LAB 01

COMPUTER ORGANIZATION AND ASSEMBLY LANG(COAL)

STUDENT NAME	ROLL NO	SEC

SIGNATURE & DATE

MARKS AWARDED: ____________

NATIONAL UNIVERSITY OF COMPUTER AND EMERGING SCIENCES (NUCES), KARACHI

Version: 1.0

Prepared by: Amin Sadiq

Date:

EL 2003 COMP ORG & ASSEMBLY LANGUAGE LAB

LABORATORY MANUAL Fall 2021Instructor: Aamir Ali, Aashir Mehboob, Amin Sadiq, Qurat-ul-Ain, M Kariz, Rabia

Lab Session 01: CONFIGURATION OF VS 2019

Objectives:

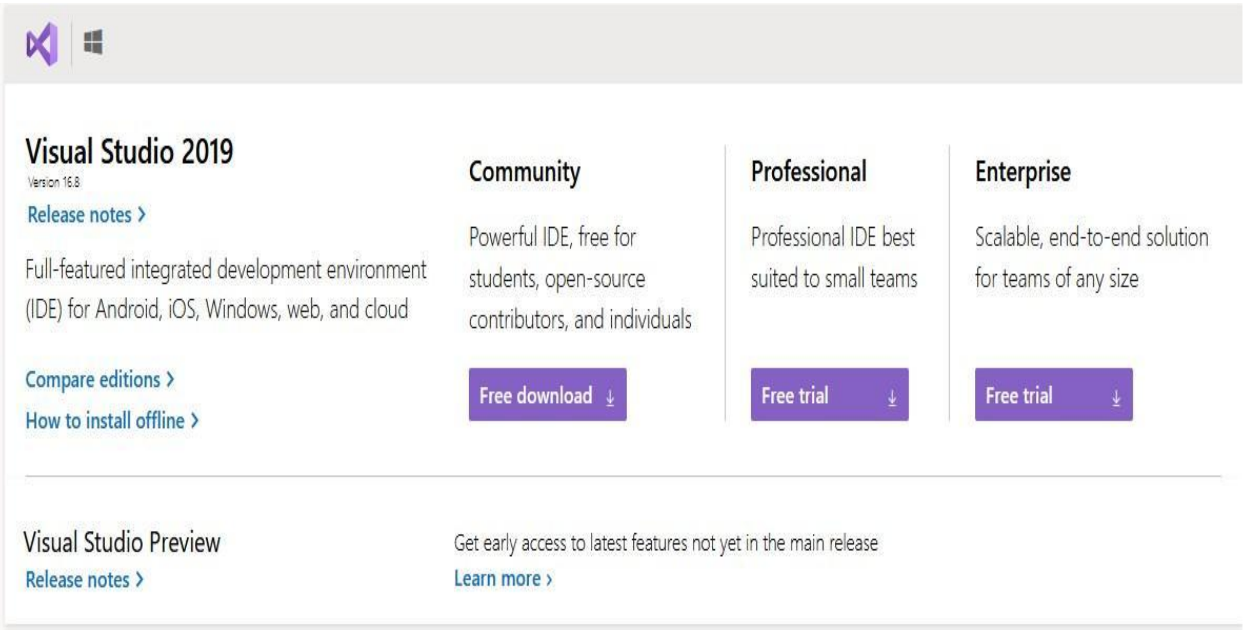
- Introduction to Visual Studio 2019
- An introduction to Assembly Language
- Understanding the Visual Studio 2019
- Configuring Visual Studio 2019 to activate MASM assembler
- Running a test program

SECTION 1: INTRODUCTION TO VISUAL STUDIO 2019

Visual Studio (for all its versions) is an integrated development environment (IDE) from Microsoft. It is a leading tool to develop computer programs, as well as web sites, web applications and web services. For this course, we will use Visual Studio version 2019 to develop programs in Assembly Language. We could, however, use a stand-alone assembler like NASM or MASM to code in Assembly Language.

INSTALLATION PROCESS

Go to this link https://visualstudio.microsoft.com/downloads/ and select VS 2019 Download for community version


Visual Studio 2019
Version 16.8
Release notes ›
Full-featured integrated development environment (IDE) for Android, iOS, Windows, web, and cloud
Compare editions ›
How to install offline ›

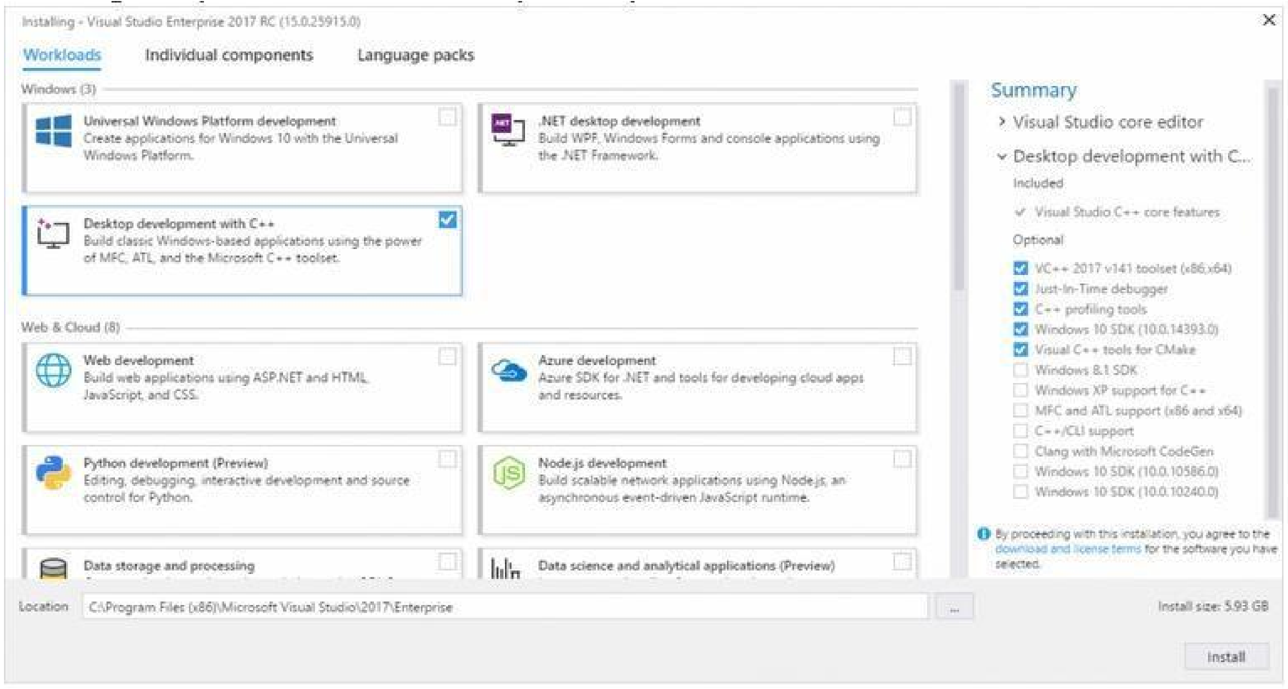
Community
Powerful IDE, free for students, open-source contributors, and individuals
Free download

Professional
Professional IDE best suited to small teams
Free trial

Enterprise
Scalable, end-to-end solution for teams of any size
Free trial

Visual Studio Preview
Release notes ›
Get early access to latest features not yet in the main release
Learn more ›

Run that downloaded setup on your system and when it's complete, you have to download and install **Desktop Development with** C++. When it's done you are ready to go.



Installing - Visual Studio Enterprise 2017 RC (15.0.25915.0)

Workloads | Individual components | Language packs

Windows (3)

- Universal Windows Platform development — Create applications for Windows 10 with the Universal Windows Platform.
- .NET desktop development — Build WPF, Windows Forms and console applications using the .NET Framework.
- Desktop development with C++ — Build classic Windows-based applications using the power of MFC, ATL, and the Microsoft C++ toolset. ✓

Web & Cloud (8)

- Web development — Build web applications using ASP.NET and HTML, JavaScript, and CSS.
- Azure development — Azure SDK for .NET and tools for developing cloud apps and resources.
- Python development (Preview) — Editing, debugging, interactive development and source control for Python.
- Node.js development — Build scalable network applications using Node.js, an asynchronous event-driven JavaScript runtime.
- Data storage and processing
- Data science and analytical applications (Preview)

Summary

› Visual Studio core editor

⌄ Desktop development with C...

Included

✓ Visual Studio C++ core features

Optional

- ✓ VC++ 2017 v141 toolset (x86,x64)
- ✓ Just-In-Time debugger
- ✓ C++ profiling tools
- ✓ Windows 10 SDK (10.0.14393.0)
- ✓ Visual C++ tools for CMake
- ☐ Windows 8.1 SDK
- ☐ Windows XP support for C++
- ☐ MFC and ATL support (x86 and x64)
- ☐ C++/CLI support
- ☐ Clang with Microsoft CodeGen
- ☐ Windows 10 SDK (10.0.10586.0)
- ☐ Windows 10 SDK (10.0.10240.0)

By proceeding with this installation, you agree to the download and license terms for the software you have selected.

Location C:\Program Files (x86)\Microsoft Visual Studio\2017\Enterprise

Install size: 5.93 GB

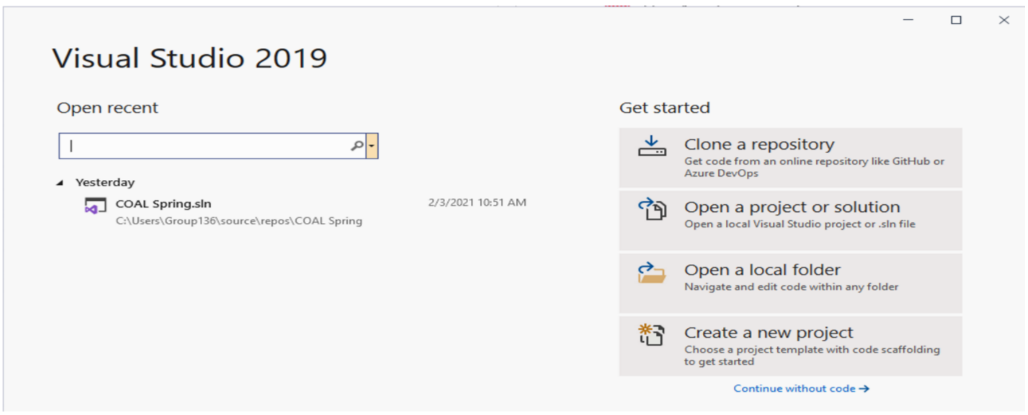
Install

Configuration VS2019 for assembly language

Click here to download Irvine library from this link:www.asmirvine.com/gettingStartedVS2019/Irvine.zip

Once you have downloaded the required Irvine library, install it in your computer and verify that a folder named Irvine has been created in your C:\ drive. Now, follow these steps to configure Visual Studio 2019:

1. Start Microsoft Visual Studio 2019. If you are running it for the first time then this would be the screen you may see



