Lab 00: Orientation: Introduction to the Visual C++ Environment
ES 036: Programming Fundamentals
Fall 2007

Welcome to ES036 Lab. This guide will help you to get started with using Visual Studio 2005 integrated development environment (IDE) for C++ programming. Please go through the "Lab Preparation Guide" if you are not familiar with Windows XP and/or WebCT using Internet Explorer.

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A. Download Sample Code from Class Website

Use your web browser to navigate to temporary class website (http://instruct.uwo.ca/engin-sc/es036/). Download `MyFirstProgram_v1.cpp` If you are not familiar with navigating to class website using a web browser and downloading files, please go through the "Preparation guide" which will walk you through those activities.

B. Introduction to Visual Studio

Please follow this section and section C carefully to learn how to use Visual Studio IDE. This section includes instructions to **open**, **edit**, **compile**, and **run** the `MyFirstProgram_v1.cpp` program downloaded to your disk area in part C.

Visual Studio is a sophisticated but easy to use integrated development environment (IDE) for C++ (and may other languages!) You will see that this environment recognizes C++ keywords and displays them in color.

B.1. Starting the Visual Studio Environment (In Engineering Labs)

1. Click on Start ![start] in the task bar, and then move the mouse to **All Programs**.
2. When the sub menu appears, slide your mouse to the option called **Engineering Applications**.
3. Choose *Microsoft Visual Studio 2005*.
4. Again, choose *Microsoft Visual Studio 2005*. See figure below.
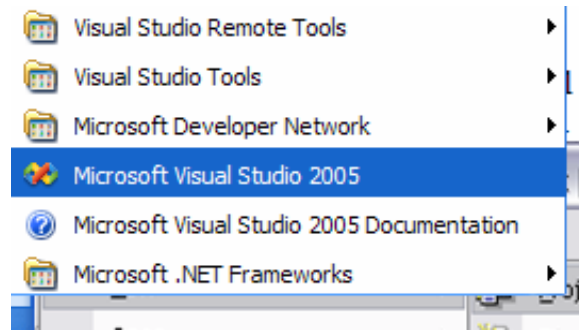
## B.2. Creating a Project in Visual Studio (to compile and run programs)

Even though we wish only to compile and run some fairly small and simple programs, we still need to create a 'project'. In general, this enables a programmer to go back later and open and modify the source code of this project. Different programs (e.g. different labs) can be contained in different projects. In Visual Studio 2005, a *Solution* can contain more than one project. In the following, let's create a solution called *ES036Labs* and a project called *Lab00*. When you want to work on your Lab01 next time, you can open the solution *ES036Labs* and add another project called *Lab01*.

