# Exercise: Decorators

This document defines the exercises for the ["Python OOP" course at @Software University.](https://softuni.bg/trainings/4371/python-oop-february-2024)

Please submit your solutions (source code) to all the below-described problems in [Judge](https://judge.softuni.org/Contests/1947/Decorators-Exercise).

## Logged

Create a decorator called logged. It should **return** the name of the function that is being called and its parameters. It should also return the **result of the execution** of the function being called. See the examples for more clarification.

### Examples

|  |  |
| --- | --- |
| **Test Code** | **Output** |
| @logged  def func(\*args):  return 3 + len(args)  print(func(4, 4, 4)) | you called func(4, 4, 4)  it returned 6 |
| @logged  def sum\_func(a, b):  return a + b  print(sum\_func(1, 4)) | you called sum\_func(1, 4)  it returned 5 |

### Hints

* Use {func}.\_\_name\_\_ to get the name of the function
* Call the function to get the result
* Return the result

## Even Parameters

Create a decorator function called **even\_parameters**. It should check if **all parameters** passed to a function are **even numbers** and only then **execute** the function and **return** the result. Otherwise, **don't execute** the function and return **"Please use only even numbers!"**

### Examples

|  |  |
| --- | --- |
| **Test Code** | **Output** |
| @even\_parameters  def add(a, b):  return a + b  print(add(2, 4))  print(add("Peter", 1)) | 6  Please use only even numbers! |
| @even\_parameters  def multiply(\*nums):  result = 1  for num in nums:  result \*= num  return result  print(multiply(2, 4, 6, 8))  print(multiply(2, 4, 9, 8)) | 384  Please use only even numbers! |

## Bold, Italic, Underline

Create **three decorators**: **make\_bold**, **make\_italic**, and **make\_underline**, which will have to **wrap** a **text** returned from a function in **<b></b>**, **<i></i>** and **<u></u>** **respectively**.

### Examples

|  |  |
| --- | --- |
| **Test Code** | **Output** |
| @make\_bold  @make\_italic  @make\_underline  def greet(name):  return f"Hello, {name}"  print(greet("Peter")) | <b><i><u>Hello, Peter</u></i></b> |
| @make\_bold  @make\_italic  @make\_underline  def greet\_all(\*args):  return f"Hello, {', '.join(args)}"  print(greet\_all("Peter", "George")) | <b><i><u>Hello, Peter, George</u></i></b> |

***Note: Submit all the decorator functions in the judge system***

## Type Check

Create a decorator called type\_check. It should receive a type (int**/**float**/**str**/…**), and it should check if the parameter passed to the decorated function is of the **type** given to the decorator. If it is, **execute** the function and **return the result**, otherwise **return "**Bad Type**"**.

### Examples

|  |  |
| --- | --- |
| **Test Code** | **Output** |
| @type\_check(int)  def times2(num):  return num\*2  print(times2(2))  print(times2('Not A Number')) | 4  Bad Type |
| @type\_check(str)  def first\_letter(word):  return word[0]  print(first\_letter('Hello World'))  print(first\_letter(['Not', 'A', 'String'])) | H  Bad Type |

## Cache

Create a decorator called cache. It should store all the returned values of the **recursive function** fibonacci. You are provided with this code:

**def** cache(func):

*#* ***TODO: Implement***

@cache

**def** fibonacci(n):

**if** n < 2:

**return** n

**else**:

**return** fibonacci(n-1) + fibonacci(n-2)

You need to create a **dictionary** called log that will store all the **n**'s (**keys**) and the **returned results** (**values**) and **attach** that dictionary to the fibonacci function as a variable called **log**, so when you call it, it returns that dictionary. For more clarification, see the examples

### Examples

|  |  |
| --- | --- |
| **Test Code** | **Output** |
| fibonacci(3)  print(fibonacci.log) | {1: 1, 0: 0, 2: 1, 3: 2} |
| fibonacci(4)  print(fibonacci.log) | {1: 1, 0: 0, 2: 1, 3: 2, 4: 3} |

## HTML Tags

Create a decorator called tags. It should receive an HTML tag as a parameter, **wrap** the result of a function with the given tag, and **return the new result**. For more clarification, see the examples below

### Examples

|  |  |
| --- | --- |
| **Test Code** | **Output** |
| @tags('p')  def join\_strings(\*args):  return "".join(args)  print(join\_strings("Hello", " you!")) | <p>Hello you!</p> |
| @tags('h1')  def to\_upper(text):  return text.upper()  print(to\_upper('hello')) | <h1>HELLO</h1> |