Visual Studio 2019

Open recent

Yesterday

COAL Spring.sln C:\Users\Group136\source\repos\COAL Spring 2/3/2021 10:51 AM

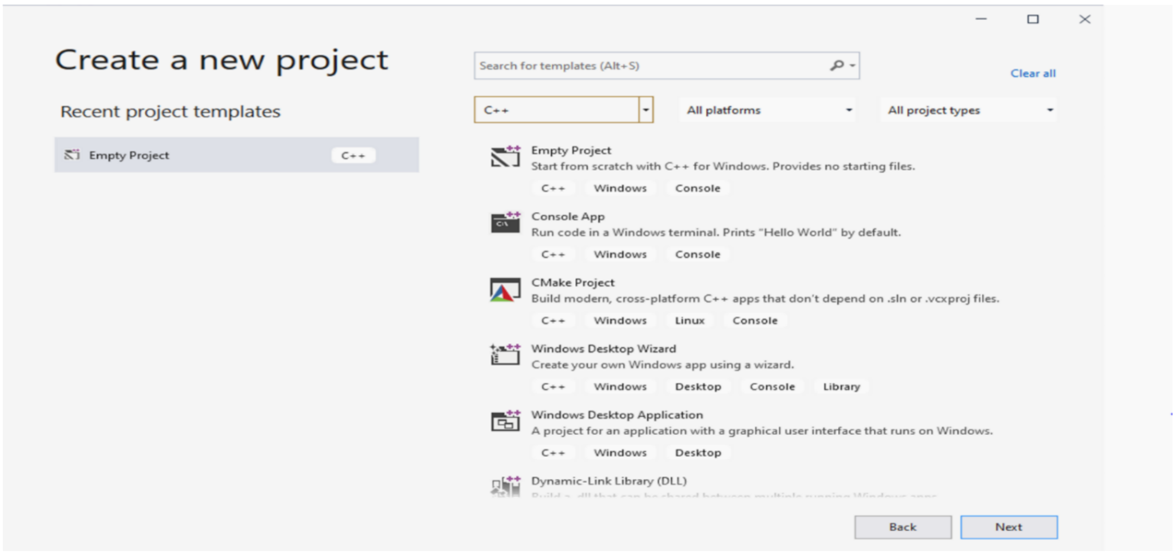
Get started

- Clone a repository — Get code from an online repository like GitHub or Azure DevOps
- Open a project or solution — Open a local Visual Studio project or .sln file
- Open a local folder — Navigate and edit code within any folder
- Create a new project — Choose a project template with code scaffolding to get started

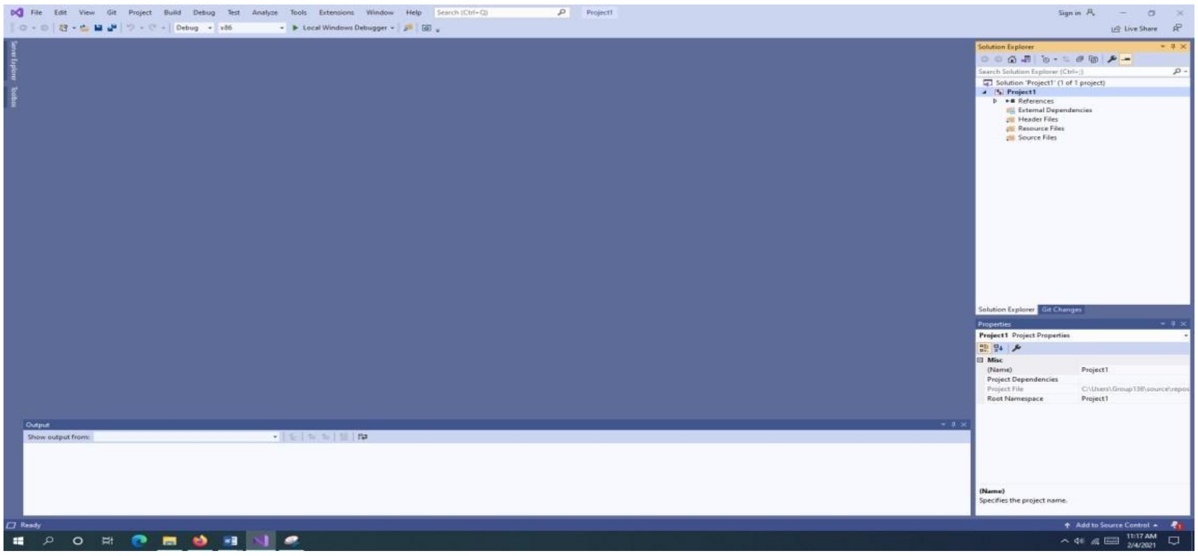
Continue without code →

Select Create a new project.

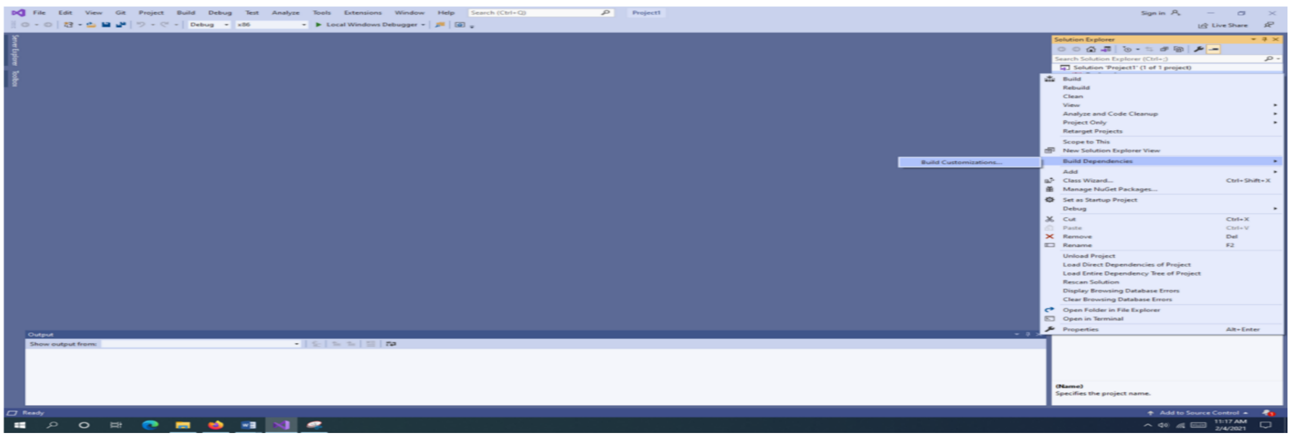
2. From languages select **C++,** and then create an empty project


Create a new project
Recent project templates
Empty Project C++
Search for templates (Alt+S)
Clear all
C++
All platforms
All project types
Empty Project
Start from scratch with C++ for Windows. Provides no starting files.
C++ Windows Console
Console App
Run code in a Windows terminal. Prints "Hello World" by default.
C++ Windows Console
CMake Project
Build modern, cross-platform C++ apps that don't depend on .sln or .vcxproj files.
C++ Windows Linux Console
Windows Desktop Wizard
Create your own Windows app using a wizard.
C++ Windows Desktop Console Library
Windows Desktop Application
A project for an application with a graphical user interface that runs on Windows.
C++ Windows Desktop
Dynamic-Link Library (DLL)
Back
Next

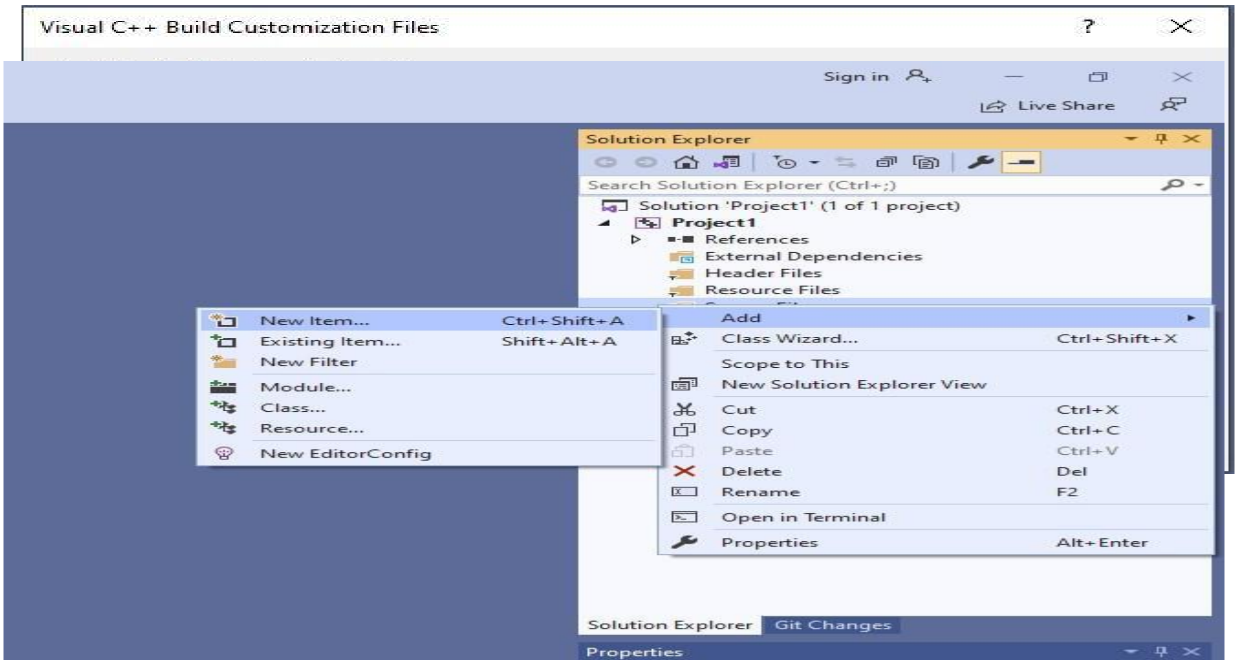
3. Once your new project is created, press **Ctrl+Alt+L** to open **Solution Explorer**. In the solution explorer window, you would see your project's file hierarchy.



Now right click on your project. Go to **Build Dependencies** and then select **Build Customization**

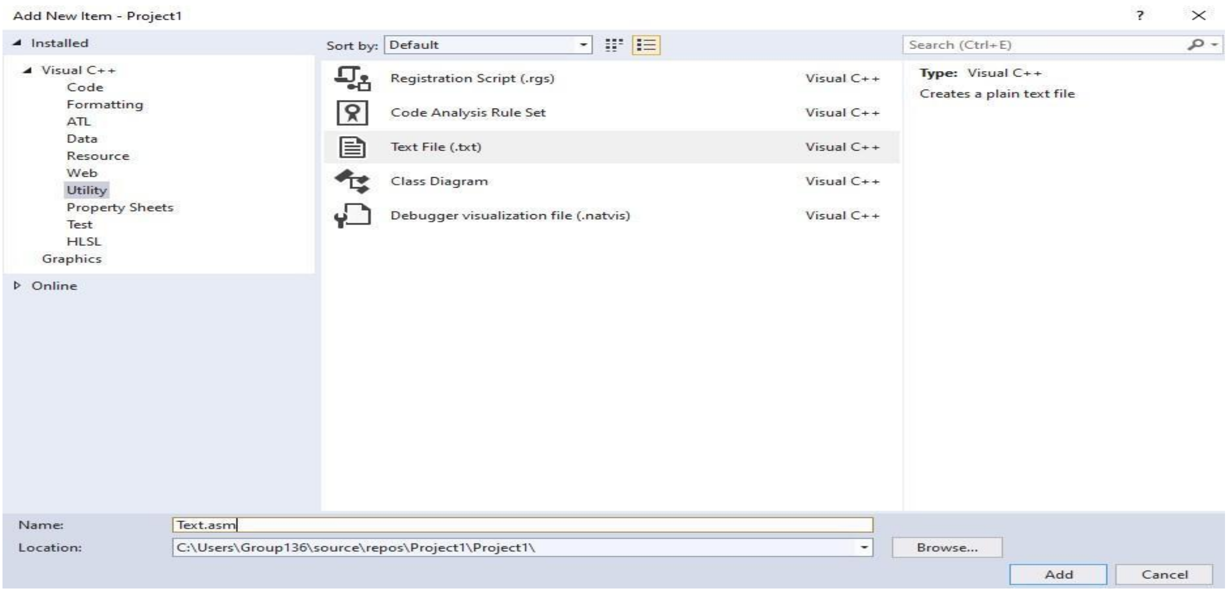


Tick the **masm** checkbox & select **OK**.