### To create a solution and a project:

1. Click **File** in the top menu bar of Visual Studio, and then select the **New...** option, and select project (shown on the next page).
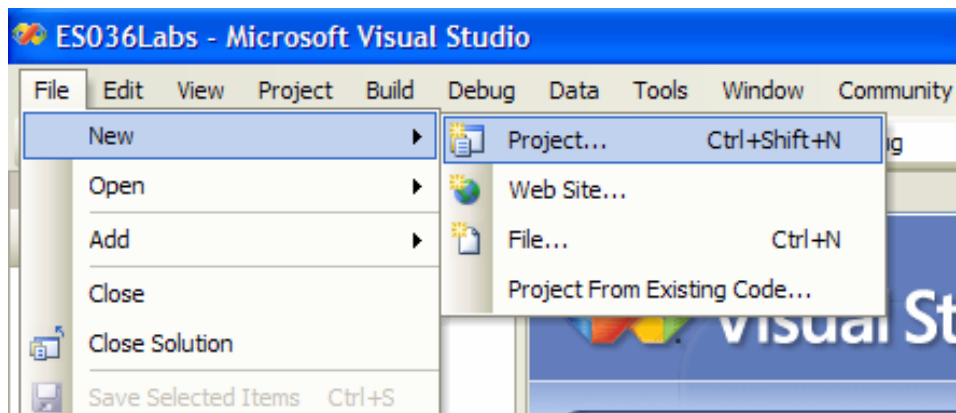
2. This will bring up a dialogue box that contains many project possibilities (**shown below**).
3. Click on "Win32" in the left pane of the window (**shown below**).
4. Select "Win32 Console Application" from the right pane of the window (you may need to scroll down in the window to find this option) (**shown below**).
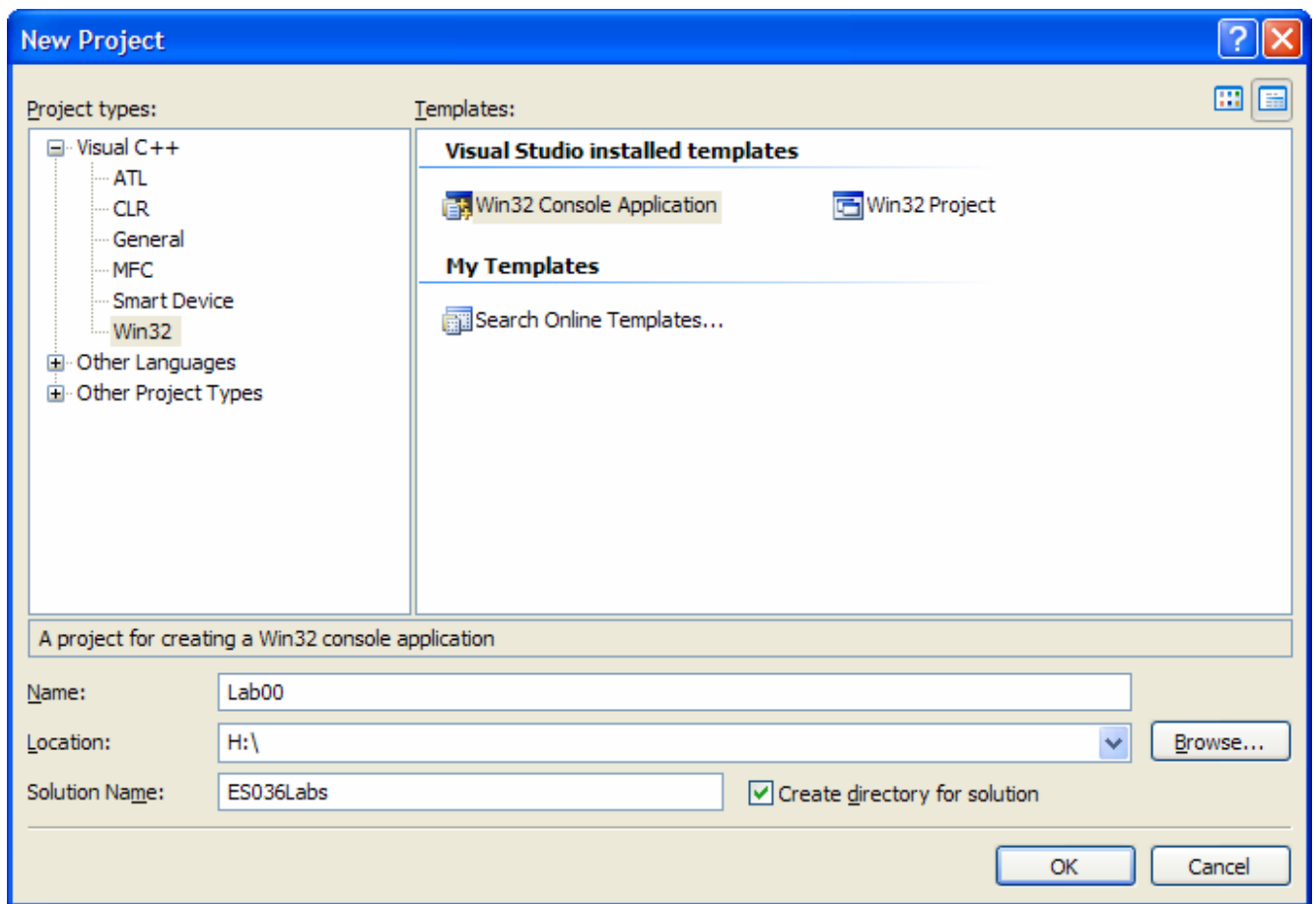
5. Enter a name for the *project* in the lower part of the windows that says <Enter name> (see above): **Lab00**.
6. Make sure that the location specified for the project is on drive H: If it is not, replace the location with H:.
