Homework 1: Math operations

- Write a program that reads 2 numbers and **print** their + - * / as following
  - For inputs 12 and 3
- Do good testing for your code
  - E.g. consider zero as first or 2nd number
  - E.g. consider negative values
  - E.g. even and odd values
  - E.g. try the MAX of int: 2147483647

```
12 3
12 + 3 = 15
12 - 3 = 9
12 / 3 = 4
12 * 3 = 36
```

```cpp
#include <iostream>

using namespace std;

int main() {

    int x,y ;
    cout << " Enter two numbers : " ;
    cin >> x >> y ;
    cout << x << "+" << y << "=" << x+y << endl ;
    cout << x << "-" << y << "=" << x-y << endl ;
    cout << x << "*" << y << "=" << x*y << endl ;
    cout << x << "/" << y << "=" << x/y << endl ;

    return 0;
}
```

Homework 2: Students grades

- A teacher want a program that reads 2 students information about math exam
  - Read per student: name, id and grade
  - Then print them. See the picture
- Be a good software engineer
  - Think deeply in your selected data types
  - The teacher gives us this dialogue to guide us
  - Be careful from your assumptions?
    - Is exam's grade an integer?

```
What is student 1 name: mostafa
His id: 111
His math exam grade: 20
What is student 2 name: ALI
His id: 555
His math exam grade: 30

Students grades in math
mostafa (with id 111) got grade: 20
ALI (with id 555) got grade: 30
Average grade is 25
```

```cpp
#include <iostream>
using namespace std;

int main() {

   string name1 , name2 ;
   int Id1 , Id2 ;
   double grade1 , grade2 ;

   cout << " What is student 1 name ? "<<endl;
   cin >> name1;

   cout << " What is the student Id ? "<<endl;
   cin >> Id1;

   cout << " What is  the student Math grade ? "<<endl;
   cin >> grade1;

   cout << " What is student 2 name ? "<<endl;
   cin >> name2;

   cout << " What is student 2 name ? "<<endl;
   cin >> name2;

   cout << " What is the student Id ? "<<endl;
   cin >> Id2;
```

```
   cout << " What is  the student Math grade ? "<<endl;
   cin >> grade2;

   double average = ( grade1 + grade2 )/2;

   cout << "Students Grades in Math \n ";
   cout << name1 << " (with id " << Id1 << ") got grade: " << grade1 << endl;
   cout << name2 << " (with id " << Id2 << ") got grade: " << grade2 << endl;
   cout << "Average grade is " << average << endl;

    return 0;
}
```

Homework 3: Even and Odd sum

Problem Statement: Given 8 space-separated integers, find the sum of those in even places and the sum of those in odd places.

Note: Even place means the 2nd, 4th, 6th or 8th numbers, while odd places are the 1st, 3rd, 5th and 7th numbers.

Example Input:

```
11 2 7 9 12 -8 3 -1
```

Example Output:

```
2 33
```

Example Explanation:

2 + 9 + (-8) + (-1) = 2
11 + 7 + 12 + 3 = 33

```cpp
#include <iostream>
using namespace std;

 int main()
    {
    int evenSum = 0 , oddSum = 0 , num;
    cout << "Enter 8 integers: ";

    for (int i = 0; i < 8; i++)
    {
        cin >> num;

        if (i % 2 == 0)
        {
            oddSum += num;
        }
        else
        {
            evenSum += num;
        }
    }

    cout << evenSum << " " << oddSum << endl;

    return 0;
 }
```

Homework 4: Guess Program Output

04_homework4.cpp

```cpp
#include<iostream>
using namespace std;

int main() {
    int num1, num2, num3;

    num1 = 0, num2 = 1, num3 = num1 + num2, cout <<num3<<"\n";
    num1 = num2, num2 = num3, num3 = num1 + num2, cout <<num3<<"\n";
    num1 = num2, num2 = num3, num3 = num1 + num2, cout <<num3<<"\n";
    num1 = num2, num2 = num3, num3 = num1 + num2, cout <<num3<<"\n";
    num1 = num2, num2 = num3, num3 = num1 + num2, cout <<num3<<"\n";
    num1 = num2, num2 = num3, num3 = num1 + num2, cout <<num3<<"\n";
    num1 = num2, num2 = num3, num3 = num1 + num2, cout <<num3<<"\n";
    num1 = num2, num2 = num3, num3 = num1 + num2, cout <<num3<<"\n";
    num1 = num2, num2 = num3, num3 = num1 + num2, cout <<num3<<"\n";

    // https://en.wikipedia.org/wiki/Fibonacci_number

    return 0;
}
```

The output :

1
2
3
5
8
13
21

Homework 5: Guess Program Output

04_homework5.cpp

```cpp
#include<iostream>
using namespace std;

int main() {
    int num = 0;

    ++num;
    num *= 10;
    num += 2;
    num = num * 10;
    num += 3;
    num = num * 10 + 4;
    num = 5 + num * 10;
    num = (num * 10 + 6) * 10 + 7;
    num = 5 * num * 2 * 1 + 5 + 2 + 1;

    cout<<num<<"\n";

    return 0;
}
```

The output :

9415678

Homework 6: Swapping 2 numbers!