4. Right-click on **Source Files** in solution explorer & select **Add** > **New Item**.

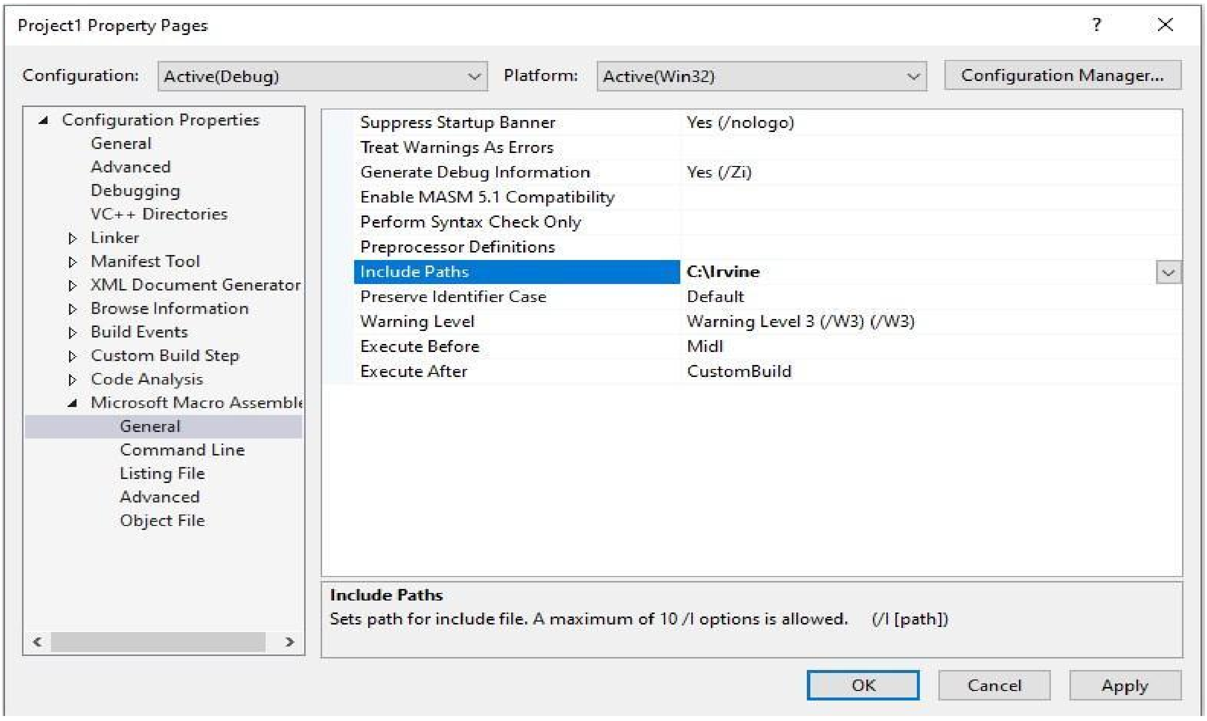
Now go to **Utility** > **Text File** to add a new file, but we do not want to add .txt file, instead we want to add a .asm file. So, rename your new text file as Test.asm (we can choose any other name e.g. xyz.asm but for this tutorial we will use the name Test.asm).



Type: Visual C++
Creates a plain text file

Name: Text.asm
Location: C:\Users\Group136\source\repos\Project1\Project1\

5. Now right-click your project again and click **Properties**. Now click the tiny arrow marker besides **Configuration Properties** to expand it. Now click **Microsoft Macro Assembler** and expand it.

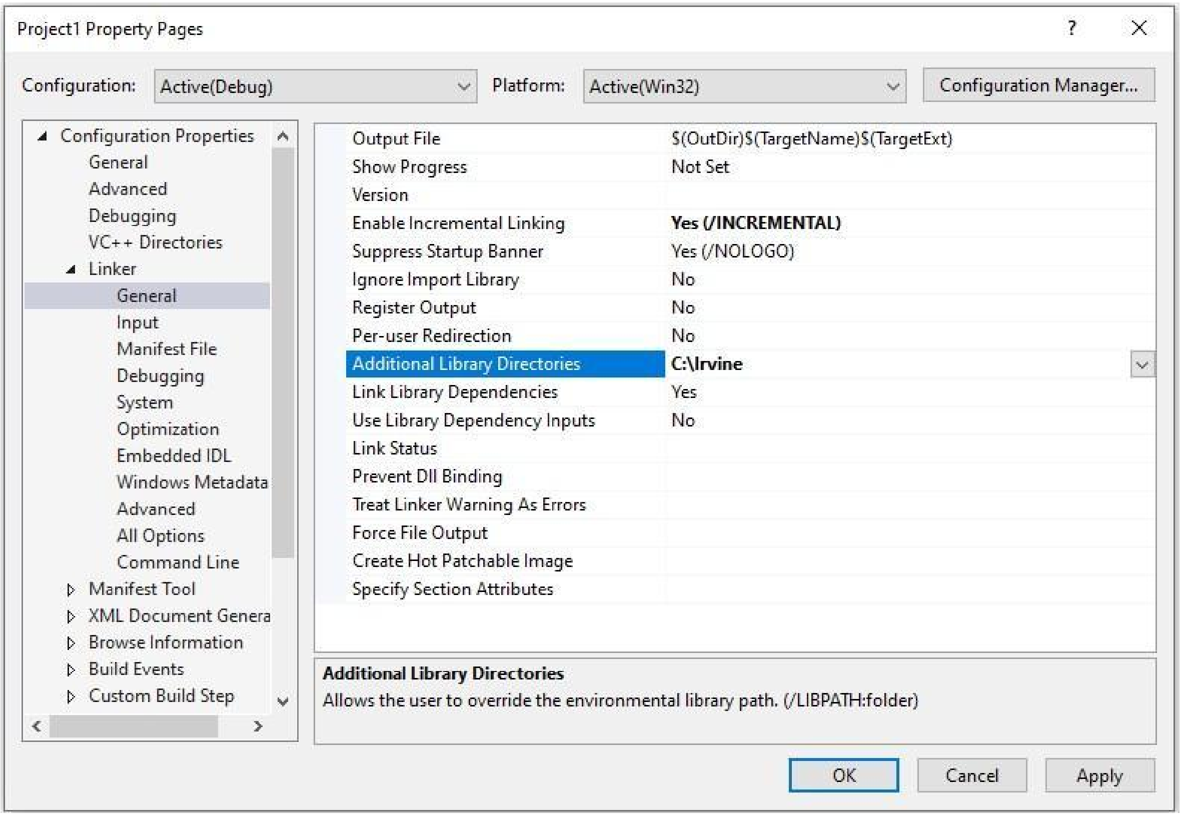


Suppress Startup Banner	Yes (/nologo)
Treat Warnings As Errors	
Generate Debug Information	Yes (/Zi)
Enable MASM 5.1 Compatibility	
Perform Syntax Check Only	
Preprocessor Definitions	
Include Paths	C:\Irvine
Preserve Identifier Case	Default
Warning Level	Warning Level 3 (/W3) (/W3)
Execute Before	Midl
Execute After	CustomBuild

Include Paths
Sets path for include file. A maximum of 10 /I options is allowed. (/I [path])

6. Now click **General** entry under Microsoft Macro Assembler and then set the value of **Include Paths** as **C:\Irvine**. The menu should now like this.

7. Click **Linker** tab to expand it. Select **General** and set the value of **Additional Library Directories** to **C:\Irvine**

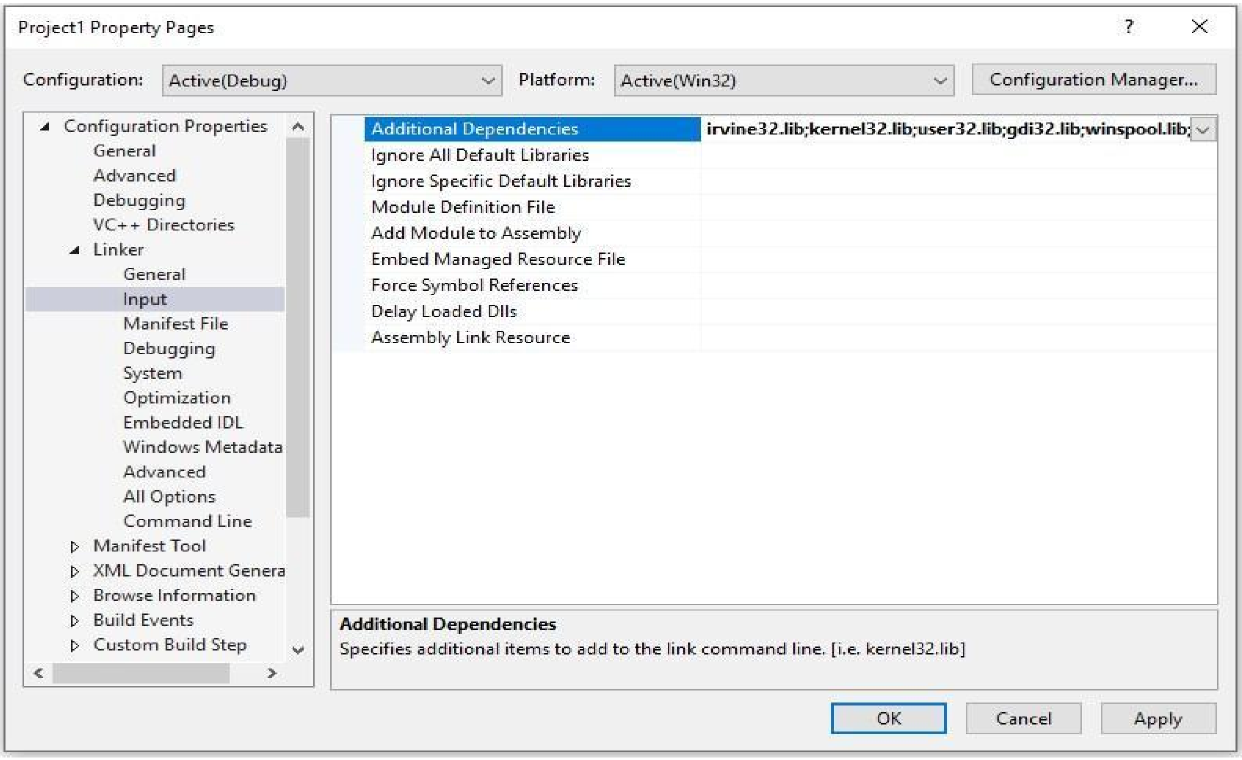

Project1 Property Pages

Configuration: Active(Debug) Platform: Active(Win32) Configuration Manager...

