need double or single quotes!
"""
print("Hello, I am new to Python")
print("Let's learn together!")
```

02

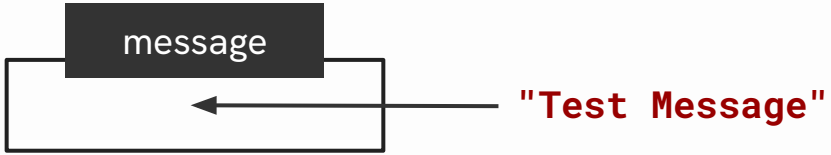
Basics

Fundamental processes for data handling

Variable Declaration

A variable can be created by writing its name, the equal sign, and the value

```
message = "Test Message"
```



Variable Printing

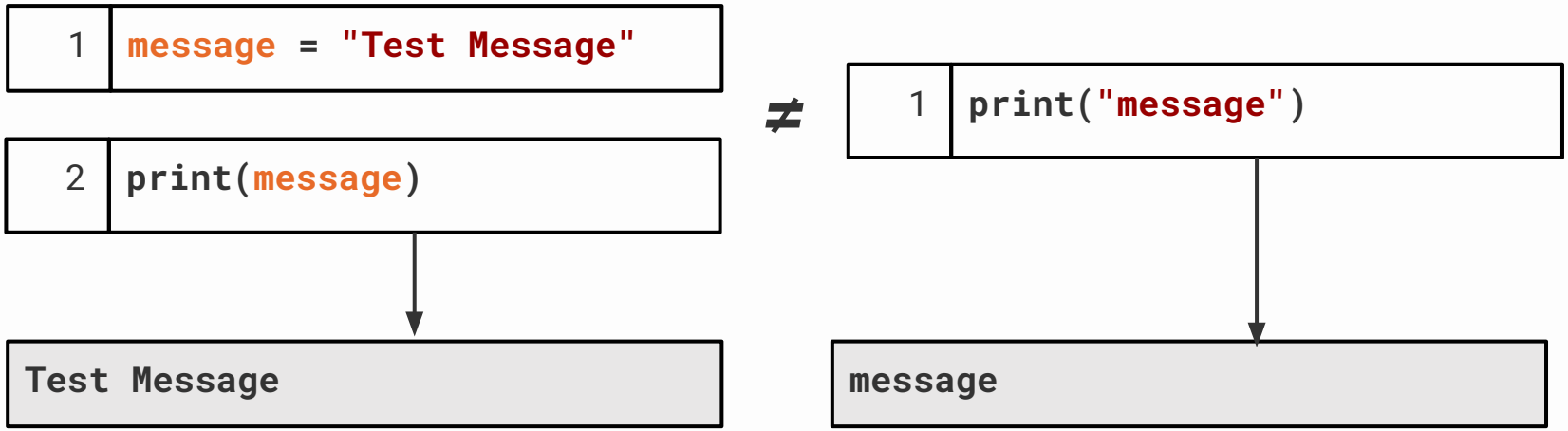
Variables can also be displayed on the console with the **`print`** function

```
1  message = "Test Message"
```

```
2  print(message)
```

Variables and Text

Be careful not to confuse strings and variables (no quotes)



Variable Naming

Case Sensitive

Variables that differ even by one letter or casing are not the same

No Special Chars

It only supports alphabetical letters or symbols and underscores

Can do numbers

But it must not be the first part of the variable

Quiz: Is this valid?

```
correct = "True"
```

```
years taken beforehand = 12
```

```
_hidden = "Please keep this a secret"
```

```
$var = 123
```

```
million_dollars = 1000000.00
```

```
何でもない = ""
```

Variable as Nicknames

Variables are often used to represent data concisely

```
name = "José Protacio Rizal Mercado y Alonso Realonda"
```

```
print(name)
```

```
José Protacio Rizal Mercado y Alonso Realonda
```

Change earlier code

Old Code:

01_hello.py

```
print("Hello! My name is your name")
print("I am learning Python")
```

New Code:

01_hello.py

```
name = "your name"
language = "Python"

print("Hello! My name is", name)
print("I am learning", language)
```

Variable Change

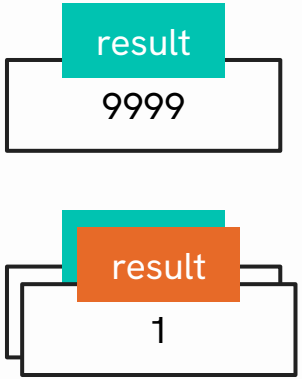
Updating existing variables

Variable Reassignment

Variables can be changed by using the same variable name

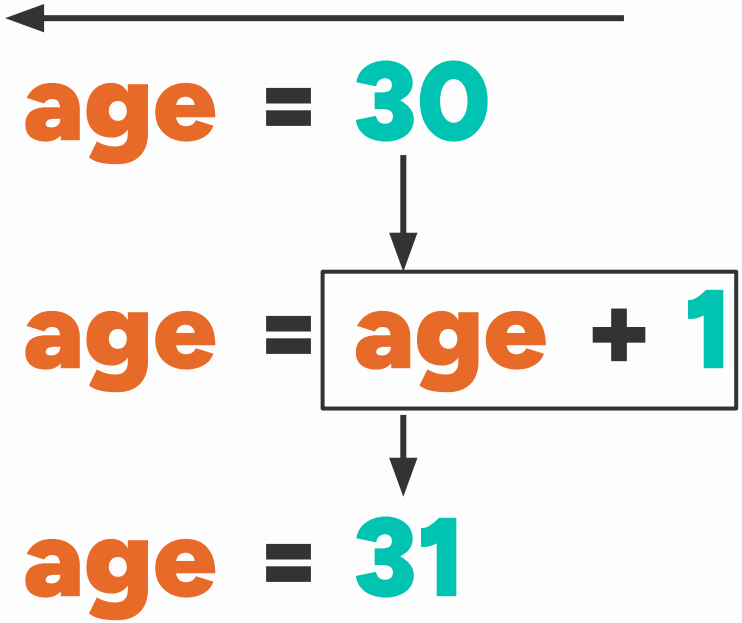
```
result = 9999
print(result)

result = 1
print(result)
```

```
9999
1
```

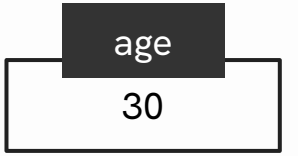


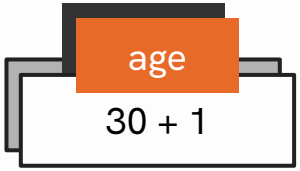
Variable Evaluation

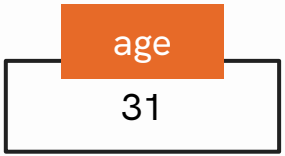
Python evaluates code top to bottom, right to left




```
age = 30
age = age + 1
```







Example 1: Level-up

Using a variable on the right side means using its current value ***with some change***

```
1  level = 1
2  print("Level:", level)
3
4  # Player gains XP
5  level = level + 1
6  print("Leveled up! Level:", level)
```

Example 2: Battery Level

Variables can be reassigned for as long as they are in scope (more on this later)

```
1  battery = 100
2  print("Battery:", battery)
3
4  # Opened Chrome with 10 tabs
5  battery = battery - 40
6  print("After Chrome:", battery)
7
8  # Plugged in charger
9  battery = battery + 20
10 print("Charger inserted:", battery)
```

Quick Exercise: Score System

02_counter.py

```
1  counter = 0
2  print("Counter:", counter)
3
4  # Point up: Add one to the counter
5  # TODO: Code here
6  print("Counter:", counter)
7
8  # Bonus: Multiply the score by 10
9  # TODO: Code here
10 print("Counter:", counter)
11
12 # Penalty: Decrease the score by 4
13 # TODO: Code here
14 print("Counter:", counter)
```

Data Types

Built-in Information representation in Python

Strings (str)

Strings represent text or a series of characters, enclosed in double or single quotes

```
empty_string_a = ''
```

```
empty_string_b = ""
```

```
quote = "I am a little teapot, short and spout."
```

What are other examples of strings?

Integers (int)

Integers represent whole (no decimal), positive, or negative numbers

```
savings = 0
```

```
balance = -100
```

```
high_score = 111_222_333
```

What are other examples of integers?

Floating-Point Numbers (float)

Floats represent real positive, or negative numbers with decimal points

```
temperature_celsius = 0.0
```

```
growth_rate = -0.56
```

```
avogadros_number = 6.022e+23
```

What are other examples of floats?

Boolean (bool)

Booleans represent True or False

```
is_raining = True
```

```
exit_program = False
```

What are other examples of booleans?

None (None)

None represent null or empty values

```
response = None
```

Quick Exercise: Wishlist

03_wishlist.py

```
1  # Fill in the variables based on the item you want to buy
2  name = What is the name of the item?
3  price = How much is the item?
4  organic = Is it organic?
5
6  # Then, print each information one line at a time
7  print(name)
8  print(price)
9  print(organic)
```

Input Function

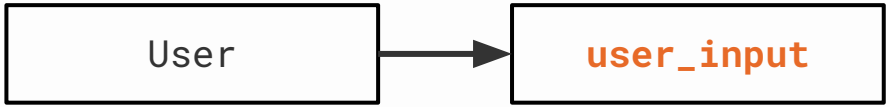
Using data given by the user of the code

Input Function

The **input** function gets data given in the console. The given data can then be stored in a variable. Note: The input will always return a str.

