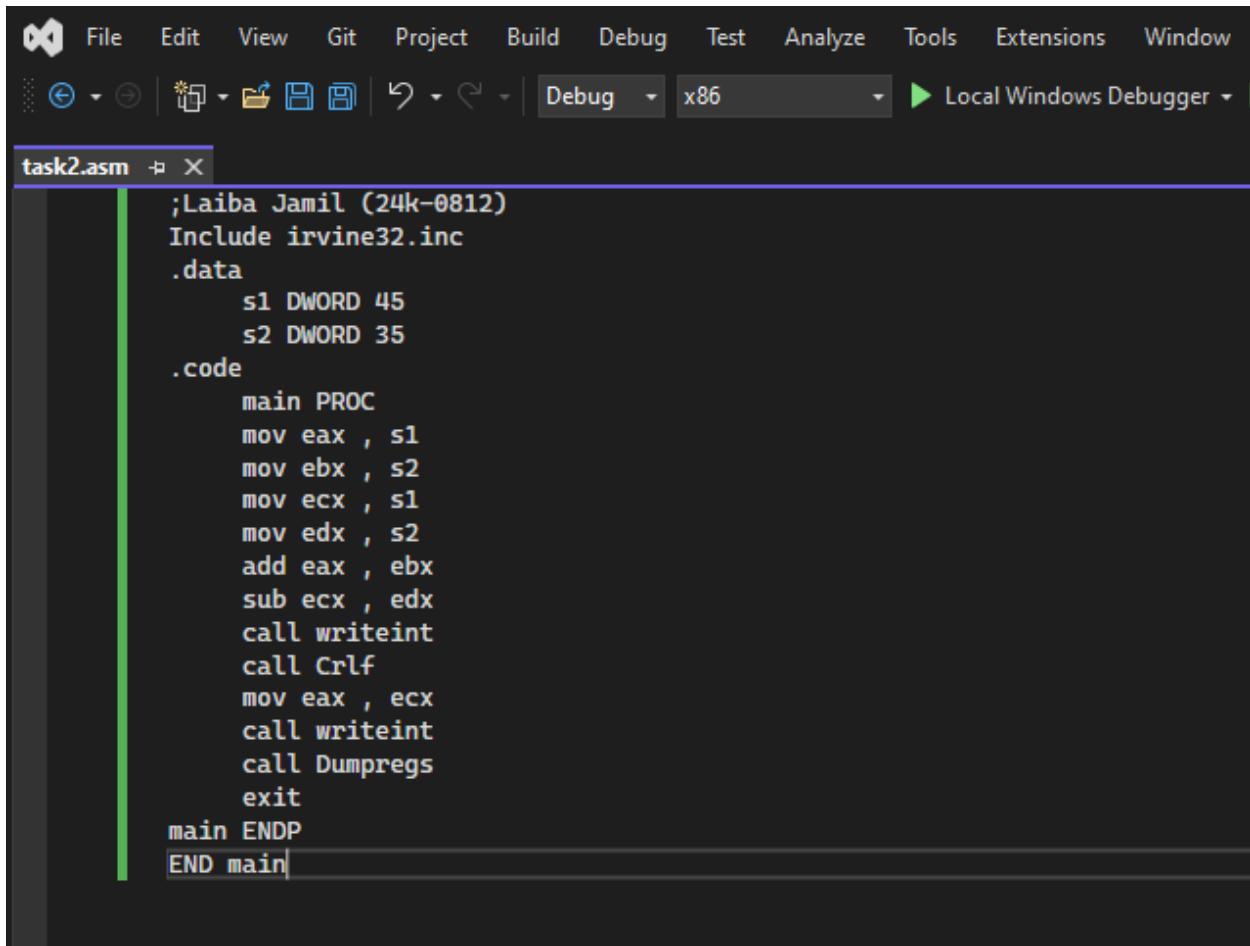


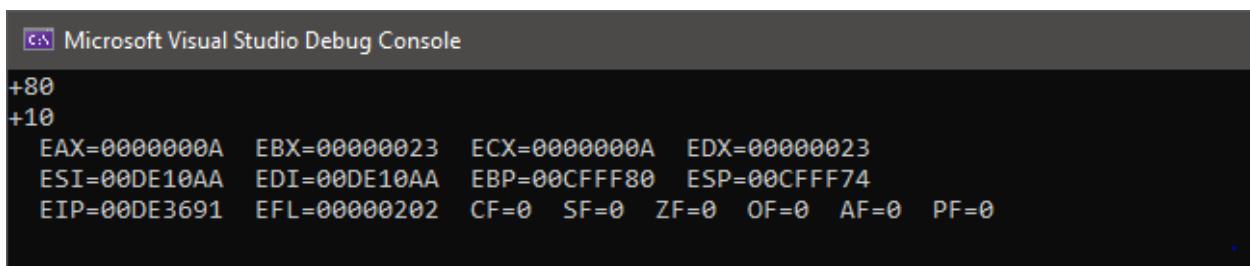
COAL HOME TASK 4A:

Task 1:



The screenshot shows the Microsoft Visual Studio IDE interface. The menu bar includes File, Edit, View, Git, Project, Build, Debug, Test, Analyze, Tools, Extensions, and Window. The toolbar has icons for file operations like Open, Save, and Print. The status bar indicates "Debug x86 Local Windows Debugger". The code editor window displays the assembly code for "task2.asm".

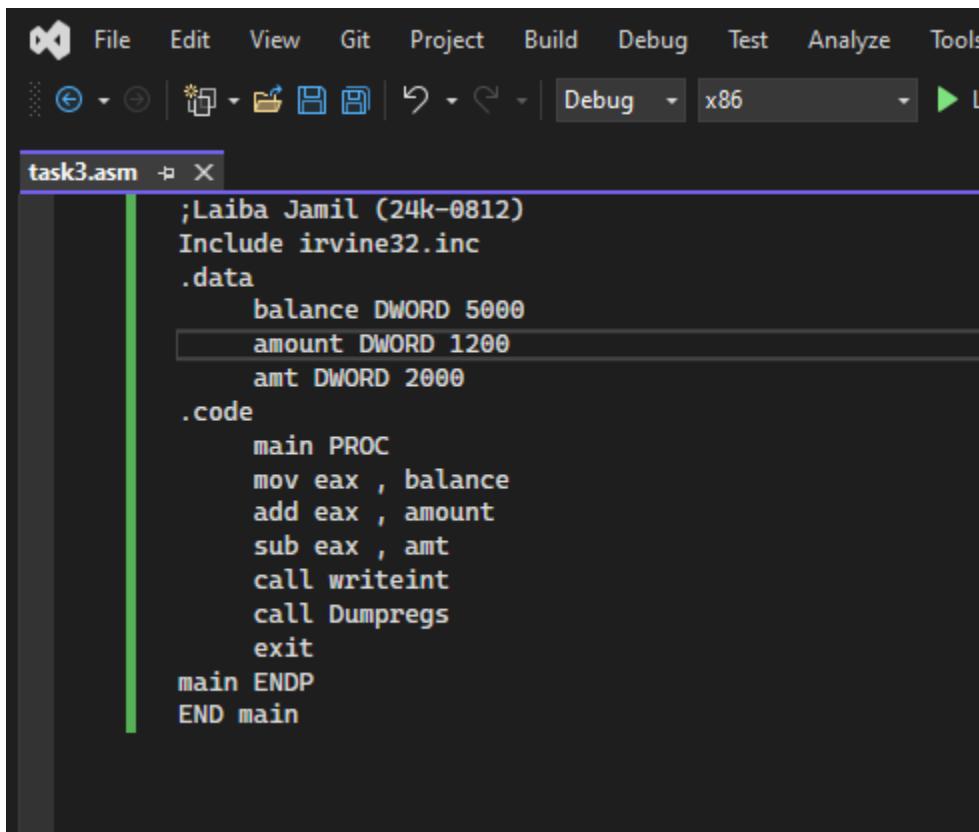
```
;Laiba Jamil (24k-0812)
Include Irvine32.inc
.data
    s1 DWORD 45
    s2 DWORD 35
.code
    main PROC
        mov eax, s1
        mov ebx, s2
        mov ecx, s1
        mov edx, s2
        add eax, ebx
        sub ecx, edx
        call WriteInt
        call CrLf
        mov eax, ecx
        call WriteInt
        call DumpRegs
        exit
    main ENDP
END main|
```