Output File	$(OutDir)$(TargetName)$(TargetExt)
Show Progress	Not Set
Version	
Enable Incremental Linking	**Yes (/INCREMENTAL)**
Suppress Startup Banner	Yes (/NOLOGO)
Ignore Import Library	No
Register Output	No
Per-user Redirection	No
Additional Library Directories	**C:\Irvine**
Link Library Dependencies	Yes
Use Library Dependency Inputs	No
Link Status	
Prevent Dll Binding	
Treat Linker Warning As Errors	
Force File Output	
Create Hot Patchable Image	
Specify Section Attributes	

Additional Library Directories
Allows the user to override the environmental library path. (/LIBPATH:folder)

8. Click **Input**, select **Additional Dependencies**. You will see a list of different .lib file names written there, do not alter any of those. Write **irvine32.lib;** at the start of the list like this.



Project1 Property Pages

Configuration: Active(Debug) Platform: Active(Win32)

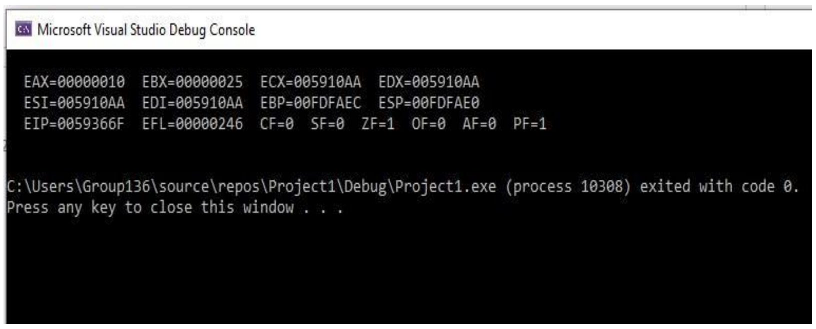
Configuration Properties > Linker > Input

Additional Dependencies: irvine32.lib;kernel32.lib;user32.lib;gdi32.lib;winspool.lib;

Additional Dependencies
Specifies additional items to add to the link command line. [i.e. kernel32.lib]

Our Visual Studio 2019 configuration for Assembly Language is complete. We can now write a sample program and run it to test our project. Open Test.asm from the solution explorer by double-clicking it. The Test.asm file will contain all the code that we write in our program. Go on and copy the following code onto your Test.asm file.

```
TITLE My First Program (Test.asm)
INCLUDE Irvine32.inc

.code
main PROC
mov eax, 10h
mov ebx, 25h
call DumpRegs
exit
main ENDP
END main
```



Microsoft Visual Studio Debug Console

```
  EAX=00000010  EBX=00000025  ECX=005910AA  EDX=005910AA
  ESI=005910AA  EDI=005910AA  EBP=00FDFAEC  ESP=00FDFAE0
  EIP=0059366F  EFL=00000246  CF=0  SF=0  ZF=1  OF=0  AF=0  PF=1

C:\Users\Group136\source\repos\Project1\Debug\Project1.exe (process 10308) exited with code 0.
Press any key to close this window . . .
```

Press **Ctrl+F5** to see the output in console window.

As we can see in the output window, the program has affected two registers eax & ebx. Let us dissect our code line by line to see what it does.

The first line TITLE MyFirstProgram (Test.asm) gives an optional title to our program. The second line INCLUDE irvine32.inc adds a reference to the include file that links your program to the Irvine library. The third line .code defines the beginning of the code segment (to be covered in detail later). The code segment is the segment of memory where all your code resides. In the fourth line, a main procedure is defined. The fifth and sixth lines show a mnemonic mov (to be covered in detail later) that 'moves' values 10h and 25h to eax and ebx, respectively. The radix h defines a hexadecimal constant.

The lines seven and eight calls the procedure DumpRegs that outputs the current values of the registers followed by a call to windows procedure named exit that halts the program. The lines nine and ten mark the end of the main procedure.

Section 2: Debugging our program

We have seen how to configure Visual Studio 2019 for Assembly Language and tested it with a sample program. The output of our sample program was displayed using a console window but it is usually more desirable to watch the step by step execution of our program with each line of code using breakpoints.

Let us briefly define the keywords relevant to debugging in Visual Studio and then we will cover an example for understanding.

Debugger

The (Visual Studio) debugger helps us observe the run-time behavior of our program and find problems. With the debugger, we can break execution of our program to examine our code, examine and edit variables, view registers, see the instructions created from our source code, and view the memory space used by our application.

Breakpoint

A breakpoint is a signal that tells the debugger to temporarily suspend execution of your program at a certain point. When execution is suspended at a breakpoint, your program is said to be in break mode.

Code Stepping

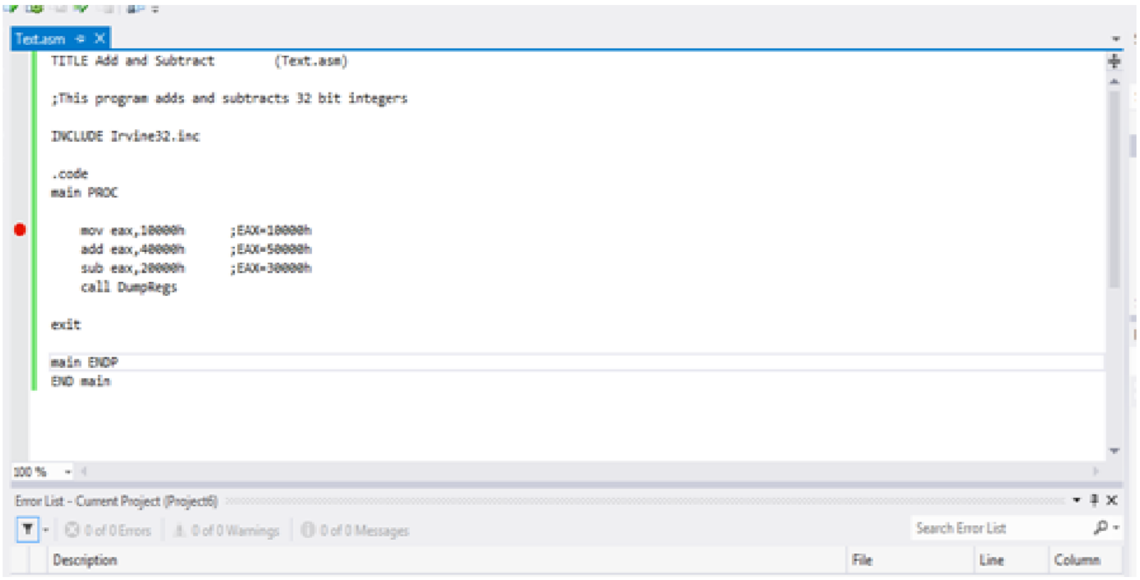
One of the most common debugging procedures is stepping: executing code one line at a time. The Debug menu provides three commands for stepping through code:

- Step Into (By pressing F11)
- Step Over (By pressing F10)
- Step Out (Shift+F11)

Single Stepping

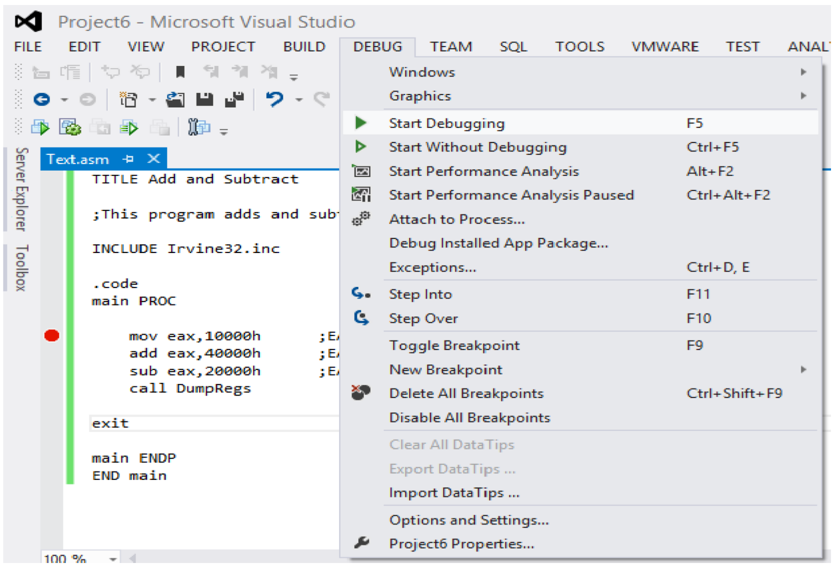
To see the values of internal registers and memory variables during execution, let us use an example. Copy the following code onto your Test.asm file.k

1. Right-click on line 6 to insert a breakpoint.



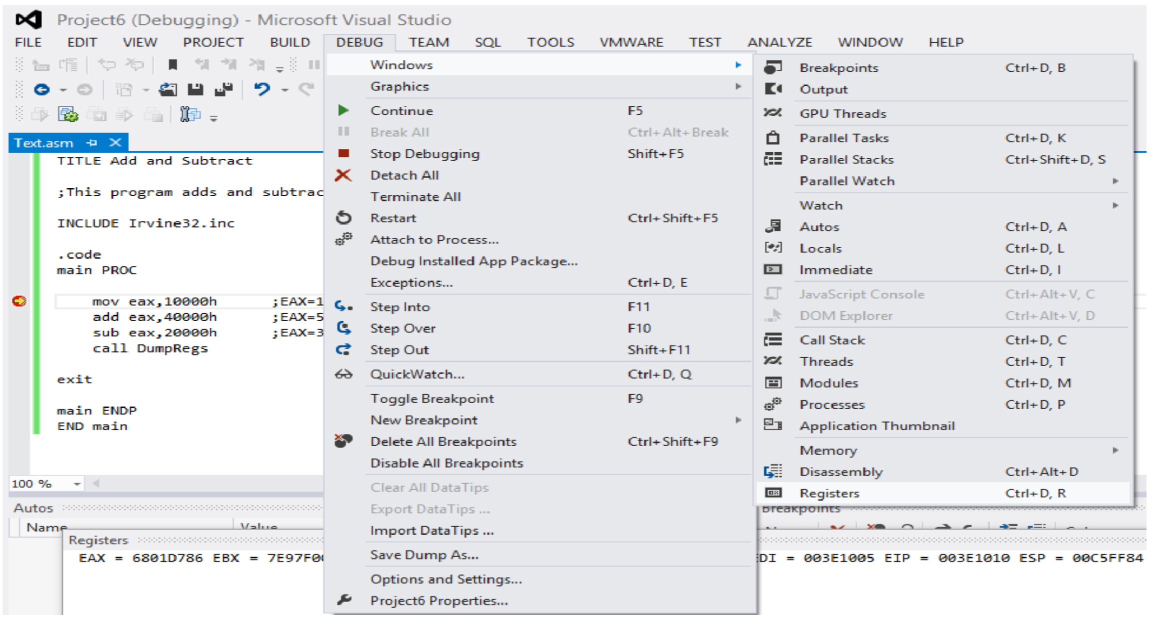
```
TITLE Add and Subtract        (Text.asm)

;This program adds and subtracts 32 bit integers

INCLUDE Irvine32.inc

.code
main PROC

    mov eax,10000h        ;EAX=10000h
    add eax,40000h        ;EAX=50000h
    sub eax,20000h        ;EAX=30000h
    call DumpRegs

exit

main ENDP
END main
```

2. Click on **Debug** tab from the toolbar, select **Start Debugging** OR press **F10** to start stepping over the code.



```
TITLE Add and Subtract

;This program adds and sub

INCLUDE Irvine32.inc

.code
main PROC

    mov eax,10000h        ;E
    add eax,40000h        ;E
    sub eax,20000h        ;E
    call DumpRegs

exit

main ENDP
END main
```

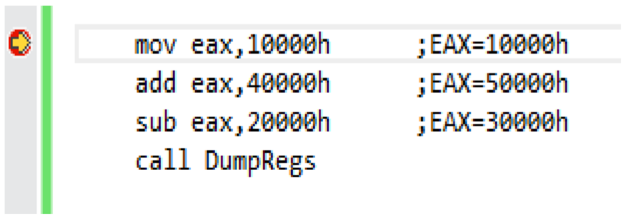
3. Click on **Debug** tab than select Windows after that open menu and select **Registers** option.



