# Programming Session Assignment 03
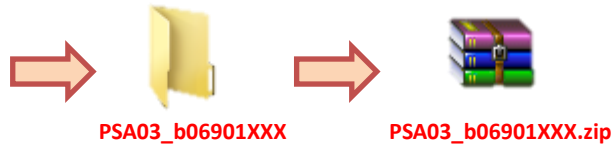
## REQUIRED FILES

Please **compress a folder** named **PSA03_b06901XXX** (student ID) that contains the following files:

- ✓ b06901XXX _p1.cpp
- ✓ b06901XXX _p2.cpp
- ✓ b06901XXX _p3.cpp
- ✓ b06901XXX _p4.cpp

PSA03_b06901XXX　　　　PSA03_b06901XXX.zip

**Do not submit executable files (.exe).** Files with names in wrong format will not be graded. In your .cpp files, we suggest you write comments in detail as much as you can. It will be good for the TAs to read your code and your future reference and maintaining. ( Due date: 10/18 06:00 )

## PROBLEM DESCRIPTION

1. Design a program so that you can input a number with type "double" and output Ans1~Ans5 derived from following formulas. Then show the result whether Ans5 is greater than 0 or not. (Note: use only one variable in the program and use conditional operator for the result, and then show all values up to the third digit after the decimal point)

   Formulas:

   $$Ans1 = number + \lceil number \rceil$$
   $$Ans2 = Ans1 - \lfloor Ans1 \rfloor$$
   $$Ans3 = Ans2 \div \log_3(Ans2)$$
   $$Ans4 = Ans3 + 1$$
   $$Ans5 = Ans4 \times e^{Ans4}$$

   Format:

   ```
   Please input a number: 123.123456
   Ans1 = 247.123
   Ans2 = 0.123
   Ans3 = -0.065
   Ans4 = 0.935
   Ans5 = 2.382
   Result:2.382
   ```

   Result:

   $$Result = \begin{cases} Ans5, & Ans5 > 0 \\ 0, & Ans5 \leq 0 \end{cases}$$

2. The Adder is the digital circuit that performs addition of numbers. There are two type of adders:
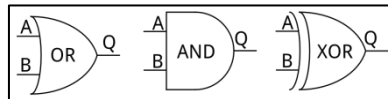
(1) Half-adder: The half adder accepts two binary digital (A and B) on its inputs and produce two binary digitals outputs, including a sum bit (S) and a carry bit (C).
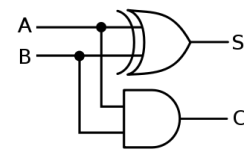


(2) Full-adder : The full adder accepts two inputs bits (A and B) and an input carry bit (Cin), then generates a sum bit (S) and as carry bit (Cout).
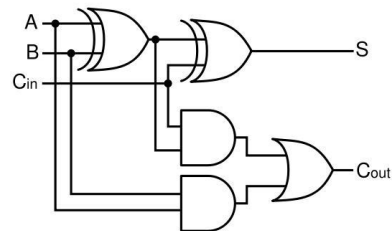


Hint:



(a) Please design a half-adder that input A and B, then show S and C.

(b) Please design a full-adder that input A, B and Cin, then show S and Cout.

Format:

```
Please input A,B for halfadder:
A = 0 or 1
B = 0 or 1
Half adder output:
S = 0 or 1
C = 0 or 1
Please input A,B,Ci for fulladder:
A = 0 or 1
B = 0 or 1
Ci= 0 or 1
Full adder output:
S = 0 or 1
Co= 0 or 1
```

3. Design a program that distinguishes the score (0 ~ 100) with type "int16_t" that you input as follows, and then outputs the level and the comment as the following format. (Note: use switch)

| Level | Score range | Comment |
|-------|-------------|---------|
| 10 | 100 | Awesome \OoO/ |
| 9 | 90 - 99 | Great \^o^/ |
| 8 | 80 - 89 | Good ^o^ |
| 7 | 70 - 79 | Not bad ^_^ |
| 6 | 60 - 69 | Do your best *o* |
| 5 | 50 - 59 | Never give up *_* |
| <5 | < 50 | God bless you...Orz |

Format:

```
Please input a score(0~100):55
Level: 5
Never give up *_*
```

4. Design a program so that you can input 3 lengths of sides of a triangle with floating data type then show its area up to the fifth digit after the decimal point. (Note: use if-else)

Format:

```
Please input 3 lengths of the sides of a triangle:
a = 234.678
b = 250
c = 94.87
The area of the triangle is: 11124.99023
```

```
Please input 3 lengths of the sides of a triangle:
a = 234.678
b = 259
c = 20.6
The lengths of the sides cannot be a triangle!
```

Hint: (Heron's formula) $\text{area} = \sqrt{s(s-a)(s-b)(s-c)}$, where $s = \frac{a+b+c}{2}$