The screenshot shows the Microsoft Visual Studio Debug Console window titled "Microsoft Visual Studio Debug Console". It displays the current state of the CPU registers.

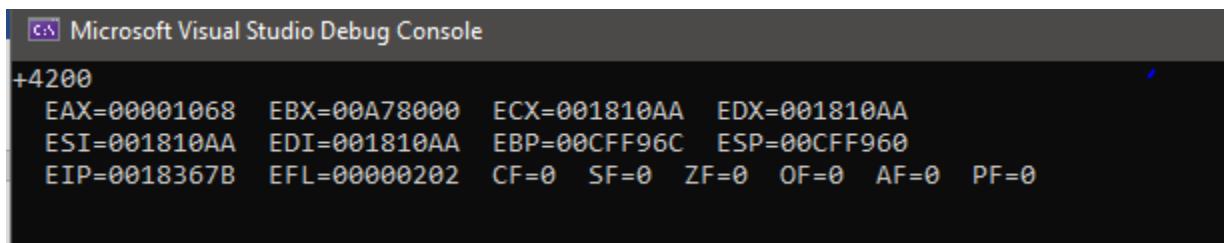
```
+80
+10
EAX=0000000A  EBX=00000023  ECX=0000000A  EDX=00000023
ESI=00DE10AA  EDI=00DE10AA  EBP=00CFFF80  ESP=00CFFF74
EIP=00DE3691  EFL=00000202  CF=0  SF=0  ZF=0  OF=0  AF=0  PF=0
```

Task 2:



The screenshot shows the Microsoft Visual Studio IDE interface. The menu bar includes File, Edit, View, Git, Project, Build, Debug, Test, Analyze, and Tools. The toolbar contains icons for file operations like Open, Save, and Print, along with symbols for Undo, Redo, and Search. A dropdown menu shows "Debug" selected. The assembly code editor window displays the following assembly code:

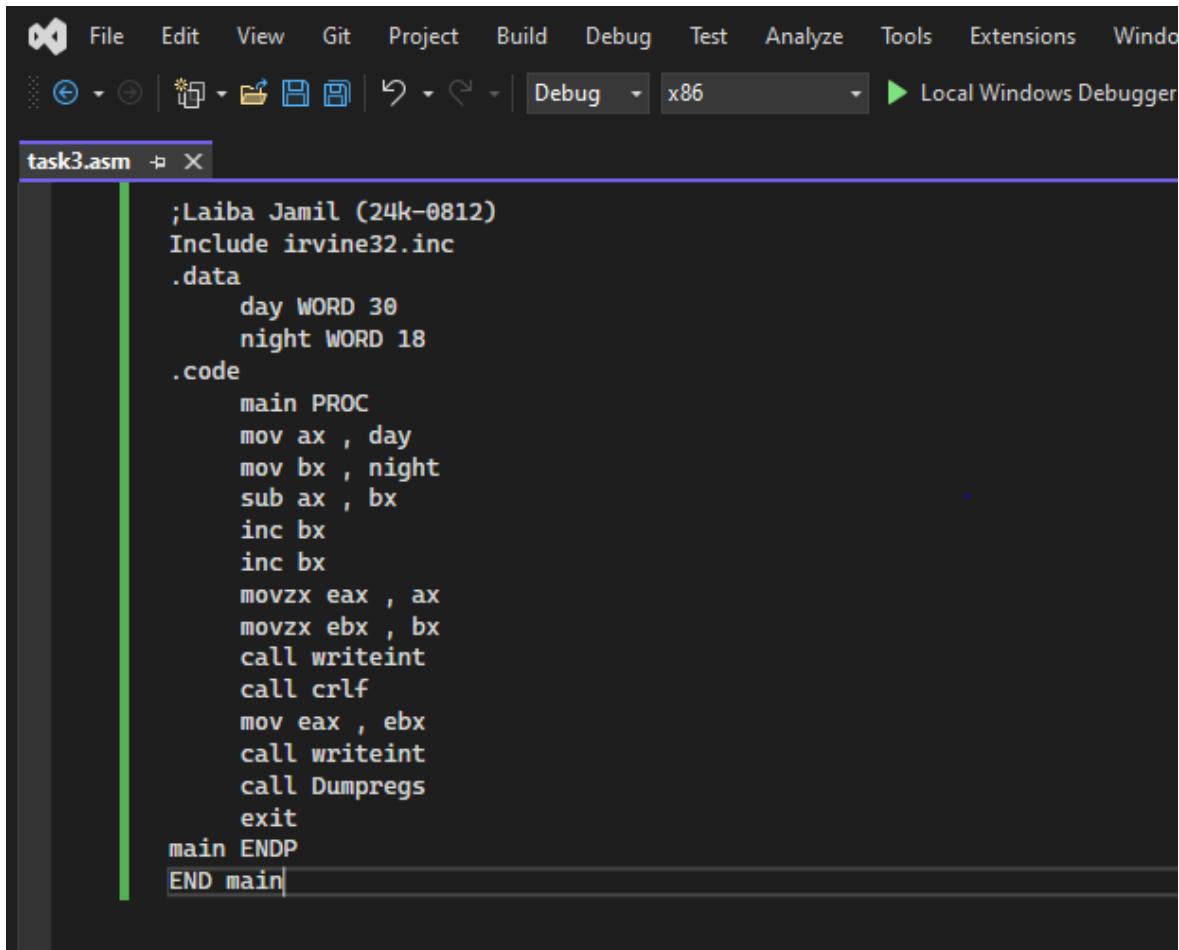
```
;Laiba Jamil (24k-0812)
Include Irvine32.inc
.data
    balance DWORD 5000
    amount DWORD 1200
    amt DWORD 2000
.code
    main PROC
        mov eax, balance
        add eax, amount
        sub eax, amt
        call writeint
        call Dumpregs
        exit
    main ENDP
END main
```



