Ho Chi Minh University of Technology
Department of Computer Science and Engineering

Programming Technique

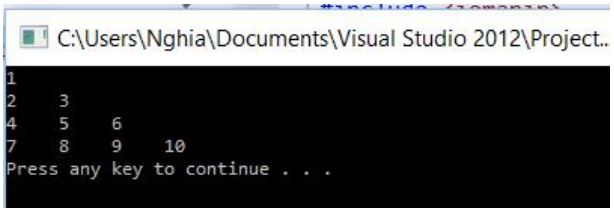
Lab 2

Expected outcomes

- Practice how to use basic input/output with C++ program.
- Know how to solve simple problem.
- Know how to use stringstream and file stream.
- Know how to execute simple operators to control input/output.

Mandatory exercises

Exercise 1. Write a program that print ten integer numbers 1, 2, 3, 4, 5, 6, 7 ,8, 9, 10 to the console. The output must have the format like the example bellow. Each number have the width of 5, and is aligned in the left side.



Guidelines:

First of all, refer to lab 1 if you don't know how to write and execute a program.

Like the example 2 in lab 1, to print in C++, we need to include the built-in library that allows us to print. The use with this library is like the example in lab 1.

```
#include <iostream>
```

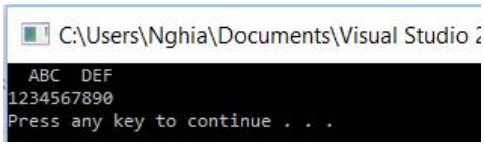
And, to format the output on console, we also need to include another built-in library.

```
#include <iomanip>
```

With this library, you can set the width or align the position of the output. Write the code as follow:

```
std::cout << std::setw(5) << "ABC" << std::setw(5) << "DEF" << std::endl;
std::cout << "1234567890" << endl;
```

The output will like:

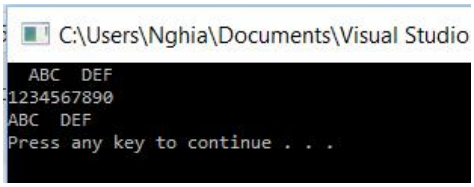


You can see that, with the function setw(5), the first string "ABC" have the width of 5, from 1 to 5. And the second string have the width of 5, from 6 to 0. You can change the width of output by modifying the value pass to setw() function. Remember that setw() affect only the next output.

Each string is aligned on the right side by default. You can change this by add std::left, std::right after "<<" operator. For example, with the code:

```
std::cout << std::setw(5) << "ABC" << std::setw(5) << "DEF" << std::endl;
std::cout << "1234567890" << endl;
std::cout << std::left << std::setw(5) << "ABC" << std::setw(5) << "DEF" << std::endl;
```

The output will like:



In the third line, the string "ABC" and "DEF" is now printed on the left side.

Of course, you can omit the "std::" by calling:

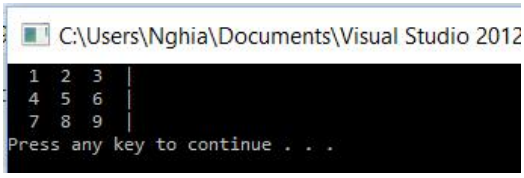
```
using namespace std;
```

with this, when printing, you only need to type cout:

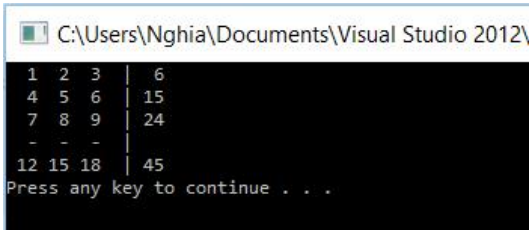
```
cout << left << setw(5) << "ABC" << setw(5) << "DEF" << endl;
```

Writing an integer number is the same with writing a string. Now you can do your exercise.

Exercise 2. Write a program that declares nine integer variables and assign their values by 1, 2, 3, 4, 5, 6, 7, 8, 9. Then prints the value of variables to console like the output below. The output is like a matrix 3x3, each number have the width of 5 and is aligned center.



Then, you need to calculate the sum of each row or column or the sum of nine numbers and print out next to the matrix. The output should look like the example bellow. The sum of each row is printed on the left, the sum of each column is printed under the matrix and the sum of all numbers is printed on the under right corner.



Guidelines:

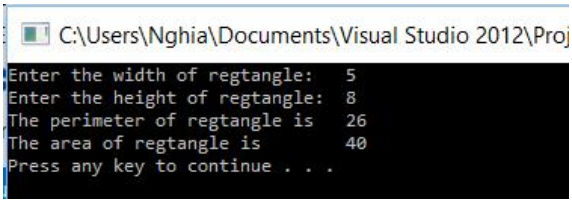
To do this exercise, you must know that printing a variable to console is similar to printing a string or a number.