```
1  user_input = input()
2  print(user_input)
```

```
1  user_input = input("Enter input: ")
2  print(user_input)
```



Quick Exercise: Expense Tracker

04_expense_tracker.py

```
1  # Ask the user for three values
2  expense_1 = Let the user enter a number
3  expense_2 = Let the user enter a number
4  expense_3 = Let the user enter a number
5
6  # Then, print each information one line at a time
7  print(expense_1)
8  print(expense_2)
9  print(expense_3)
```

Operations

Applying transformations to data

Number Operations

Symbol	Operation	Example	Result
+	Addition	`result = 11 + 2`	13
-	Subtraction	`result = 11 - 2`	9
*	Multiplication	`result = 11 * 2`	22
/	Division	`result = 11 / 2`	5.5

Quick Exercise: Expense Tracker (v2)

04_expense_tracker.py

```
1  # Ask the user for three values
2  expense_1 = Let the user enter a number
3  expense_2 = Let the user enter a number
4  expense_3 = Let the user enter a number
5
6  # Then, print each information one line at a time
7  print(expense_1)
8  print(expense_2)
9  print(expense_3)
10
11 total = Calculate the sum of the numbers
12 print(total)
```

Strings and Numbers

Be careful not to confuse integers and strings that look like integers

```
1  number = "123"
2  number = number + 1
```

≠

```
1  number = 123
2  number = number + 1
```

Integer Type Conversion

You can convert most basic data types to an integer with `int()` function.

```
number1 = input("Enter number: ")
number2 = input("Enter number: ")
total = number1 + number2
print(total)
```



```
number1 = int(input("Enter number: "))
number2 = int(input("Enter number: "))
total = number1 + number2
print(total)
```

Integer Type Conversion

Original Data Type	Result
Float	Drops all decimal places
Boolean	True →1, False → 0
String	Converts to integer. If invalid, **raises an error**
None	**Raises an error**

Float Type Conversion

Original Data Type	Result
Integer	Adds .0 decimal place
Boolean	True → 1.0, False → 0.0
String	Converts to float. If invalid, **raises an error**
None	**Raises an error**

Quick Exercise: Expense Tracker (v2)

04_expense_tracker.py

```
1  # Ask the user for three values
2  expense_1 = Let the user enter a number
3  expense_2 = Let the user enter a number
4  expense_3 = Let the user enter a number
5
6  # Then, print each information one line at a time
7  print(expense_1)
8  print(expense_2)
9  print(expense_3)
10
11 total = Calculate the sum of the numbers
12 print(total)
```

Operations+

Applying more complex transformations to data

Floor Division

The floor division operator divides the number on the left by the right and rounds down

```
1  division = 11 / 2
2  print(division)
3
4  floor_division = 11 // 2
5  print(floor_division)
```

```
5.5
5
```

Exponent/Power Operator

The exponent operator multiplies the number on the left by itself multiple times

```
1  result = 2 ** 4
2  print(result)
3
4  manual_result = 2 * 2 * 2 * 2
5  print(manual_result)
```

```
16
16
```

Modulo/Remainder Operator

The modulo operator returns the remainder if the left side was divided by the right side

```
1  result = 11 % 3
2  print(result)
```

```
2
```

$$11 \div 3 \quad = \quad 3 \text{ remainder } 2$$

$$\begin{aligned} &\text{Step 1:} \quad 3 \times 3 = 9 \quad && (3 \text{ fits into } 11 \text{ three times}) \\ &\text{Step 2:} \quad 11 - 9 = 2 \quad && (\text{remainder is } 2) \end{aligned}$$

Order of Operations

Given the following operation:

$$3 + 5 \times 2 - \frac{8}{4}$$

This can be translated in Python with the following expression:

```
result = 3 + 5 * 2 - 8 / 4
print(result)
```

```
result = 3 + (5 * 2) - (8 / 4)
print(result)
```

String Operations

Two common operations for strings

String Concatenation (Addition)

Multiple strings can be combined using the addition operator

```
1 print("Hello" + " " + "Hello")
```

```
Hello World
```

String Repetition (Multiplication)

A string can be repeated multiple times using the multiplication operator.

```
1 print("ice " * 3)
```

```
ice ice ice
```

Challenge: Ice Ice Ice Baby

05_ice_ice_ice_baby.py

```
ice = "Ice"
baby = "Baby"

# Print "Ice Ice Ice Baby" using + and *
print()
```

Updates

Shortcut for reassignments

Update Shortcut

All operations where the variable is changed by a copy of it can be simplified

Original Statement	Shortcut
`result = result + 5`	`result += 5`
`result = result * 10`	`result *= 10`
`message = message + "World"`	`message += "World"`

Example 1: Level-up (Updated)

Using a variable on the right side means using its current value ***with some change***

```
1  level = 1
2  print("Level:", level)
3
4  # Player gains XP
5  # Previously: level = level + 1
6  level += 1
7  print("Leveled up! Level:", level)
```

Example 2: Battery Level (Updated)

Variables can be reassigned for as long as they can be accessed (again, more on this later)

```
1  battery = 100
2  print("Battery:", battery)
3
4  # Opened Chrome with 10 tabs
5  # Previously: battery = battery - 40
6  battery -= 40
7  print("After Chrome:", battery)
8
9  # Plugged in charger
10 # Previously: battery = battery + 20
11 battery += 20
12 print("Charger inserted:", battery)
```

Quick Exercise: Score System (v2)

02_counter.py

```
1  counter = 0
2  print("Counter:", counter)
3
4  # Point up: Add one to the counter
5  # Change your code in this line
6  print("Counter:", counter)
7
8  # Bonus: Multiply the score by 10
9  # Change your code in this line
10 print("Counter:", counter)
11
12 # Penalty: Decrease the score 4
13 # Change your code in this line
14 print("Counter:", counter)
```

String Formats

Combine strings and variables conveniently

String Placeholder

```
1  # Message Template
2  message = "Hello {}! Nice to meet you!"
3  print(message)
4
5  # Use Template
6  formatted_message = message.format("Juan")
7  print(formatted_message)
```

```
Hello {}! Nice to meet you!
Hello Juan! Nice to meet you!
```

String Placeholder (Repeated Use)

```
1  # Message Template
2  message = "Hello {}! Nice to meet you!"
3  print(message)
4
5  # Use Template
6  formatted_message = message.format("Juan")
7  print(formatted_message)
8
9  # Use Template (again)
10 new_message = message.format("Jesse")
11 print(new_message)
```

```
Hello {}! Nice to meet you!
Hello Juan! Nice to meet you!
Hello Jesse! Nice to meet you!
```

Multiple String Formatting

The format method supports multiple inputs as well as needed.

```
1  message = "Hello {}. Your nickname is {}"
2
3  name = input("Enter name: ")
4  nickname = input("Enter nickname: ")
5
6  formatted_message = message.format(name, nickname)
7  print(formatted_message)
```

Multiple String Formatting (Named)

Placeholders can be given a variable name to make assignment easier

```
1  message = "Hello {first}. Your nickname is {second}"
2
3  name = input("Enter name: ")
4  nickname = input("Enter nickname: ")
5
6  formatted_message = message.format(first=name, second=nickname)
7  print(formatted_message)
```

Quick Exercise: Price Post

06_price_post.py

```
1  # Price notification template
2  price_notification = "The price of {} is ${}."
3
4  # Post: Latte ($3.5)
5  print(price_notification)
6
7  # Post: Espresso ($2.75)
8  print(price_notification)
9
10 # Post: Cappuccino ($4.0)
11 print(price_notification)
```

String Formatting (Modern)

This is the old format that is still used to this day

```
1 name = input("Enter your name: ")
2 print("Hello {} Nice to meet you!".format(name))
```

For short strings, the modern f-string format is used

```
1 name = input("Enter your name: ")
2 print(f"Hello {name} Nice to meet you!")
```

Quick Exercise: Expense Tracker (v3)

04_expense_tracker.py

```
1  # Ask the user for three values
2  expense_1 = Let the user enter a number
3  expense_2 = Let the user enter a number
4  expense_3 = Let the user enter a number
5
6  # Then, print each information one line at a time
7  print(expense_1)
8  print(expense_2)
9  print(expense_3)
10
11 total = expense_1 + expense_2 + expense_3
12 print(total)
13
14 print(expense_1, "+", expense_2, "+", expense_3, "=", total)
```

H1

Sales Tracker

Quick practice of all the concepts discussed so far

Quick Exercise: Sales Tracker

07_sales_tracker.py