The screenshot shows the Microsoft Visual Studio Debug Console window. The title bar says "Microsoft Visual Studio Debug Console". The console output shows the state of the registers at address +4200:

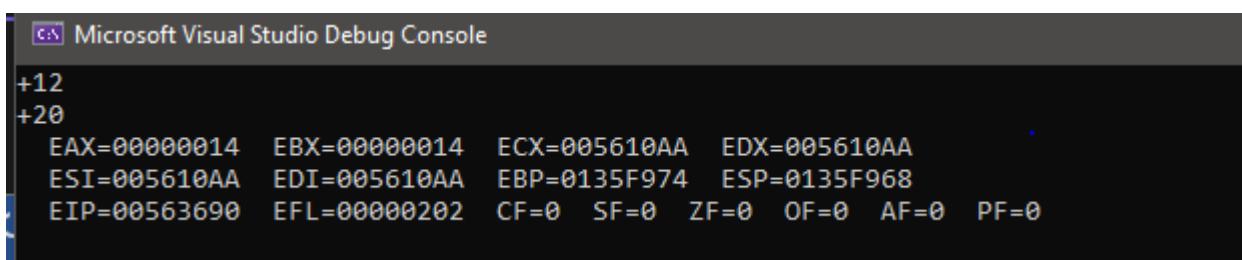
```
+4200
EAX=00001068 EBX=00A78000 ECX=001810AA EDX=001810AA
ESI=001810AA EDI=001810AA EBP=00CFF96C ESP=00CFF960
EIP=0018367B EFL=00000202 CF=0 SF=0 ZF=0 OF=0 AF=0 PF=0
```

Task 3:



The screenshot shows the Microsoft Visual Studio IDE interface. The menu bar includes File, Edit, View, Git, Project, Build, Debug, Test, Analyze, Tools, Extensions, Windows, and Help. The toolbar contains icons for file operations like Open, Save, and Print, along with symbols for search and refresh. A dropdown menu shows "Debug" selected, followed by "x86". A status bar at the bottom right says "Local Windows Debugger". The code editor window is titled "task3.asm" and contains the following assembly code:

```
;Laiba Jamil (24k-0812)
Include Irvine32.inc
.data
    day WORD 30
    night WORD 18
.code
    main PROC
        mov ax, day
        mov bx, night
        sub ax, bx
        inc bx
        inc bx
        movzx eax, ax
        movzx ebx, bx
        call WriteInt
        call CrLf
        mov eax, ebx
        call WriteInt
        call DumpRegs
        exit
    main ENDP
END main
```



The screenshot shows the Microsoft Visual Studio Debug Console window. The title bar says "Microsoft Visual Studio Debug Console". The console displays the following register dump:

```
+12
+20
EAX=00000014  EBX=00000014  ECX=005610AA  EDX=005610AA
ESI=005610AA  EDI=005610AA  EBP=0135F974  ESP=0135F968
EIP=00563690  EFL=00000202  CF=0  SF=0  ZF=0  OF=0  AF=0  PF=0
```

Task 4:

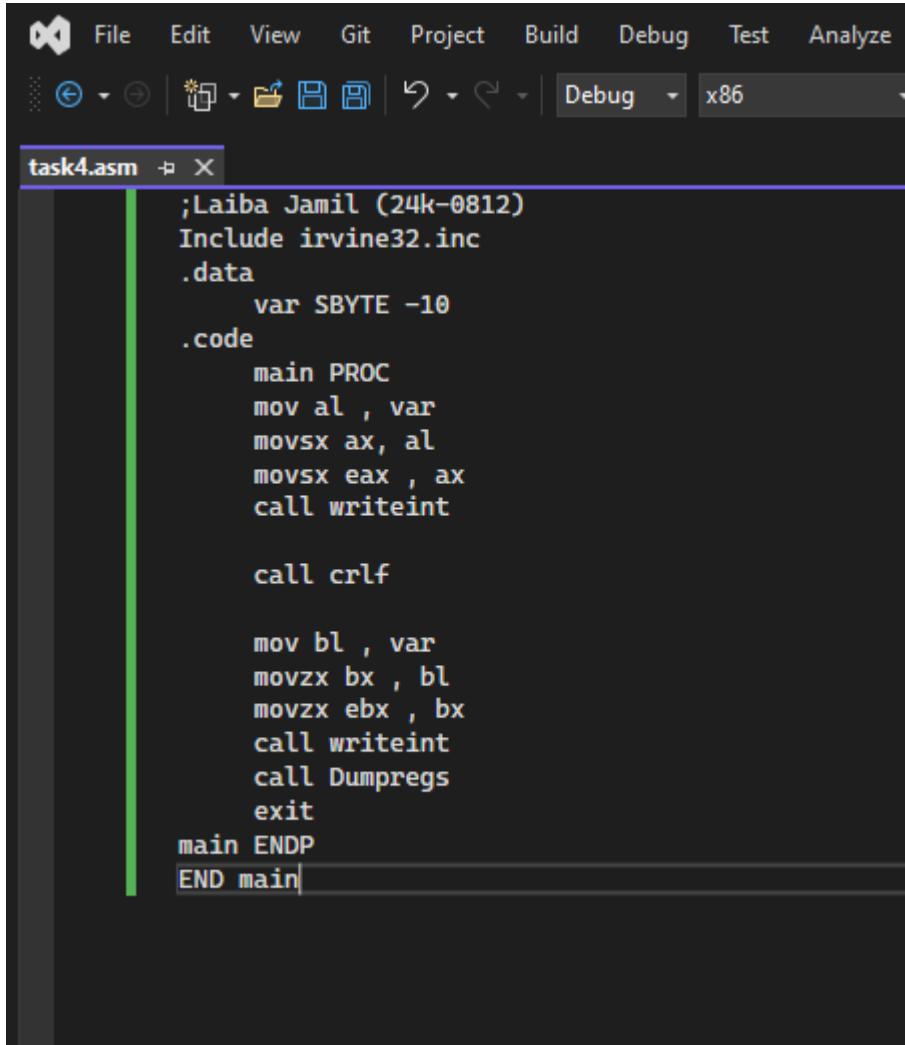
The screenshot shows the Microsoft Visual Studio interface. The top menu bar includes File, Edit, View, Git, Project, Build, Debug, Test, Analyze, Tools, Extensions, and Window. The toolbar below the menu has icons for file operations like Open, Save, and Print, along with symbols for search, refresh, and other tools. A dropdown menu for 'Debug' is open, showing options like 'Local Windows Debugger'. The status bar at the bottom indicates 'x86' and 'Local Windows Debugger'. The main window displays an assembly language source code named 'task3.asm'. The code is as follows:

```
;Laiba Jamil (24k-0812)
Include Irvine32.inc
.data
    items WORD 50
    buys WORD 7
    restocks WORD 15
.code
    main PROC
        mov ax, items
        mov bx, buys
        sub ax, bx
        add ax, restocks
        movzx eax, ax
        movzx ebx, bx
        call WriteInt
        call DumpRegs
        exit
    main ENDP
END main
```

