

LAB 01

COMPUTER ORGANIZATION AND ASSEMBLY LANG(COAL)



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Task 01:

Write an uninitialized data declaration for a 16-bit signed integer `val1`. Initialize 8-bit signed integer `val2` with -10.

Initialized variables, moved to register and printed values

```
1  TITLE My First Program (Test.asm)
2  INCLUDE Irvine32.inc
3  .data
4  val1 SWORD ?
5  val2 SBYTE -10d
6  .code
7  main PROC
8  mov ax, val1
9  mov bl, val2
10 call DumpRegs
11 exit
12 main ENDP
13 END main
```

Microsoft Visual Studio Debug Console

EAX=01370000	EBX=0114B0F6	ECX=00ED10AA	EDX=00ED10AA
ESI=00ED10AA	EDI=00ED10AA	EBP=0137FEC4	ESP=0137FEB8
EIP=00ED3671	EFL=00000246	CF=0	SF=0 ZF=1 OF=0 AF=0 PF=1

Task 02:

Declare a 32-bit signed integer `val3` and initialize it with the smallest possible negative decimal value.

Used `SDWORD` to initialize Signed DWORD 32 bit, input value of 2 to the power of -31 as the smallest possible decimal value.

```
ext.asm  ▢ ✕
1  TITLE My First Program (Test.asm)
2  INCLUDE Irvine32.inc
3  .data
4  val3 SDWORD -2147483648d
5  .code
6  main PROC
7  mov eax, val3
8  call DumpRegs
9  exit
10 main ENDP
11 END main
```

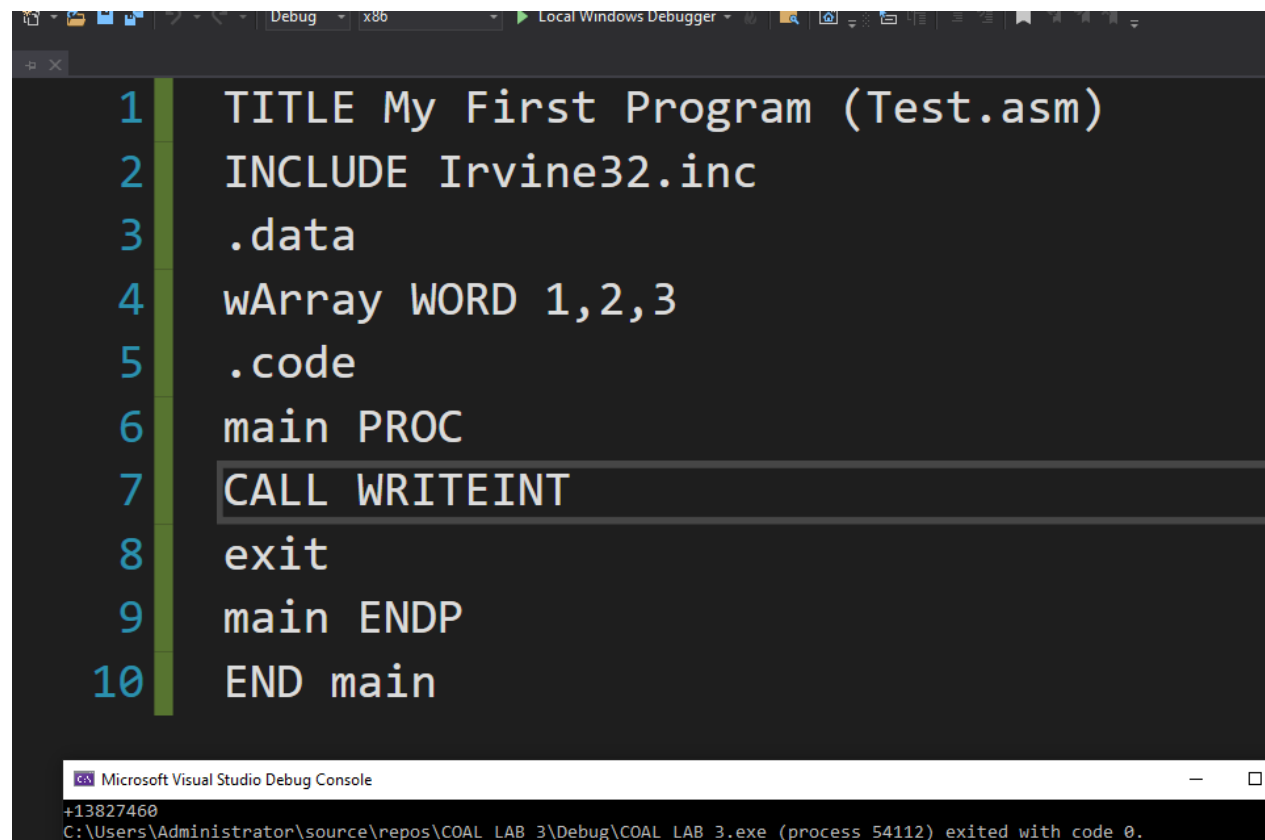
Select Microsoft Visual Studio Debug Console

```
EAX=80000000  EBX=00367000  ECX=00B610AA  EDX=00B610AA
ESI=00B610AA  EDI=00B610AA  EBP=0053FDEC  ESP=0053FDE0
EIP=00B6366A  EFL=00000246  CF=0  SF=0  ZF=1  OF=0  AF=0  PF=1
```

