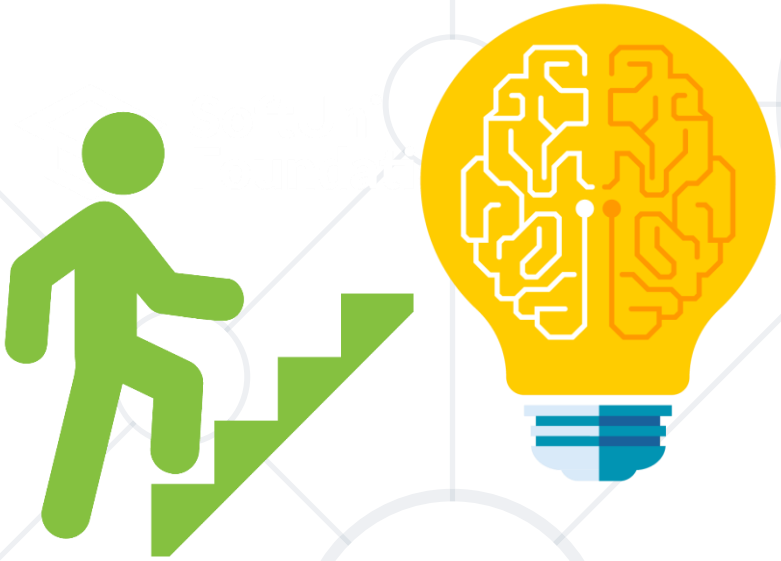
Data Types, Variables and Simple Operations



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Contents

What is Programming?

What is Programming?

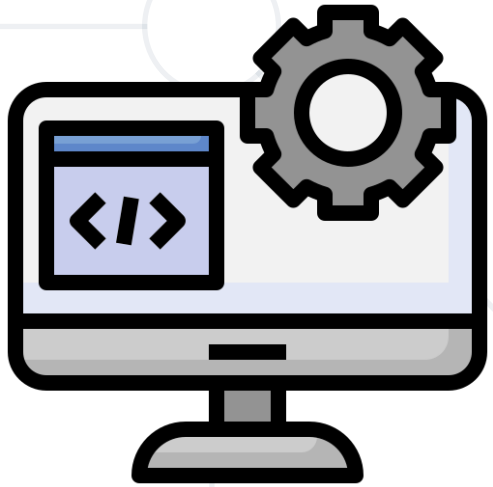
- Computer science
- Uses **commands** to **communicate** with the computer
- Commands are arranged and executed **one after another**
- The sequence of commands forms a **computer program**

What is a Programming Language?

- Computer programs are written in a programming language
- Examples: **Python, C#, JavaScript, Java, PHP, C, C++**
- A **programming environment (development environment)** is used
- Examples: **PyCharm, IntelliJ IDEA, Visual Studio, Visual Studio Code, Code Blocks**

What is a Computer Program?

- A program is a **sequence of commands**
- It can contain calculations, checks, loops
- Programs are written in text format
- The text of the program is called **source code**



Interesting Facts About Python

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- One of the **top 3** most popular programming languages
- One of **the best** for beginners
- The syntax is close to **plain English**
- Created in the **early 90s**
- Supported by a **large community** of people