The screenshot shows the 'Microsoft Visual Studio Debug Console' window. The title bar says 'Microsoft Visual Studio Debug Console'. The console output shows the current state of the registers:

```
+58
EAX=0000003A  EBX=00000007  ECX=00BB10AA  EDX=00BB10AA
ESI=00BB10AA  EDI=00BB10AA  EBP=00EFFB3C  ESP=00EFFB30
EIP=00BB3687  EFL=00000202  CF=0  SF=0  ZF=0  OF=0  AF=0  PF=0
```

Task 5:

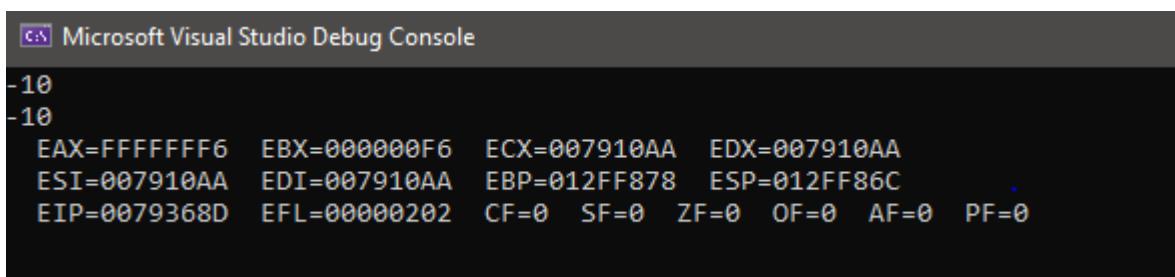


The screenshot shows the Microsoft Visual Studio interface with the assembly code editor open. The file being edited is named "task4.asm". The code itself is as follows:

```
;Laiba Jamil (24k-0812)
Include Irvine32.inc
.data
    var SBYTE -10
.code
    main PROC
        mov al, var
        movsx ax, al
        movsx eax, ax
        call WriteInt

        call CrLf

        mov bl, var
        movzx bx, bl
        movzx ebx, bx
        call WriteInt
        call DumpRegs
        exit
    main ENDP
    END main
```



The screenshot shows the Microsoft Visual Studio Debug Console window. The console output is as follows:

```
-10
-10
EAX=FFFFFFF6  EBX=000000F6  ECX=007910AA  EDX=007910AA
ESI=007910AA  EDI=007910AA  EBP=012FF878  ESP=012FF86C
EIP=0079368D  EFL=00000202  CF=0  SF=0  ZF=0  OF=0  AF=0  PF=0
```

Task 6:

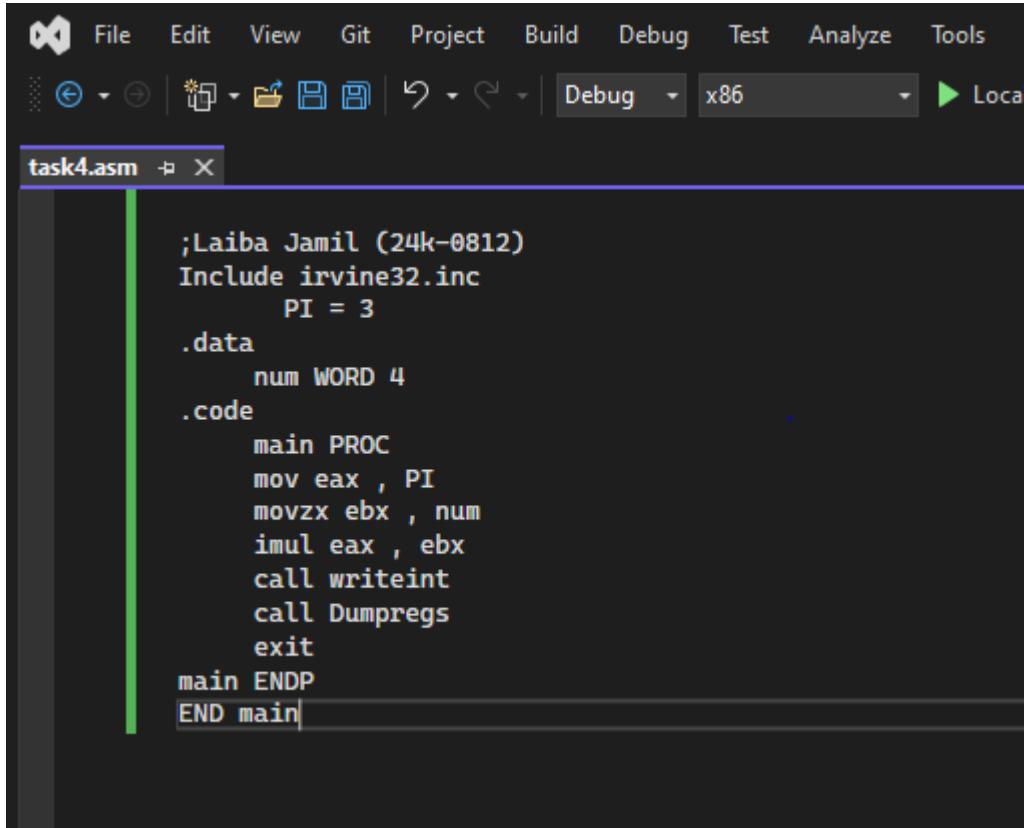
The screenshot shows the Microsoft Visual Studio interface. The top menu bar includes File, Edit, View, Git, Project, Build, Debug, Test, Analyze, Tools, Extensions, Window, and Help. The toolbar below has icons for file operations like Open, Save, and Print. The status bar indicates "Debug x86 Local Windows Debugger". The main window displays an assembly file named "task4.asm". The code is as follows:

```
;Laiba Jamil (24k-0812)
Include Irvine32.inc
.data
    num WORD 10
.code
    main PROC
        mov ax, num
        inc ax
        inc ax
        inc ax
        dec ax
        dec ax
        movzx eax, ax
        call WriteInt
        call DumpRegs
        exit
    main ENDP
END main
```

The screenshot shows the Microsoft Visual Studio Debug Console window. It displays the register state at address +11:

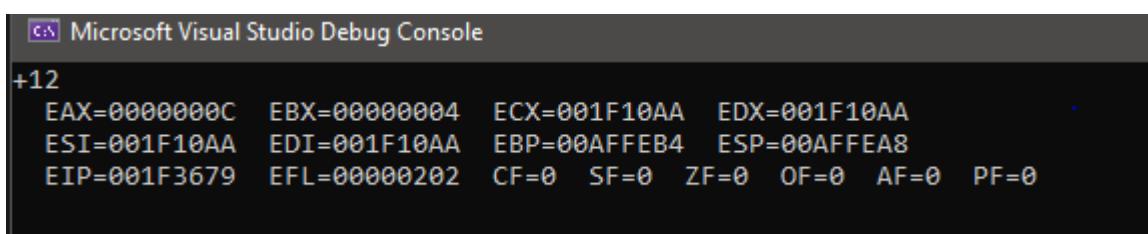
```
+11
EAX=0000000B  EBX=005B7000  ECX=009E10AA  EDX=009E10AA
ESI=009E10AA  EDI=009E10AA  EBP=006FF964  ESP=006FF958
EIP=009E367D  EFL=00000202  CF=0  SF=0  ZF=0  OF=0  AF=0  PF=0
```

