

COAL LAB 03 - 13 Feb 2025

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Task 1:

```
include irvine32.inc
```

```
.data
```

```
    val1 SWORD ?    ; 16 bit signed integer (not initialized)
```

```
    val2 SBYTE -11   ; 8 bit signed integer initialized w/ -11
```

```
.code
```

```
main PROC
```

```
    mov ax, val1    ; loading val1 into ax
```

```
    mov al, val2    ; loading val2 into al
```

```
    call DumpRegs
```

```
    exit
```

```
main endp
```

```
end main
```

The screenshot shows the Visual Studio Code interface with the assembly code for Lab 3 open in the Source Editor. The code is as follows:

```
1 include irvine32.inc
2 .data
3     val1 SWORD ?    ; 16 bit signed integer (not initialized)
4     val2 SBYTE -11   ; 8 bit signed integer initialized w/ -11
5 .code
6 main PROC
7     mov ax, val1    ; loading val1 into ax
8     mov al, val2    ; loading val2 into al
9     call DumpRegs
10    exit
11 main endp
12 end main
13
```

The Solution Explorer on the right shows the project structure for 'Lab 3', including References, External Dependencies, Header Files, Resource Files, and Source Files (Source.asm).

The Windows Debugger output at the bottom shows the register values:

```
EAX=008F00F5  EBX=00719000  ECX=00B610AA  EDX=00B610AA
ESI=00B610AA  EDI=00B610AA  EBP=008FF968  ESP=008FF95C
EIP=00B63670  EFL=00000246  CF=0   SF=0   ZF=1   OF=0   AF=0   PF=1
```

The process name and path are shown as: C:\Ibrahim\Personal\University Stuff\COAL\Labs\03\Lab 3\Debug\Lab 3.exe (process 31352) exit

Task 2:

```
include Irvine32.inc
```

```
.data
```

```
    val3 SDWORD -2147483648 ; smallest 32bit signed integer
```

```
.code
```

```
main PROC
```

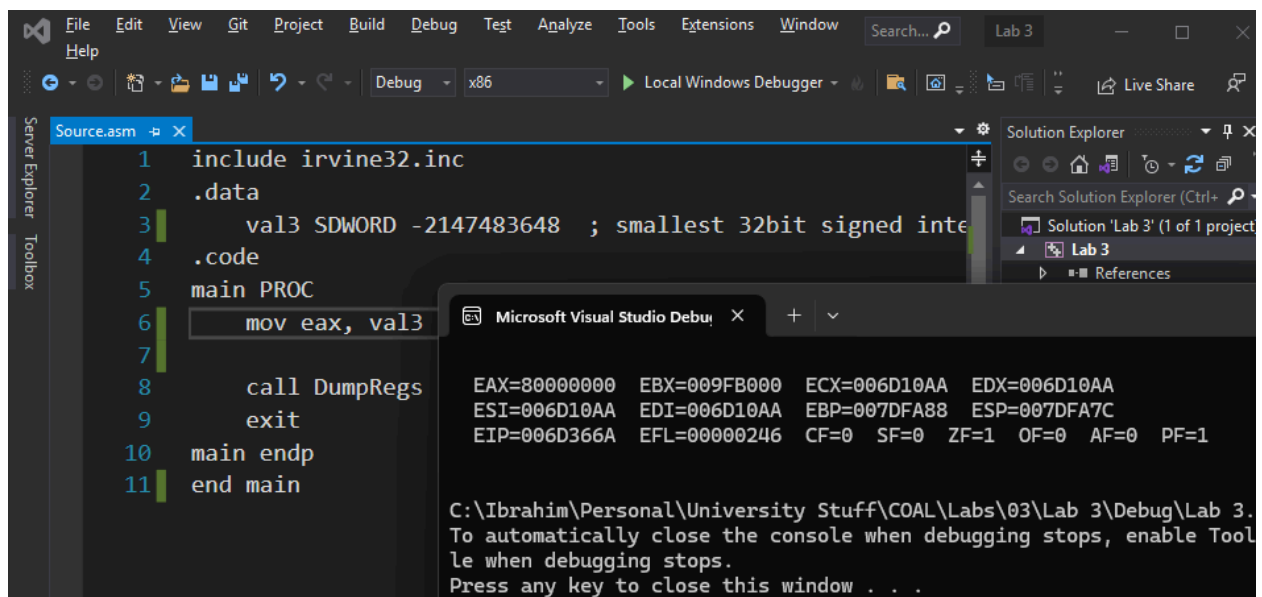
```
    mov eax, val3
```

```
    call DumpRegs
```

```
    exit
```

```
main endp
```

```
end main
```