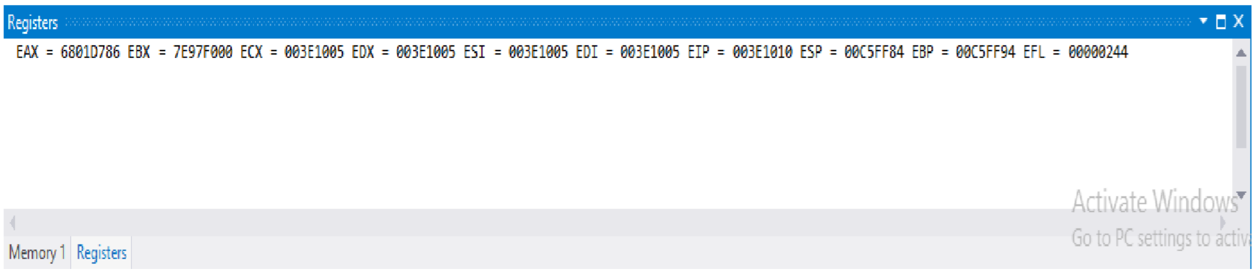
```
TITLE Add and Subtract

;This program adds and subtrac

INCLUDE Irvine32.inc

.code
main PROC

    mov eax,10000h        ;EAX=1
    add eax,40000h        ;EAX=5
    sub eax,20000h        ;EAX=3
    call DumpRegs

exit

main ENDP
END main
```

```
EAX = 6801D786 EBX = 7E97F0
DI = 003E1005 EIP = 003E1010 ESP = 00C5FF84
```

4. Breakpoint set on 1st instruction

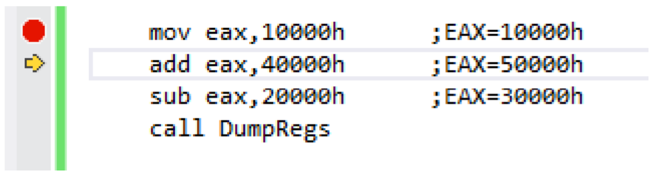


```
mov eax,10000h        ;EAX=10000h
add eax,40000h        ;EAX=50000h
sub eax,20000h        ;EAX=30000h
call DumpRegs
```

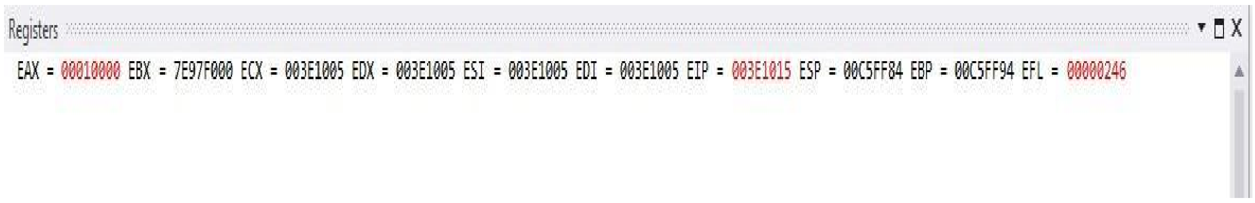


```
EAX = 6801D786 EBX = 7E97F000 ECX = 003E1005 EDX = 003E1005 ESI = 003E1005 EDI = 003E1005 EIP = 003E1010 ESP = 00C5FF84 EBP = 00C5FF94 EFL = 00000244
```

Press **F10** again to execute next line.

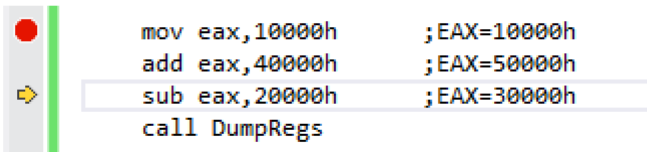


```
mov eax,10000h        ;EAX=10000h
add eax,40000h        ;EAX=50000h
sub eax,20000h        ;EAX=30000h
call DumpRegs
```

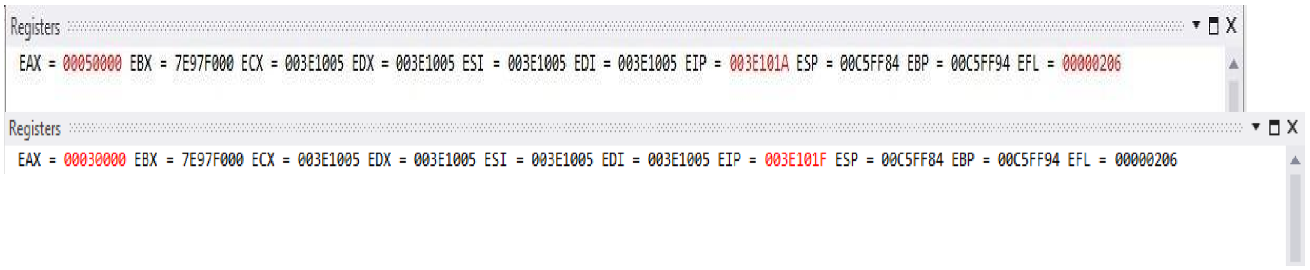


```
EAX = 00010000 EBX = 7E97F000 ECX = 003E1005 EDX = 003E1005 ESI = 003E1005 EDI = 003E1005 EIP = 003E1015 ESP = 00C5FF84 EBP = 00C5FF94 EFL = 00000246
```

Again press **F10** key for next instruction execution.



```
mov eax,10000h      ;EAX=10000h
add eax,40000h      ;EAX=50000h
sub eax,20000h      ;EAX=30000h
call DumpRegs
```



```
Registers
EAX = 00050000 EBX = 7E97F000 ECX = 003E1005 EDX = 003E1005 ESI = 003E1005 EDI = 003E1005 EIP = 003E101A ESP = 00C5FF84 EBP = 00C5FF94 EFL = 00000206
Registers
EAX = 00030000 EBX = 7E97F000 ECX = 003E1005 EDX = 003E1005 ESI = 003E1005 EDI = 003E1005 EIP = 003E101F ESP = 00C5FF84 EBP = 00C5FF94 EFL = 00000206
```

Press **F10** again, the program will not terminate after executing the current instruction and as soon as it reaches the line with a call to **DumpRegs**

Section 2: Exercise

1. Install Visual Studio 2019 & create a new Visual C++ project for Assembly Language.
2. Configure the project using the steps show in this lab.
3. Run a test program in console window by changing the value of EAX in line 6 to 8500h.
4. Debug the below program and note down the values of all the registers after the execution of each line.

```
TITLE My First Program (Test.asm)
INCLUDE Irvine32.inc

        .code
        main PROC
        mov eax, 47h
        mov ebx, 39h
        mov ecx, 60h
        add eax, ebx
        add eax, ecx
        mov ebx, 85h
        mov ecx, 64h
        add eax, ebx
        add eax, ecx

call DumpRegs
exit
main ENDP
END main
```

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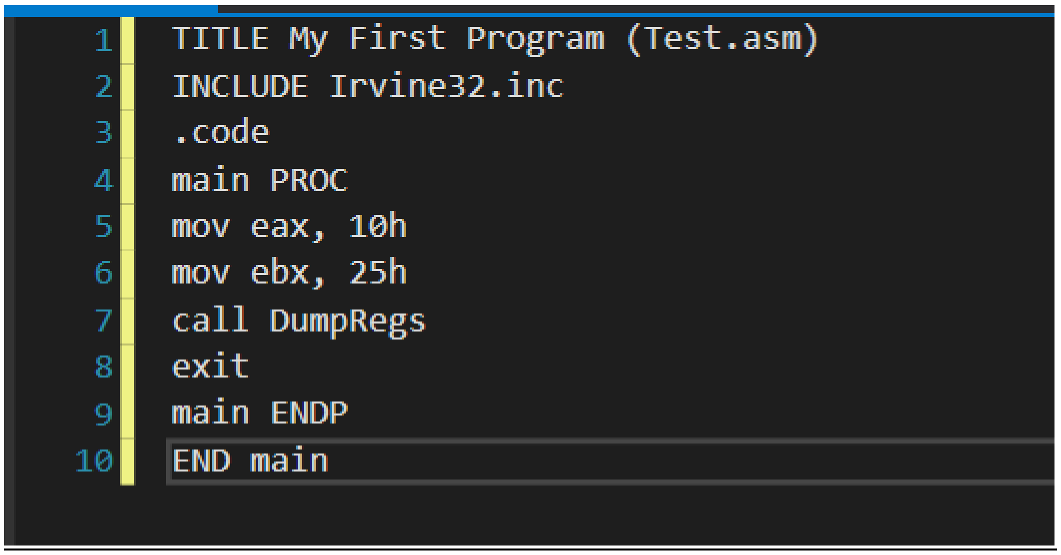
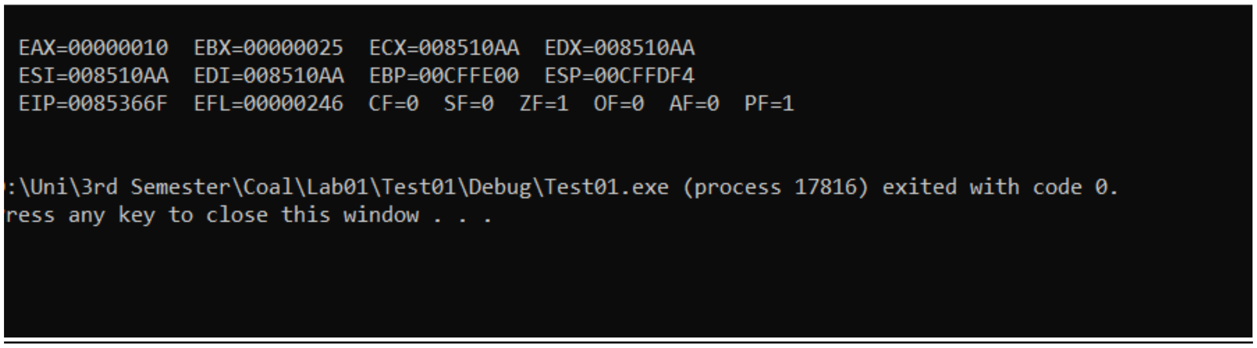
Task 1: Sample Program



```
TITLE My First Program (Test.asm)
INCLUDE Irvine32.inc
.code
main PROC
mov eax, 10h
mov ebx, 25h
call DumpRegs
exit
main ENDP
END main
```