Task 7:



The screenshot shows the Microsoft Visual Studio interface with the assembly code editor open. The file being edited is named "task4.asm". The code itself is as follows:

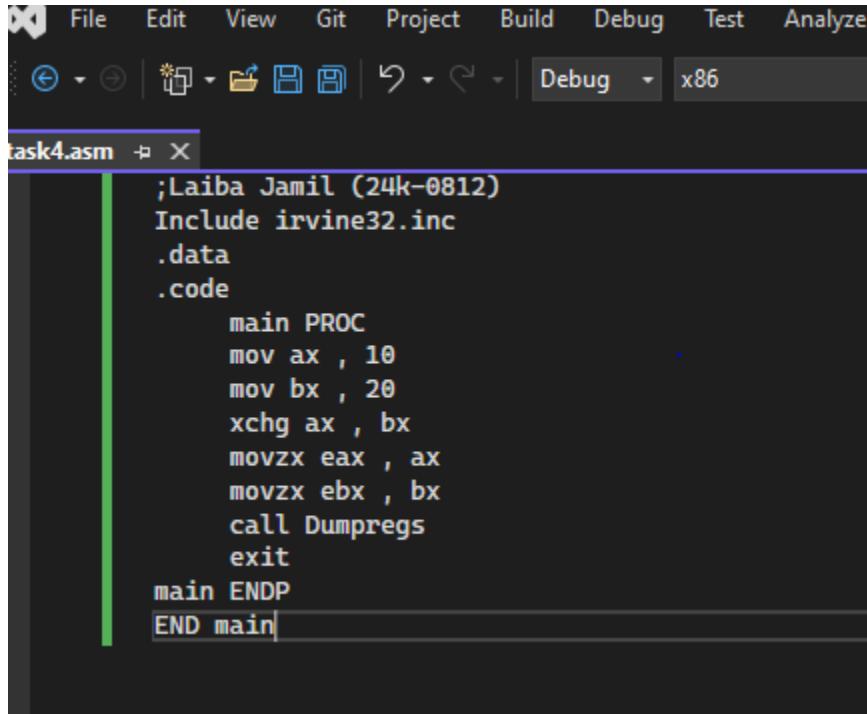
```
;Laiba Jamil (24k-0812)
Include Irvine32.inc
    PI = 3
.data
    num WORD 4
.code
    main PROC
        mov eax, PI
        movzx ebx, num
        imul eax, ebx
        call writeint
        call Dumpregs
        exit
    main ENDP
END main
```



The screenshot shows the Microsoft Visual Studio Debug Console window. It displays the assembly register values for the current state of the program:

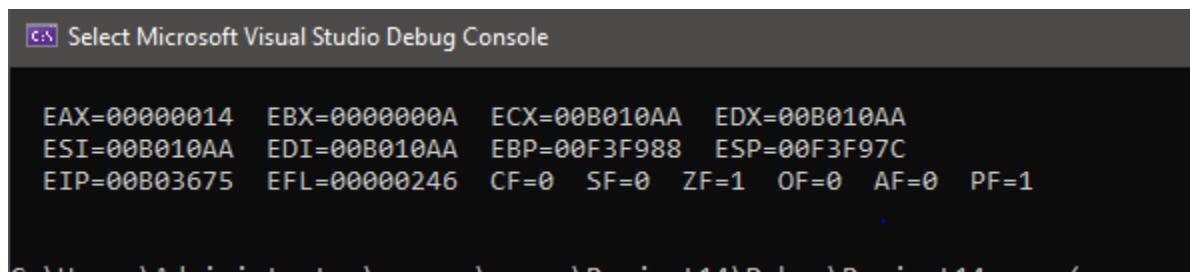
```
+12
EAX=0000000C  EBX=00000004  ECX=001F10AA  EDX=001F10AA
ESI=001F10AA  EDI=001F10AA  EBP=00AFFEB4  ESP=00AFFEA8
EIP=001F3679  EFL=00000202  CF=0  SF=0  ZF=0  OF=0  AF=0  PF=0
```

Task 8:



The screenshot shows the Microsoft Visual Studio IDE interface. The menu bar includes File, Edit, View, Git, Project, Build, Debug, Test, and Analyze. The toolbar has icons for file operations like Open, Save, and Print. The status bar indicates "Debug" and "x86". The code editor window is titled "task4.asm" and contains the following assembly code:

```
;Laiba Jamil (24k-0812)
Include Irvine32.inc
.data
.code
    main PROC
        mov ax, 10
        mov bx, 20
        xchg ax, bx
        movzx eax, ax
        movzx ebx, bx
        call DumpRegs
        exit
    main ENDP
END main
```



The screenshot shows the Microsoft Visual Studio Debug Console window. The title bar says "Select Microsoft Visual Studio Debug Console". The console displays the current state of the CPU registers:

```
EAX=00000014  EBX=0000000A  ECX=00B010AA  EDX=00B010AA
ESI=00B010AA  EDI=00B010AA  EBP=00F3F988  ESP=00F3F97C
EIP=00B03675  EFL=00000246  CF=0  SF=0  ZF=1  OF=0  AF=0  PF=1
```