```
1  # Ask the cost and pax or count for three separate items
2  item_cost_1 = Let the user enter a number
3  item_count_1 = Let the user enter a number
4
5  item_cost_2 = Let the user enter a number
6  item_count_2 = Let the user enter a number
7
8  item_cost_3 = Let the user enter a number
9  item_count_3 = Let the user enter a number
10
11 # Calculate the total
12 total = 0
13 print(total)
```

03

Control Flow

Providing logic to data processing

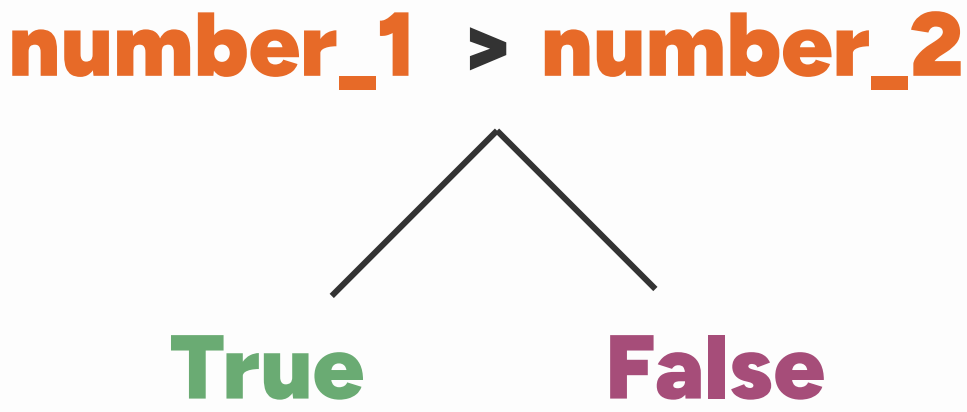
Relations

Checking if two values are related to each other


EXAM FORM

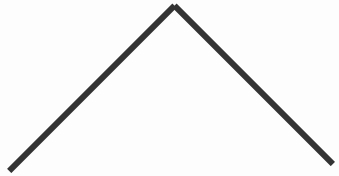

THE FIFTH

What are the possible results?



The result can be stored

result = number_1 > number_2



True

False

Relational Operator

All of the basic data types (except None) support relational operator (returns a bool)

Symbol	Operation	Example	Value
<	Less Than	11 < 2	False
<=	Less than or Equal	11 <= 2	False
>	Greater Than	11 > 2	True
>=	Greater Than or Equal	11 >= 2	True

Remember: PACMAN First

Quick Exercise: Height Requirement

08_height_requirement.py

```
1  minimum_height = 138
2
3  # Ask the user for the following inputs
4  user_height = User height (in cm)
5
6  # Notify user if they can enter the ride
7  can_enter_ride = None
8  print("Can enter the ride:", can_enter_ride)
```

Chained Relational Operator

Similar to the mathematical notation, relational operators can be chained to ask for ranges

```
1  x = int(input("Enter number: "))
2
3  print("Exclusive Range")
4  print(3 < x < 20)
5
6  print("Equal or Greater than 3 and Less than 20")
7  print(3 <= x < 20)
8
9  print("Greater than 3 and Less than or Equal to 20")
10 print(3 < x <= 20)
11
12 print("Inclusive Range")
13 print(3 <= x <= 20)
```

Quick Exercise: Valid Score

09_valid_score.py

```
1  # Range minimum and maximum bounds
2  min_number = 0
3  max_number = 100
4
5  # Enter user input
6  number = Enter number
7
8  # Notify user if the number is a valid score
9  valid_score = None
10 print("Valid score:", valid_score)
```

Value (In)equality

The most common relation operator is the equal and not equal operators

Symbol	Operation	Integer Example	String Example
`==`	Equal	`11 == 2`	`"Hello" == "World"`
`!=`	Not Equal	`11 != 2`	`"Hello" != "World"`

Example: Perfect Score Check

Similar to the mathematical notation, relational operators can be chained to ask for ranges

```
1  score = int(input("Enter score: "))
2  perfect_score = 100
3
4  has_perfect_score = score == perfect_score
5
6  print("You got a perfect score:", has_perfect_score)
```

Quick Exercise: Login System

10_login_system.py

```
1  # Expected password (you can change the value)
2  correct_password = "pass"
3
4  # Enter user password
5  password_input = input("Please provide password: ")
6
7  # Notify user if password is valid
8  correct_password_given = None
9  print("Access Granted", correct_password_given)
```

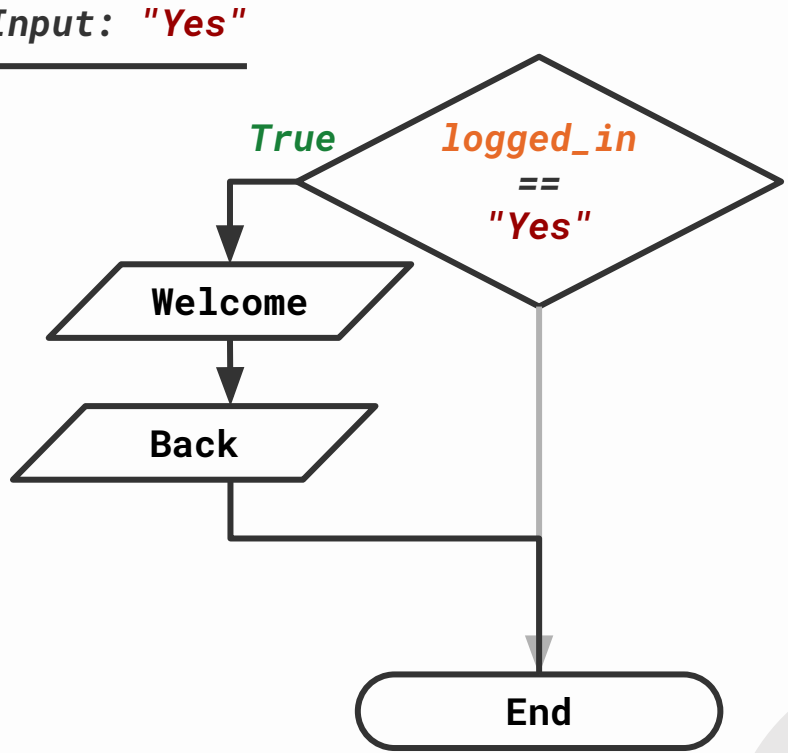
Conditionals

Control when code executes

If Statement - True

```
1  login_input = input("Login: ")
2
3  if login_input == "Yes":
4      print("Welcome")
5      print("Back")
6  print("End")
```

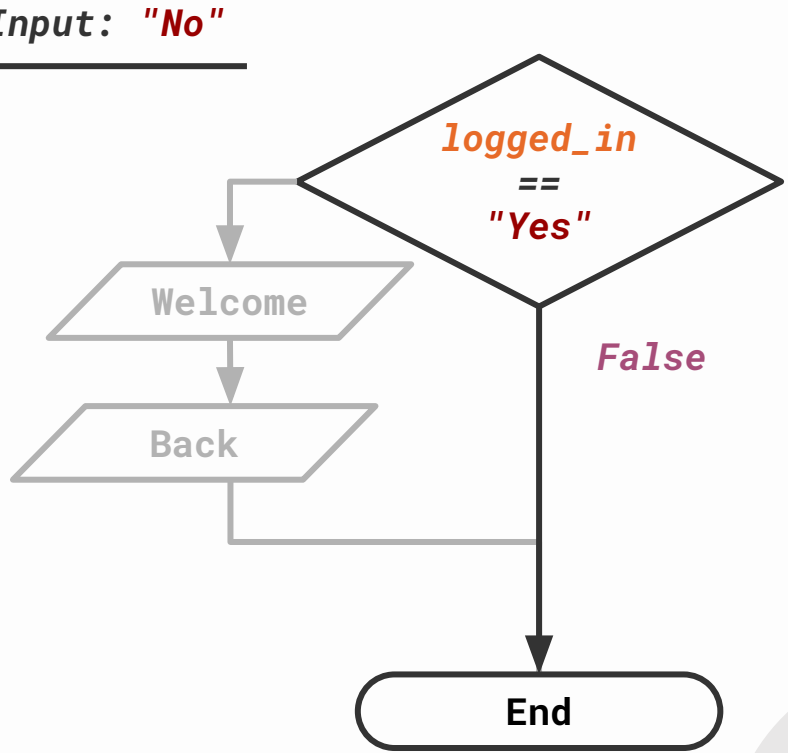
```
Welcome
Back
End
```



If Statement - False

```
1  login_input = input("Login: ")
2
3  if login_input == "Yes":
4      print("Welcome")
5      print("Back")
6  print("End")
```

```
Welcome
Back
End
```



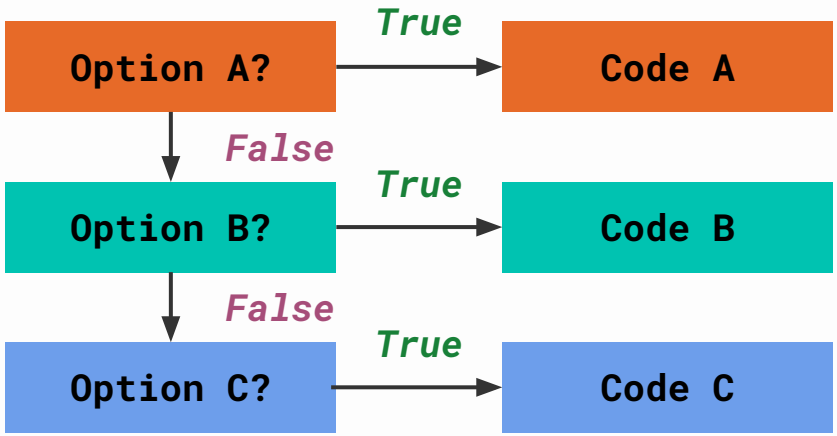
Quick Exercise: Login System (v2)

10_login_system.py