Output Window



```
 EAX=00000010  EBX=00000025  ECX=008510AA  EDX=008510AA
 ESI=008510AA  EDI=008510AA  EBP=00CFFE00  ESP=00CFFDF4
 EIP=0085366F  EFL=00000246  CF=0  SF=0  ZF=1  OF=0  AF=0  PF=1


:\Uni\3rd Semester\Coal\Lab01\Test01\Debug\Test01.exe (process 17816) exited with code 0.
ress any key to close this window . . .
```

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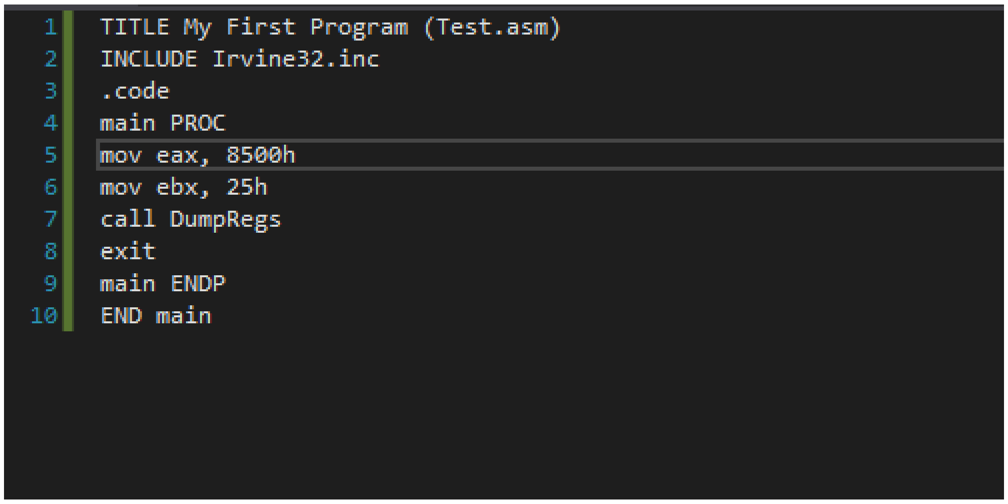
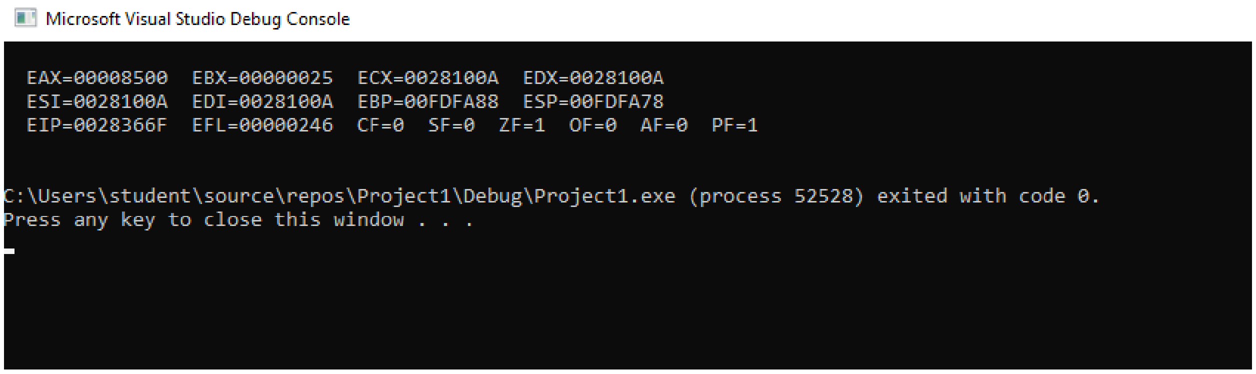
Task 2: includes changing the value of EAX by 8500h in line 6



```
 1  TITLE My First Program (Test.asm)
 2  INCLUDE Irvine32.inc
 3  .code
 4  main PROC
 5  mov eax, 8500h
 6  mov ebx, 25h
 7  call DumpRegs
 8  exit
 9  main ENDP
10  END main
```

Output Window



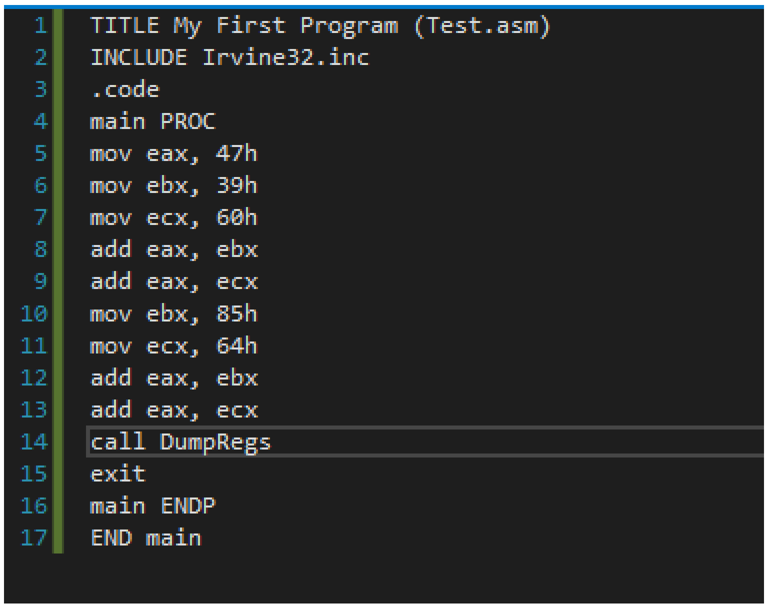
Microsoft Visual Studio Debug Console

```
  EAX=00008500  EBX=00000025  ECX=0028100A  EDX=0028100A
  ESI=0028100A  EDI=0028100A  EBP=00FDFA88  ESP=00FDFA78
  EIP=0028366F  EFL=00000246  CF=0  SF=0  ZF=1  OF=0  AF=0  PF=1


C:\Users\student\source\repos\Project1\Debug\Project1.exe (process 52528) exited with code 0.
Press any key to close this window . . .
```

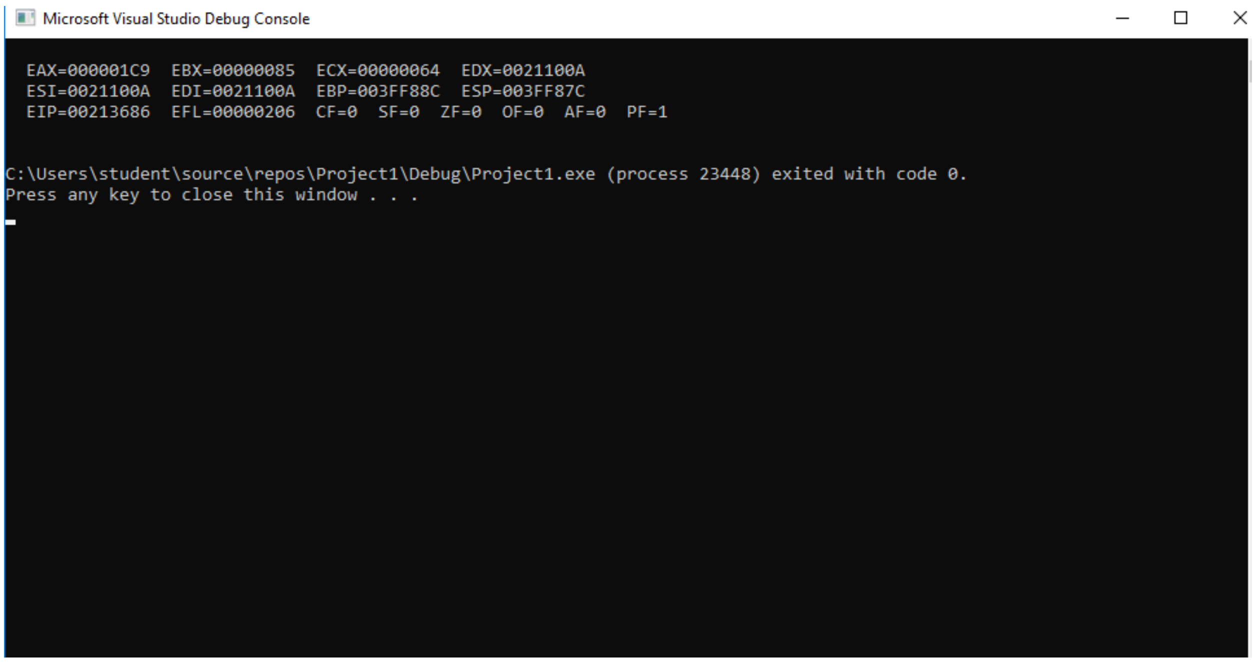
LAB 01

Code For Section 2 Exercise



```
TITLE My First Program (Test.asm)
INCLUDE Irvine32.inc
.code
main PROC
mov eax, 47h
mov ebx, 39h
mov ecx, 60h
add eax, ebx
add eax, ecx
mov ebx, 85h
mov ecx, 64h
add eax, ebx
add eax, ecx
call DumpRegs
exit
main ENDP
END main
```

Output Window



Microsoft Visual Studio Debug Console

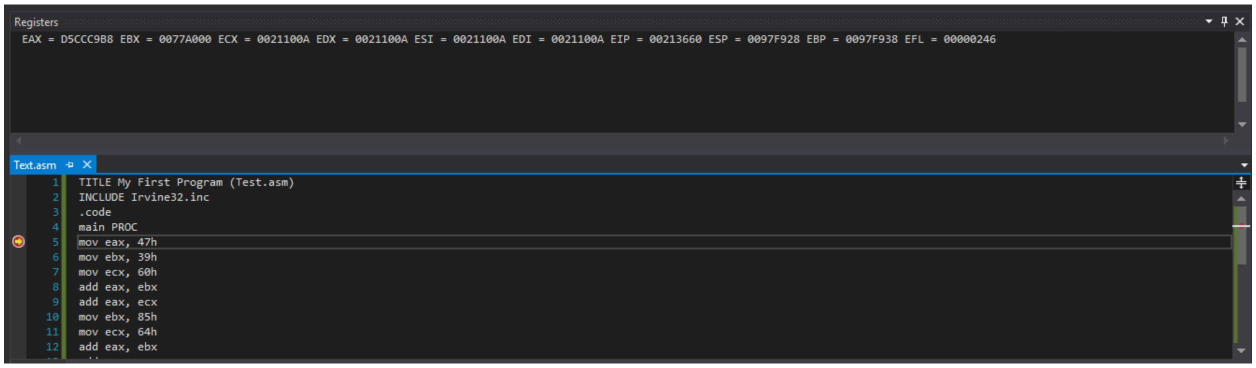
```
  EAX=000001C9  EBX=00000085  ECX=00000064  EDX=0021100A
  ESI=0021100A  EDI=0021100A  EBP=003FF88C  ESP=003FF87C
  EIP=00213686  EFL=00000206  CF=0  SF=0  ZF=0  OF=0  AF=0  PF=1


C:\Users\student\source\repos\Project1\Debug\Project1.exe (process 23448) exited with code 0.
Press any key to close this window . . .
```

