File Input/Output

1. Variables are stored in Main Memory/RAM
   a. Values are lost when the program is finished executing
2. To preserve the values computed by the program: save them to a file
3. Files are stored in Secondary Storage
4. To have your program manipulate values stored in a file, they must be input into variables first.

Reading from or writing to a file in C++ requires 3 basic steps:

1. Open the file.
2. Do all the reading or writing.
3. Close the file.

Header files

To use input and output files , you will need to load file stream header files :

```
#include <iostream>   // I/O Console and Screen output
#include <fstream>    // file I/O
```

File streams are of type **ifstream** (**input**) or **ofstream** (**output**) a.

```
ifstream fp_in;    // declarations of stream fp_in   fp_out
```

objects of type ifstream can input (read)
values from a file. (like cin)

```
ofstream fp_out;   // declarations of fp_out
```

objects of type ofstream can output (write)
values to a file. (like cout)

Open The Files

```
fp_in.open("I_File.txt");
fp_out.open("O_file.txt");
```

- The input file must be created by the programmer.
- If the file "O_File.txt" does not exist, it will be created.

Do all the reading , perform calculations, and do all the writing

Closing Files

- To close a file stream when you are done reading/writing:

```
fp_in.close();
fp_out.close();
```

- Not required, but good practice.

Reading from Files

- Use the stream insertion operator :   **>>**

- When opened, file stream's read position points to first character in file.

- Extraction operator (**>>**) starts at read position and skips whitespace to read data into the variable.

- The read position then points to whitespace after the value it just read.

Example

```
int a, b;
fp_in >> a;
cout << a << " ";   //  display on the screen
fp_in >> b;
cout << " " << b << endl; //  display on the
screen
```

Writing to Files

Use Output file name along with the stream insertion operator: **<<**

Example

```
int a, b;
fp_in >> a;
fp_out << a << " ";    //  Print to Output file
fp_in>> b;
fp_out << " " << b << endl; //  Print to Output
file
```

Complete Example

```cpp
#include <iostream>
#include <fstream>
using namespace std;
int main()
{
      int value, sum;
      double avg;

      ifstream fin;                 // Input File Definition
      fin.open("InputFile.txt"); // Open fin as an input file


      if ( !fin )
        {
          cout << endl << endl
               << "***Program Terminated.***" << endl << endl
               << "Input file failed to open." << endl;

        fin.close();

        return 1;  } // Quit, but don't return a 0; send back a non-zero value.

        ofstream fout;
        fout.open("OutputFile.txt");

        if ( !fout )
           {
             cout << endl << endl
                  << " ***Program Terminated.*** " << endl << endl
                  << "Output file failed to open." << endl;

             fout.close();

          return 2; } // Quit, but don't return a 0, send back a non-zero value.

      // Beginning of Calculations


      sum = 0;

      fin >> value;
      sum = sum + value;

      fin >> value;
      sum = sum + value;

      avg = static_cast<double>(sum) / 2;



      fout << "The sum of the integer values is: " << sum << endl   ;
      fout << "The average of the integer values  is : " << avg << endl;

      fin.close();               // Close Input   File
      fout.close();          // Close Output  File

      return 0;
}
```