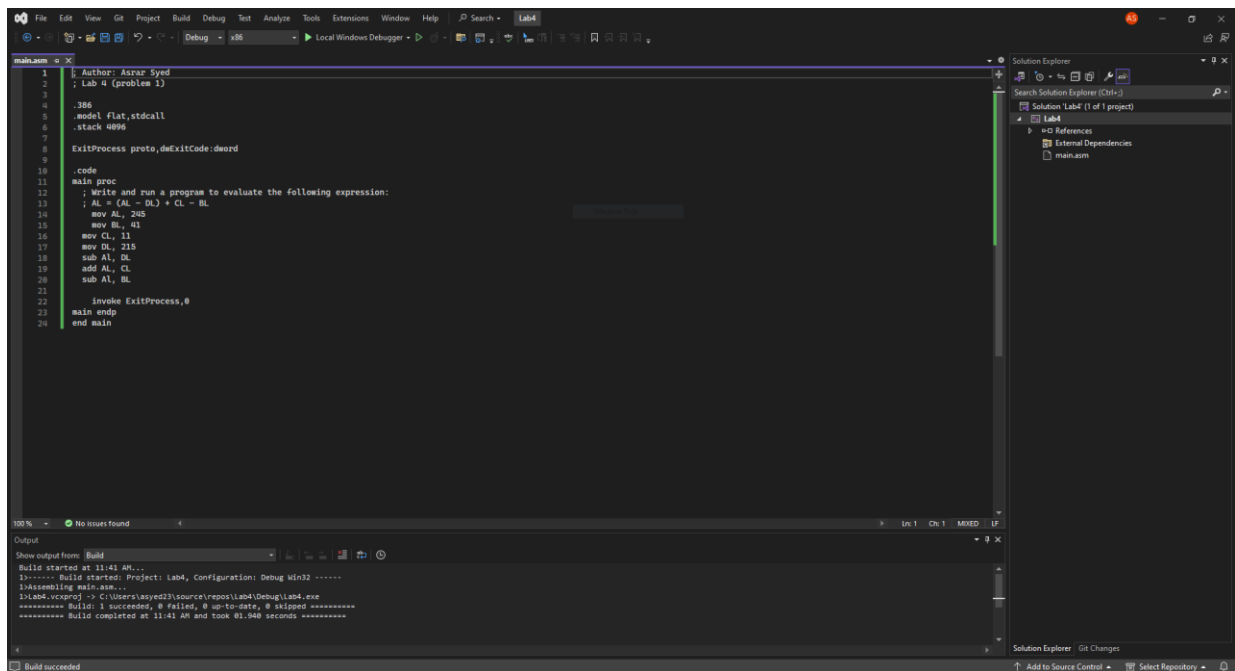


CSC 3210
Computer Organization and Programming
Lab 4
Answer Sheet

Student Name: **Asrar Syed**
Section: **022 / CRN: 17915**

Debug through each line of code and explain the register content.
Write and run a program to evaluate the following expression:
$$AL = (AL - DL) + CL - BL$$



The screenshot displays the Visual Studio Code interface for a project named 'Lab4'. The main editor shows the assembly file 'main.asm' with the following code:

```
1 ; Author: Asrar Syed
2 ; Lab 4 (problem 1)
3
4 .386
5 .model flat,stdcall
6 .stack 4096
7
8 ExitProcess proto, dwExitCode:DWORD
9
10 .code
11 main proc
12 ; Write and run a program to evaluate the following expression:
13 ; AL = (AL - DL) + CL - BL
14 mov AL, 245
15 mov BL, 41
16 mov CL, 11
17 mov DL, 215
18 sub AL, DL
19 add AL, CL
20 sub AL, BL
21
22 invoke ExitProcess,0
23 main endp
24 end main
```