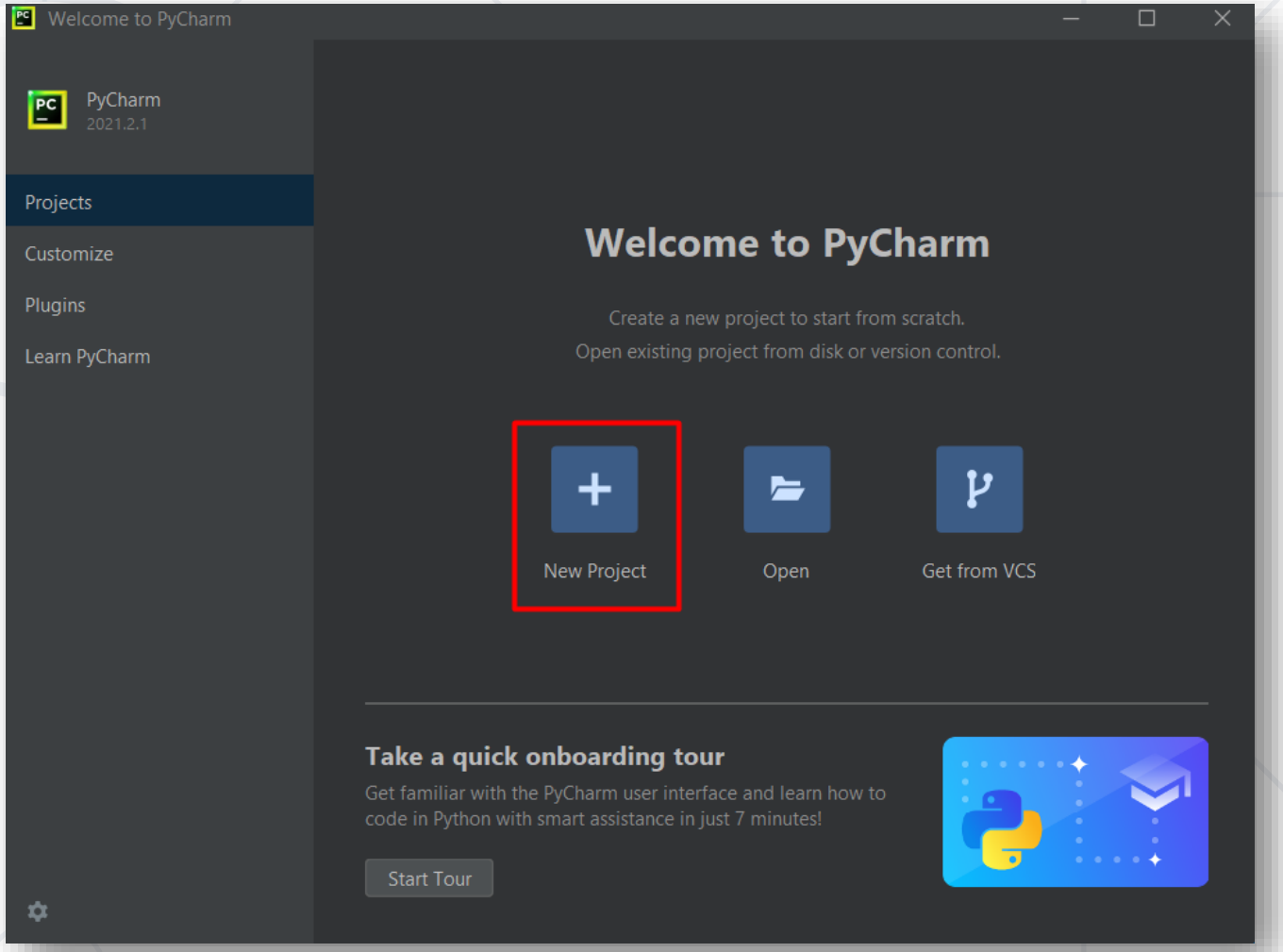
First Console Program

Development Environment

- A development environment is necessary for programming
- **Integrated Development Environment (IDE)**
  - **PyCharm** is a development environment for the **Python** language
- Install **PyCharm Community**
  - **Installation instructions**
  - **Instructions for installing an older version**
- The application is **cross-platform** (Linux, Mac OS, Windows)