7. Now enter the name for the *solution*: **ES036Labs**.
8. Press **OK** to create the solution and the project.
9. A Win32 Application Wizard window will appear (see on the **next page**). Select "Application Settings" on the left side of this window.
10. Under additional options, check the "Empty Project" box (see on the **next page**).
11. Select Finish (see on the **next page**).
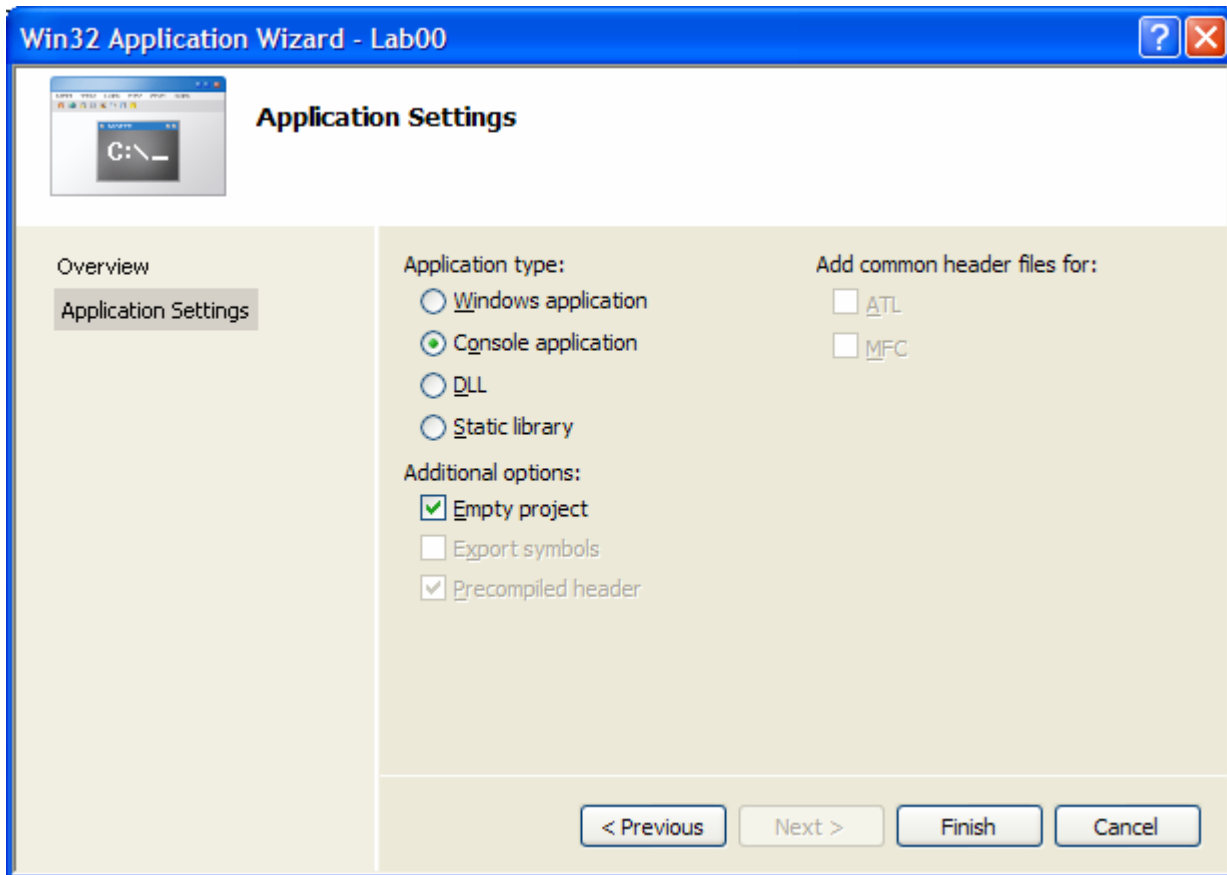
When we complete theis process, Visual Studio create a folder H:\ES036Labs. This is the folder where the solution is located. You will see a file with extension .sln here (ES036Labs.sln). This is the file you need to click if you want to reopen your solution next time.