Task 03:

Declare an unsigned 16-bit integer variable named `wArray` that uses three Initializers.

Learned how to initialize an array and display it using `WRITEINT`



The screenshot shows the Visual Studio assembly editor with the following code:

```
1  TITLE My First Program (Test.asm)
2  INCLUDE Irvine32.inc
3  .data
4  wArray WORD 1,2,3
5  .code
6  main PROC
7  CALL WRITEINT
8  exit
9  main ENDP
10 END main
```

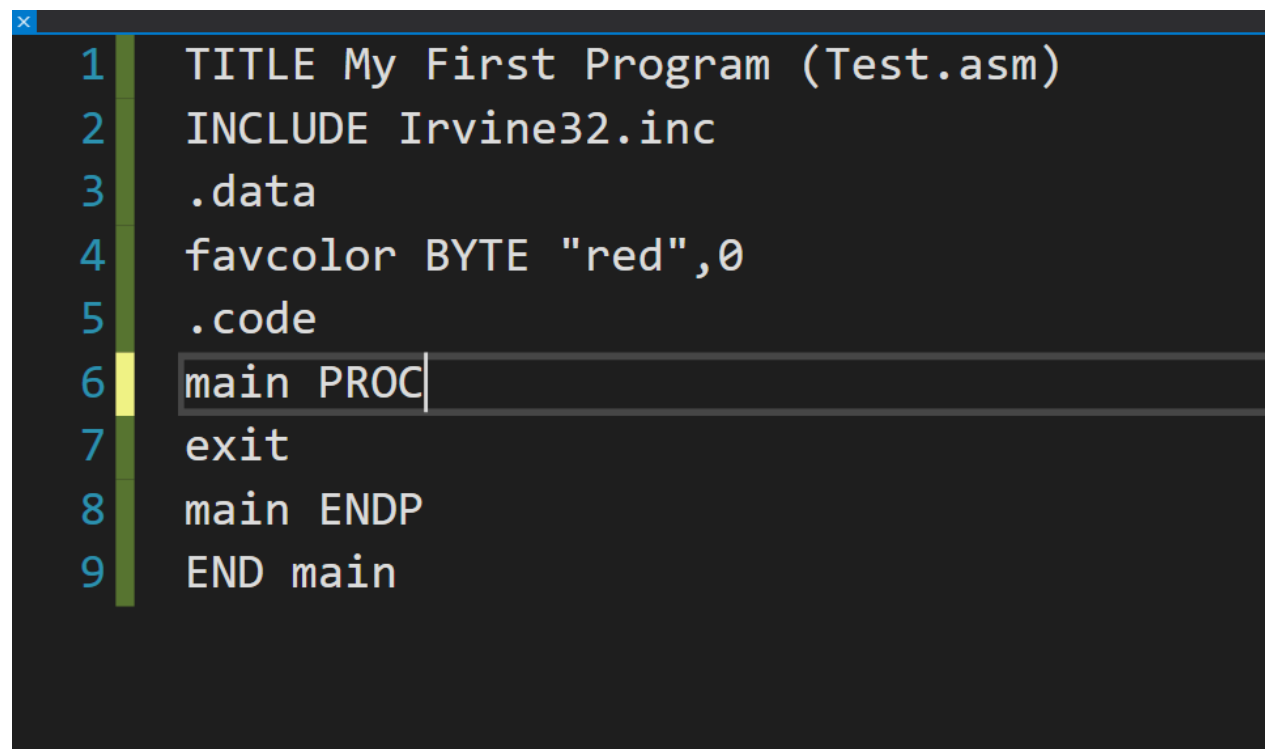
The `CALL WRITEINT` instruction on line 7 is highlighted. Below the code editor, the Microsoft Visual Studio Debug Console shows the output:

```
+13827460
C:\Users\Administrator\source\repos\COAL LAB 3\Debug\COAL LAB 3.exe (process 54112) exited with code 0.
```