## \*Store Results

Create a **class** called **store\_results**. It should be used as a **decorator** and **store information** about the executed functions in a **file** called **results.txt** in the format: **"Function {func\_name} was called. Result: {func\_result}"**

***Note: The solutions to this problem cannot be submitted in the judge system***

### Examples

|  |  |
| --- | --- |
| **Test Code** | **results.txt** |
| @store\_results  def add(a, b):  return a + b  @store\_results  def mult(a, b):  return a \* b  add(2, 2)  mult(6, 4) | Function 'add' was called. Result: 4  Function 'mult' was called. Result: 24 |

## Execution Time

Import the **time** module. Create a decorator called exec\_time. It should calculate how much **time** a function needs to be **executed**. See the examples for more clarification.

***Note: You might have different results from the given ones. The solutions to this problem cannot be submitted in the judge system.***

### Examples

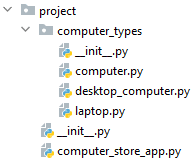
|  |  |
| --- | --- |
| **Test Code** | **Output** |
| @exec\_time  def loop(start, end):  total = 0  for x in range(start, end):  total += x  return total  print(loop(1, 10000000)) | 0.8342537879943848 |
| @exec\_time  def concatenate(strings):  result = ""  for string in strings:  result += string  return result  print(concatenate(["a" for i in range(1000000)])) | 0.14537858963012695 |
| @exec\_time  def loop():  count = 0  for i in range(1, 9999999):  count += 1  print(loop()) | 0.4199554920196533 |

### Hints

* Use the time library to start a timer
* Execute the function
* Stop the timer and return the result

## \*9. Computer Store

For this task, you will be provided with a **skeleton** that includes all the folders and files you need.



***Note: You cannot change the folder and file structure and their names!***

### Judge Upload

Create a **zip** file with the **project** **folder** and **upload it** to the judge system.

You do not need to include **in the zip file** your **venv**, **.idea**, **pycache**, and **\_\_MACOSX** (for Mac users), so you do not exceed **the maximum allowed size** of **16.00 KB**.

### Description

Your friend is the owner of one of the best computer stores in the world. Recently he started building computers, and he asked you as a programmer to create a program for his store so that he can track the computer's building process and the sale process. Your app should have the following structure and functionality.

### 1. Class Computer

In the **computer.py** file, the class **Computer** should be implemented. It is a **base class** for any **type of computer,** and it **should not be able to be instantiated**.

#### Structure

The class should have the following attributes:

* **manufacturer: str**
* A string that represents the **manufacturer's name**.
* If the string is **empty or contains only whitespaces**, raise **ValueError** with the message: **"Manufacturer name cannot be empty."**
* **model: str**
* A string that represents the **computer's model name**.
* If the string is **empty or contains only whitespaces**, raise **ValueError** with the message: **"Model name cannot be empty."**
* **processor: str**
* A string that represents the **computer's processor**.
* Should be **set to** **None** upon initialization
* **ram: int**
* An integer that represents the **computer's RAM memory**.
* Should be **set to** **None** upon initialization
* **price: int**
* An integer that represents the **computer's price**.
* Should be **set to** **0** upon initialization

#### Methods

#### \_\_init\_\_(manufacturer: str, model: str)

* In the **\_\_init\_\_** method, all the needed attributes must be set.

#### configure\_computer(processor: str, ram,: int)

* Every type of computer **should be configurable**
* Valid types: **"Laptop", "Desktop Computer"**

#### \_\_repr\_\_()

* Representsts the class as: **"{ manufacturer } { model } with { processor } and { ram }GB RAM"**

### 2. Class DesktopComputer

In the **desktop\_computer.py** file, the class **DesktopComputer** should be implemented.

#### Methods

#### \_\_init\_\_(manufacturer: str, model: str)

* In the **\_\_init\_\_** method, all the needed attributes must be set.

#### configure\_computer(processor: str, ram,: int)

* Desktop computers can be built only with the available processors for desktop computers, which are:
  + **AMD Ryzen 7 5700G: 500$**
  + **Intel Core i5-12600K: 600$**
  + **Apple M1 Max: 1800$**
* Desktop computers can have a **max RAM of 128GB**
  + Valid RAM sizes are 2, 4, 8…128. In other words, all the **powers of the number 2 to the max size**.
  + RAM **price is defined by** **the power of the number 2, which gives the RAM size, multiplied by 100**.