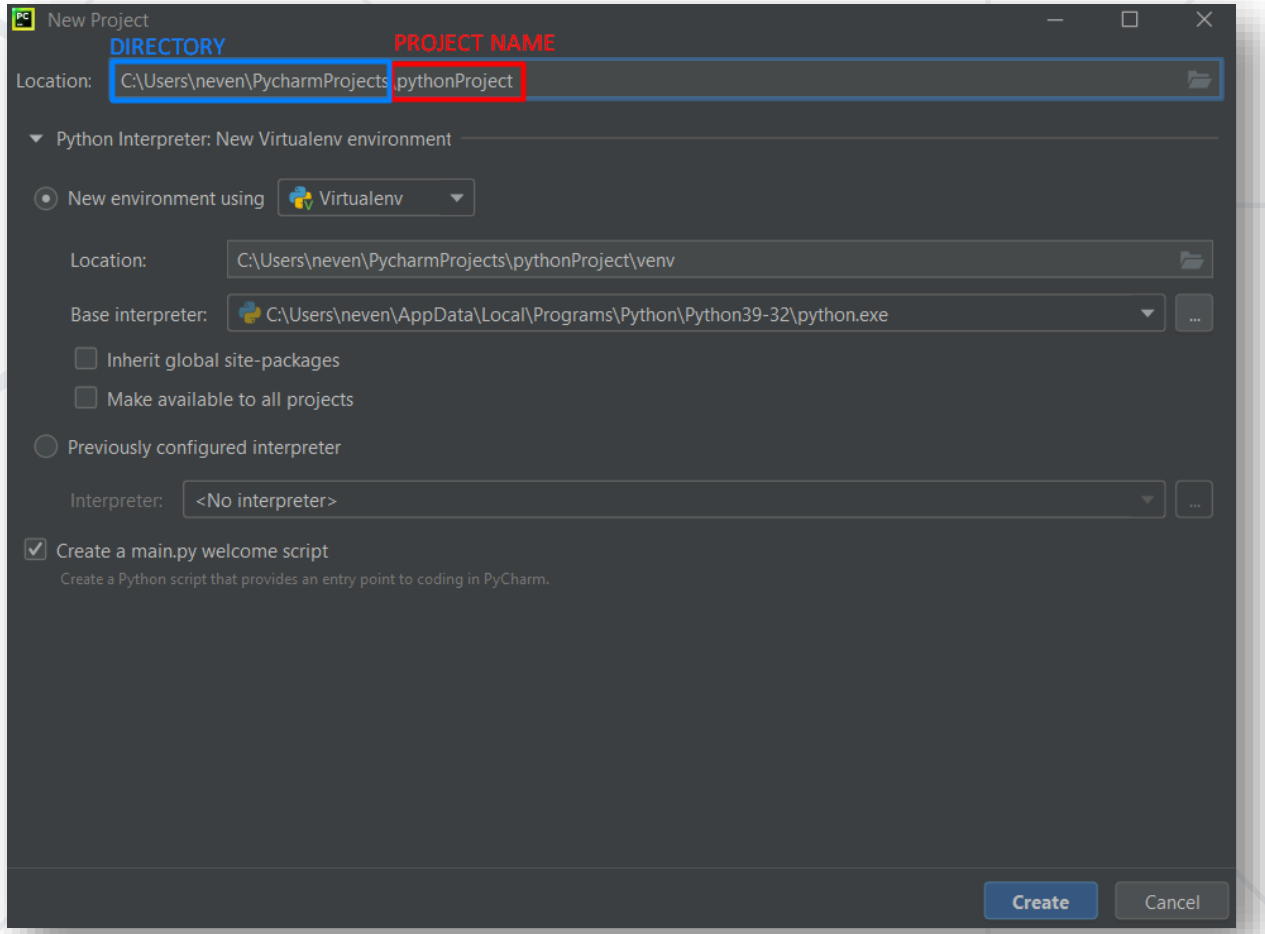
Creating a Console Program

- Start **PyCharm**
- Choose **New Project**



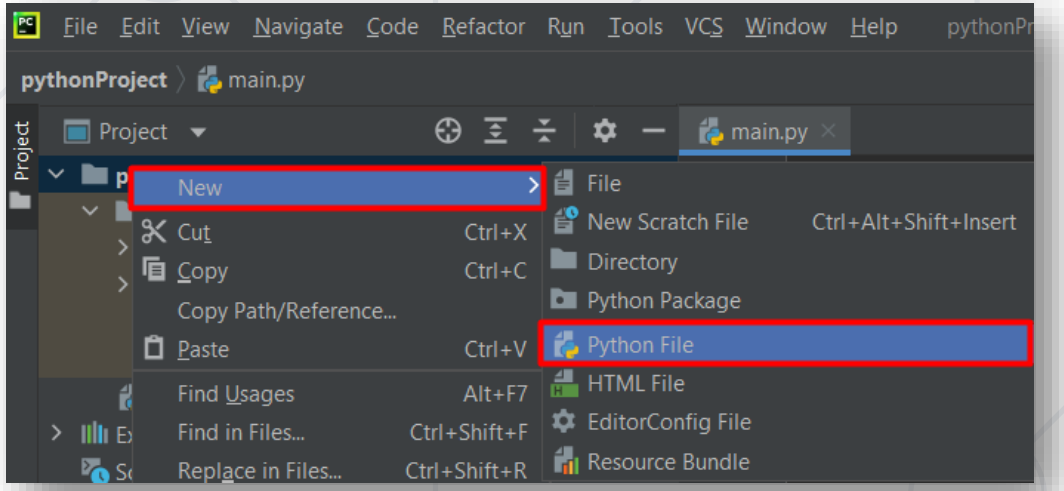
Creating a Console Program

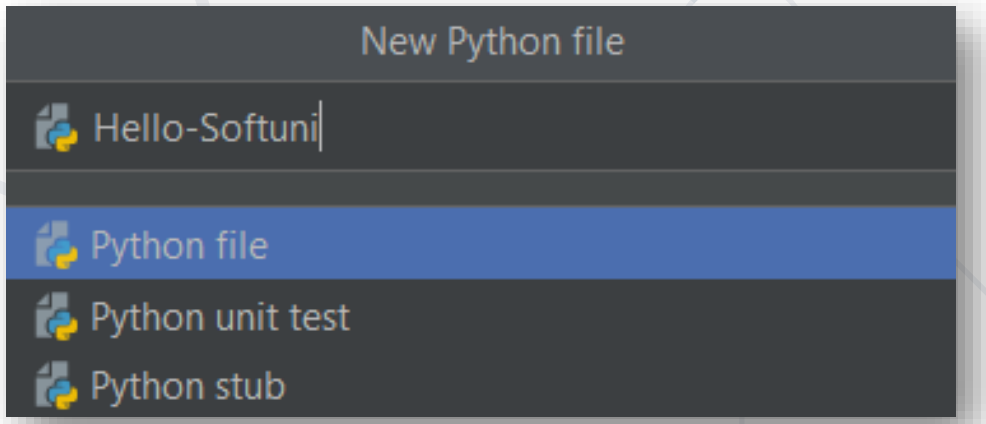
- Enter an **appropriate name for the project** and the **directory where it will be created**
- Ensure that the **Base Interpreter** is configured
- Click **Create**



Creating a Console Program

- Right click on the project folder
- Select the **New** option from the dropdown menu
- Choose the **Python File** from the dropdown menu
- Give your project an appropriate name