Task 04:

Declare a string variable containing the name of your favorite color. Initialize it as a null terminated string

Initialized a string with a null terminator



```
1  TITLE My First Program (Test.asm)
2  INCLUDE Irvine32.inc
3  .data
4  favcolor BYTE "red",0
5  .code
6  main PROC
7  exit
8  main ENDP
9  END main
```

Task 05:

Convert the following high-level instruction into Assembly

Language: $ebx = \{ (a+b) - (a-b) + c \} + d$

a= 10h , b=15h, c=20h, d=30h

performed add and sub arithmetic operations and assigned the answer to ebx using zero extend

```
1  TITLE My First Program (Test.asm)
2  INCLUDE Irvine32.inc
3  .data
4  a BYTE 10h
5  b BYTE 15h
6  cat BYTE 20h
7  d BYTE 30h
8  .code
9  main PROC
10 mov al,a
11 add al,b
12 mov ah,a
13 sub ah,b
14 sub al,ah
15 add al,cat
16 add al,d
17 movzx ebx,al
18 call dumpregs
19 exit
20 main ENDP
21 END main
```

Microsoft Visual Studio Debug Console

EAX=008FFB7A	EBX=0000007A	ECX=002E10AA	EDX=002E10AA
ESI=002E10AA	EDI=002E10AA	EBP=008FF870	ESP=008FF864
EIP=002E368D	EFL=00000202	CF=0	SF=0 ZF=0 OF=0 AF=0 PF=0

Task 06:

Changed hexa values into binary and performed the same operation, resulting in the same answer

```
Text.asm  X
1  TITLE My First Program (Test.asm)
2  INCLUDE Irvine32.inc
3  .data
4  a BYTE 1010b
5  b BYTE 00010101b
6  cat BYTE 00100000b
7  d BYTE 00110000b
8  .code
9  main PROC
10 mov al,a
11 add al,b
12 mov ah,a
13 sub ah,b
14 sub al,ah
15 add al,cat
16 add al,d
17 movzx ebx,al
18 call dumpregs
19 exit
20 main ENDP
21 END main
```

Select Microsoft Visual Studio Debug Console

EAX=008FF57A	EBX=0000007A	ECX=00D910AA	EDX=00D910AA
ESI=00D910AA	EDI=00D910AA	EBP=008FF88C	ESP=008FF880
EIP=00D9368D	EFL=00000202	CF=0	SF=0 ZF=0 OF=0 AF=0 PF=0

Task 07:

Performed arithmetic operations

```
Text.asm  ▾ ×
1  TITLE My First Program (Test.asm)
2  INCLUDE Irvine32.inc
3  .data
4  Data1 WORD 8h
5  Data2 WORD 15h
6  Data3 WORD 30h
7  Imm8=20
8  .code
9  main PROC
10 mov eax,0
11 mov ax,Imm8
12 add ax,Data1
13 sub ax,Data3
14 add ax,Imm8
15 add ax,Data2
16 movzx eax,ax
17 call dumpregs
18 exit
19 main ENDP
20 END main
```

Microsoft Visual Studio Debug Console

EAX=00000015	EBX=011A6000	ECX=003F10AA	EDX=003F10AA
ESI=003F10AA	EDI=003F10AA	EBP=012FFCD4	ESP=012FFCC8
EIP=003F368A	EFL=00000202	CF=0	SF=0 ZF=0 OF=0 AF=0 PF=0