```
1  # Expected password (you can change the value)
2  correct_password = "pass"
3
4  # Enter password
5  password_input = input("Please provide password: ")
6
7  # Notify user if password is valid
8  correct_password_given = None
9  print("Access Granted")
```

Elif Statement

The else-if or elif statements allow you to run parts of the code when the first condition is `False` but there are other possible options

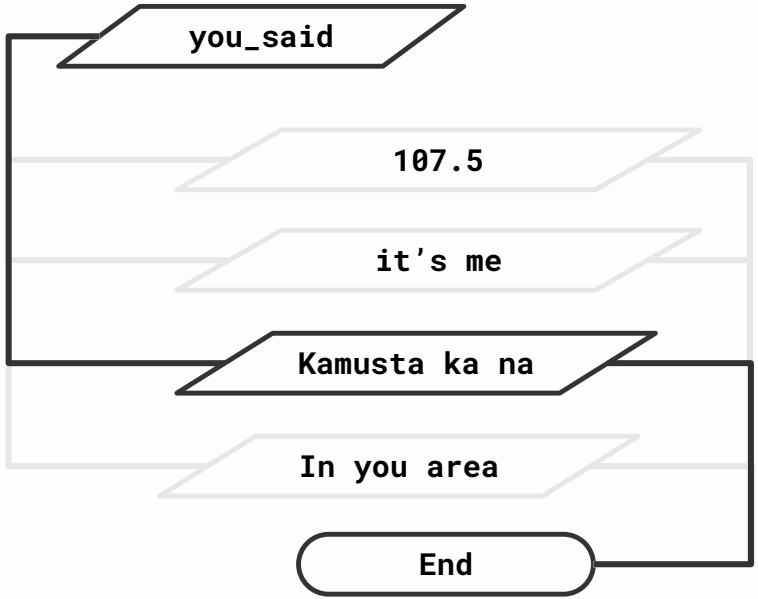



```
if condition_1:
    """Code A"""

elif condition_2:
    """Code B"""

elif condition_3:
    """Code C"""
```

Elif Statement Example 01

```
1  you_said = input("You said: ")
2
3  if you_said == "Wish":
4      print("107.5")
5  elif you_said == "Hello":
6      print("...it's me")
7  elif you_said == "Jopay":
8      print("...kamusta ka na")
9  elif you_said == "Black Pink":
10     print("...in your area")
```

```
...kamusta ka na
```



Elif Statement Example 02

```
1  battery = int(input("Battery percentage: "))
2
3  if battery >= 80:
4      print("Full Battery")
5  elif battery >= 40:
6      print("Good Battery")
7  elif battery >= 15:
8      print("Low Battery")
9  elif battery > 0:
10     print("Critically Low Battery")
```

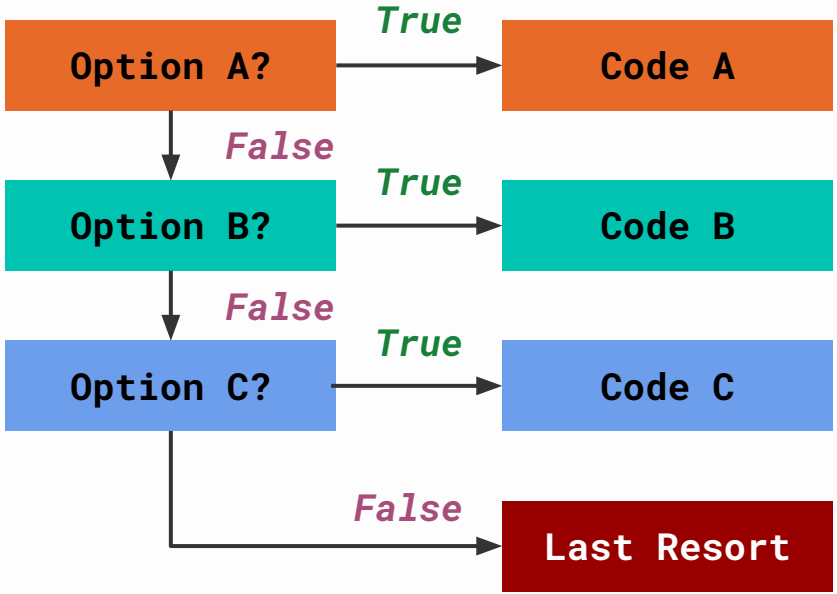
Quick Exercise: Greetings

11_traffic_lights.py

```
1  # Ask the user input for a color
2  color_input = input("Please enter a color: ")
3
4  # Print the following depending on the color input
5  # "green"   -> print "Go"
6  # "yellow"  -> print "Wait..."
7  # "red"     -> print "Stop"
```

Else Statement (Last Resort)

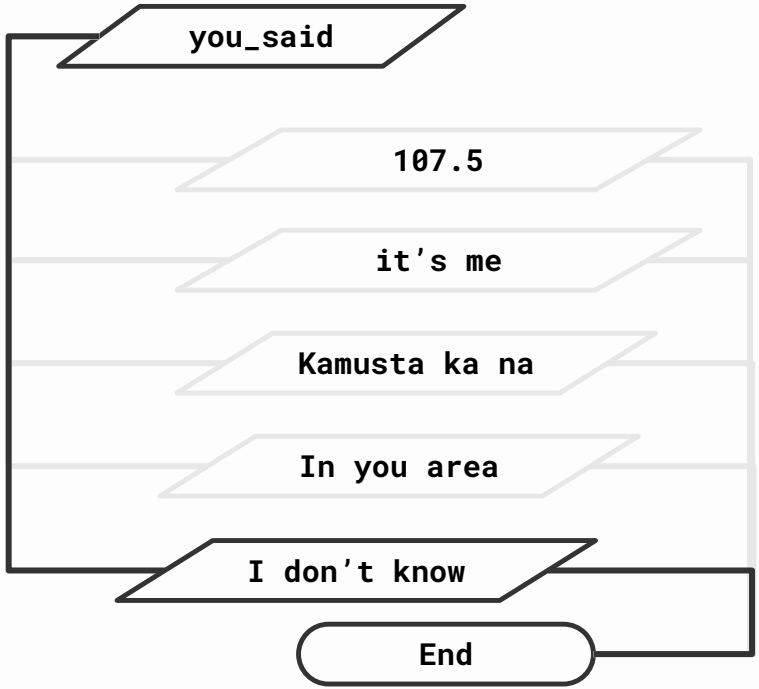
The else statement runs a piece of code when every condition fails




```
if condition_1:
    """Code A"""

elif condition_2:
    """Code B"""

elif condition_3:
    """Code C"""

else:
    """Last Resort"""
```

Else Statement

```
1  you_said = input("You said: ")
2
3  if you_said == "Wish":
4      print("107.5")
5  elif you_said == "Hello":
6      print("...it's me")
7  elif you_said == "Jopay":
8      print("...kamusta ka na")
9  elif you_said == "Black Pink":
10     print("...in your area")
11 else:
12     print("I don't know")
```



Quick Exercise: Traffic Lights (version 2)

11_traffic_lights.py

```
1  # Ask the user input for a color
2  color_input = input("Please enter a color: ")
3
4  # Print the following depending on the color input
5  # if green
6  #    -> "Go"
7  # elif yellow
8  #    -> "Wait..."
9  # elif red
10 #    -> "Stop"
11 # else
12 #    -> "Malfunction"
```

Multiple If's versus If-Elif's

If-elif statements ensure only one option runs. That's not the case for multiple if statements

```
1  grade = 85
2
3  if grade >= 90:
4      print("A")
5  if grade >= 80:
6      print("B")
7  if grade >= 70:
8      print("C")
```

```
B
C
```

```
1  grade = 85
2
3  if grade >= 90:
4      print("A")
5  elif grade >= 80:
6      print("B")
7  elif grade >= 70:
8      print("C")
```

```
B
```

If-Else Condition

```
1  age = int(input("Enter age: "))
2  if age >= 18:
3      print("Old enough to watch movie")
4  else:
5      print("Too young to watch movie")
```

```
1  balance = 150
2  price = 200
3
4  if balance >= price:
5      print("Payment successful")
6  else:
7      print("Insufficient funds")
```

Quick Exercise: Login System (v3)

10_login_system.py

```
1  # Expected password (you can change the value)
2  correct_password = "pass"
3
4  # Enter password
5  password_input = input("Please provide password: ")
6
7  # Notify user if password is valid or invalid
8  correct_password_given = None
9  print("Access Granted")
10 print("Access Denied")
```

Logical Operators

Simplifying conditionals

And Operator

Use the `and` operator to restrict conditions

```
1  applied = True
2  has_skill = True
3  has_experience = True
4
5  if applied and has_skill and has_experience:
6      print("You're hired")
```

And Operator Example

You can use the `and` operator to make the condition more strict

```
1  money = float(input("Enter money: "))
2  stock = int(input("Enter stock: "))
3
4  if money >= 100 and stock > 0:
5      print("You can buy the item!")
6  else:
       print("You can't buy the item")
```

Quick Exercise: Login System (v4)

10_login_system.py

```
1  # Expected username and password (you can change the value)
2  correct_username = "user"
3  correct_password = "pass"
4
5  # Enter username and password
6  username_input = input("Please provide username: ")
7  password_input = input("Please provide password: ")
8
9  # Notify user if credentials are valid or invalid
10 correct_credentials = None
11 print("Access Granted")
12 print("Access Denied")
```

Or Operator

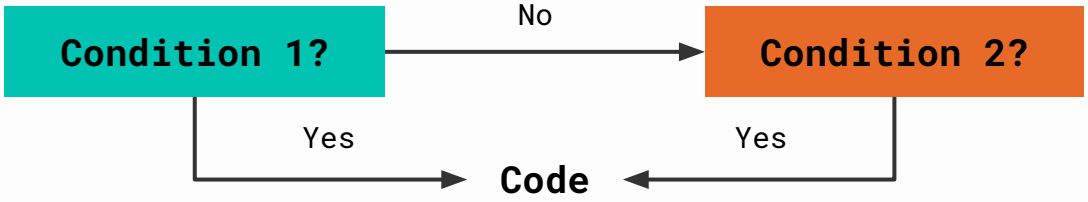
Use the `or` operator to add alternative conditions

