計算機概論與程式設計
LAB3

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Lab3

- Factorial
- Floyd’s Triangle
- Calculator
- Pyramid (bonus)

Nested Loop

```c
#include <stdio.h>

int main()
{
    printf("[i, j]\n");
    for (int i = 0; i < 3; i++)
    {
        for (int j = 0; j < 4; j++)
        {
            printf("[%d, %d] ", i, j);
        }
        printf("\n");
    }
}
```

```
[i, j]
[0, 0] [0, 1] [0, 2] [0, 3]
[1, 0] [1, 1] [1, 2] [1, 3]
[2, 0] [2, 1] [2, 2] [2, 3]
```

Nested Loop

```c
#include <stdio.h>

int main()
{
    for (int i = 0; i <= 4; i++)
    {
        for (int j = 0; j <= i; j++)
        {
            printf("*");
        }
        printf("\n");
    }
}
```

```
*
**
***
****
*****
```

Question 1 : Factorial (40%)

- TA will randomly input an integer X.
- X ranges = [10, 15].
- The output format should be correct.
- 5! = 1 * 2 * 3 * 4 * 5 = 120
- 6! = 1 * 2 * 3 * 4 * 5 * 6 = 720
- Test Case :

input

```
Input a number : 10
1 * 2 * 3 * 4 * 5 * 6 * 7 * 8 * 9 * 10 = 3628800
```

input

```
Input a number : 15
1 * 2 * 3 * 4 * 5 * 6 * 7 * 8 * 9 * 10 * 11 * 12 * 13 * 14 * 15 = 1307674368000
```

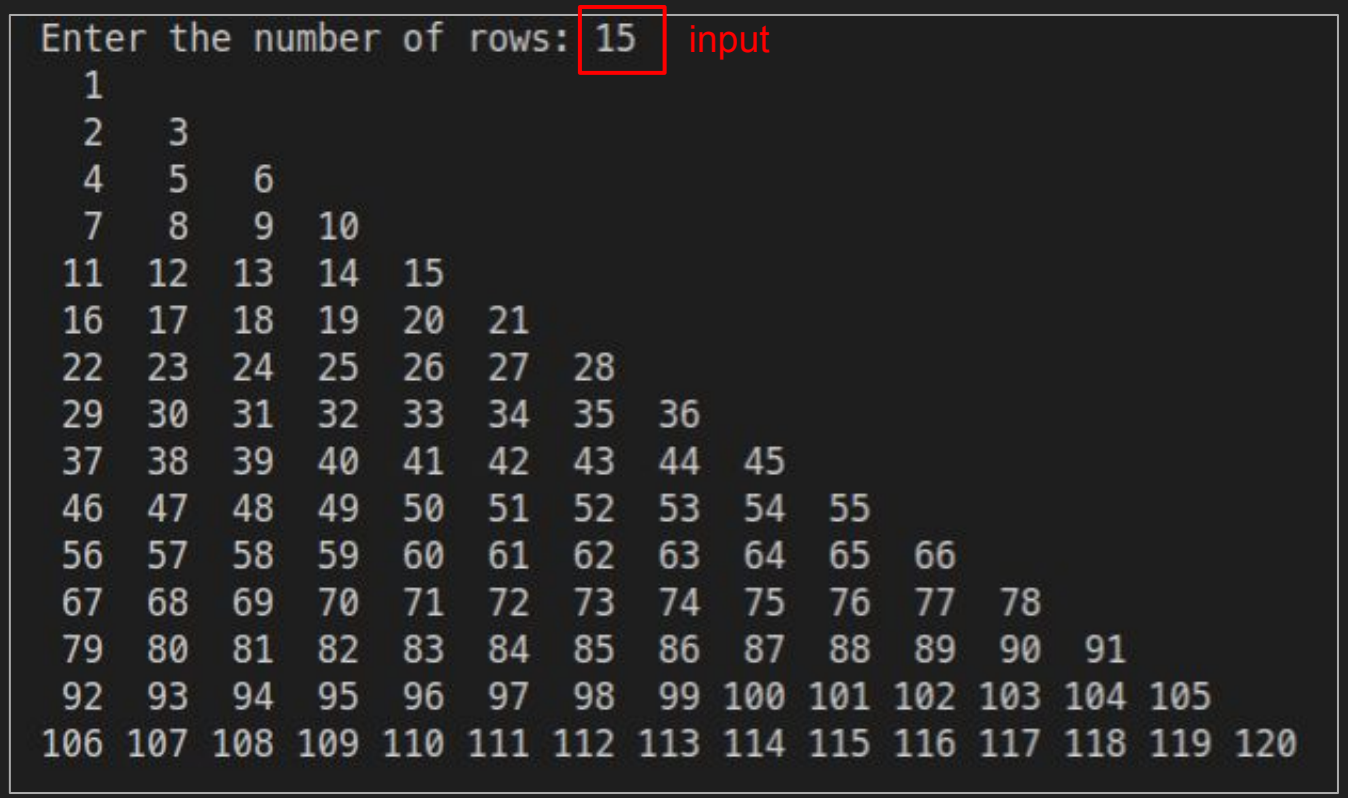
Question 2 : Floyd's Triangle (30%)