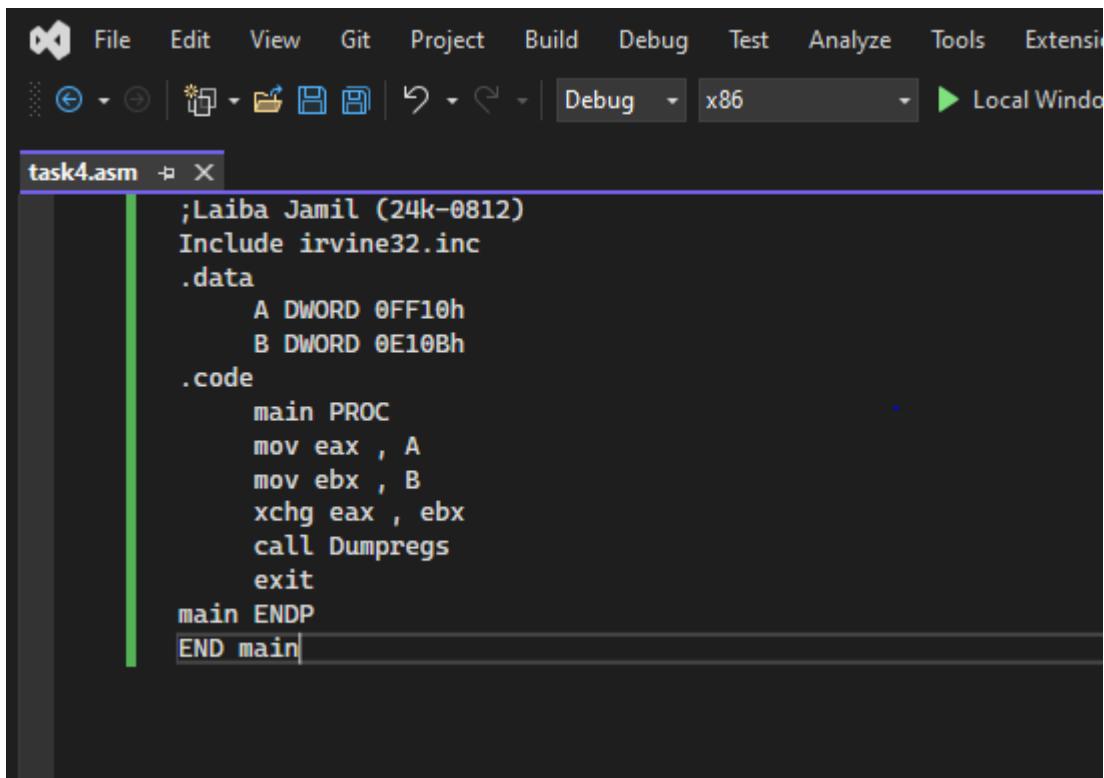
Task 9:

```
;Laiba Jamil (24k-0812)
Include Irvine32.inc
    SecondsInDay = 24 * 60 * 60
.data
.code
    main PROC
        mov eax, SecondsInDay
        call writeint
        call Dumpregs
        exit
    main ENDP
END main
```

```
+86400
EAX=00015180  EBX=0061C000  ECX=00C410AA  EDX=00C410AA
ESI=00C410AA  EDI=00C410AA  EBP=008FFE20  ESP=008FFE14
EIP=00C4366F  EFL=00000202  CF=0  SF=0  ZF=0  OF=0  AF=0  PF=0

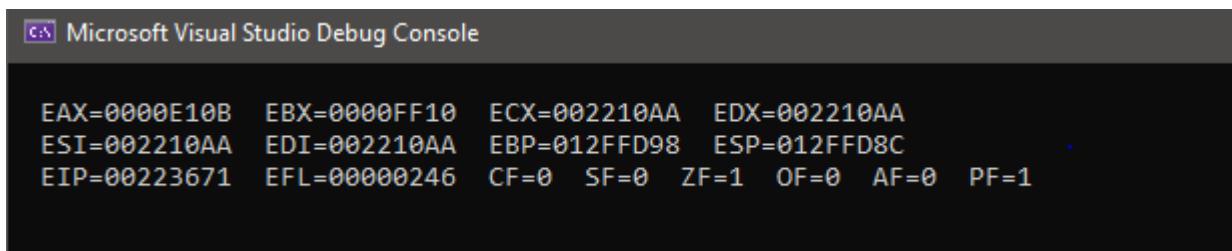
C:\Users\Administrator\source\repos\Project14\Debug\Project14.exe -process
```

Task 10:



The screenshot shows the Microsoft Visual Studio interface with the assembly code editor open. The file is named "task4.asm". The code is as follows:

```
;Laiba Jamil (24k-0812)
Include Irvine32.inc
.data
    A DWORD 0FF10h
    B DWORD 0E10Bh
.code
    main PROC
        mov eax, A
        mov ebx, B
        xchg eax, ebx
        call Dumpregs
        exit
    main ENDP
END main
```

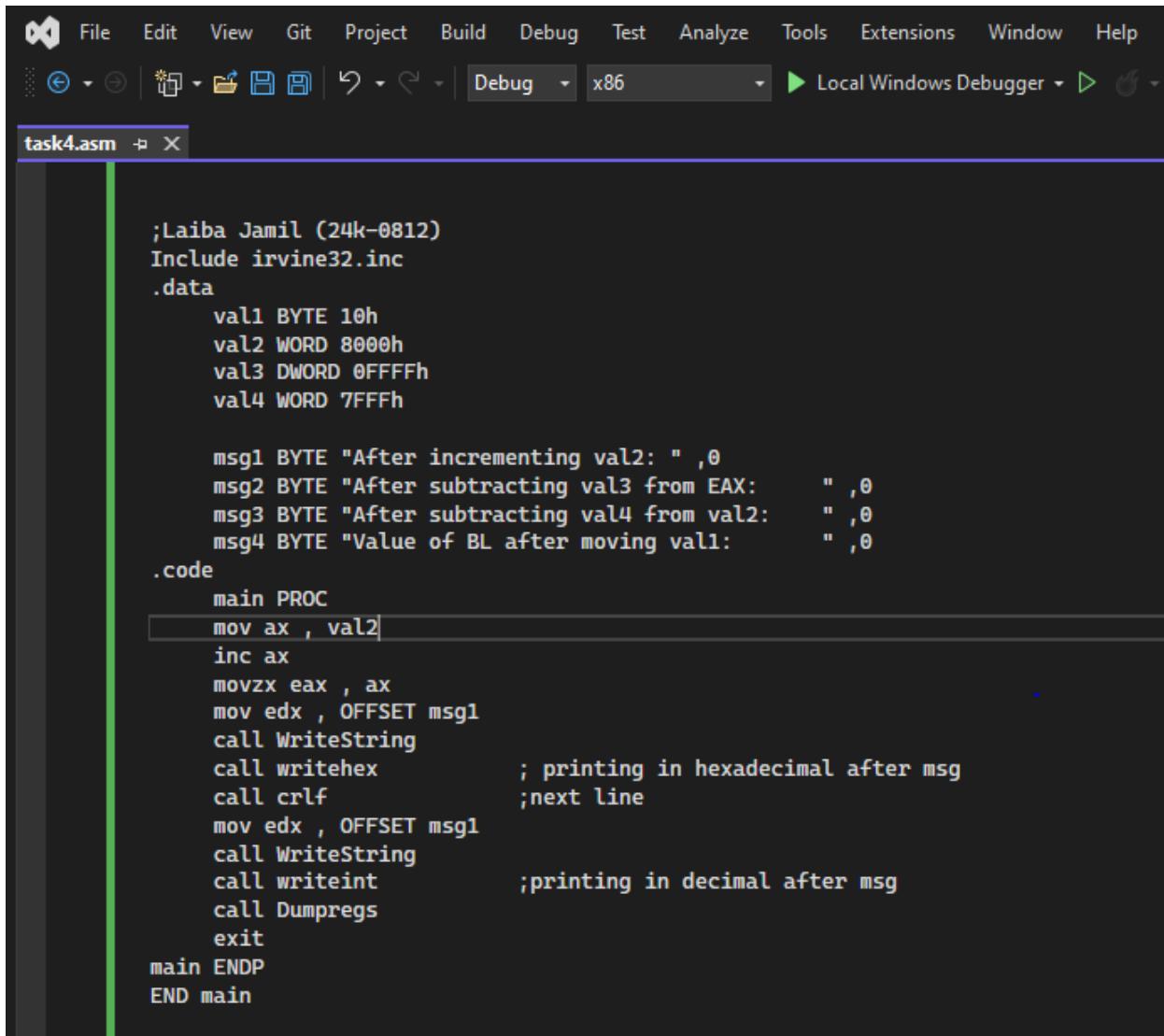


The screenshot shows the Microsoft Visual Studio Debug Console window. It displays the state of the CPU registers after the program has run. The output is:

```
EAX=0000E10B  EBX=0000FF10  ECX=002210AA  EDX=002210AA
ESI=002210AA  EDI=002210AA  EBP=012FFD98  ESP=012FFD8C
EIP=00223671  EFL=00000246  CF=0  SF=0  ZF=1  OF=0  AF=0  PF=1
```