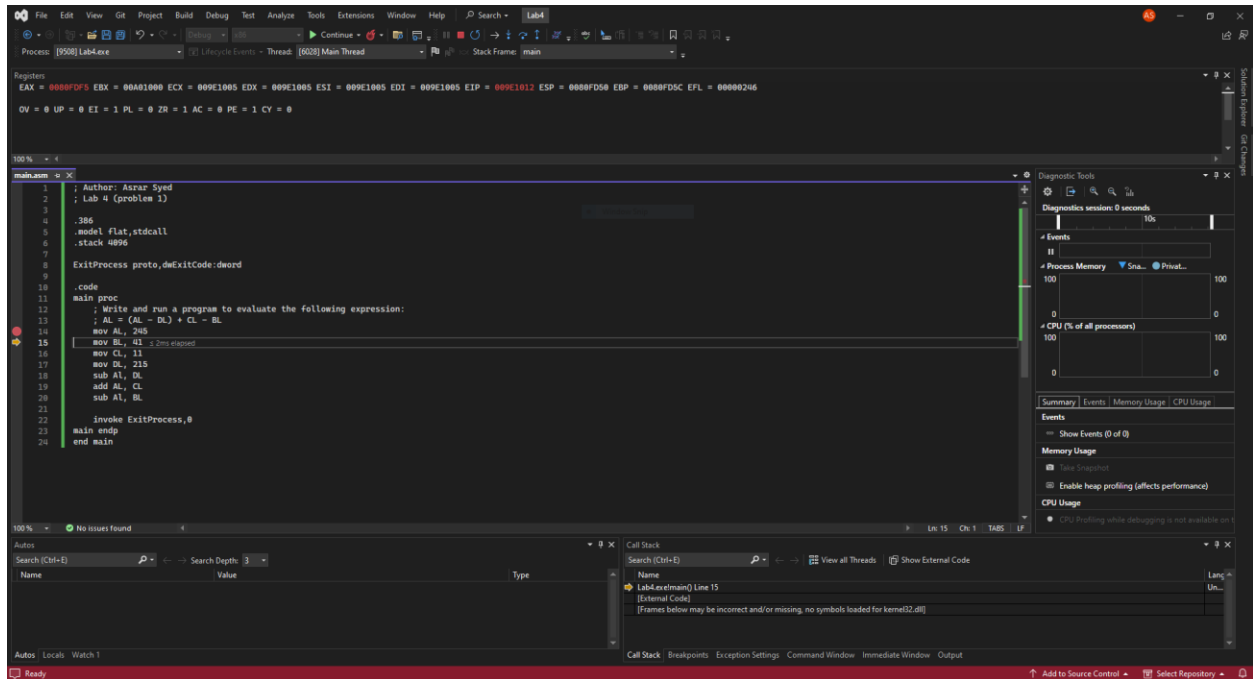
The Solution Explorer on the right shows the project structure with 'Lab4' containing 'External Dependencies' and 'main.asm'.

The Output window at the bottom shows the build process:

```
Output
Show output from: Build
Build started at 11:41 AM...
1>----- Build started: Project: Lab4, Configuration: Debug Win32 -----
2>Assembling main.asm...
3>lab4.vcxproj -> C:\Users\asrard3\source\repos\Lab4\Debug\Lab4.exe
4>----- Build 1 succeeded, 0 failed, 0 up-to-date, 0 skipped -----
5>----- Build completed at 11:41 AM and took 01.546 seconds -----
```

The status bar at the bottom indicates 'Build succeeded'.