Task 3:

```
include Irvine32.inc
```

```
.data
```

```
    val4 WORD 5, 25, 75
```

```
.code
```

```
main PROC
```

```
    mov ax, val4
```

```
    mov bx, val4 + 2
```

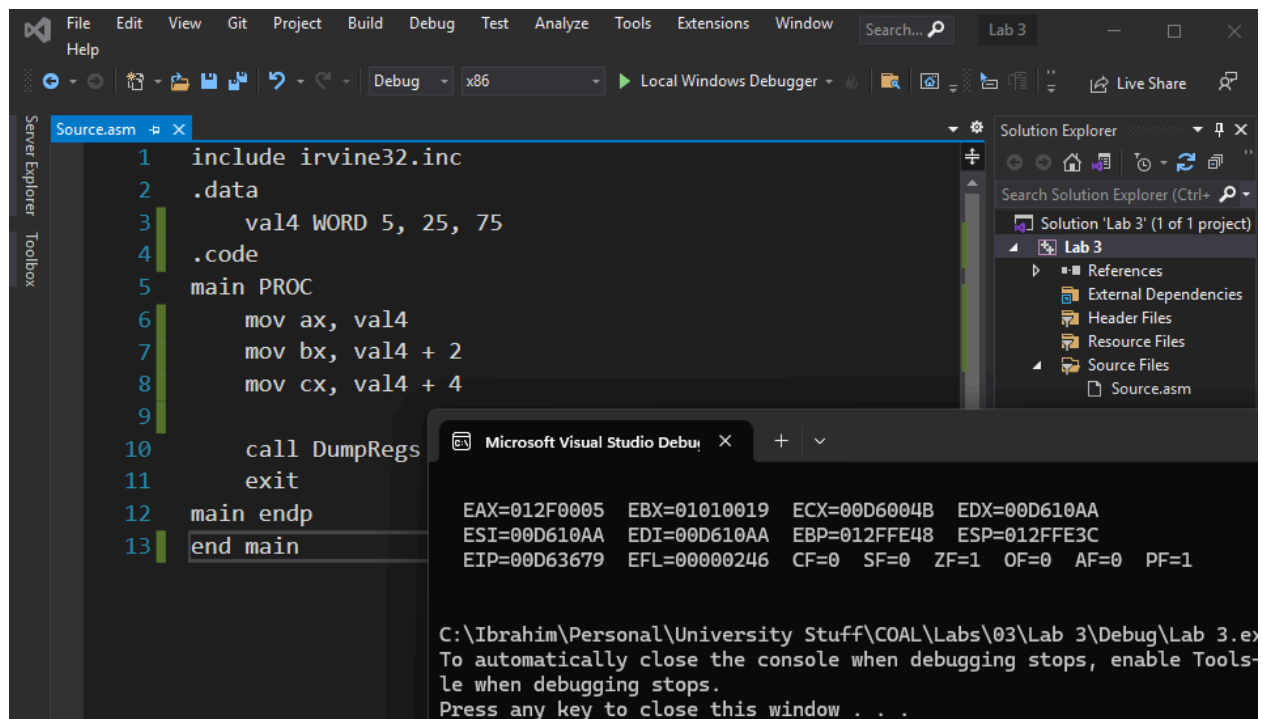
```
    mov cx, val4 + 4
```

```
    call DumpRegs
```

```
    exit
```

```
main endp
```

```
end main
```



Task 4:

```
include irvine32.inc
```

```
.data
```

```
    favcolor BYTE "Red", 0
```

```
    A WORD 12
```

```
    B WORD 2
```

```
    C_VAL WORD 13
```

```
    D WORD 8
```

```
    E WORD 14
```

```
.code
```

```
main PROC
```

```
    mov edx, OFFSET favcolor
```

```
    call WriteString
```

```
    call CrLf
```

```
    mov ax, A
```

```
    mov bx, B
```

```
    mov cx, C_VAL
```

```
    mov dx, D
```

```
    mov si, E
```

```
    call DumpRegs
```

```
    exit
```

```
main endp
```

```
end main
```

The screenshot shows the Microsoft Visual Studio IDE with the assembly code for Task 4 loaded in the Source window. The code is as follows:

```
1 include irvine32.inc
2 .data
3     favcolor BYTE "Red", 0
4     A WORD 12
5     B WORD 2
6     C_VAL WORD 13
7     D WORD 8
8     E WORD 14
9 .code
10 main PROC
11     mov edx, OFFSET favcolor
12     call WriteString
13     call CrLf
14
15     mov ax, A
16     mov bx, B
17     mov cx, C_VAL
18     mov dx, D
19     mov si, E
20
21     call DumpRegs
22     exit
23 main endp
24 end main
```