- TA will randomly input an integer X.
- X ranges = [10, 15].
- Print x rows of Floyd's triangle.
- Each number should be aligned.
- [Hint] page.4

input

```
Enter the number of rows: 12
 1
 2  3
 4  5  6
 7  8  9 10
11 12 13 14 15
16 17 18 19 20 21
22 23 24 25 26 27 28
29 30 31 32 33 34 35 36
37 38 39 40 41 42 43 44 45
46 47 48 49 50 51 52 53 54 55
56 57 58 59 60 61 62 63 64 65 66
67 68 69 70 71 72 73 74 75 76 77 78
```

Question 2 : Floyd's Triangle (30%)



Question 3 : Calculator (30%)

- Implement two calculators about **(1) long long int (2) unsigned int.**
- The calculator contains “+” and “-”.
- Each calculator keeps computing until the input is “0/0”.
- [Hint]
  - Use **correct format**, while or loop.

Question 3 : Calculator (30%)

- Test Cases:

```
Long int calculator
Expression:9223372036854775807 + 1
-9223372036854775808
Expression:9223372036854775807 + 2
-9223372036854775807
Expression:-9223372036854775808 - 1
9223372036854775807
Expression:-9223372036854775808 - 2
9223372036854775806
Expression:0/0
```

input

output

```
Unsigned int calculator
Expression:4294967295 + 1
0
Expression:4294967295 + 2
1
Expression:0 - 1
4294967295
Expression:0 -2
4294967294
Expression:0/0
```

input

output

Bonus : Pyramid (20%)

- TA will randomly input an integer **X**.
- **X** ranges = [10, 15].
- Print pyramid star pattern(*) with X rows.
- There are (2*i - 1) stars in row i.
  - 1st row, 1 star
  - 2nd row, 3 stars
  - …
- [Hint]

```
for(){
    // space
    for(){
        ...
    }
    // star
    for(){
        ...
    }
}
```

input

```
Input pyramid's row = 15
              *
             ***
            *****
           *******
          *********
         ***********
        *************
       ***************
      *****************
     *******************
    *********************
   ***********************
  *************************
 ***************************
*****************************
```

Bonus : Pyramid (20%)

input

Grading

- Question1 : Factorial 40%
- Question2 : Floyd’s Triangle 30%
- Question3 : Calculator 30%
- Bonus : Pyramid 20%
- Total 120%

Requirements

- Write **a** program that can answer 3 questions.
- Test case for each question is random.
- Your program should keep running until answering 3 questions.
- Use **For** or **While** in 3 questions.
- Upload your code with file name LAB3_<StudentID>.c/.cpp to E3.