Task 11:

i)

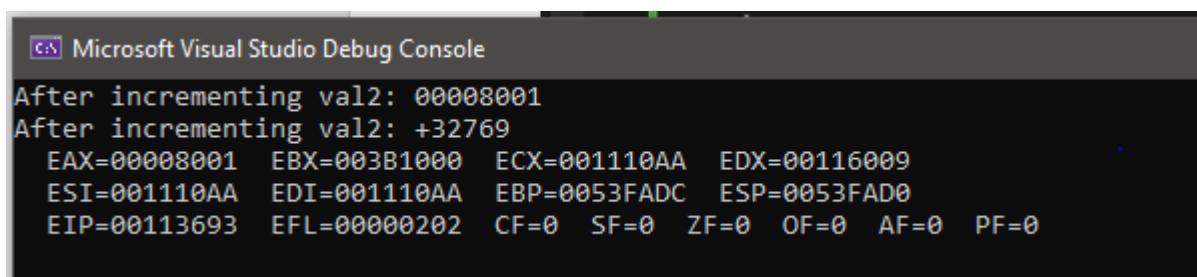


The screenshot shows the Microsoft Visual Studio IDE interface. The title bar reads "task4.asm". The menu bar includes File, Edit, View, Git, Project, Build, Debug, Test, Analyze, Tools, Extensions, Window, and Help. The toolbar has icons for file operations like Open, Save, and Print. The status bar indicates "Debug x86 Local Windows Debugger". The code editor displays the following assembly code:

```
;Laiba Jamil (24k-0812)
Include Irvine32.inc
.data
    val1 BYTE 10h
    val2 WORD 8000h
    val3 DWORD 0FFFFh
    val4 WORD 7FFFh

    msg1 BYTE "After incrementing val2: " ,0
    msg2 BYTE "After subtracting val3 from EAX:      " ,0
    msg3 BYTE "After subtracting val4 from val2:      " ,0
    msg4 BYTE "Value of BL after moving val1:        " ,0

.code
    main PROC
        mov ax , val2
        inc ax
        movzx eax , ax
        mov edx , OFFSET msg1
        call WriteString
        call writehex           ; printing in hexadecimal after msg
        call crlf               ;next line
        mov edx , OFFSET msg1
        call WriteString
        call writeint            ;printing in decimal after msg
        call Dumpregs
        exit
    main ENDP
END main
```

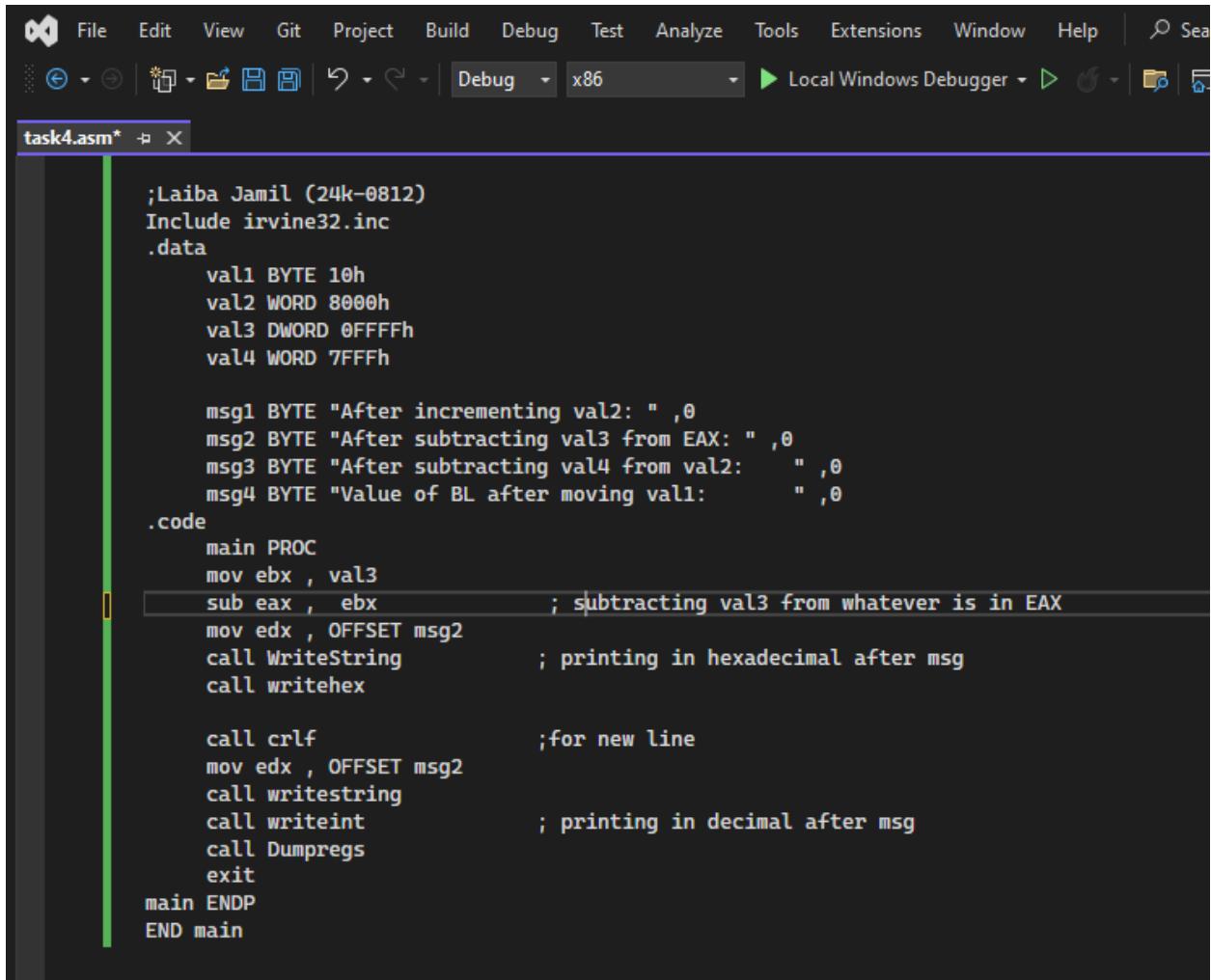


The screenshot shows the Microsoft Visual Studio Debug Console window. It displays the output of the assembly code execution:

```
Microsoft Visual Studio Debug Console

After incrementing val2: 00008001
After incrementing val2: +32769
  EAX=00008001  EBX=003B1000  ECX=001110AA  EDX=00116009
  ESI=001110AA  EDI=001110AA  EBP=0053FADC  ESP=0053FAD0
  EIP=00113693  EFL=00000202  CF=0  SF=0  ZF=0  OF=0  AF=0  PF=0
```

ii)



