【2023 Object-Oriented Programming Homework 3】

1. Please use **Python language** for this homework and make sure it can run correctly.
2. Please provide **ipynb files** to validate your homework.
3. Do not copy the others work definitely. Otherwise, you will fail this class.
4. If you have any question, please send email to TA or drop by Room EC5018. However, TA will not help you to debug program.

Turn in your homework:

1. Please compress your homework into zip file.
2. Naming rule: “OOP_HW3.zip”.
3. Upload your homework (zip file) to NSYSU Cyber University (網路大學).
4. **Deadline: 2023/03/17 09:00.** You can not get any credit if you do not turn in your homework before the deadline.

Homework description:

1. Write a program that allows user to enter parameter and you need to create a function named **is_ palindrome()** to check the parameter whether the input is a palindrome. The program should interact with the user as follows:

```
Enter the word or integer> 121
The answer of 121 is a palindrome.

Enter the word or integer>madam
The answer of madam is a palindrome.

Enter the word or integer> Anns
The answer of Anns is not a palindrome.
```

2. The Fibonacci numbers are sequence of integer sequences (0,1, 1, 2, 3, 5, 8, 13, 21, 34…….).Write a program that allows user to enter the integer N (must larger than three), you need to create a function named **Fibonacci()** to Find the Nth number of a sequence of integers and print out the answer. The program should interact with the user as follows:
(Note: $F_0=0$, $F_1=1$, $F_n= F_{n-1}+F_{n-2}$ $(n\geq 2)$)

```
Enter the integer(must >3 ) > 9
The answer is: 34

Enter the integer(must >3 ) > 11
The answer is: 89
```

3. Write a program that requests a positive integer larger than 1 as input and print out the largest and smallest prime factors of the number. You need to write function named **prime()** to finish this homework. The program should interact with the user as follows:

```
Enter the integer (must larger than 1) > 2345
Largest prime factor: 67
Smallest prime factor: 5
```

4. Write a program to allows user to enter the text, and you should create the function named **most_common_character().** Find the character that appears the most times in the input text and print out the times. The program should interact with the user as follows:

```
Enter the word> hello world
The most character and times is : ['l',3]
```

```
Enter the word> aabbccdd
The most character and times are :[['a',2], ['b',2],[ 'c',2], ['d',2]]
```

5. Enter some numbers separated by spaces, then you need to create function named **merge_sort()** and **bubble_sort()** to sort the input number. Final, you should list the time spent in the sort function. The program should interact with the user as follows:

   (* Note: The time may not be the same as the example)

   ```
   Enter the numbers> 5 2 9 1 5 6
   The answer of merge sort is: [1,2,5,5,6,9], time is: 0.00017s
   The answer of bubble sort is: [1,2,5,5,6,9], time is: 0.0002s
   ```