Notice the folder called Lab00 is located in our solution folder. This is the project folder for our Lab00 and the source files (.cpp and .h) are saved inside this folder. If you have your files elsewhere (e.g your USB pen or My Documents) you should copy them into this folder. When you create your Lab01 project next time, another project folder called Lab01 will be created in the solution folder. In your Visual Studio window you will see a view like this at the top left in the following figure[1].

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[1] If you do not see this view select **View** > **Solution Explorer** or click on the solution explorer button.
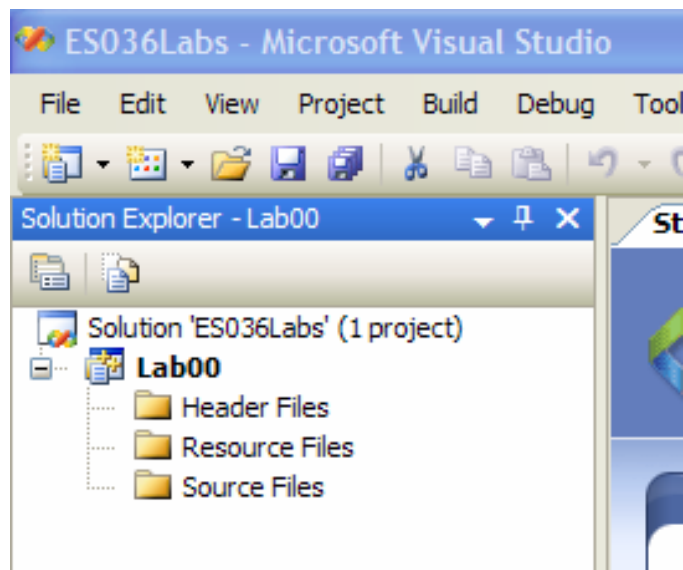
When you have created your Lab01 next time, the view will look like this.
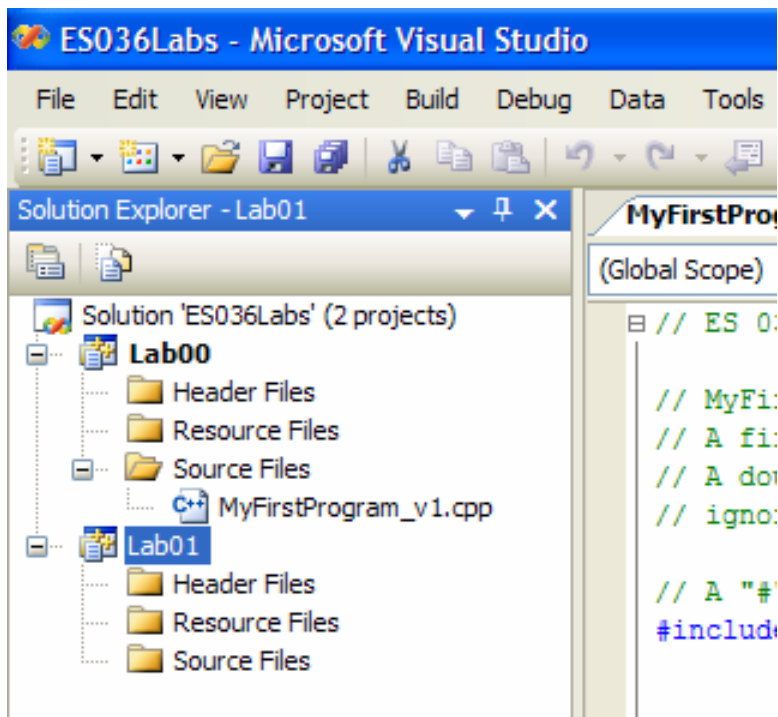
Now we see how Visual Studio helps us to manage our projects and files.

You wish to add some source code to this project:

We have two options when we want to add source code to our project. First is to create new file (**Add New Item**) and the second is to use an existing item (**Add Existing Item**).

1. Copy the .cpp files that you downloaded from the WebCT to folder H:\ES036labs\Lab00
2. Click **Project** in the top menu bar of Visual Studio, and then select the **Add Existing Item** option (see the following figure).
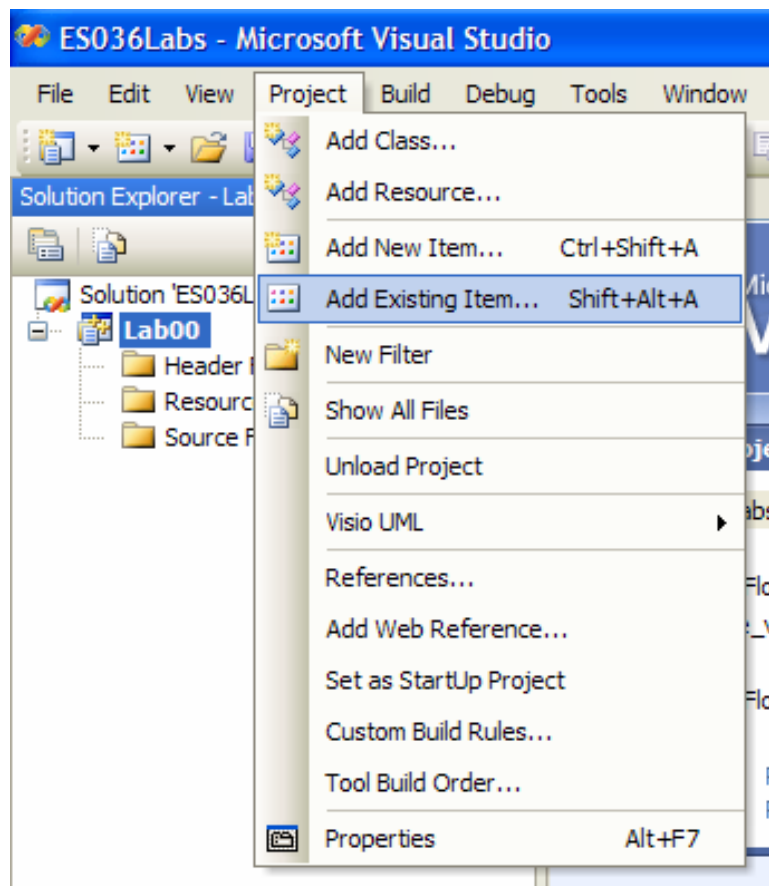
3. Since we have already copied the files to the right place (H:\ES036labs\Lab00) you will see the icon of the file you need to add. Select `MyFirstProgram_v1.cpp`. If you wish, by selecting the arrow beside the **Look in** address box, you can navigate to the folder in which you saved the `MyFirstProgram_v1.cpp` file on your network disk area (H:). To see the C++ files in this folder, set the Files of type (see bottom box of **Look in** menu) box to contain Visual C++ Files (which may already be the default value).