The Solution Explorer on the right shows the project structure for 'Lab 3', including 'Source Files' and 'Source.asm'. The Microsoft Visual Studio Debug Console at the bottom displays the output of the program, showing the string 'Red' and the register values:

```
Red
EAX=00D3000C EBX=00A40002 ECX=000A000D EDX=000A0008
ESI=000A000E EDI=000A10AA EBP=00D3FE84 ESP=00D3FE78
EIP=000A3696 EFL=00000202 CF=0 SF=0 ZF=0 OF=0 AF=0 PF=0
```

The debug console also shows the path to the debug log file: C:\Ibrahim\Personal\University Stuff\COAL\Labs\03\Lab 3\Debug\Lab 3. To automatically close the console when debugging stops, enable Tool Le when debugging stops. Press any key to close this window . . .

Task 5:

include irvine32.inc

.data

a WORD 11h

b WORD 10h

c_val WORD 30h

d WORD 40h

result DWORD ?

.code

main PROC

mov ax, a ; AX = a (11h)

add ax, b ; AX = a + b

mov bx, ax ; store (a + b) in BX

mov ax, a ; AX = a (11h)

sub ax, b ; AX = a - b

mov cx, ax ; store (a - b) in CX

mov ax, bx ; AX = (a + b)

sub ax, cx ; AX = (a + b) - (a - b)

add ax, c_val ; AX = {(a + b) - (a - b)} + c

add ax, d ; AX = final result

movzx ebx, ax ; store final result in EBX

mov result, ebx ; store result in memory

call DumpRegs

exit

main endp

end main

The screenshot shows the Microsoft Visual Studio IDE with the assembly code for Task 5 loaded in the Source window. The code is as follows:

```
1 include irvine32.inc
2 .data
3     a WORD 11h
4     b WORD 10h
5     c_val WORD 30h
6     d WORD 40h
7     result DWORD ?
8 .code
9 main PROC
10     mov ax, a ; AX = a (11h)
11     add ax, b ; AX = a + b
12     mov bx, ax ; store (a + b) in BX
13     mov ax, a ; AX = a (11h)
14     sub ax, b ; AX = a - b
15     mov cx, ax ; store (a - b) in CX
16     mov ax, bx ; AX = (a + b)
17     sub ax, cx ; AX = (a + b) - (a - b)
18     add ax, c_val ; AX = {(a + b) - (a - b)} + c
19     add ax, d ; AX = final result
20     movzx ebx, ax ; store final result in EBX
21     mov result, ebx ; store result in memory
22     call DumpRegs
23     exit
24 main endp
25 end main
```

The Solution Explorer on the right shows the project structure for 'Lab 3', including 'Source Files' and 'Source.asm'. The Output window at the bottom shows the following register values:

```
EAX=00790090 EBX=00000090 ECX=00910001 EDX=009110AA
ESI=009110AA EDI=009110AA EBP=0079FDEC ESP=0079FDE0
EIP=009136A2 EFL=00000206 CF=0 SF=0 ZF=0 OF=0 AF=0 PF=1
```

The status bar at the bottom indicates 'No issues found' and 'Show output from: Debug'.

Task 6:

```
include Irvine32.inc
```

```
.data
```

```
    a_ DWORD 00010001b
```

```
    b_ DWORD 00010000b
```

```
    c_ DWORD 00110000b
```

```
    d_ DWORD 01000000b
```

```
.code
```

```
main PROC
```

```
    mov ebx, a_
```

```
    mov eax, b_
```

```
    add ebx, eax
```

```
    mov ecx, a_
```

```
    sub ecx, eax
```

```
    sub ebx, ecx
```

```
    mov eax, c_
```

```
    mov ecx, d_
```

```
    add ebx, eax
```

```
    add ebx, ecx
```

```
    call DumpRegs
```

```
    exit
```

```
main endp
```

```
end main
```

The screenshot displays the Microsoft Visual Studio IDE. The main window shows the assembly code for 'Source.asm', which is the same code provided in the previous blocks. The code is as follows:

```
1 include Irvine32.inc
2 .data
3     a_ DWORD 00010001b
4     b_ DWORD 00010000b
5     c_ DWORD 00110000b
6     d_ DWORD 01000000b
7 .code
8 main PROC
9     mov ebx, a_
10    mov eax, b_
11    add ebx, eax
12    mov ecx, a_
13    sub ecx, eax
14    sub ebx, ecx
15    mov eax, c_
16    mov ecx, d_
17    add ebx, eax
18    add ebx, ecx
19    call DumpRegs
20    exit
21 main endp
22 end main
```