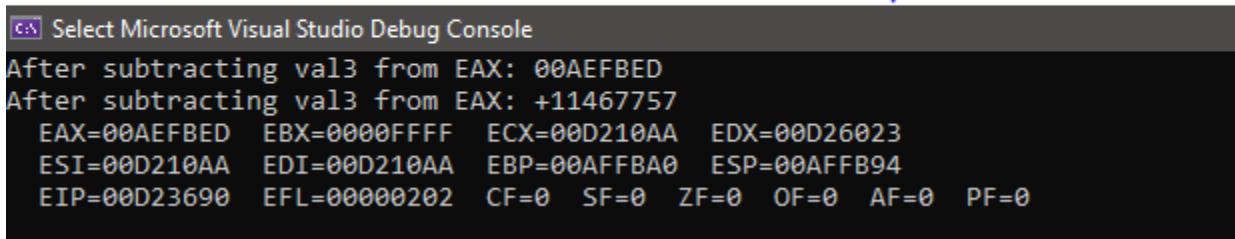
The screenshot shows the Microsoft Visual Studio interface with the assembly code editor open for the file "task4.asm". The menu bar includes File, Edit, View, Git, Project, Build, Debug, Test, Analyze, Tools, Extensions, Window, Help, and Search. The toolbar includes icons for file operations like Open, Save, and Print, along with a Local Windows Debugger icon. The code editor window has a dark theme and displays the following assembly code:

```
;Laiba Jamil (24k-0812)
Include Irvine32.inc
.data
    val1 BYTE 10h
    val2 WORD 8000h
    val3 DWORD 0FFFFh
    val4 WORD 7FFFh

    msg1 BYTE "After incrementing val2: " ,0
    msg2 BYTE "After subtracting val3 from EAX: " ,0
    msg3 BYTE "After subtracting val4 from val2:      " ,0
    msg4 BYTE "Value of BL after moving val1:      " ,0

.code
    main PROC
        mov ebx, val3
        sub eax, ebx           ; subtracting val3 from whatever is in EAX
        mov edx, OFFSET msg2
        call WriteString         ; printing in hexadecimal after msg
        call WriteHex

        call Crlf                ; for new line
        mov edx, OFFSET msg3
        call WriteString
        call WriteInt              ; printing in decimal after msg
        call DumpRegs
        exit
    main ENDP
    END main
```



The screenshot shows the Microsoft Visual Studio Debug Console window. The title bar says "Select Microsoft Visual Studio Debug Console". The console output is as follows:

```
After subtracting val3 from EAX: 00AEFBED
After subtracting val3 from EAX: +11467757
EAX=00AEFBED  EBX=0000FFFF  ECX=00D210AA  EDX=00D26023
ESI=00D210AA  EDI=00D210AA  EBP=00AFFBA0  ESP=00AFFB94
EIP=00D23690  EFL=00000202  CF=0  SF=0  ZF=0  OF=0  AF=0  PF=0
```

iii)

The screenshot shows the Microsoft Visual Studio interface. The top menu bar includes File, Edit, View, Git, Project, Build, Debug, Test, Analyze, Tools, Extensions, Window, Help, and a search bar. Below the menu is a toolbar with various icons. The main window displays an assembly file named "task4.asm". The code is as follows:

```
;Laiba Jamil (24k-0812)
Include Irvine32.inc
.data
    val1 BYTE 10h
    val2 WORD 8000h
    val3 DWORD 0FFFFh
    val4 WORD 7FFFh

    msg1 BYTE "After incrementing val2: " ,0
    msg2 BYTE "After subtracting val3 from EAX: " ,0
    msg3 BYTE "After subtracting val4 from val2: " ,0
    msg4 BYTE "Value of BL after moving val1:      " ,0

.code
    main PROC
        mov ax, val2
        mov bx, val4
        movzx eax, ax
        movzx ebx, bx
        sub eax, ebx
        mov edx, OFFSET msg3
        call Writestring
        call writehex           ; printing in hexadecimal after msg

        call crlf               ; for newline
        mov edx, OFFSET msg3
        call Writestring
        call writeint            ;printing in decimal after msg
        call Dumpregs
        exit
    main ENDP
END main
```

The screenshot shows the Microsoft Visual Studio debugger console. The output is as follows:

```
Select Microsoft Visual Studio Debug Console

After subtracting val4 from val2: 00000001
After subtracting val4 from val2: +1
  EAX=00000001  EBX=00007FFF  ECX=009910AA  EDX=00996045
  ESI=009910AA  EDI=009910AA  EBP=00F3F80C  ESP=00F3F800
  EIP=0099369D  EFL=00000202  CF=0  SF=0  ZF=0  OF=0  AF=0  PF=0
```

iv)

The screenshot shows the Microsoft Visual Studio interface. The top menu bar includes File, Edit, View, Git, Project, Build, Debug, Test, Analyze, Tools, Extensions, Window, Help, and a search bar. The title bar says "Project14". The main window contains an assembly file named "task4.asm". The code is as follows:

```
;Laiba Jamil (24k-0812)
Include Irvine32.inc

.data
    val1 BYTE 10h
    val2 WORD 8000h
    val3 DWORD 0FFFFh
    val4 WORD 7FFFh

    msg1 BYTE "After incrementing val2: " ,0
    msg2 BYTE "After subtracting val3 from EAX: " ,0
    msg3 BYTE "After subtracting val4 from val2: " ,0
    msg4 BYTE "Value of BL after moving val1: " ,0

.code
    main PROC
        mov bl , val1
        movzx eax , bl
        mov edx , OFFSET msg4
        call writestring
        call writehex           ; printing in hexadecimal after msg

        call crlf              ; for new line
        mov edx , OFFSET msg4
        call writestring
        call writeint           ; printing in decimal after msg
        call Dumpregs
        exit
    main ENDP
END main
```

The screenshot shows the Microsoft Visual Studio interface. The top menu bar includes File, Edit, View, Git, Project, Build, Debug, Test, Analyze, Tools, Extensions, Window, Help, and a search bar. The title bar says "Project14". The main window contains an assembly file named "task4.asm". The code is as follows:

```
;Laiba Jamil (24k-0812)
Include Irvine32.inc

.data
    val1 BYTE 10h
    val2 WORD 8000h
    val3 DWORD 0FFFFh
    val4 WORD 7FFFh

    msg1 BYTE "After incrementing val2: " ,0
    msg2 BYTE "After subtracting val3 from EAX: " ,0
    msg3 BYTE "After subtracting val4 from val2: " ,0
    msg4 BYTE "Value of BL after moving val1: " ,0

.code
    main PROC
        mov bl , val1
        movzx eax , bl
        mov edx , OFFSET msg4
        call writestring
        call writehex           ; printing in hexadecimal after msg

        call crlf              ; for new line
        mov edx , OFFSET msg4
        call writestring
        call writeint           ; printing in decimal after msg
        call Dumpregs
        exit
    main ENDP
END main
```

The "Microsoft Visual Studio Debug Console" window is open at the bottom, displaying the output of the assembly code execution:

```
Value of BL after moving val1: 00000010
Value of BL after moving val1: +16
EAX=00000010  EBX=00F02010  ECX=002A10AA  EDX=002A6068
ESI=002A10AA  EDI=002A10AA  EBP=00DAFEC4  ESP=00DAFEB8
EIP=002A3691  EFL=00000202  CF=0  SF=0  ZF=0  OF=0  AF=0  PF=0
```