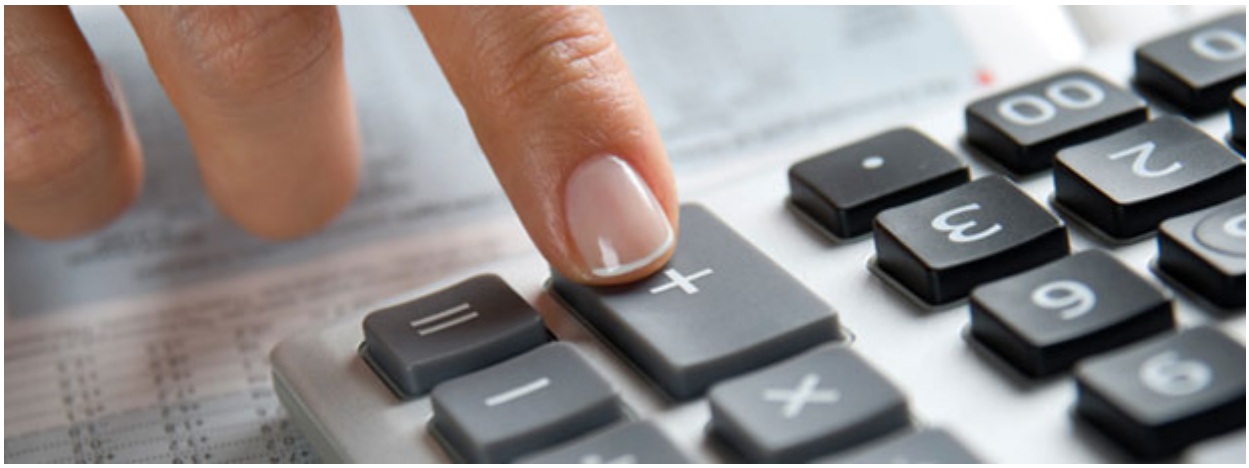
Hints for Project 1 B.

Problem description

Task B. Calc: A calculator program.



We want to make a **simple calculator that can add and subtract integers**, and will accept arbitrarily long mathematical formulas composed of symbols `+`, `-`, and non-negative integer numbers.

Imagine you have a file `formula.txt` with the summation formula such as:

```
100 + 50 - 25 + 0 + 123 - 1
```

If you redirect the file into your program, it should compute and print the answer:

```
$ ./calc < formula.txt
247
```

It may sound tricky, but it is actually easy to write such a program, and you already know all the needed tools. Just think carefully how to put it all together.

Specifically, write a program `calc.cpp` that reads from the `cin` a sequence of **one or more non-negative integers** written to be **added or subtracted**. Space characters can be anywhere in the input. After the input ends (end-of-file is reached), the program should compute and print the result of the input summation.

Possible input for your program may look like this:

```
15
10 + 3 + 0 + 25
5+6- 7 -8 + 9  + 10 -   11
1 + 1 + 1 + 1 +
1 + 1 + 1 + 1 +
1 + 1 + 1 + 1 +
1 + 1 + 1 + 1
```

(Each of the inputs above is a separate file containing one single formula, even if it spans multiple lines.)
The corresponding outputs should be: `15`, `38`, `4`, and `16`.

A hint on how to handle possible space characters in the input:

You can use `>>` operator to read the numbers and the `+/-` characters, because `>>` will be skipping all spaces between the input terms. It is also suggested to use the `char` type for reading the `+/-` operator characters, not `string`, because it will work well even when numbers and the operator symbol are adjacent and not separated by spaces (such as in `10+5+3`).

Reading int from cin in C++

C++ will skip all spaces before an int to put value into an integer variable.
For example, given the following code:

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

int main()
{
    //Prompt user to enter age.
    cout << "Enter your age: ";
    int age; //declare age as an int.
    cin >> age; //Initialize age by reading input from cin.

    //Output age.
    cout << "Your age is " << age << endl;

    //main method needs to return an int.
    //Since the code runs smoothly to the end,
    //return 0 to the caller of current method main.
    return 0;
}
```

Here is a sample run:

```
Enter your age:      35
Your age is 35
```

Note from that above run, there are spaces before 35 but they are (rightfully) omitted by cin. Hence we do not need to worry about spaces before integers; we only need to read and skip spaces **before** character '+' or '-'.

Analysis of the problem

There are two types of symbols: one is operator, the other are operands.
For example, in 5+6- 7 -8 + 9 + 10 - 11, operands are 5, 6, …, 11, operator are + and -.

Let *operand* be an integer variable. To read an int into *operand* in C++, we use

```
cin >> operand;
```

Let ch (warning: `operator` is a keyword in C++ and cannot be a variable name) be a char variable. To read a character in ch in C++, we use

```
cin >> ch;
```

For consistence, we can rewrite the original formula as
0+5+6- 7 -8 + 9 + 10 - 11

Let variable sum be the current sum and is initialized to be **zero (see the first 0?)**.
Let ch be the character before the first original operand. Variable ch is initialized to be **'+'**.

round	read next operand	if ch is '+', add operand to sum, otherwise, if ch is '-', subtract operand from sum	skip all spaces until '+' or '-' is reached, save it in ch
1	5	ch is '+' (by initialization), run sum += operand; so sum is 0 + 5 = 5	+
2	6	ch is '+', run sum += operand; so sum is 5 + 6 = 11	-
3	7	ch is '-', run sum -= operand; so sum is 11 – 7 = 4	-
4	8	ch is '-', run sum -= operand; so sum is 4 - 8 = -4	+
5	9	ch is '+', run sum += operand; so sum is -4 + 9 = 5	+
6	10	ch is '+', run sum += operand; so sum is 5 + 10 = 15	-
7	11	ch is '-', run sum -= operand; so sum is 15 - 11 = 4	

Pseudocode

Each round is a loop. Operations in each round are loop statements. Here is a pseudocode.

```
int sum = 0;
char ch = '+';
int operand;
while (cin >> operand)
{
    if ch is '+'
      sum += operand;
    else if ch is '-'
          sum -= operand;

    skip all spaces (if any) until a non-space character is encountered
    //comments: In this problem, non-space character other than digit can only be '+' or '-'.
}

report sum;
```

So, the remaining job is to implement the following code:
skip all spaces (if any) until a non-space character is encountered.

Hint: you can use cin >> ch; to read a char into ch. You need to use a repetition statement since there might be more than one space.

Warning: the file name needs to be named as calc.cpp.