```
1  raining = False
2  cold = False
3  trendy = True
4
5  if raining or cold or trendy:
6      print("Wear a jacket")
```

Or Operator Example

Use the **or** operator to add alternative conditions

```
1  response = input("Continue? ")
2  if response == "yes" or response == "YES":
3      print("We will continue!")
```



Quick Exercise: Login System (v5)

10_login_system.py

```
1  # Expected username and password (you can change the value)
2  correct_username = "user"
3  correct_password = "pass"
4  admin_username = "admin"
5  admin_password = "admin"
6
7  # Enter username and password
8  username_input = input("Please provide username: ")
9  password_input = input("Please provide password: ")
10
11 # Notify user if credentials are valid or invalid
12 correct_credentials = None
13 print("Access Granted")
14 print("Access Denied")
```

Not Operator

A boolean value or statement can be reversed or negated using the not operator

```
1  print(not True)
```

```
2  print(not False)
```

```
3  correct_credentials = False
4  if not correct_credentials:
5      print("Access Denied")
```

For Loops

Controlled repetitions

Defining a List

```
items = ["milk","egg","ice"]
print( items )
```

Implement: Bookmarks

12_bookmarks.py

```
1  # Define a list of your favorite websites
2  websites = ["facebook.com", "youtube.com"]
3
4  # Print the entire list of websites
5  print(websites)
```

For Loop

```
items = ["milk","egg","ice"]
for item in items:
    print(item)
```

For Loop

A for loop goes through the items or elements of a list one at a time by assigning to a variable

```
1  items = ["milk","egg","ice"]
2  for item in items:
3      print(item)
```

"milk"	"egg"	"ice"

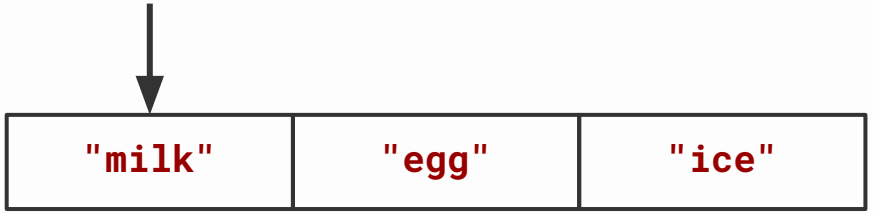
```
1  item = "milk"
2  print(item)
3
4  item = "egg"
5  print(item)
6
7  item = "ice"
8  print(item)
```

For Loop

A for loop goes through the items or elements of a list one at a time by assigning to a variable

```
1  items = ["milk","egg","ice"]
2  for item in items:
3      print(item)
```

item="milk"




```
1  item = "milk"
2  print(item)
3
4  item = "egg"
5  print(item)
6
7  item = "ice"
8  print(item)
```

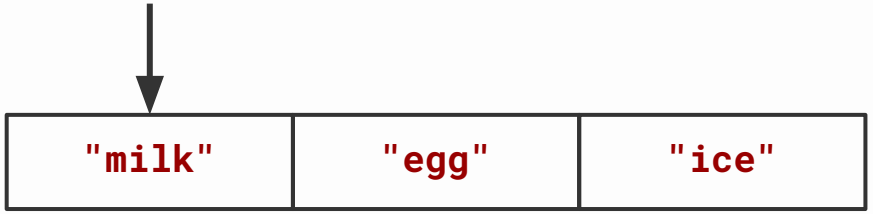
For Loop

A for loop goes through the items or elements of a list one at a time by assigning to a variable

```
1  items = ["milk","egg","ice"]
2  for item in items:
3      print(item)
```

```
milk
```

item="milk"



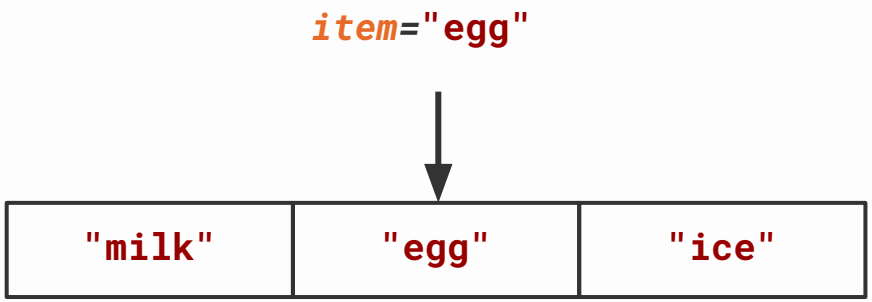

```
1  item = "milk"
2  print(item)
3
4  item = "egg"
5  print(item)
6
7  item = "ice"
8  print(item)
```

For Loop

A for loop goes through the items or elements of a list one at a time by assigning to a variable

```
1  items = ["milk","egg","ice"]
2  for item in items:
3      print(item)
```

```
milk
```



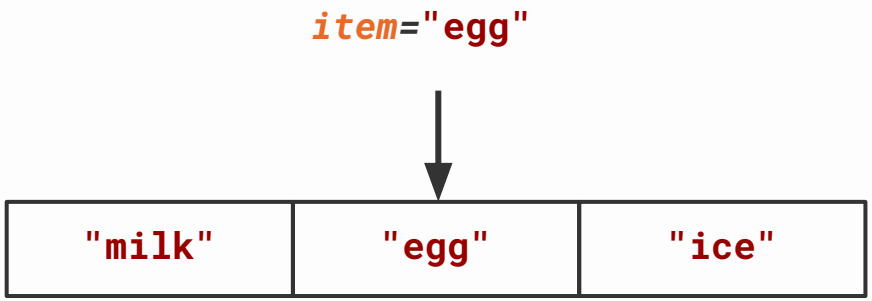

```
1  item = "milk"
2  print(item)
3
4  item = "egg"
5  print(item)
6
7  item = "ice"
8  print(item)
```

For Loop

A for loop goes through the items or elements of a list one at a time by assigning to a variable

```
1  items = ["milk","egg","ice"]
2  for item in items:
3      print(item)
```

```
milk
egg
```



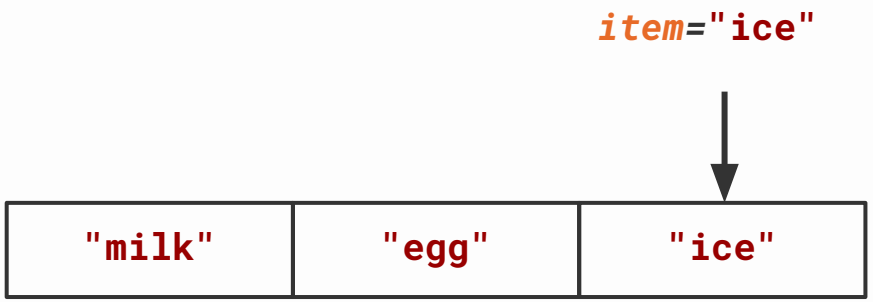

```
1  item = "milk"
2  print(item)
3
4  item = "egg"
5  print(item)
6
7  item = "ice"
8  print(item)
```

For Loop

A for loop goes through the items or elements of a list one at a time by assigning to a variable

```
1  items = ["milk","egg","ice"]
2  for item in items:
3      print(item)
```

```
milk
egg
```




```
1  item = "milk"
2  print(item)
3
4  item = "egg"
5  print(item)
6
7  item = "ice"
8  print(item)
```

For Loop

A for loop goes through the items or elements of a list one at a time by assigning to a variable

```
1  items = ["milk","egg","ice"]
2  for item in items:
3      print(item)
```

```
milk
egg
ice
```


```
1  item = "milk"
2  print(item)
3
4  item = "egg"
5  print(item)
6
7  item = "ice"
8  print(item)
```

For Loop Example 01: Prints

For prints are often used to print values one at a time

```
1  notifications = ["Battery low", "New message", "New Update"]
2
3  for notification in notifications:
4      print("Alert:", notification)
```

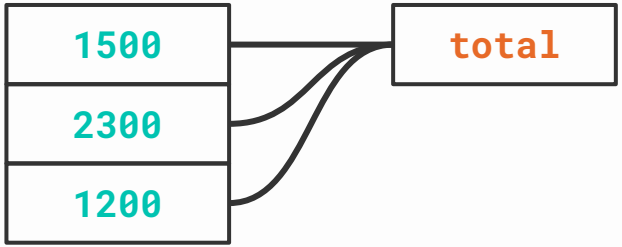
```
Alert: Battery low
Alert: New message
Alert: New Update
```

For Loop Example 02: Aggregation

A common task in for loops is combining all of the items into one value

```
1  expenses = [1500, 2300, 1200]
2  total = 0
3
4  for amount in expenses:
5      total += amount
6
7  print("Total expenses:", total)
```

```
Total expenses: 5000
```

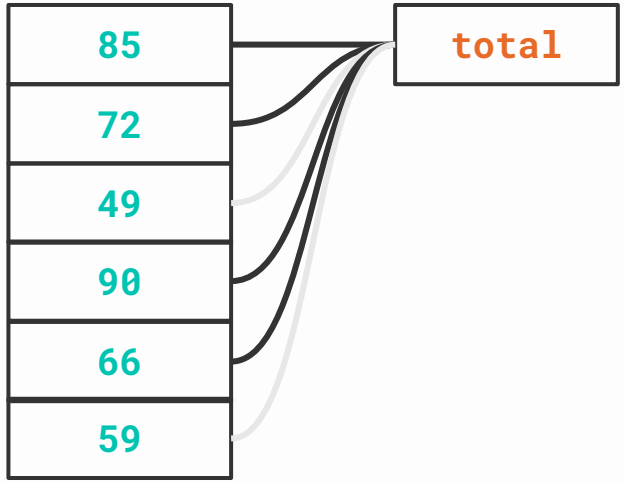


For Loop Example 03: Counting

Finally, another common task besides aggregation is counting