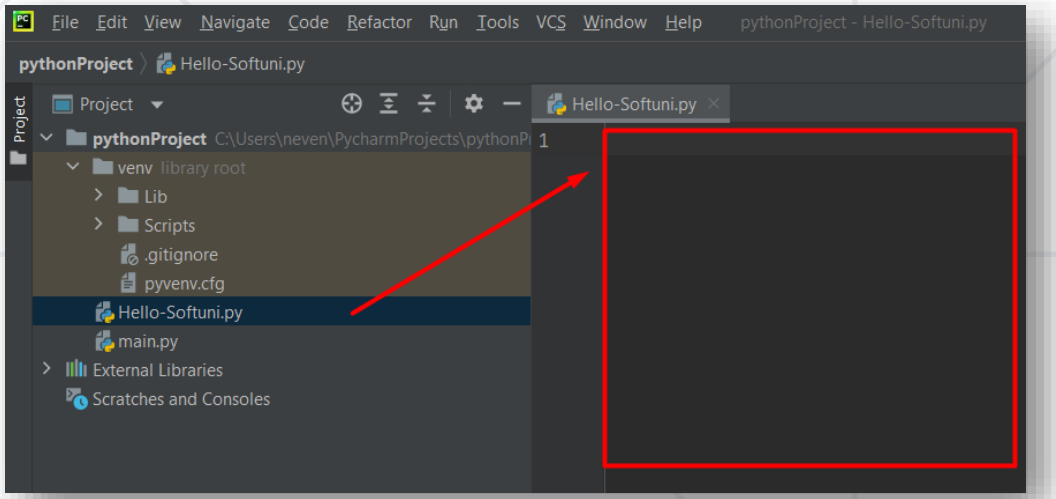


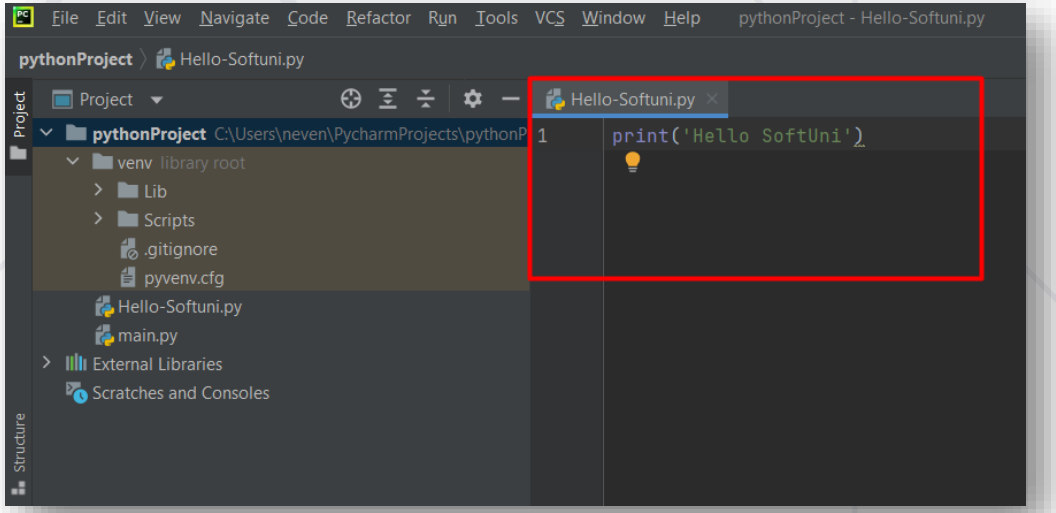


Writing a Program Code

- We will write the program code in the file "**Hello-SoftUni.py**" that we have already created
- Write the following code