4. You should now see the name of this file (`MyFirstProgram_v1.cpp`) displayed under the folder Source Files in the upper left panel.

5. Double click on `MyFirstProgram_v1.cpp` under "Source Files" on the left-hand side to display the contents of the file in the main portion of the Visual Studio development environment.

To get the program working we need to do two important things. First we need to compile (and link) the program. This takes the C++ statements that you have written and converts them to machine-code, which the CPU can understand. The next step is to run the program. This will tell the CPU to follow the machine-code instructions generated from the C++ code. Here is how to do that.

Compiling the C++ statements in the file MyFirstProgram_v1.cpp:

1. To compile, select the Build menu in the top menu bar (see the following figure).
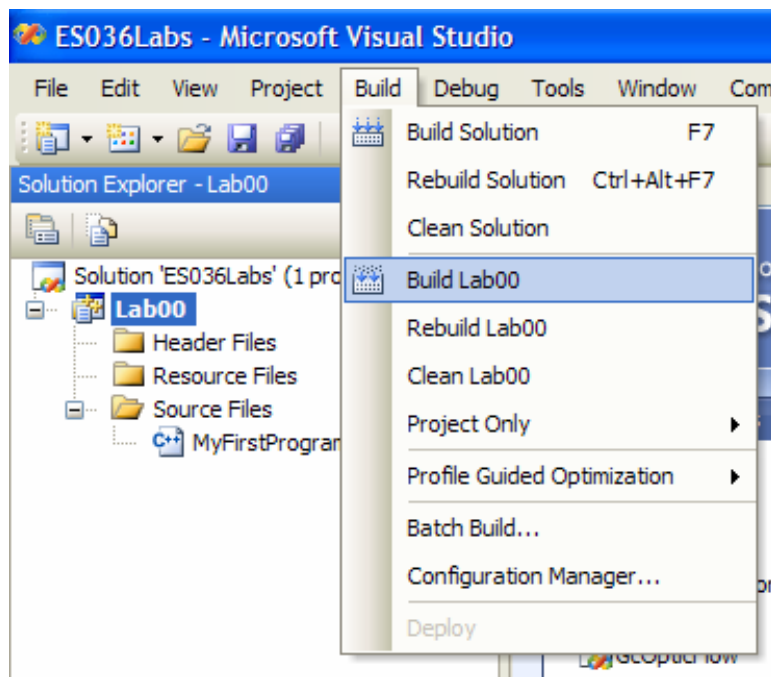
2. Select the option **Build**[2] **Lab00** (assuming that **Lab00** is the name of your project).
3. A lower window will show the results of this process. (As it is, `MyFirstProgram_v1.cpp` file will compile successfully.) You will see an output like this. You should have 0 error(s).

```
1>Lab00 - 0 error(s), 0 warning(s)
========== Build: 1 succeeded, 0 failed, 0 up-to-date, 0 skipped ==========
```

Running the program created by the above step:

4. To run (execute), select the **Debug** menu in the top menu bar.
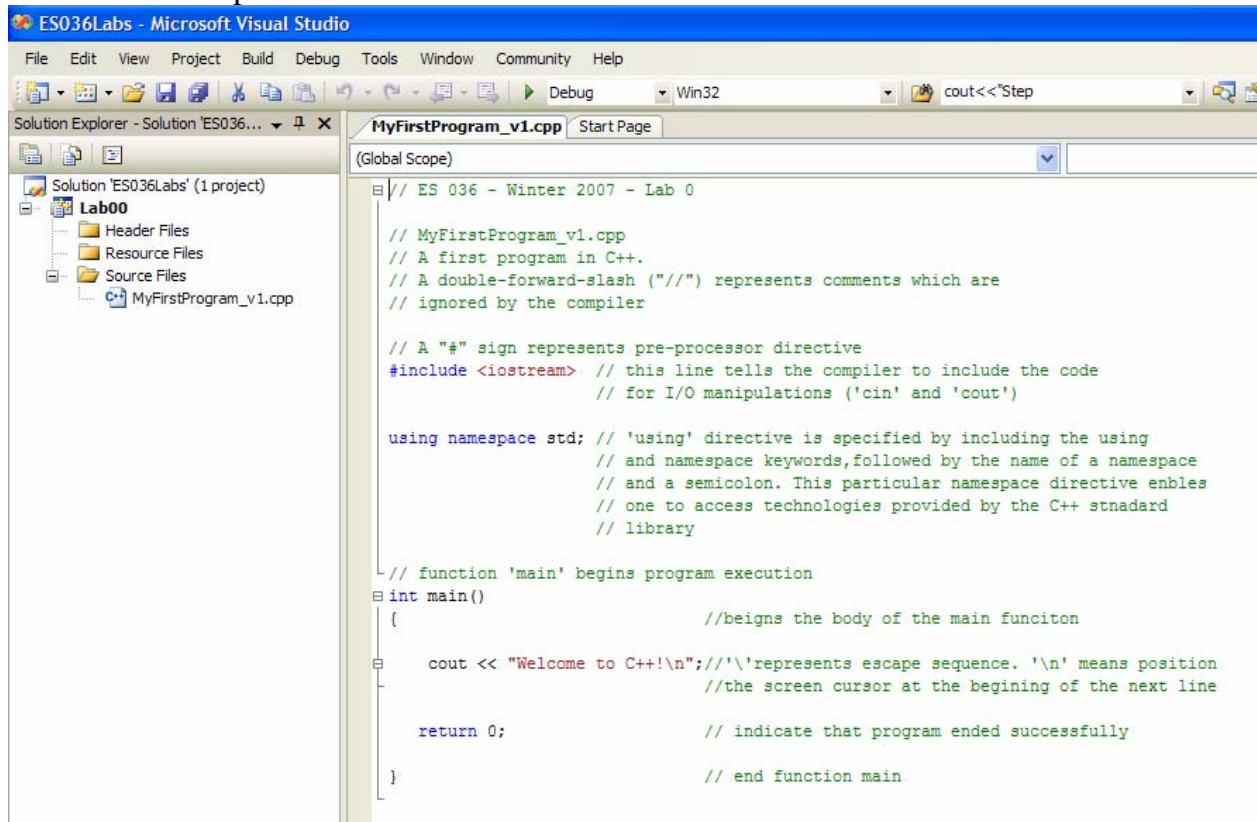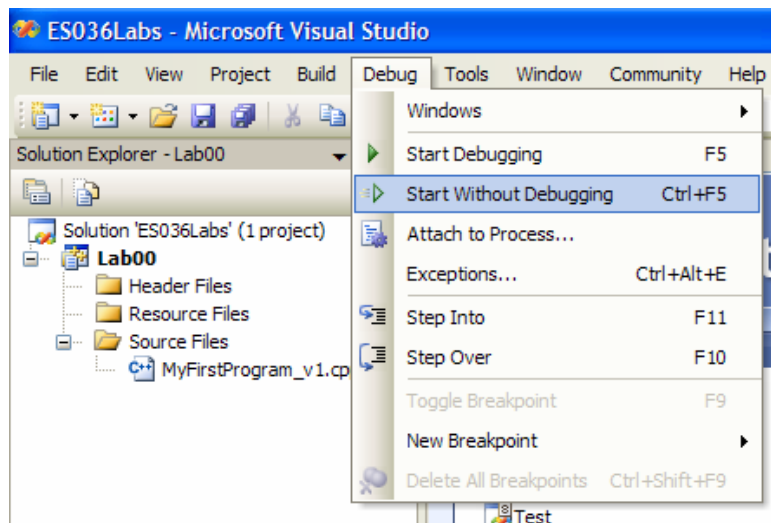

5. Select the option **Start Without Debugging**.

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[2] Rebuild Solution will rebuild all the projects in the solution as defined by the configuration manager. If your projects are small this is a convenient option.

6. A black 'DOS-type' window will appear showing the output of your program.

To edit the source code (modify the program):
7. To edit, double click on `MyFirstProgram_v1.cpp` under the folder Source Files in the upper left-hand panel if it is not already displayed in the main panel. This will load your file into the main panel.

8. Modify the "Welcome to C++!!" data to read something a little different, say "Hello there! Welcome to C++!!"

To *recompile* the source code of this project:
9. To recompile, select the **Build** menu in the top menu bar.
10. Select the option **Rebuild Lab00** (assuming that Lab00 is the name of your project).
11. A lower window will show the results of this process.

To *rerun* the executable file created in the compilation process:
12. To run (execute), select the **Debug** menu in the top menu bar.
13. Select the option **Start Without Debugging**.
14. A black 'DOS-type' window appears showing the *new* output of your program.

B.3.   Reviewing the Visual Studio Environment
Now let's try everything again from scratch!
1. Go to the ES036 web site and download to your network disk area (H:\ES036labs\Lab00) the file ArithmeticOpearation.cpp.