```
1  grades = [85, 72, 49, 90, 66, 59]
2  passing = 0
3
4  for grade in grades:
5      if grade >= 60:
6          passing += 1
7
8  print("Passing:", passing)
```

```
Passing: 4
```



Quick Exercise: Bookmarks (v2)

12_bookmarks.py

```
1  # Define a list of your favorite websites (add or change below)
2  websites = ["facebook.com", "youtube.com"]
3
4  # Print the entire list of websites (one at a time)
5  print(websites)
```

Fixed Repetition

Using a *range(n)* function instead of a list makes the code repeat that many times

```
1  for item in range(3):
2      print("This will be repeated")
```

```
This will be repeated
This will be repeated
This will be repeated
```

Quick Exercise: Repetition

13_repetition.py

```
1  # Long Message
2  message = "This is a very long message that's hard to type"
3
4  # Print the message eleven times
5  print(message)
```

For Range Loop

The *range(n)* function actually generates a list from *0* to *n-1*

```
1 for item in range(3):
2     print(item)
```

```
0
1
2
```

```
1 numbers = [0, 1, 2]
2 for item in numbers:
3     print(item)
```

Quick Exercise: Counting

14_counting.py

```
1  # Ask the user for a number
2  end = int(input("Enter number: "))
3
4  # Print the numbers 0 to end
5  print()
```

Range() with different start

The *range(start,end)* is a variation of *range(n)* function that generates a list from *start* to *end-1*

```
1 for item in range(1, 6):
2     print(item)
```

```
1
2
3
4
5
```

Quick Exercise: Counting (v2)

14_counting.py

```
1  # Ask the user for a starting and ending number
2  start = int(input("Enter start: "))
3  end = int(input("Enter end: "))
4
5  # Print the numbers start to end
6  print()
```

Range() with different step

The *range(start,end,step)* is a variation of *range(n)* function that generates a list from *start* to *end-1* and skips count by *step*

```
1 for item in range(2, 11, 2):
2     print(item)
```

```
2
4
6
8
10
```

Quick Exercise: Tens

15_tens.py

```
1  # Print the following pattern up to 100
2  # 10, 20, 30, 40, 50, 60, 70, 80, 90, 100
3
4  print()
```

While Loops

Dynamic repetitions

Dynamic Repetition

Some repetitions cannot be fixed or determined

```
1  correct_password = "pass"
2
3  password = input("Enter password: ")
```

Dynamic Repetition

Some repetitions cannot be fixed or determined

```
1  correct_password = "pass"
2
3  password = input("Enter password: ")
4  if password != correct_password:
5      password = input("Enter password: ")
```

Dynamic Repetition

Some repetitions cannot be fixed or determined

```
1  correct_password = "pass"
2
3  password = input("Enter password: ")
4  if password != correct_password:
5      password = input("Enter password: ")
6
7      if password != correct_password:
8          password = input("Enter password: ")
```

Dynamic Repetition

Some repetitions cannot be fixed or determined

```
correct_password = "pass"

password = input("Enter password: ")
if password != correct_password:
    password = input("Enter password: ")

    if password != correct_password:
        password = input("Enter password: ")

        if password != correct_password:
            password = input("Enter password: ")
```

Repeat until the user gets it right

```
password = input()
while password != "pass":
    password = input()
```

While Loop Example

This structure is commonly used to repeat certain tasks until user says otherwise

```
1  running = True
2  while running:
3      command = input("Provide command: ")
4      if command == "command 1":
5          print("command 1 done")
6      elif command == "command 2":
7          print("command 2 done")
8      elif command == "command 3":
9          print("command 3 done")
10     elif command == "exit":
11         running = False
```

Quick Exercise: Running Balance

16_running_balance.py

```
1  total = 0
2  running = True
3  while running:
4      command = input("Provide command: ")
5
6      if command == "add":
7          # Ask for number, add to total, and print
8      if command == "sub":
9          # Ask for number, subtract to total, and print
10     elif command == "exit":
11         running = False
```

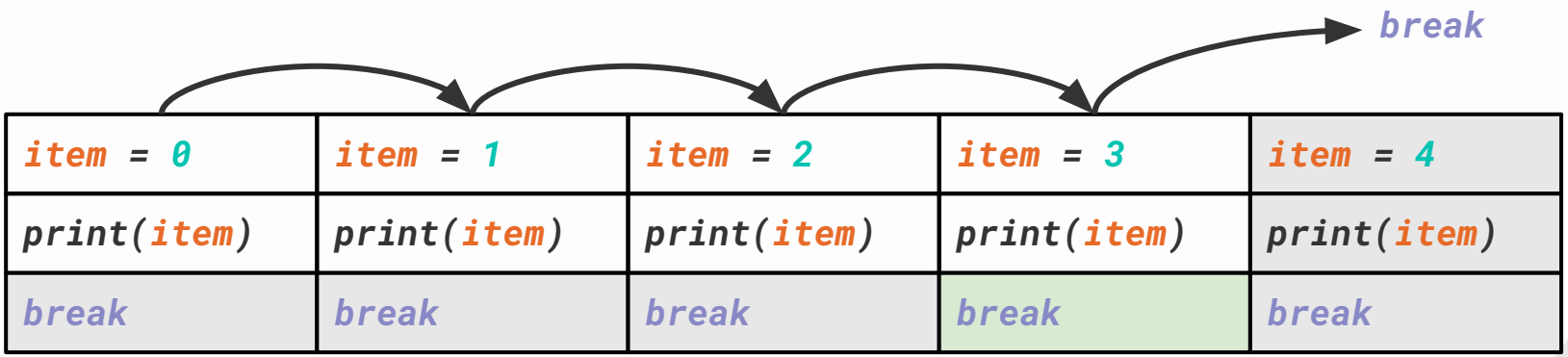
Loop Control

Exit the common mold

Break Keyword

The **break** keyword immediately stops the loop

```
1  for item in range(100):
2      print(item)
3      if item == 3:
4          break
```



While Loop: Password Attempt

```
1  max_attempt = 3
2  correct_password = "pass"
3
4  for attempt in range(max_attempt):
5      password = input("Enter password: ")
6      if password == correct_password:
7          print("Access granted")
8          break
```

Quick Exercise: Search

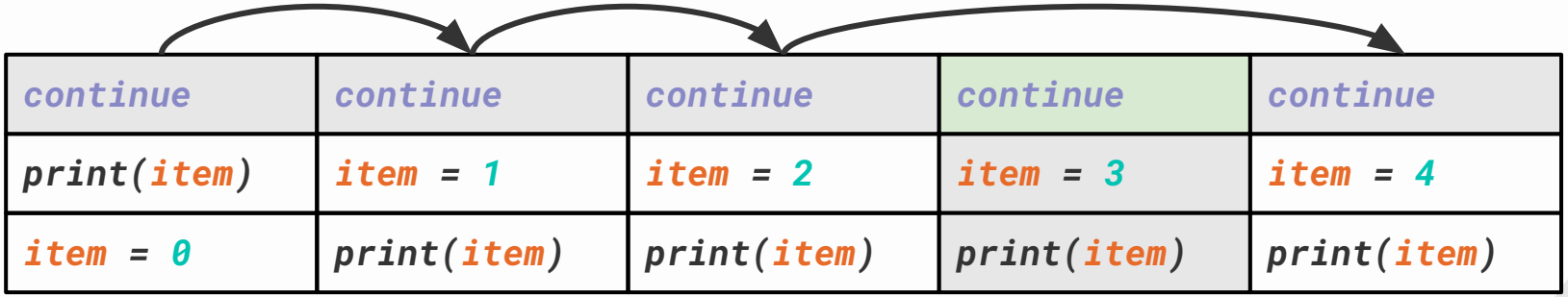
17_search.py

```
1  items = ["rice", "noodles", "toyo", "spam", "coffee"]
2  item_to_find = "spam"
3
4  for item in items:
5      """If item equals the item_to_find, print and exit loop"""
6
7
```

Continue Keyword

The **continue** keyword skips the succeeding code

```
1  for item in range(100):
2      if item == 3:
3          continue
4      print(item)
```



Quick Exercise: Skip Range

18_skip_range.py

```
1  for item in range(100):
2      # Change code to skip printing numbers 20 to 80.
3      print(item)
```

H2

Sales Tracker v2

Make the previous version more dynamic!

Sales Tracker (v2)

07_sales_tracker.py

```
1  input_count = Ask the user how many items will be calculated
2
3  total = 0
4
5  # Use a for loop to ask for more than one cost and count
6  item_cost = Let the user enter a number
7  item_count = Let the user enter a number
8  item_total = item_cost * item_count
9
10 print(total)
```

04

Functions

First step to code organization

Sum Calculator

```
1  numbers = [1, 3, 5, 7, 2, 4, 6]
2  total = 0
3  for number in numbers:
4      total += number
5
6  print(total)
```

```
7  new_numbers = [9, 3, 0, 1, 2, 7]
```

Sum Calculator

```
1  numbers = [1, 3, 5, 7, 2, 4, 6]
2  total = 0
3  for number in numbers:
4      total += number
5
6  print(total)
```