Mohsin Ali Mirza **k200353** **3E-BSCS**

LAB 01

Step 1: Adding Breakpoint and Debugging at line 5

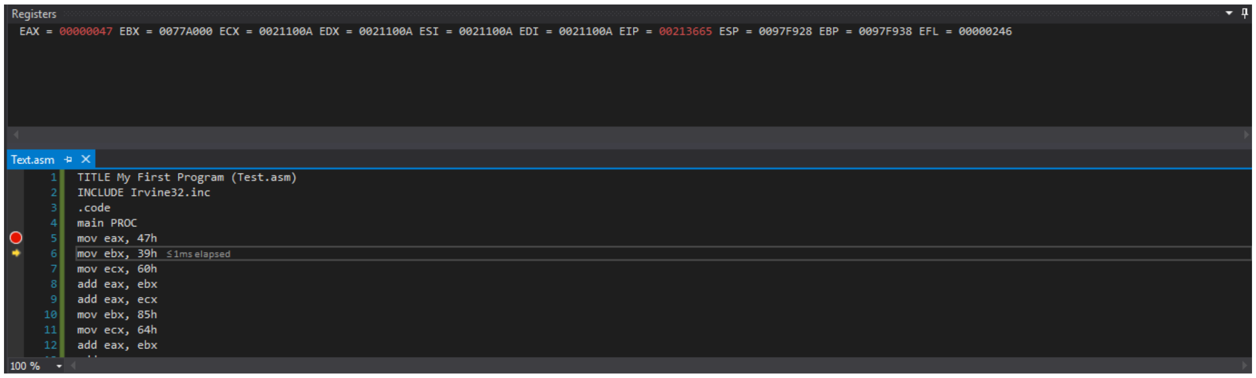


```
Registers
EAX = D5CCC9B8 EBX = 0077A000 ECX = 0021100A EDX = 0021100A ESI = 0021100A EDI = 0021100A EIP = 00213660 ESP = 0097F928 EBP = 0097F938 EFL = 00000246
```

Text.asm

```
 1  TITLE My First Program (Test.asm)
 2  INCLUDE Irvine32.inc
 3  .code
 4  main PROC
 5  mov eax, 47h
 6  mov ebx, 39h
 7  mov ecx, 60h
 8  add eax, ebx
 9  add eax, ecx
10  mov ebx, 85h
11  mov ecx, 64h
12  add eax, ebx
```

Step 2: Changing The Value Of EAX By 47h



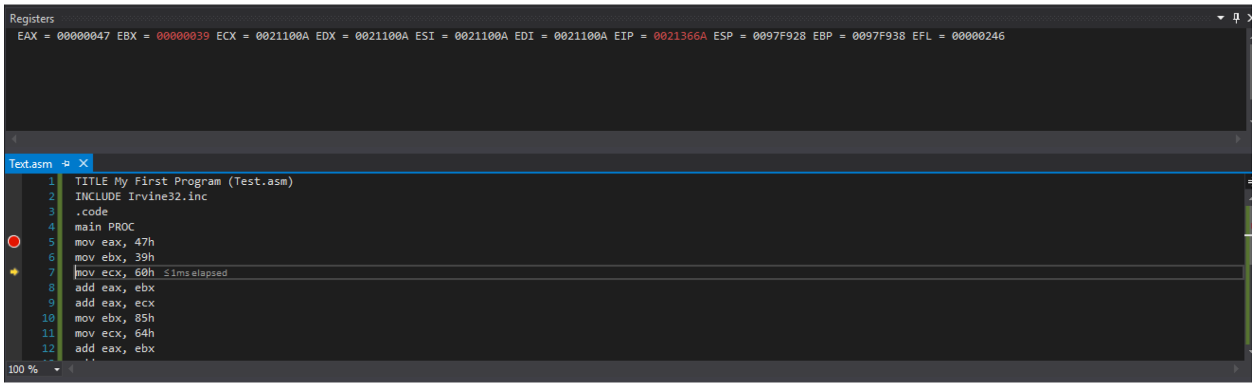
```
Registers
EAX = 00000047 EBX = 0077A000 ECX = 0021100A EDX = 0021100A ESI = 0021100A EDI = 0021100A EIP = 00213665 ESP = 0097F928 EBP = 0097F938 EFL = 00000246
```

Text.asm

```
 1  TITLE My First Program (Test.asm)
 2  INCLUDE Irvine32.inc
 3  .code
 4  main PROC
 5  mov eax, 47h
 6  mov ebx, 39h  ≤1ms elapsed
 7  mov ecx, 60h
 8  add eax, ebx
 9  add eax, ecx
10  mov ebx, 85h
11  mov ecx, 64h
12  add eax, ebx
```

100 %

Step 3: Changing The Value Of EBX By 39h



```
Registers
EAX = 00000047 EBX = 00000039 ECX = 0021100A EDX = 0021100A ESI = 0021100A EDI = 0021100A EIP = 0021366A ESP = 0097F928 EBP = 0097F938 EFL = 00000246
```

Text.asm

```
 1  TITLE My First Program (Test.asm)
 2  INCLUDE Irvine32.inc
 3  .code
 4  main PROC
 5  mov eax, 47h
 6  mov ebx, 39h
 7  mov ecx, 60h  ≤1ms elapsed
 8  add eax, ebx
 9  add eax, ecx
10  mov ebx, 85h
11  mov ecx, 64h
12  add eax, ebx
```

100 %

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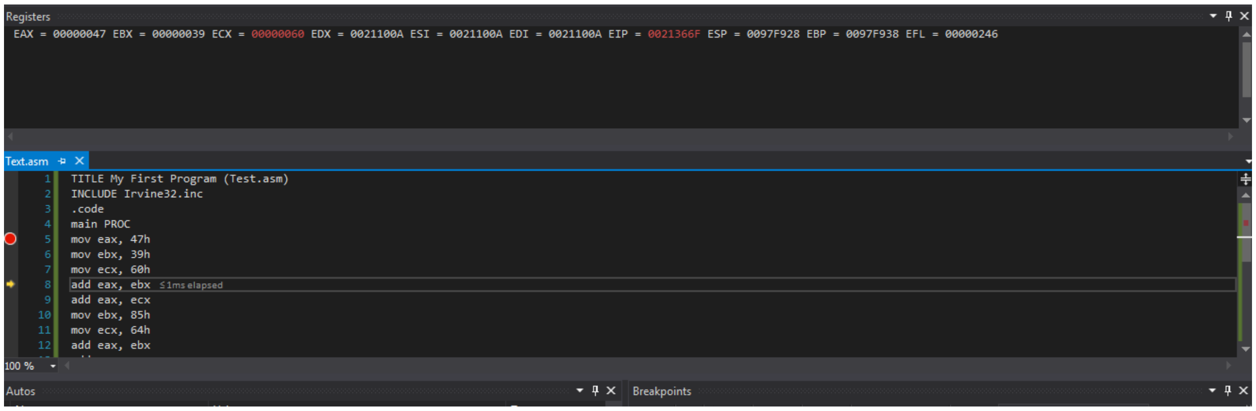
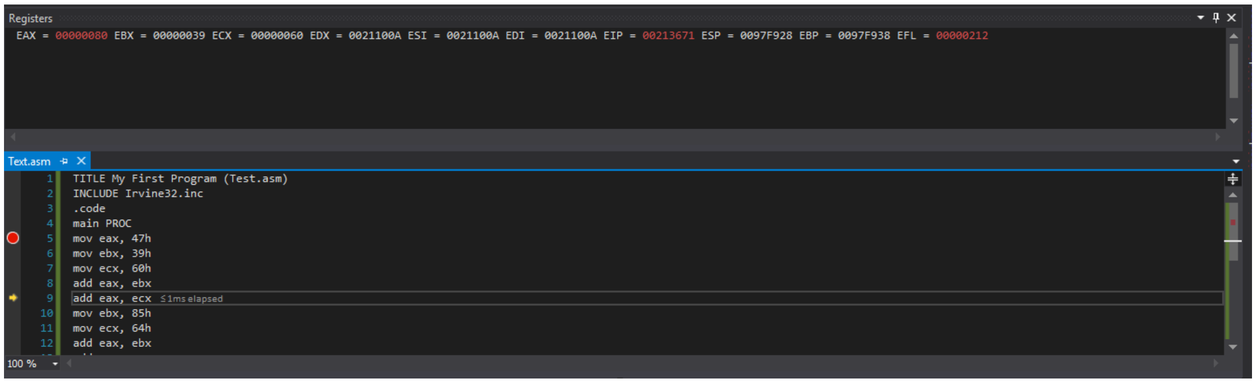
Step 4: Changing The Value Of ECX By 60h



```
EAX = 00000047 EBX = 00000039 ECX = 00000060 EDX = 0021100A ESI = 0021100A EDI = 0021100A EIP = 0021366F ESP = 0097F928 EBP = 0097F938 EFL = 00000246
```

```
TITLE My First Program (Test.asm)
INCLUDE Irvine32.inc
.code
main PROC
mov eax, 47h
mov ebx, 39h
mov ecx, 60h
add eax, ebx  ≤1ms elapsed
add eax, ecx
mov ebx, 85h
mov ecx, 64h
add eax, ebx
```

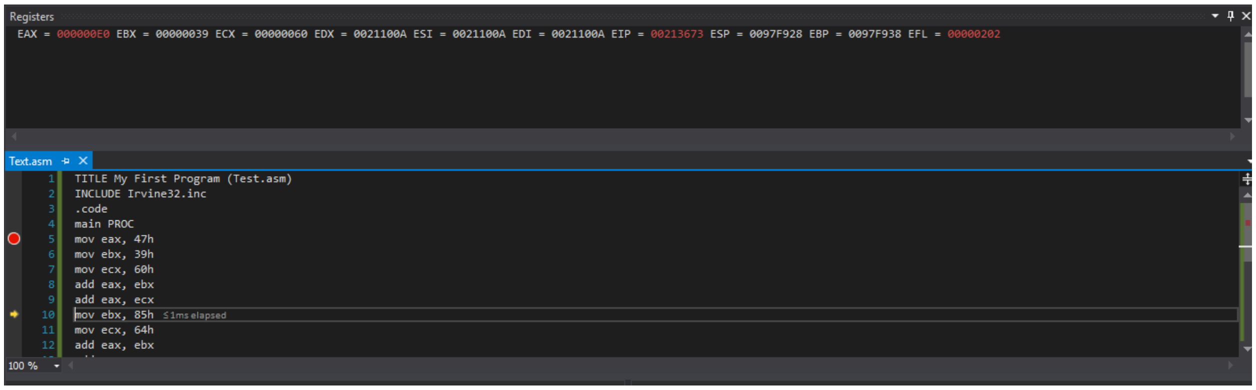
Step 5: Adding The Value Of EAX By EBX (39h)



```
EAX = 00000080 EBX = 00000039 ECX = 00000060 EDX = 0021100A ESI = 0021100A EDI = 0021100A EIP = 00213671 ESP = 0097F928 EBP = 0097F938 EFL = 00000212
```

```
TITLE My First Program (Test.asm)
INCLUDE Irvine32.inc
.code
main PROC
mov eax, 47h
mov ebx, 39h
mov ecx, 60h
add eax, ebx
add eax, ecx  ≤1ms elapsed
mov ebx, 85h
mov ecx, 64h
add eax, ebx
```

