

Tutorial 2

Exercise 1 (Boolean Logic).

Evaluate the following boolean expression **without running any code**. Write down the final result (**True** or **False**) and then verify your answer by running the code to see if you were correct.

```
result = (True or False) and (not True or False) and (True or not False) or (not (True and
↪ False) and (True or False)) and (True and False or not False)
```

Optional: Truthy and Falsy Values

Evaluate the following expression using the predefined variables. Some values in Python are considered *truthy* (treated as **True**) or *falsy* (treated as **False**) in boolean contexts. Determine each variable's boolean equivalent, calculate the final result, and then verify it by running the code.

```
A = 0
B = "hello"
C = []
D = [1, 2]
E = ""
F = -3
G = {}
```

```
result_optional = ((A and not B) or (C and not D)) and (not E or (F and G)) or (not (A or
↪ C) and (D or not F)) and (E or not G)
```

In Python, logical operators are processed in the following order:

- (i) **not** (highest priority)
- (ii) **and**
- (iii) **or** (lowest priority)

Use parentheses () to override the default order when needed.

Exercise 2 (Set Operations).

In Python, the *symmetric difference* between two sets A and B includes elements that are in either A or B , but not in both. The symmetric difference can be computed directly with `A.symmetric_difference(B)` or `A ^ B`.

Replicate this operation using the other set operations: `union (|)`, `intersection (&)`, and `difference (-)`. Use the provided sets to verify your result.

```
A = {1, 2, 3, 4}
B = {3, 4, 5, 6}

# Symmetric Difference
print(f'Symmetric Difference: {A ^ B}')
```

Exercise 3 (Password Strength Check).

A password is considered *strong* if it meets the following criteria:

- At least 8 characters long,
- Contains at least one uppercase letter,
- Contains at least one digit,
- Contains at least one special character that is not a letter or digit.

Write code to check if a given password meets these criteria, copy **Python2025** as a string into the Python shell and evaluate its strength.

Hint: use `set` and membership.

Exercise 4 (Leap Year Check).

The concept of leap years was introduced by **Julius Caesar** in 45 BCE with the **Julian calendar**, which added one extra day every four years. In 1582, the **Gregorian calendar** refined this system to correct the small yearly drift caused by the Julian rule.

A year is a leap year if it is divisible by 4, except for years divisible by 100. However, if a year is divisible by both 100 and 400, it is still a leap year. For example, 2000 was a leap year because it is divisible by 400, whereas 1900 was not.

In this exercise, we follow the modern (Gregorian) rules but allow checking back until Caesar's introduction of leap years. Years before 45 BCE should not be accepted.

- Ask the user to enter a year using `input()`.
- Apply conditional statements to determine whether the year is a leap year according to the modern rules.
- Print an appropriate message to the console depending on the result (e.g., "2024 is a leap year." or "2023 is not a leap year.").
- If the entered year is before 45 BCE, print a message indicating that such years are not valid for this check.

Exercise 5 (Secret Word - String Operations).

You have been given a long string of words without any particular order or meaning. The words together form a continuous text stored in the variable `words`.

```
words = (  
    " i a to a "  
    "people write code in school index split join slice print tests memory system "  
    "design object number string module import kernel tree proof result level order "  
    "focus topic figure work skill theory beyond "  
    "a is a note once help test yeti pro "  
)
```

Your task is to carefully follow the instructions below to transform this text step by step and extract a hidden secret word.

- Remove all whitespace and spaces from `words` and replace every occurrence of the letter 'x' with 'p'.
- Split the resulting string on the letter 'a' to obtain a list.
- From this list, take the first two and the last two elements and join them together without a separator.
- Slice the resulting string using `[-3:1:-4]` to obtain the secret word.

Exercise 6 (Visual Studio Code installation).

Install Visual Studio Code from [Visual Studio Code](#) on your computer. Then, open VS Code and install the Python extension from the Extensions view (`Ctrl + Shift + X`). Create a new Python file `hello_world.py`, write a simple "Hello World" program and run it in Visual Studio Code.

Note: Consult the [VS Code Tutorial for Python](#), if questions or problems arise. You do **not** need to create a virtual environment.

Exercise 7 (Jupyter Notebook installation).

Open VS Code and install the Jupyter extension from the Extensions view. In the terminal, run the following to install the required packages:

```
pip install jupyter
```

Create a new Jupyter Notebook `hello_world.ipynb`, write another "Hello World" program and run it in the Jupyter Notebook.

Note: Consult the [Jupyter Notebook documentation](#) or this introductory tutorial on [Real Python](#), if questions or problems arise.