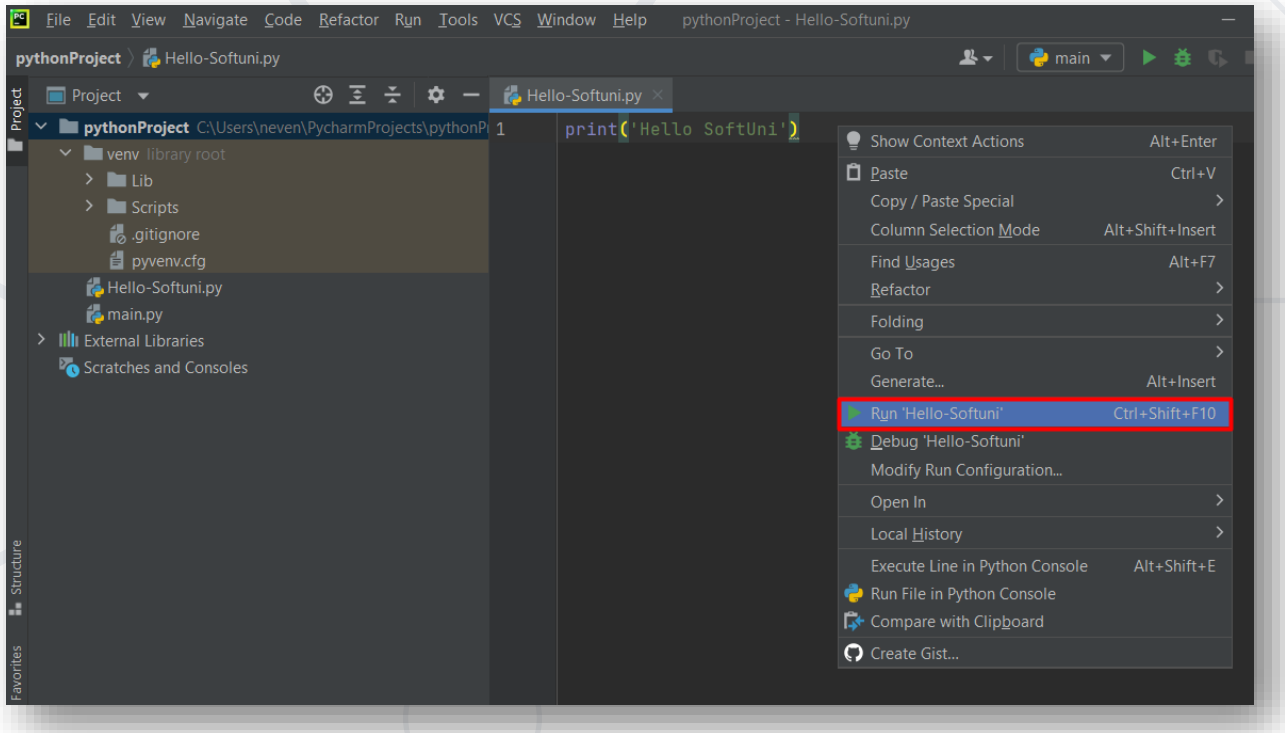
```
print('Hello SoftUni')
```





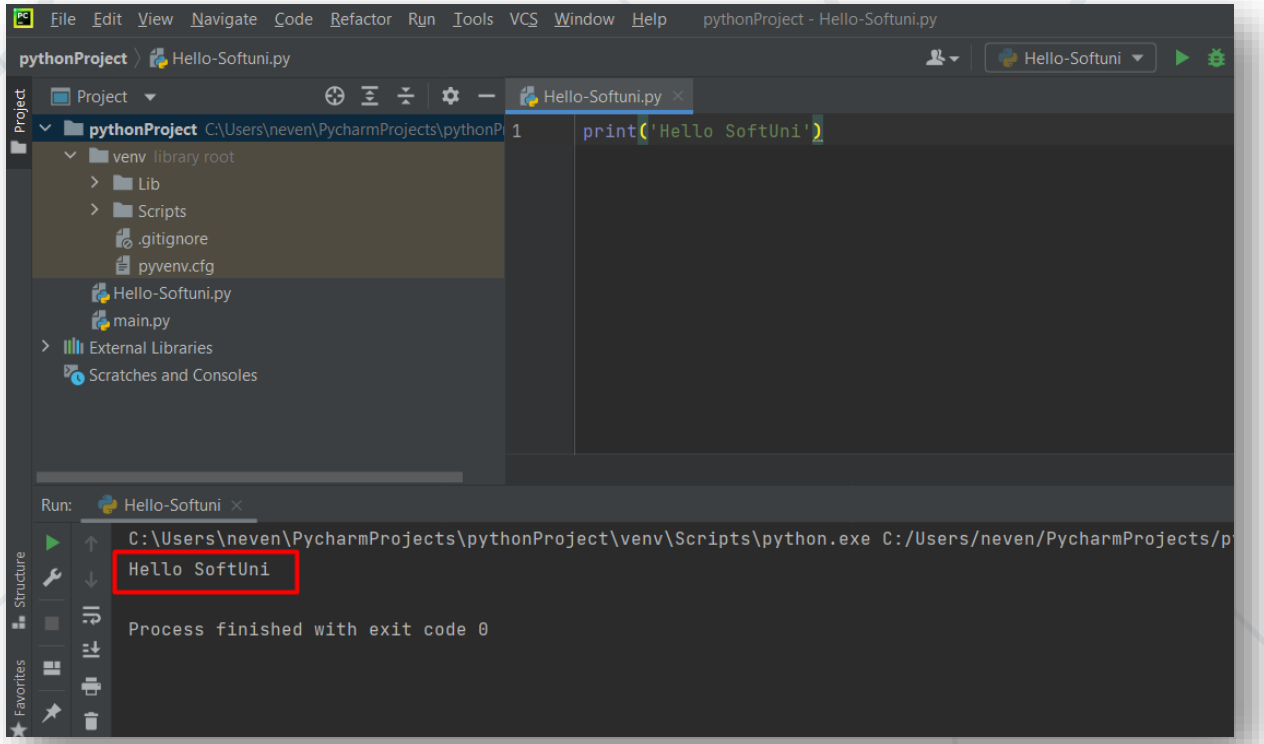
Starting the Program

- There are two ways to run the program:
  - Using the keyboard shortcut: **Ctrl + Shift + F10**
  - Right click -> **Run** (from the dropdown menu)