```
7  new_numbers = [9, 3, 0, 1, 2, 7]
8  total_2 = 0
9  for number in new_numbers:
10     total_2 += number
11
12 print(total_2)
```

What if I need to calculate another list?

Sum Calculator

```
1 numbers = [1, 3, 5, 7, 2, 4, 6]
2 total = sum(numbers)
3 print(total)
```

```
4 new_numbers = [9, 3, 0, 1, 2, 7]
5 total_2 = sum(new_numbers)
6 print(total_2)
```

No need to copy paste code

Function Copy-Pasting

```
1  def extra():
2      print("Extra Line 1")
3      print("Extra Line 2")
4
5  print("First Line")
6  extra()
7  print("Second Line")
```

```
1  print("First Line")
2
3  print("Extra Line 1")
4  print("Extra Line 2")
5
6  print("Second Line")
```

```
First Line
Extra Line 1
Extra Line 2
Second Line
```

Simple Function Declaration

```
def function_name():
    """processes here"""
```

```
1  def greet():
2      print("Hello, good day to you!")
```

```
3  greet()
```

Quick Exercise: Line Generator

19_line_generator.py

```
"""
Create a function line_generator that prints the following:
    Line 1
    Line 2
    Line 3
"""

# Use the function once
line_generator()
```

```
def function_name():
    """processes here"""
```

Simple Input Declaration

```
def function_name(variable_name):
    """processes here"""
```

```
1  def greet(username):
2      print(f"Hello {username}, good day to you!")
```

```
3  greet("Joseph")
```

Quick Exercise: Line Generator (version 2)

19_line_generator.py

```
"""
Create a function line_generator that has a parameter number
and prints the following:
    Line 1
    Line 2
    ...
    Line number
"""

# Use the function once
line_generator(4)
```

Multiple Input Declaration

```
def function_name(variable_name_1, variable_name_2):
    """processes here"""
```

```
1  def greet(username, message):
2      print(f"Hello {username}, {message}")
```

```
3  greet("Joseph", "Nice to meet you!")
```

Quick Exercise: Product

20_product.py

```
1  def product():
2      """Takes three inputs and print the product"""
3
4  product(1, 1, 1) # 1
5  product(1, 2, 3) # 6
6  product(2, 5, 10)# 100
```

Optional Parameter

```
def function_name(variable_name_1, variable_name_2=default):
    """processes here"""
```

```
1  def greet(username, message="Nice to meet you!"):
2      print(f"Hello {username}, {message}")
```

```
3  greet("Joseph")
```

Optional Parameter (Overriding)

```
def function_name(variable_name_1, variable_name_2=default):
    """processes here"""
```

```
1  def greet(username, message="Nice to meet you!"):
2      print(f"Hello {username}, {message}")
```

```
3  greet("Joseph", "Hajimemashite!")
```

Quick Exercise: Product (v2)

20_product.py

```
1  def product():
2      """Takes three inputs (or two inputs) and print the product"""
3
4  product(1, 1, 1) # 1
5  product(1, 2, 3) # 6
6  product(2, 5, 10)# 100
7  product(3, 3)    # 9
8  product(2, 5)    # 10
```

Function Returns

Simplifying calculations and data handling

Return Value

```
def function_name(...):
    """processes here"""
    return output
```

```
1  def add(num1, num2):
2      result = num1 + num2
3
4
5  add(1, 2)
6  print()
```

```
1  def add(num1, num2):
2      result = num1 + num2
3      return result
4
5  final = add(1, 2)
6  print(final)
```

Return Value

```
def function_name(...):
    """processes here"""
    return output
```

```
1  def add(num1, num2):
2      result = num1 + num2
3
4
5  final = result * 5
6  print(final)
```

```
1  def add(num1, num2):
2      result = num1 + num2
3      return result
4
5  final = add(1, 2) * 5
6  print(add_result)
```

Return versus Print

The return keyword does not print the value in the console

```
1  def add(num1, num2):
2      result = num1 + num2
3      return result
4
5  add(1, 2)
```

```
1  def add(num1, num2):
2      result = num1 + num2
3      print(result)
4
5  add(1, 2)
```

```
3
```

Return versus Print

The return keyword allows you to store the value in a variable instead

```
1  def add(num1, num2):
2      result = num1 + num2
3      return result
4
5  add_result = add(1, 2)
6  print(add_result)
```

3

```
1  def add(num1, num2):
2      result = num1 + num2
3      print(result)
4
5  add_result = add(1, 2)
6  print(add_result)
```

None

Return Function Example 01

Return functions are used to provide context to a calculation

```
1  def to_fahrenheit(celsius):
2      return celsius * 9/5 + 32
3
4  print(to_fahrenheit(30))
```

Return Function Example 02

Functions are also used to augment strings

```
1  def happy(string):
2      return string + " :D"
3
4  message = "Hello World"
5  happy_message = happy(message)
6  print(happy_message)
```

Return is Final!

When you return in a function it skips everything else after it!

```
1  def add(num1, num2):
2      total = num1 + num2
3      return total
4      print("Code finished")
```

skipped

```
5  result = add(3, 4)
6  print(result)
```

Quick Exercise: Product (v3)

20_product.py

```
1  def product():
2      """Takes three inputs (or two inputs) and return"""
3
4  product(1, 1, 1) # 1
5  product(1, 2, 3) # 6
6  product(2, 5, 10)# 100
7  product(3, 3)    # 9
8  product(2, 5)    # 10
```

Function Scope

Determining variable lifetime

Functions can read outside

Function can detect and print variables outside of it

```
outer_variable = 10

def function():
    print("Inner", outer_variable)

function()
print("Outer", outer_variable)
```

```
Inner: 10
Outer: 10
```

Namespace

outer_variable	10

Functions can’t write outside

Function can’t edit variables outside normally

```
outer_variable = 10

def function():
    outer_variable = 999
    print("Inner", outer_variable)

function()
print("Outer", outer_variable)
```

```
Inner: 999
Outer: 10
```

Namespace

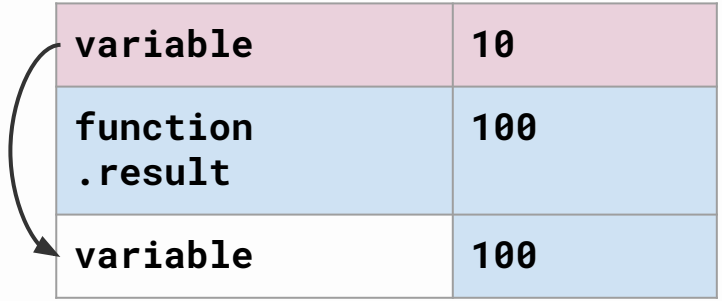
outer_variable	10
function .outer_variable	999

Functions update using return

Function can interact outside using a return statement

```
variable = 10

def pow2(x):
    result = x ** 2
    return result

variable = pow2(variable)
print(variable)
```

Namespace



Full Process Example 1

```
1  def get_balance():
2      return float(input("Enter your balance: "))
3
4  def get_withdrawal():
5      return float(input("Enter amount to withdraw: "))
6
7  def process_withdrawal(balance, amount):
8      if amount > balance:
9          return "Insufficient funds!"
10     return f"Success. Remaining: {balance - amount}"
11
12 current_balance = get_balance()
13 current_amount = get_withdrawal()
14 print(process_withdrawal(current_balance, current_amount))
```

Full Process Example 2

```
1  def get_quiz_score():
2      return float(input("Quiz score: "))
3
4  def get_exam_score():
5      return float(input("Exam score: "))
6
7  def compute_average(quiz, exam):
8      return (quiz * 0.4) + (exam * 0.6)
9
10 def check_pass(average):
11     if average >= 60:
12         return "Pass!"
13     return "Fail!"
14
15 quiz_score = get_quiz_score()
16 exam_score = get_exam_score()
17 average = compute_average(quiz_score, exam_score)
18 print("Status:", check_pass(average_score))
```

H3

Sales Tracker v3

Making a more robust console tracker

Sales Tracker v3

```
1  def add(total):
2       item_cost = int(input("Enter item cost: "))
3       item_count = int(input("Enter item count: "))
4       total_item_cost = item_cost * item_count
5       return total + total_item_cost
6  def sub(total):
7       """Remove total item cost (cost, count) from total and return"""
8  def show(total):
9       """Print total"""
10
11 def main():
12      total = 0
13      running = True
14      while running:
15           command = input("Provide command: ")
16           if command == "command 1":
17                total = add(total)
18           elif command == "exit":
19                running = False
```

05

Error Handling

Making the code secure by preparing for errors

Possible Errors

```
1
2  divider = int(input("Number: "))
3  budget = 1_000
4  print(budget / divider)
5
6
```

Catch Input Error

```
1  try:
2      divider = int(input("Number: "))
3      budget = 1_000
4      print(budget / divider)
5  except ValueError:
6      print("Enter a valid number!")
```

Catch Zero Division Error

```
1  try:
2      divider = int(input("Number: "))
3      budget = 1_000
4      print(budget / divider)
5  except ValueError:
6      print("Enter a valid number!")
7  except ZeroDivisionError:
8      print("Cannot pick zero")
```

Error Raising

You can trigger errors using the `raise` keyword, followed by the error name and parentheses

```
raise Exception()
```

```
raise ValueError()
```

```
raise ValueError("Custom message here")
```

Error Raising Example 1

```
1  def withdraw(balance, amount):
2      if balance < amount:
3          raise ValueError("Insufficient funds")
4      if amount < 0:
5          raise ValueError("Withdraw amount must be positive")
6
7      new_balance = balance - amount
8      return new_balance
```

Error Raising Example 2

```
1  try:
2      user_input = int(input("Enter Number: "))
3      if user_input < 0:
4          raise ValueError()
5
6  except ValueError:
7      print("We don't accept strings or negatives!")
```

Final Code Execution

Given a line of code that has to run whether the code failed or not...