Step 6: Adding The Value Of EAX By ECX (60h)



```
EAX = 000000E0 EBX = 00000039 ECX = 00000060 EDX = 0021100A ESI = 0021100A EDI = 0021100A EIP = 00213673 ESP = 0097F928 EBP = 0097F938 EFL = 00000202
```

```
TITLE My First Program (Test.asm)
INCLUDE Irvine32.inc
.code
main PROC
mov eax, 47h
mov ebx, 39h
mov ecx, 60h
add eax, ebx
add eax, ecx
mov ebx, 85h  ≤1ms elapsed
mov ecx, 64h
add eax, ebx
```

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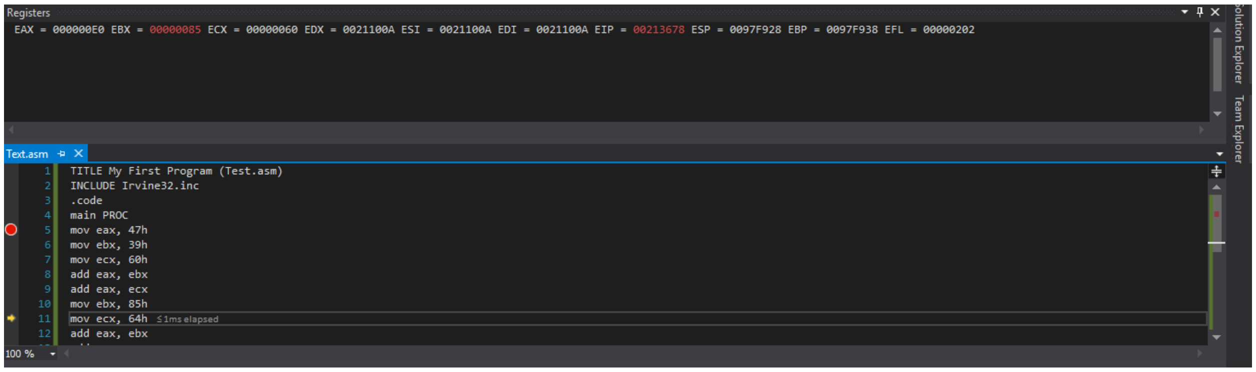
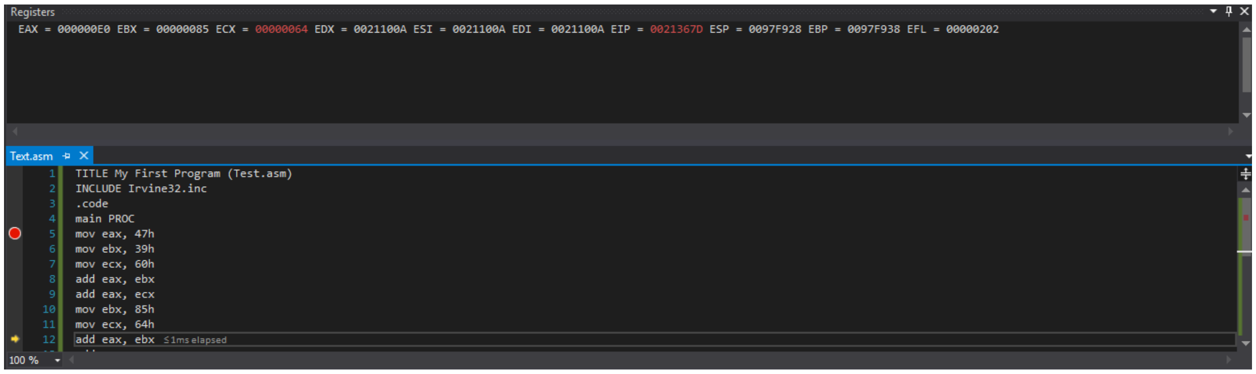
Step 7: Changing The Value Of EBX By 85h



```
EAX = 000000E0 EBX = 00000085 ECX = 00000060 EDX = 0021100A ESI = 0021100A EDI = 0021100A EIP = 00213678 ESP = 0097F928 EBP = 0097F938 EFL = 00000202
```

```
TITLE My First Program (Test.asm)
INCLUDE Irvine32.inc
.code
main PROC
mov eax, 47h
mov ebx, 39h
mov ecx, 60h
add eax, ebx
add eax, ecx
mov ebx, 85h
mov ecx, 64h  ≤1ms elapsed
add eax, ebx
```

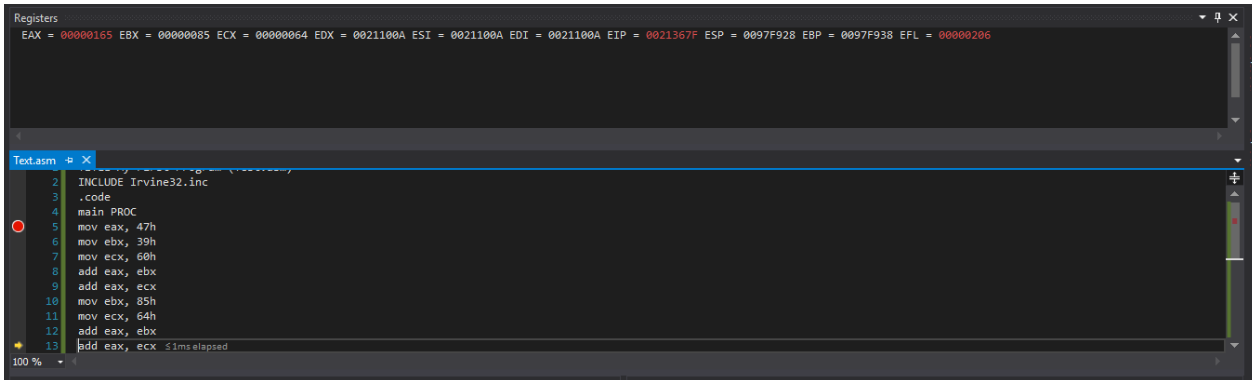
Step 8: Changing The Value Of ECX By 64h



```
EAX = 000000E0 EBX = 00000085 ECX = 00000064 EDX = 0021100A ESI = 0021100A EDI = 0021100A EIP = 0021367D ESP = 0097F928 EBP = 0097F938 EFL = 00000202
```

```
TITLE My First Program (Test.asm)
INCLUDE Irvine32.inc
.code
main PROC
mov eax, 47h
mov ebx, 39h
mov ecx, 60h
add eax, ebx
add eax, ecx
mov ebx, 85h
mov ecx, 64h
add eax, ebx  ≤1ms elapsed
```

Step 9: Adding The Value Of EAX By EBX (85h)



```
EAX = 00000165 EBX = 00000085 ECX = 00000064 EDX = 0021100A ESI = 0021100A EDI = 0021100A EIP = 0021367F ESP = 0097F928 EBP = 0097F938 EFL = 00000206
```

```
INCLUDE Irvine32.inc
.code
main PROC
mov eax, 47h
mov ebx, 39h
mov ecx, 60h
add eax, ebx
add eax, ecx
mov ebx, 85h
mov ecx, 64h
add eax, ebx
add eax, ecx  ≤1ms elapsed
```

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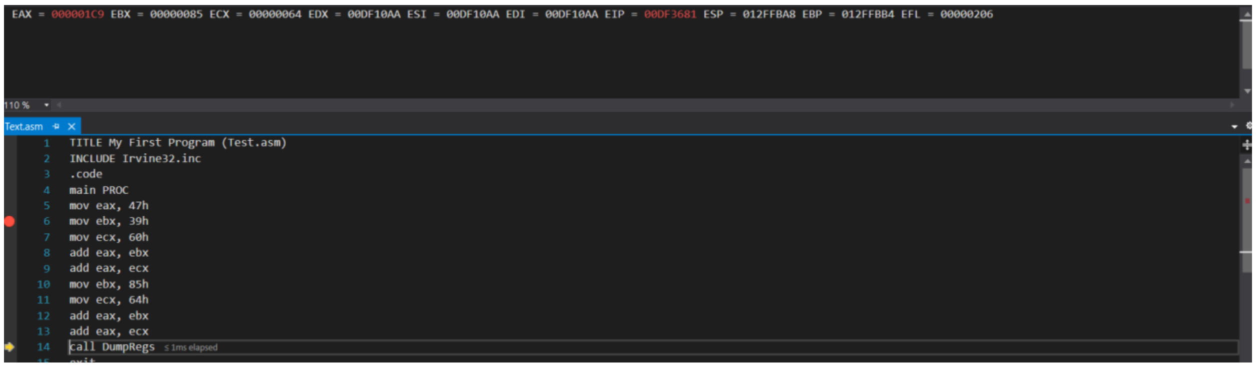
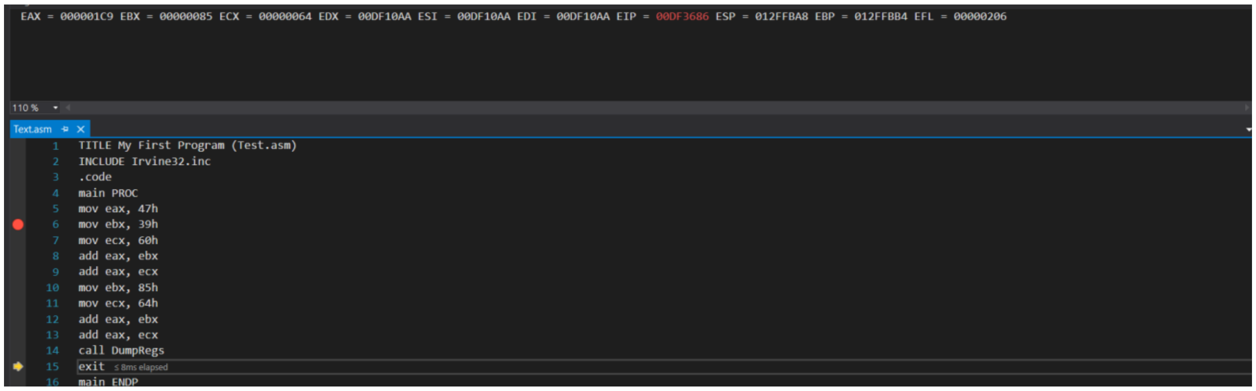
Step 10: Adding The Value Of EAX By ECX (64h)



```
EAX = 000001C9 EBX = 00000085 ECX = 00000064 EDX = 00DF10AA ESI = 00DF10AA EDI = 00DF10AA EIP = 00DF3681 ESP = 012FFBA8 EBP = 012FFBB4 EFL = 00000206
```

```
TITLE My First Program (Test.asm)
INCLUDE Irvine32.inc
.code
main PROC
mov eax, 47h
mov ebx, 39h
mov ecx, 60h
add eax, ebx
add eax, ecx
mov ebx, 85h
mov ecx, 64h
add eax, ebx
add eax, ecx
call DumpRegs  ≤ 1ms elapsed
```

Step 11: Calling DumpRegs To Output All The Values Of Registers On The Console



```
EAX = 000001C9 EBX = 00000085 ECX = 00000064 EDX = 00DF10AA ESI = 00DF10AA EDI = 00DF10AA EIP = 00DF3686 ESP = 012FFBA8 EBP = 012FFBB4 EFL = 00000206
```

```
TITLE My First Program (Test.asm)
INCLUDE Irvine32.inc
.code
main PROC
mov eax, 47h
mov ebx, 39h
mov ecx, 60h
add eax, ebx
add eax, ecx
mov ebx, 85h
mov ecx, 64h
add eax, ebx
add eax, ecx
call DumpRegs
exit  ≤ 8ms elapsed
main ENDP
```