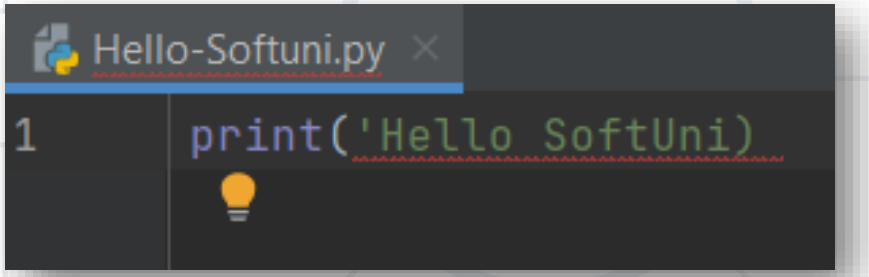
Result of Running the Program

- If there are no errors, the program will execute **successfully**
- The result will be **displayed in the console** (at the bottom)

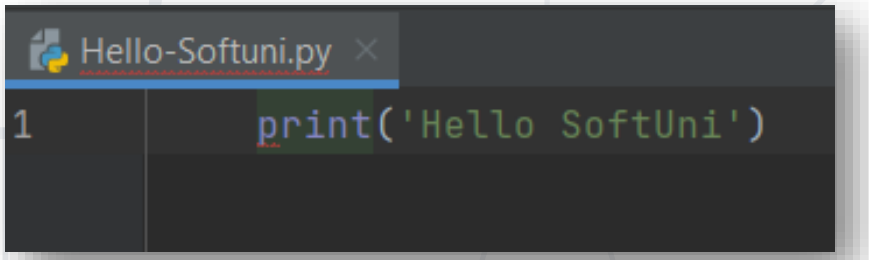


Typical Errors in Python Programs

- **Syntax errors**: missing **closing quotation marks** in parentheses



- **Indentation errors**: there is an unnecessary tabulation before the `print` statement

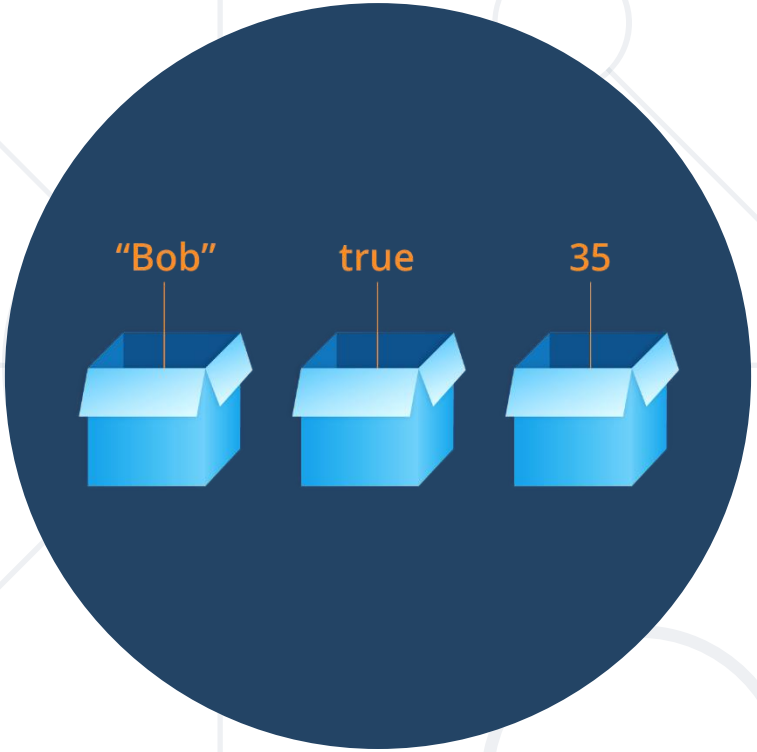


Numbers from 1 to 10

- Write a program which prints numbers from 1 to 10, each on a new row

- Solution:

```
print(1)
print(2)
print(3)
…
print(10)
```



Data Types and Variables

Data Types

- Variables store **values of a given type**
  - Number, text (string), date, color, image, list, …
- Data types - examples:
  - `int` – integer: **1**, **2**, **3**, **4**, **5**, …
  - `float` – floating-point number: **0.5**, **3.14**, **-1.5**, …
  - `str` – text (string) and symbols: **'a'**, **'Hello'**,**'Hi'**, …
- In Python, the type is determined by the value that is assigned

Examples

```
int_num = 10                                    # int value
float_num = 10.2                                # float value
a_str = 'Hello world'                           # str value
is_true = True                                  # bool value
list = [123, 'abcd', 10.2, 'd']                 # list
dict = {'name': 'Amy', 'age': 10}               # dictionary
```

Data Types are Dynamic

- Python is a **dynamic** language
- Variables are **not** directly associated with any particular value type
- Any variable can be **assigned** (and **re-assigned**) values of all types

```
variable = 42          # variable is now an int
variable = 'bar'       # variable is now a string
variable = True        # variable is now a boolean
```