```
try:
    print(5 / 0)
except:
    print("Please don't divide by zero")
```

Full Exception Handling

The finally keyword can be used to ensure a line of code runs no matter what happens

```
1  try:
2      print(5 / 0)
3  except:
4      print("Please don't divide by zero")
5  finally:
6      print("Code completed!")
```

H4

Sales Tracker v4

Putting all of it together

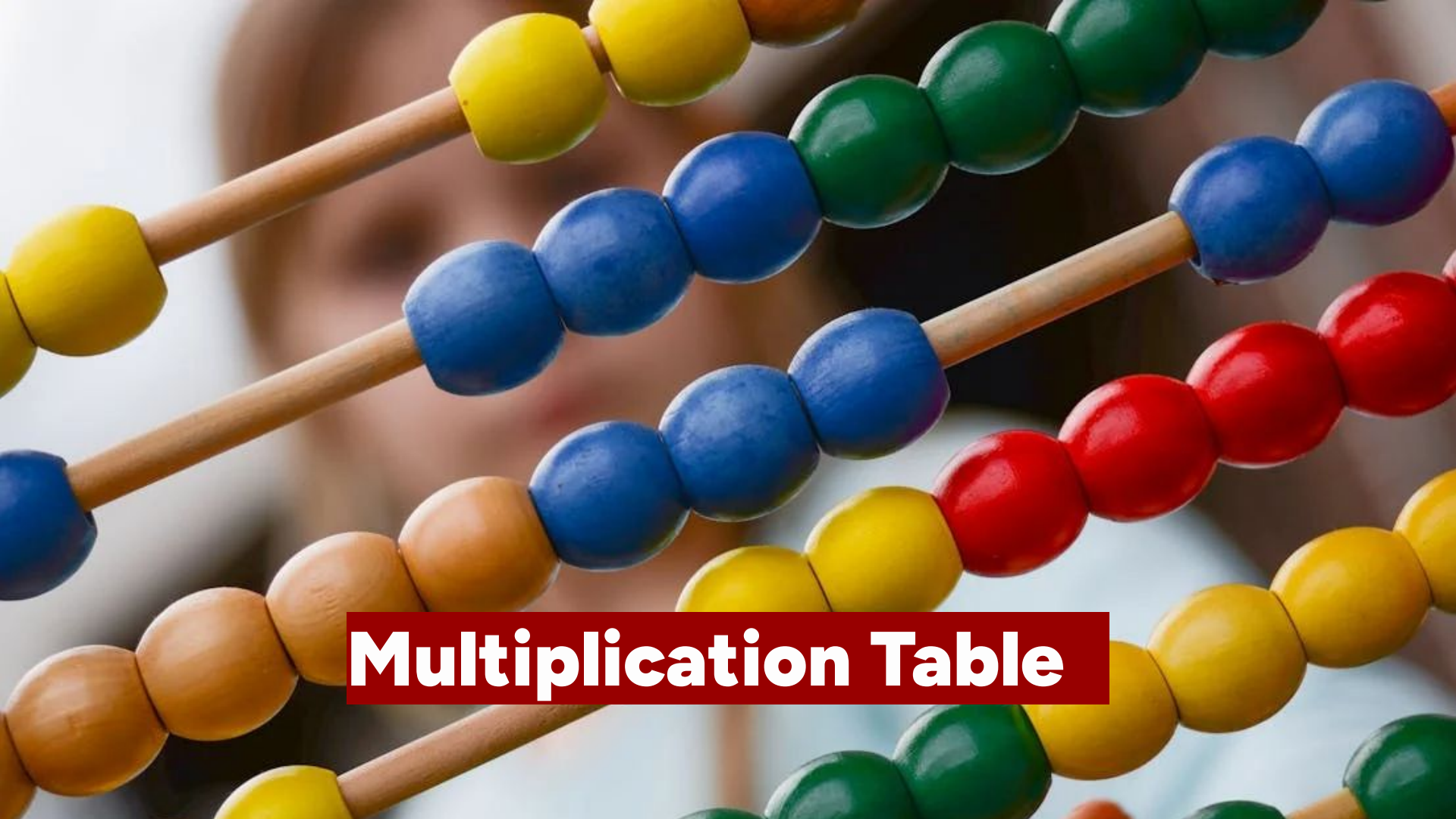
Sales Tracker v4

```
1  def add(total):
2      """Add item cost (cost, count) from total and return"""
3  def sub(total):
4      """Remove item cost (cost, count) from total and return"""
5  def show(total):
6      """Print total"""
7
8  def main():
9      total = 0
10     running = True
11     while running:
12         command = input("Provide command: ")
13         if command == "command 1":
14             total = add(total)
15         elif command == "exit":
16             running = False
```

06

Lab Session

Overview of the Course and Python in General


Multiplication Table

Multiplication Table

Ask the user for an integer input

```
1 number = int(input("Pick a number: "))
```

Print the multiplication table for that `number`

```
3 x 1 = 3
3 x 2 = 6
3 x 3 = 9
…
3 x 10 = 30
```


Positive Input

Positive Input

```
1  def positive_input():
2      number = input("Enter number: ")
3      return number
```

Main Task: Ask the user for a positive whole number (int) and return it as an int

Challenges:

- The user could provide an invalid integer input (string)
- The user could give a negative number

While the user keeps giving an invalid answer, keep asking for an input (infinite retry)


Quick Draw

Prerequisite: Random Choice

In case we need to simulate randomness. First, put this at the top of your code.

```
1 from random import choice
```

This allows us to use the given function that returns a random item from a list

```
2 options = ["rock", "paper", "scissors"]
3 random_option = choice(options)
4 print(random_option )
```

Recommended Project: Quick Draw

Ask the user for an input

```
1 user_choice = input("Pick a choice (rock/paper/scissors): ")
```

Make a random choice for the computer

```
2 cpu_choice = ...
```

Depending on their choices, tell if the user won, lost, or that there was a draw:

```
You win!
```

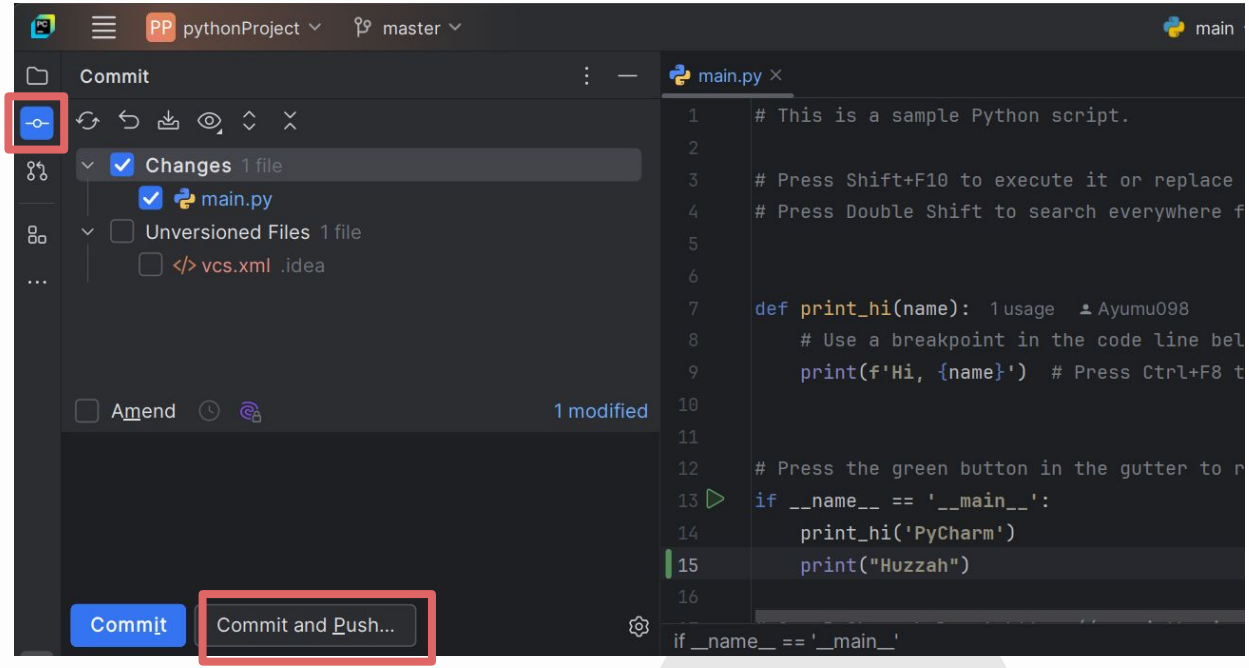
```
You Lost!
```

```
Draw!
```

Challenge: Multi-rounds

Saving Work: Commit and Push

Close the slides, then select **Commit** to save locally and **Commit and Push** to save remote.



Sneak Peak

01

Lists & Tuple

Ordered Group

02

Dictionary & Set

Unordered Group

03

String

Handling Text

04

Comprehension

Iteration Shortcut

05

File Handling

Data outside code

06

Lab Session

Culminating Exercise

Python: Day 01

Introduction