The right-hand side of the IDE shows the 'Solution Explorer' with a project named 'Lab 3'. Below it, the 'Microsoft Visual Studio Debugger' window is open, displaying the following register values and status flags:

Register	Value
EAX	00000030
EBX	00000090
ECX	00000040
EDX	00BC10AA
ESI	00BC10AA
EDI	00BC10AA
EBP	00A2F924
ESP	00A2F918
EIP	00BC368B
EFL	00000206
CF	0
SF	0
ZF	0
OF	0
AF	0
PF	1

Below the register values, the debugger console shows the following text:

```
C:\Ibrahim\Personal\University Stuff\COAL\Labs\03\Lab 3\Debug\Lab 3.e
To automatically close the console when debugging stops, enable Tools
le when debugging stops.
Press any key to close this window . . .
```

Task 7:

```
include Irvine32.inc
```

```
.data
```

```
    wArray WORD 1, 2, 3
```

```
.code
```

```
main PROC
```

```
    mov ax, wArray
```

```
    mov bx, wArray + 2
```

```
    mov cx, wArray + 4
```

```
    call DumpRegs
```

```
    exit
```

```
main endp
```

```
end main
```

The screenshot shows the Microsoft Visual Studio IDE with the assembly code for Task 7 loaded in the Source window. The code is as follows:

```
1 include Irvine32.inc
2 .data
3     wArray WORD 1, 2, 3
4 .code
5 main PROC
6     mov ax, wArray
7     mov bx, wArray + 2
8     mov cx, wArray + 4
9     call DumpRegs
10    exit
11 main endp
12 end main
```

The Solution Explorer on the right shows the project structure for 'Lab 3', including 'References', 'External Dependencies', 'Header Files', 'Resource Files', 'Source Files', and 'Source.asm'.

The Debug Console at the bottom shows the output of the program, displaying the values of the registers EAX, EBX, ECX, EDX, ESI, EDI, EBP, ESP, EIP, EFL, CF, SF, ZF, OF, AF, and PF. The output is as follows:

```
EAX=007A0001 EBX=00460002 ECX=006A0003 EDX=006A10AA
ESI=006A10AA EDI=006A10AA EBP=007AFE14 ESP=007AFE08
EIP=006A3679 EFL=00000246 CF=0 SF=0 ZF=1 OF=0 AF=0 PF=1
```

Below the register values, the console displays the path to the executable and the process name:

```
C:\Ibrahim\Personal\University Stuff\COAL\Labs\03\Lab 3\Debug\Lab 3.exe (proc...
```

The console also shows the message: 'To automatically close the console when debugging stops, enable Tools->Options...'. Press any key to close this window . . .

Task 8:

```
include irvine32.inc
```

```
.data
```

```
    dArray DWORD 50 DUP(?)
```

```
.code
```

```
main PROC
```

```
    call DumpRegs
```

```
    exit
```

```
main endp
```

```
end main
```

Task 9:

```
include irvine32.inc
```

```
.data
```

```
    teststring BYTE 500 DUP("TEST")
```

```
.code
```

```
main PROC
```

```
    mov edx, OFFSET teststring
```

```
    call WriteString
```

```
    exit
```

```
main endp
```

```
end main
```

The screenshot displays the Microsoft Visual Studio IDE. The main window shows the assembly source file 'Source.asm' with the following code:

```
1 include irvine32.inc
2 .data
3     teststring BYTE 500 DUP("TEST")
4 .code
5 main PROC
6     mov edx, OFFSET teststring
7     call WriteString
8
9     exit
10 main endp
11 end main
```

The Solution Explorer on the right shows the project structure for 'Lab 3', including 'References', 'External Dependencies', 'Header Files', 'Resource Files', and 'Source Files' (containing 'Source.asm').

Below the source code, the 'Microsoft Visual Studio Debug' window shows the output of the program. The output consists of a large block of text where the word 'TEST' is repeated 500 times, as specified in the assembly code. The output window also shows the process path: 'C:\Ibrahim\Personal\University Stuff\COAL\Labs\03\Lab 3\Debug\Lab 3.exe (process 3644)' and the exit code: 'Exited with code 0'.

Task 10:

```
include Irvine32.inc
```

```
.data
```

```
    bArray BYTE 20 DUP(0)
```

```
.code
```

```
main PROC
```

```
    call DumpRegs
```

```
    exit
```

```
main endp
```

```
end main
```

Activity 1:

```
include Irvine32.inc
```

```
.data
```

```
    val BYTE 10
```

```
.code
```

```
main proc
```

```
    mov eax,0
```

```
    mov al,val
```

```
    add al,40
```

```
    call writeint
```

```
    exit
```

```
main endp
```

```
end main
```