***For example: 2GB RAM will cost 100$ because 2 = 21  and 1 \* 100 = 100. 4GB will be 200$.***

* If a processor is **not in the available processors**, raise **ValueError** with the message: **"{ processor } is not compatible with desktop computer { manufacturer name } { model name }!"**
* If **RAM is not a valid size or is above the max size**, raise **ValueError** with the message: **"{ RAM }GB RAM is not compatible with desktop computer { manufacturer name } { model name }!"**
* If **everything is valid**, attach the processor to the computer, attach the RAM, and update the price. Return the following message: **"Created { manufacturer name } { model name } with { processor } and { ram }GB RAM for { computer price }$."**

### 3. Class Laptop

In the **laptop.py** file, the class **Laptop** should be implemented.

#### Methods

#### \_\_init\_\_(manufacturer: str, model: str)

* In the **\_\_init\_\_** method, all the needed attributes must be set.

#### configure\_computer(processor: str, ram: int)

* Laptops can be built only with the available processors for laptops, which are:
  + **AMD Ryzen 9 5950X: 900$**
  + **Intel Core i9-11900H: 1050$**
  + **Apple M1 Pro: 1200$**
* Laptops can have a **max RAM of 64GB**
  + Valid RAM sizes are 2, 4, 8…64. In other words, all the **powers of the number 2 to the max size**.
  + RAM **price is defined by** **the power of the number 2, which gives the RAM size, multiplied by 100**.

***For example: 2GB RAM will cost 100$ because 2 = 21  and 1 \* 100 = 100. 4GB will be 200$.***

* If a processor is **not in the available processors**, raise **ValueError** with the message: **"{ processor } is not compatible with laptop { manufacturer name } { model name }!"**
* If **RAM is not a valid size or is above the max size**, raise **ValueError** with the message: **"{ RAM }GB RAM is not compatible with laptop { manufacturer name } { model name }!"**
* If **everything is valid**, attach the processor to the computer, attach the RAM, and update the price. Return the following message: **"Created { manufacturer name } { model name } with { processor } and { ram }GB RAM for { computer price }$."**

### 4. Class ComputerStoreApp

In the **computer\_store\_app.py** file, the class **ComputerStoreApp** should be implemented. It will contain all the functionality of the project.

#### Structure

The class should have the following attributes:

* **warehouse: list**
* A list that will **store the built computers**.
* Should be **empty** upon initialization
* **profits: int**
* An integer that represents the **store profits**.
* Should be **set to** **0** on initialization

#### Methods

#### \_\_init\_\_()

* In the **\_\_init\_\_** method, all the needed attributes must be set.

#### build\_computer(type\_computer: str, manufacturer: str, model: str, processor: str, ram: int)

* Valid types of computers are: **"Desktop Computer", "Laptop"**
* If a **computer type isn't valid**, raise **ValueError** with the message: **"{ type computer } is not a valid type computer!"**
* Otherwise, configure the computer, add it to the warehouse, and return the result from the configuration.

#### sell\_computer(client\_budget: int, wanted\_processor: str, wanted\_ram: int)

* **Search for a computer** in the warehouse. To sell a computer, it has to meet the following criteria:
  + The computer's price is **less than or equal to** the client's budget.
  + The computer has the **same processors** as the one requested by the client.
  + The computer's RAM is **more or equal to** the one requested by the client.
* If you **can't find a computer to sell**, raise an **Exception** with the message: **"Sorry, we don't have a computer for you."**
* If you **find a computer** that meets the criteria, **sell it** at the **client's budget price**, **add the difference between the sale price and the build price** to the store **profits**, and return the following message: **"{ computer } sold for { client budget }$."**

## Examples

|  |
| --- |
| **Input** |
| from project.computer\_store\_app import ComputerStoreApp  computer\_store = ComputerStoreApp()  print(computer\_store.build\_computer("Laptop", "Apple", "Macbook", "Apple M1 Pro", 64))  print(computer\_store.sell\_computer(10000, "Apple M1 Pro", 32)) |
| **Output** |
| Created Apple Macbook with Apple M1 Pro and 64GB RAM for 1800$.  Apple Macbook with Apple M1 Pro and 64GB RAM sold for 10000$. |

*"Hey man, where are the SSDs?"*