Check the Type of a Variable

- The `type()` function helps you find the type of the variable

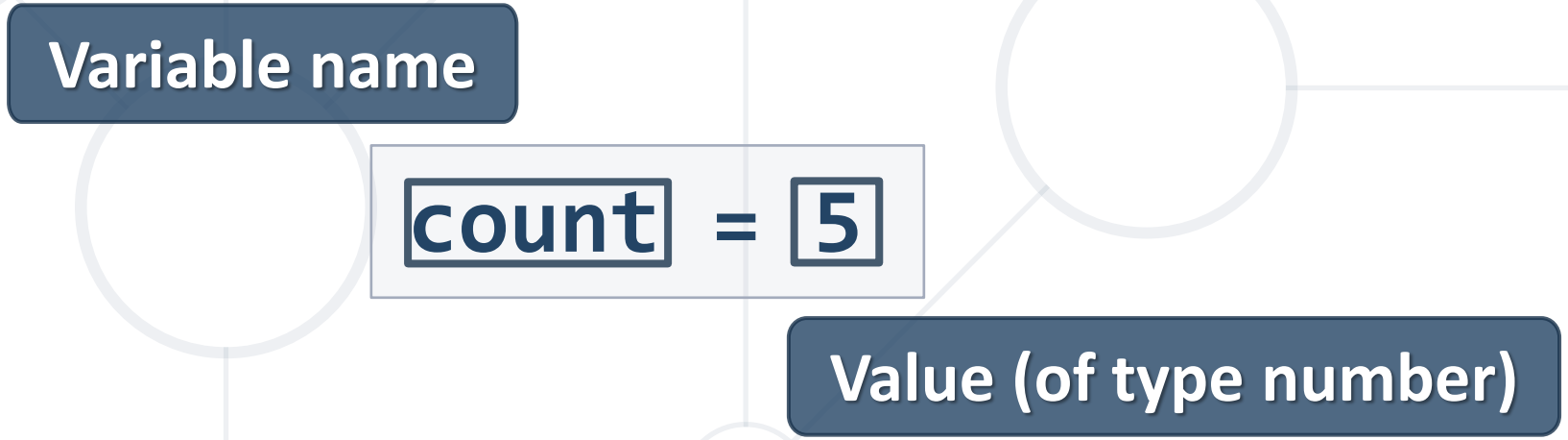
```
print(type('123'))      # <class 'str'>
print(type(123))        # <class 'int'>
print(type(123==123))   # <class 'bool'>
```

- The `isinstance()` function checks if the specified object is of the specified type

```
print(isinstance('123', str))       # True
print(isinstance(123, str))         # False
print(isinstance(123==123, bool))   # True
```

Variables

- Computers are machines that process **data**
  - Data is stored in the computer's memory in **variables**
  - Variables have a **name**, **type** and **value**
- **Defining** a variable and **assigning** a value:



Reading User Input

Working with the console

Reading Text

- Everything we **receive** from the console comes in the form of a **text**
- Everything we **print** on the console is **converted into text**
- Command from reading from the console:

```
name = input()
```

  - It returns the text entered by the user

Reading Text

A program which **reads** a name from the console and **prints it**:

```
name = input()
print(name)
```

Example input

Output

```
D:\SimpleOperationsAndCalculations
George
George

Process finished with exit code 0
```

Reading Numbers

- Reading an integer:

```
data = input()
num = int(data)
```

- Example: Calculating square area with side length a:

```
a = int(input())
area = a * a
print(area)
```

Reading an integer on a single line

Reading Numbers

- Reading a floating-point number:

```
data = input()
num = float(data)
```

- Example: Converting inches to centimeters:

```
inches = float(input())
centimeters = inches * 2.54
print(centimeters)
```

Reading a floating-point number on a single line

Simple Operations

Working with text and numbers

Concatenation of Text and Numbers

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- Concatenation of text and numbers (**operator +**):

```
first_name= 'Maria'
last_name= 'Ivanova'
age = 19
str = first_name + ' ' + last_name + ' @ ' +
str(age)
print(str)  # Maria Ivanova @ 19
```

The result is concatenation

```
a = 1.5
b = 2.5
sum = 'The sum is: ' + str(a) + str(b)
print(sum) # The sum is: 1.52.5
```

Converting a numeric value to text

Arithmetic Operations: + and –

- Addition of numbers (**operator +**):

```
a = 5
b = 7
sum = a + b    # 12
```

- Subtraction of numbers (**operator -**):

```
a = int(input())
b = int(input())
result = a - b
print(result)
```

Arithmetic Operations: * , /, //

- Multiplication of numbers (operator *):

```
a = 5
b = 7
product = a * b   # 35
```

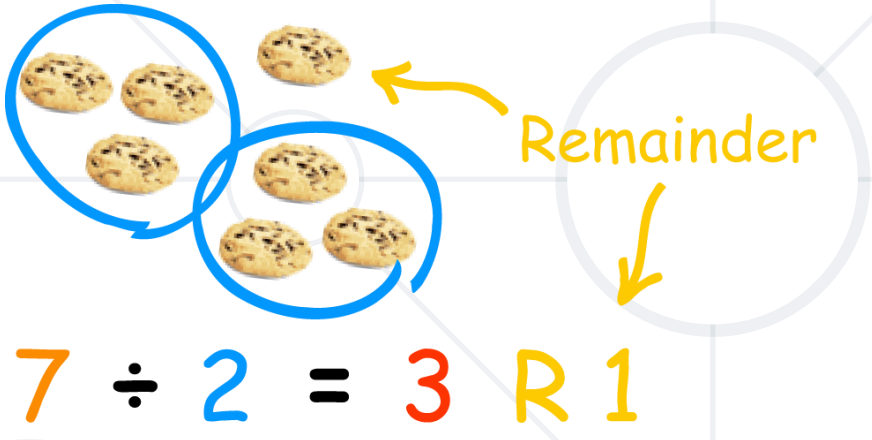
- Division of numbers (operators / and //):

```
a = 25
f = a / 4           # 6.25
i = a // 4          # 6 - integer division
error = a / 0       # Error: division by 0
```