With this exercise, you can do by following step:

- Step1: Declare nine integer numbers and assign their value by 1, 2, 3, 4, 5, 6, 7, 8, 9.
- Step 2: Print nine numbers like a 3x3 matrix, each number have the width of 3 and is aligned on the right.
- Step 3: Calculate the sum of each row or column and print the result to console. With each row, you can edit the code in step 2 to print the sum in the end of the line. For the sum of the columns, add a fourth line for printing.
- Step 4: Calculate the sum of all nine numbers and print to the console, at the under right corner of the matrix.

To format the printing, you can do like exercise 1.

Exercise 3. Write a program that calculate the perimeter and area of a rectangle. The program must allow user input width and height from keyboard and output the result to console. You should do like the example bellow.



Guidelines:

With C++, to get input from keyboard, you can use std::cin with ">>" operator. For example, to input an Integer number, you can write your code like:

```
int num;
std::cout << "Enter an Integer number:";
std::cin >> num;
```

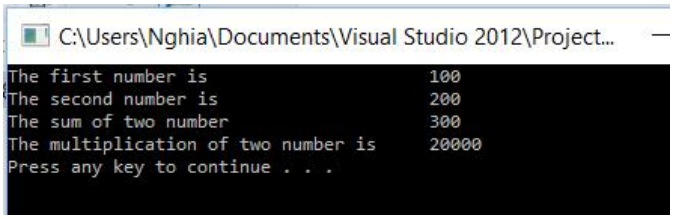
The first line declares an Integer number. The second line prints a string "Enter an Integer number:" to let user know that we need to input an Integer number. And the final

`std::cin >> variable;` allow us to get the input from the keyboard. Of course, the type of variable must be the same with the type of input get from keyboard.

With this exercise, you can do by following step:

- Step1: Write code to declare width, height, perimeter and area variable. Then, let user enter the width and height of rectangle.
- Step 2: Calculate the perimeter and and area of rectangle.
  Perimeter = 2 * (width + height);
  Area = width * height;
- Step 3: Print the result to screen. Remember to format the output like the example, the width of text is 32.

Exercise 4. Write a program that declares two integer variables and assign their value using std::stringstream. For example, you can assign 100 to the first number, and 200 to the second number. Output to the console two number and the result when add or multiply two number. You should print like the example bellow.



Guidelines:

In C++, a Stringstream is stream class to operate on strings. Object of Stringstream use a string buffer that contains a sequence of characters. And the squence of characters can be accessed directly as a string object. To use Stringstream, we need to include the built-in library:

```
#include <sstream>
```

Character can be inserted or extracted from the stream using any operation allowed on both input and output stream. For example:

```
	std::stringstream ss;
	ss << 1 << ' ' << 2;
	int first, second;
	ss >> first >> second;
```

The first line in the code above declares an object of Stringstream. In the second line, we inserted 1, character space and 2 to the stream. The third line we define two integer number and in the final line, we extract number from stringstream and assign the value to two variables.

For this exercise, you first need to define a stringstream and insert value to it. Then, you extract the value and assign to variables defined. Finally, you calculate the multiplication and the sum of two number, then print the result to the screen. Remember that the output should have the format like the example, the text has the width of 40, and is aligned to the left.

Exercise 5. Assume that we have the following program to read input from keyboard and then print this value into console:

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

int main(){
    int val;
    cin  >> val;
    cout << val;
    return 0;
}
```

How can we use this small program to read inputs from a file, say input.txt, automatically without using keyboard and write value into file?

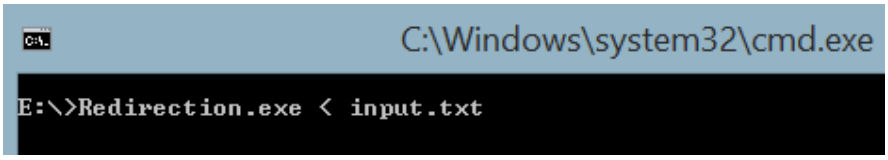
Guidelines:

First of all, you need to know how to use cin/cout in the program, if you don't, read the previous exercises carefully before we get started.

Given a program that read inputs from keyboard like above example, we can use "IO redirection" to quickly input some data from a text file, and process it as it we were inputting it directly through keyboard.

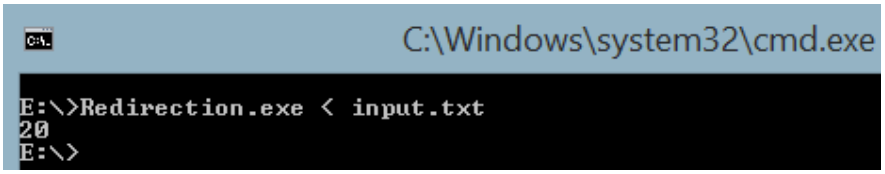
All you have to do is compile your program, say MyProgram.exe, then you can run it with input redirection by placing certain characters between commands

- Input redirection
  The syntax of these characters is as follow, using < to redirect input (the < operator feeds in the contents of input.txt into the standard input of your program):

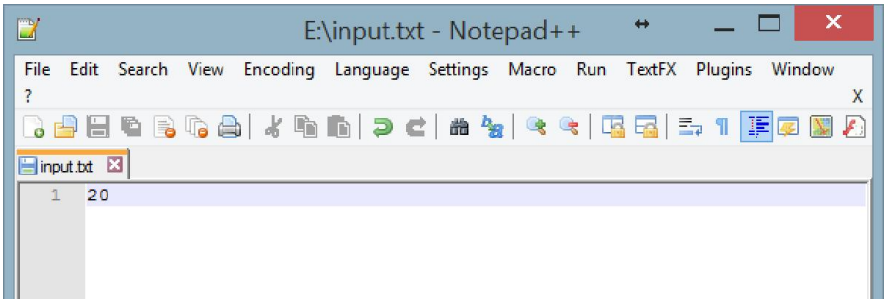


(command 1)

The output will look like:

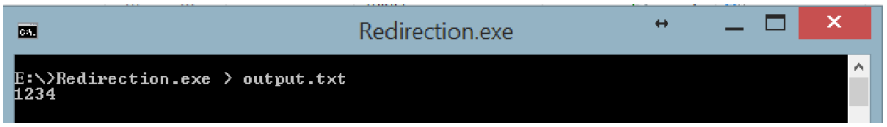


Where input.txt text file looks like this:



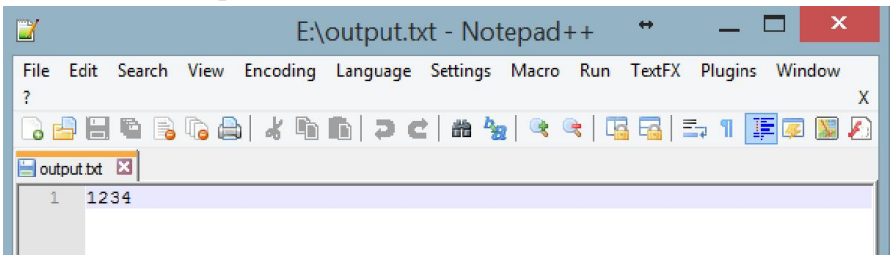
- Output redirection

Using > operator to redirect output (The > operator feeds result into output.txt, as opposed to displaying it at the terminal)

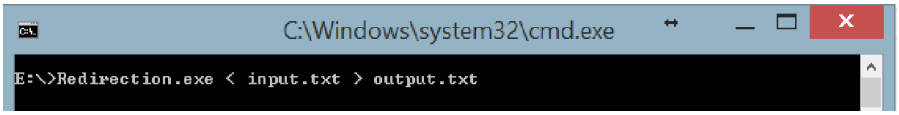


(command 2 – we type a number and enter because program require an input from keyboard)

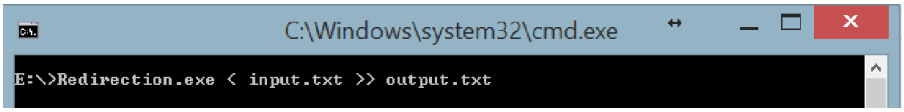
The result in output.txt will look like:



You can combines the two capabilities: command1 read from input.txt and write to file

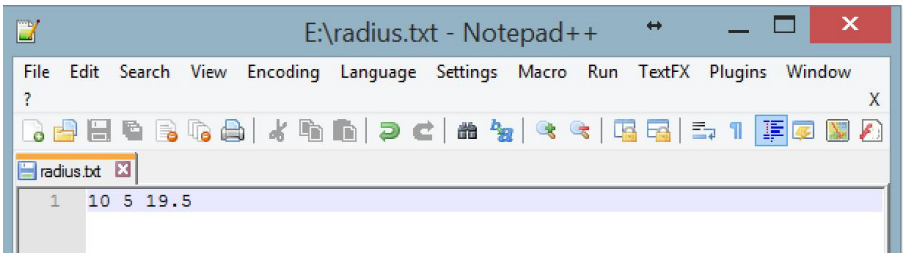


To append output to the end of the file, rather than clobbering it, the >> operator is used

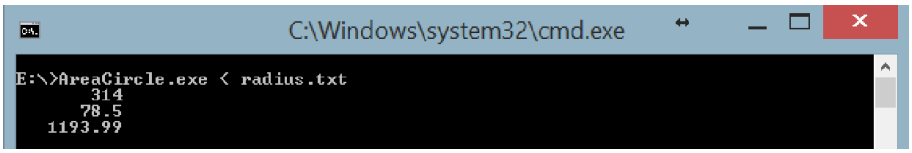


Exercise 6. Write a program that calculate the area of circles where each given radius is in radius.txt text file.

The inputs in radius.txt looks like:



The output looks like:



Guidelines:

a) Data: the program needs variables to store the following data:
- Radius of circle 1 → data type is double, name R1
- Radius of circle 2 → data type is double, name R2
- Radius of circle 3 → data type is double, name R3

b) Algorithm:
First of all, you read inputs from text file by using cin with ">>" operator. For example, you can use this code to get 3 number from input file.