2. We need to remove the existing source file to add the new one. To do that right click on the existing source file and select remove. Removing does not mean that you are deleting the file. The file is just removed from the project. This step is important[3].
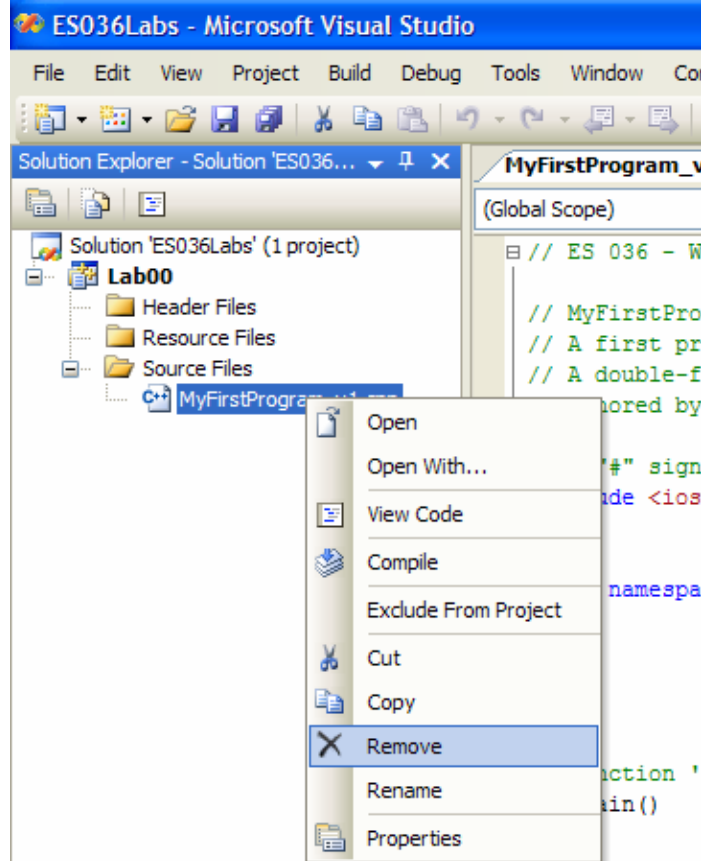
3. Add the file ArithmeticOpearation.cpp as the source code.
4. Compile and run this code. Input (type and hit enter key) the integer values 4 and 2 and see the output.

Modifying the File ArithmeticOpearation.cpp

5. Uncomment one 'result' statement at a time while others will be commented out and check the output with integer values 4 and 2 respectively.
6. This time, try to use integer values 2 and 4 respectively and check the output for each case. Find a reasonable answer, since the results are not same as the previous set
7. Try to uncomment the second `cout` statement and comment out the first one and then run the program to check the output. In both cases, the output will be the same. This will give you an idea of the `endl` function. Make a reasonable guess and be ready to respond to TA's question on this.

You can practice with a couple of more programs downloaded from the course web site!
Possible things to try:
   a) If you modify a file with a deliberate error, you can see what sort of message this error

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[3] If you get an error saying
```
1>Arithmetic_Operations.obj : error LNK2005: _main already defined in MyFirstProgram_v1.obj
```
you have more than one source file containing a main function. Remove all except the one you want.

generates when you try to recompile.

For example,

- try omitting a semicolon from the end of a statement (and then recompiling).
- try a different integer name

b) Can you start a new program from scratch? (use the editor to open a new file, then edit the file, compile and run)

C. Creating a New Program from Scratch

After completing this section you will be able to create a new program in C++.

