

# Programming Session Assignment 03

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## 1. Required files

You need to submit a .zip file named **PSA03\_b07901xxx.zip** (your student ID) that contains the following files:

PSA03\_p1.cpp

PSA03\_p2.cpp

PSA03\_p3.cpp

Please upload the .zip file to the CEIBA website by the deadline. **Do not submit any executable files (.exe)**. Files with names in wrong format will not be graded.

**Due date: 10/19 03:00**

## 2. Problem Description

### (1) [Approximation of $\pi$ ][Required File: PSA03\_p1.cpp][20pts]

According to Leibniz formula, we can calculate the value of  $\pi$  from the infinite series:

$$\pi = 4 - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \frac{4}{9} - \frac{4}{11} \dots$$

Print a table that shows the approximate value of  $\pi$  for the first **500** terms of this series. Each column should be separated by a tab. The output value of each term should accurate to the fifth digit after the decimal point(輸出至小數點後第五位).

Term	Value of Pi
1	4.00000
2	2.66667
3	3.46667
4	2.89524
5	3.33968
6	2.97605
7	3.28374
8	3.01707
9	3.25237
10	3.04184
11	3.23232
12	3.05840

### (2) [Fibonacci][Required File: PSA03\_p2.cpp][40pts]

In mathematics, the **Fibonacci numbers** or **Fibonacci sequence** are the numbers in the following integer sequence:

1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, ...

By definition, the first two numbers in the Fibonacci sequence are 1 and 1, and each subsequent number is the sum of the previous two. Please write a program that ask an integer  $n$  ( $1 \leq n \leq 40$ ) and output the first  $n$  elements of the Fibonacci sequence. **You have to handle input error in this problem (15pts)**. If the input is not an integer or out of the range  $[1, 40]$ , you should reject it and ask for a new input. [Hint] You can use `char a[2]` to read and check the input, and then convert it to integer type if the input is correct.

```
n = 0
Illegal input! Please enter an integer in the range [1, 40].
n = 41
Illegal input! Please enter an integer in the range [1, 40].
n = 123
Illegal input! Please enter an integer in the range [1, 40].
n = -5
Illegal input! Please enter an integer in the range [1, 40].
n = 30.5
Illegal input! Please enter an integer in the range [1, 40].
n = //
Illegal input! Please enter an integer in the range [1, 40].
n = ab
Illegal input! Please enter an integer in the range [1, 40].
n = 15
The first 15 elements of the Fibonacci sequence are:
1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, 610
```

### (3) [Matrix Rotation][Required File: PSA03\_p3.cpp][40pts]

In this problem, you have to rotate an  $n \times n$  square matrix clockwise with angle =  $90^\circ$ ,  $180^\circ$  and  $270^\circ$ . Please write a program that ask an integer  $n$  ( $1 \leq n \leq 5$ ) first, and then read the  $n \times n$  matrix. Rotate the matrix and output the rotation result. You don't need to handle input error in this problem.

```
n = 3
1 2 3
4 5 6
7 8 9
Angle = 90°:
7 4 1
8 5 2
9 6 3
Angle = 180°:
9 8 7
6 5 4
3 2 1
Angle = 270°:
3 6 9
2 5 8
1 4 7
```

Input

Output