- Write a program that reads 2 variables num1 and num2
  - E.g. say we read num1 = 7 and num2 = 231
- Target: we want swap the values of Num1 and Num2?
  - Swap means exchange
  - So Num1 takes value 231 and Num2 takes value 7

```
int main() {
    int num1, num2, num3 = -1;

    cin>>num1>>num2;                    // let say we read 7 and 231

    // TODO write 3 lines that swaps them

    cout<<num1<<" "<<num2<<endl;        // This should print 231 7

    return 0;
}
```

```
#include<iostream>
using namespace std;

int main()
{
    int x , y , temp;
    cout << "Enter two numbers: ";
    cin >> x >> y ;

    temp = x ;
    num1 = y ;
    num2 = temp;

    cout << x << " " << y << endl;

    return 0;
}
```

Homework 7: Swapping 3 numbers!

- Same as previous, but on 3 numbers
- Let say we have numbers a = 115, b = 20, c = 301
- We wanna their final values to be: a = 20, b = 301, c = 115

```cpp
#include<iostream>
using namespace std;

int main()
{
    int x, y, z, temp;
    cout << "Enter three numbers: ";
    cin >> x >> y >> z;

    temp = x;
    x = y;
    y = z;
    z = temp;

    cout << x << " " << y << " " << z << endl;

    return 0;
}
```

Homework 8: Print Me

- Write a program that reads 2 integers A, B
  - B is either -1 or 1
    - If -1, print 2*A+1
    - If 1, print A*A
- However, you need to assume the following
  - Don't use if conditions, if you know them
  - Don't use comparison operators (e.g. ==, <=, >=, etc)
- Thinking hint
  - Thinking without constraints/assumptions makes thinking easier
- Hint
  - You need to think in a **simple 1 line formula** for the output

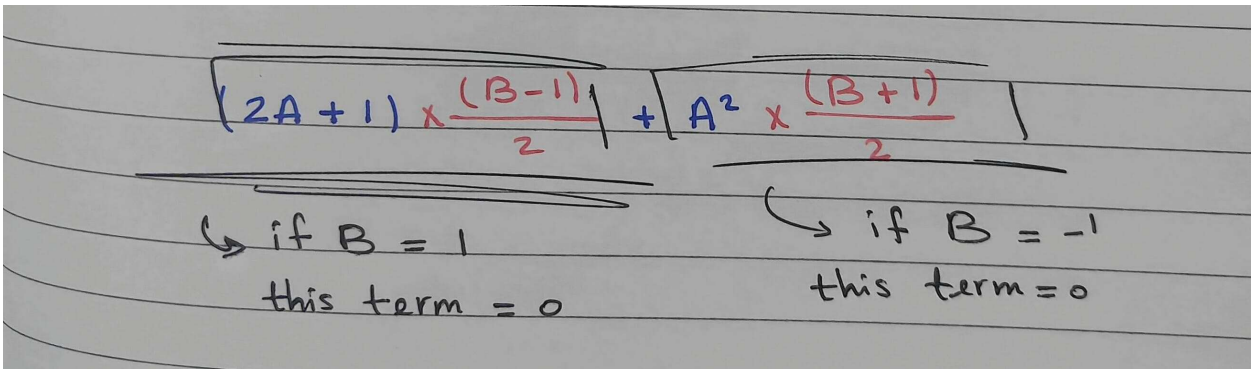
```cpp
#include <iostream>

using namespace std;

int main()
{
    int A, B;
    cin >> A >> B;

    cout << ((1 + B) / 2 * (A * A)) + ((1 - B) / 2 * (2 * A + 1)) << endl;

    return 0;
}
```



Homework 9: Sum numbers from 1 to N

- Write a program that reads integer N and Print the sum from 1 to N
  - E.g. If input N = 5, then Output is: 15
  - Why? As 1+2+3+4+5 = 15
  - Below table of more values
  - 3 ⇒ 6 (1+2+3)
  - 4 ⇒ 10 (1+2+3+4)
  - 5 ⇒ 15 (1+2+3+4+5)
- You need to find a **simple 1 line formula** to solve the problem :)
  - Hint: Let N = 8. Write numbers from 1 to 8
  - What is the sum of 1st and 8th number? sum of 2nd and 7th? And so on
  - Your formula should be good for even and odd N. Be careful programmer!
  - What is the maximum N after it overflow occurs? Recall int max is **2147483647**

```cpp
#include <iostream>

using namespace std;

int main()
{
    int N;
    cout << "Enter N: ";
    cin >> N;

    int sum = N * (N + 1) / 2;
    cout << sum << endl;

    return 0;
}
```