Arithmetic Operations: %

- Module / remainder of integer division of numbers (**operator %**):

```
a = 7
b = 2
product = a % b     # 1
```




```
odd = 3 % 2       #  1 - the number 3 is odd
even = 4 % 2      #  0 - the number 4 is even
error = 3 % 0     #  Error: division by 0
```

Printing on the Console

Concatenation of Text and Numbers

- We can format the output using **interpolation**, which is indicated by the '**f**' symbol:

```
first_name = input()
last_name = input()
age = int(input())
town = input()
print(f"You are {first_name} {last_name}, a {age}-
years old person from {town}.")
```

The name of the variable is placed inside the curly braces

Loading Libraries (Import)

- Sometimes we need to use **already existing programs** to make it easier to write our own
  - To do this, we need to "load" them:

```
import The name of the library
```

  - Example:

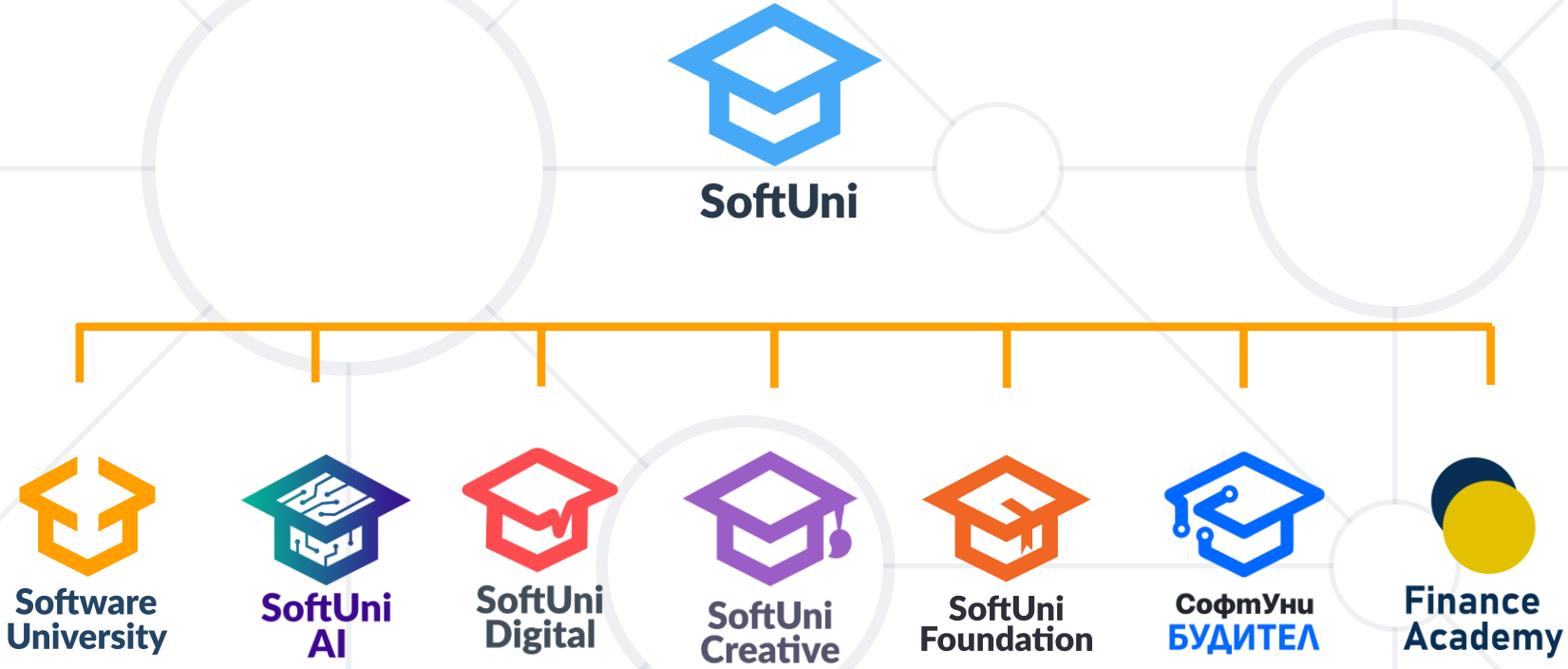
```
import math          # Loads the library named math
import sys           # Loads the library named sys
import math, sys     # Loads all the mentioned libraries
```

What did we learn today?

- A computer program is a sequence of commands
- Commands are written in .py files
- We print with **print(…)**
- Input of text and numbers
- Arithmetic operations with numbers:

  +, **-**, ***, **/**, **//**, **%**, **()**
- Printing text using a template

Questions?



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