1. Remove existing source files. (If you do not already have a project, you need to create one. If you followed this lab from the beginning, you should have a project called Lab00 within the solution ES036Labs.)
2. Click **File** in the top menu bar of Visual Studio, and then select the **Add New Item** option.
3. Select C++ File
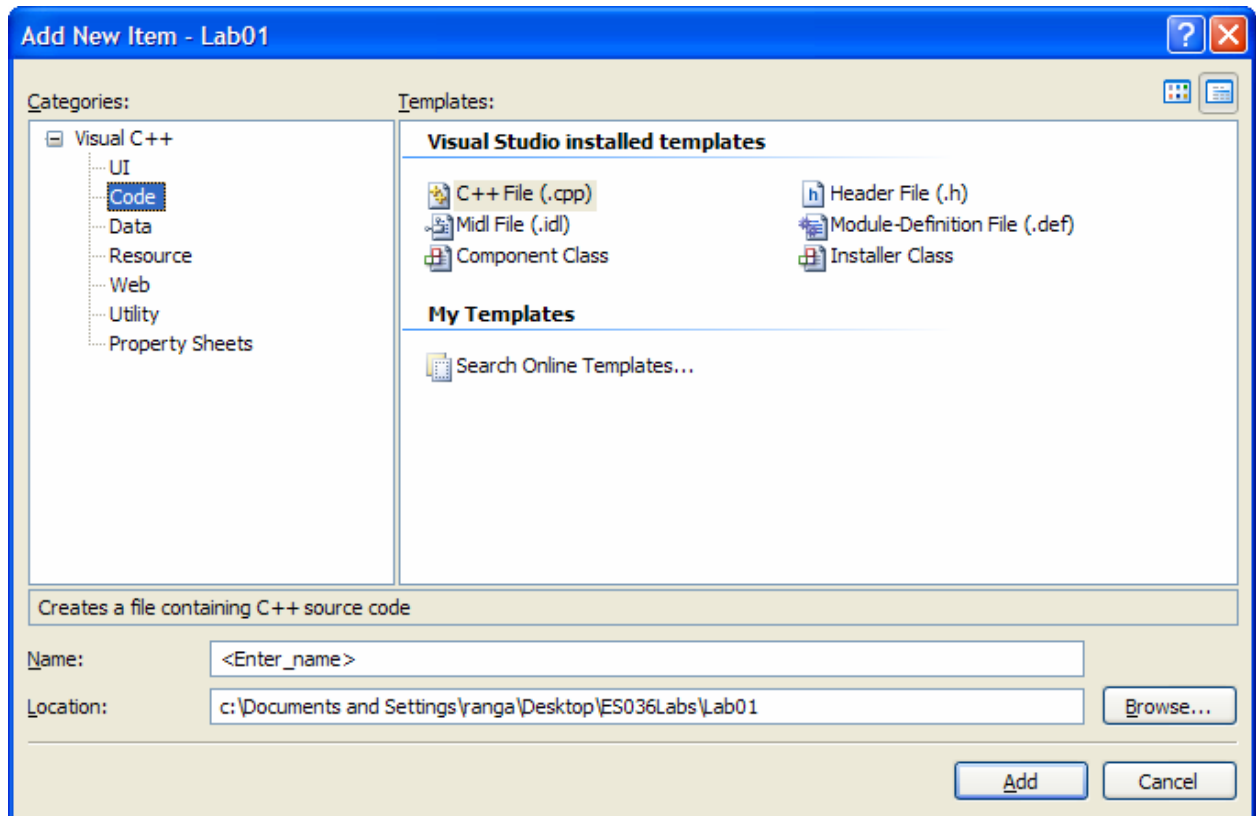
4. Type in the code in page 16 of the text book (listed below).
5. Replace the first set of comment lines with a set of comments that identifies you (name, student number, section, email address).   Compile the program and execute it.
6. Call your TA to your computer so that they can verify your result.
7. Modify the program (save it as a second file with a different name) so that the program also prints out the perimeter of the triangle inscribed by side 1, side 2, and the hypotenuse.
8. Compile the program and execute
9. Call your TA to your computer so that they can verify your result.
10. **Now save a copy of your modified cpp file giving your username as the file name.** (For example, for a student named Wes Tern, the account name is probably something like *wtern*).

Submit this file via WebCT.

```cpp
/***********************************************************************
ES 036 - Summer 2006 - Lab 00 Part E

                  Name: Your Name
                  Student No.: 250 xxx xxx
                  Email:
                  Section:
                  Date:


This program computes the distance between two points


***********************************************************************/

#include <iostream>
#include <cmath>

using namespace std;

int main()
{
      //Declare and initialize objects
      double x1(1), y1(5), x2(4), y2(7),
             side_1, side_2, distance;

      //Compute the sides of the triangle
      side_1 = x2 - x1;
      side_2 = y2 - y1;
      distance = sqrt(side_1*side_1 + side_2*side_2);

      //Print the distance
      cout << "The distance between the two points is "
           << distance << endl;
      //Exit the program
      return 0;
}
```

D. Logging Off After a Session

It is very important that you log off the machine after you have finished.
Otherwise, someone may do something malicious with your account. However,
DO NOT shut the computer off!
1. To log off, click on the Start button, and select Shut Down at the bottom of the menu..
2. The shutdown dialogue box will appear, and ask "What do you want the computer to do?" If the choice box contains "Log off your_user_name" then click on OK. If the choice in the box is "Shut down" or "Restart" then click on the down-arrow to the right of the choice, click on "Log off your_user_name", and then click on OK. (This will end your session, leaving the computer running for the next student.)

E. General Lab Instructions to Help Labs Run Smoothly
- Attending all the labs is mandatory.

- Obtain the lab instructions from the ES036 web site.
- Read through the lab instructions and work on the alb before coming to the lab.
- Write the QUIZ at the beginning of the lab.
- Answer any pre-lab questions.
- Bring a printed copy of the lab handout to the lab. It will make it easier to follow the instructions.
- Preferably have the lecture notes printed with you.
- Retain copies of the cpp files that you create or submit via WebCT (have a back up of your ES036Labs folder).