Build Succeeded



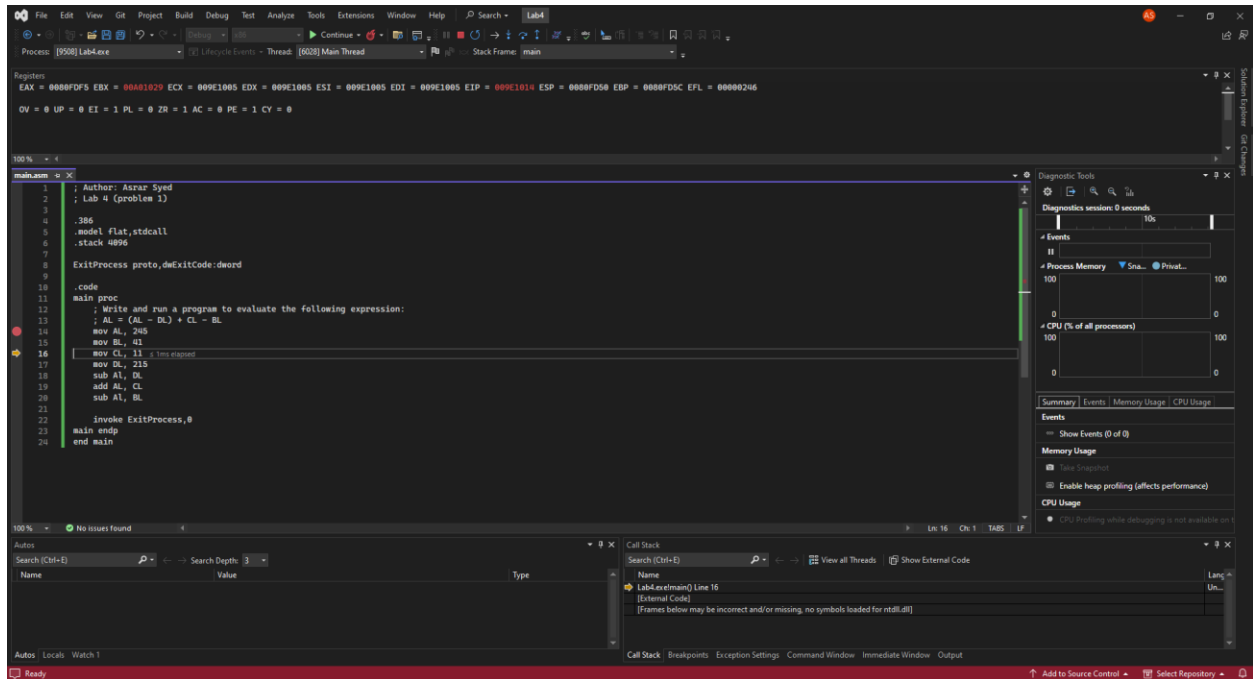
Line number: 14

Instruction: **mov AL, 245**

Register value: **EAX = 0080FDF5 | AL = F5 (245 in decimal)**

Flags: **None changed**

Explanation: **Move the value 245 into the 8-bit AL register, i.e. loading the first 8-bits of the EAX register with this value.**



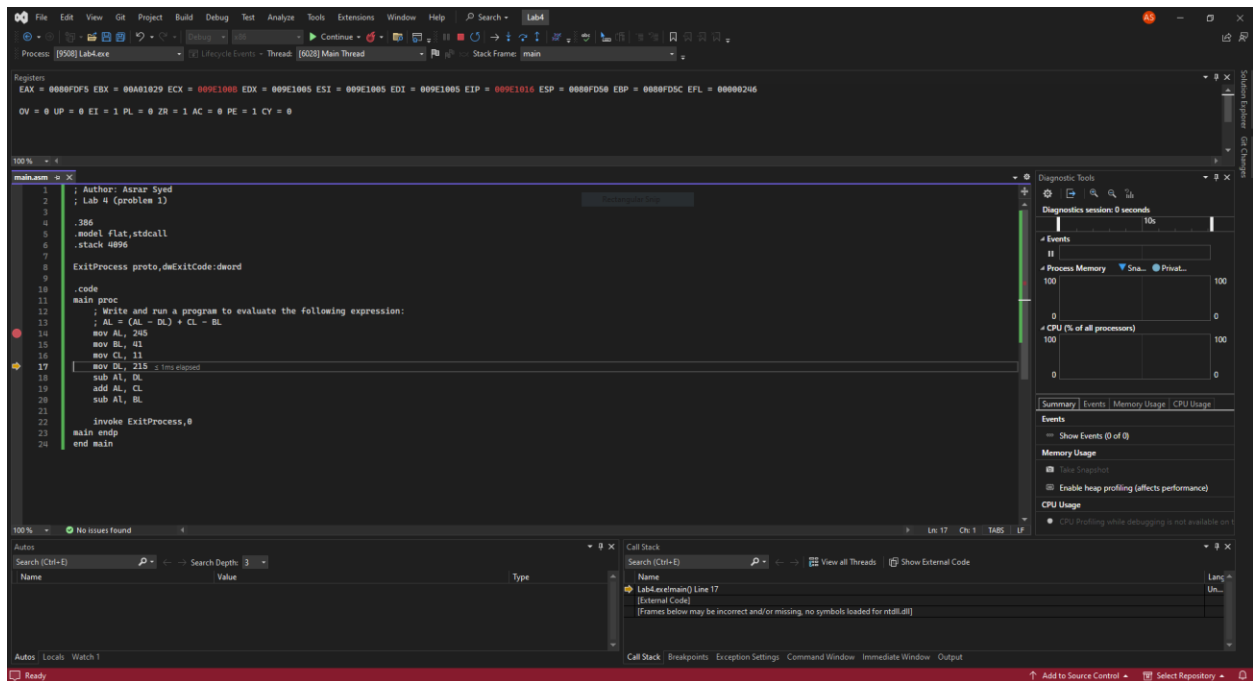
Line number: 15

Instruction: **mov BL, 41**

Register value: **EBX = 00A01029 | BL = 29 (41 in decimal)**

Flags: **None** changed

Explanation: Move the value 41 into the 8-bit BL register, i.e. loading the first 8-bits of the EBX register with this value.



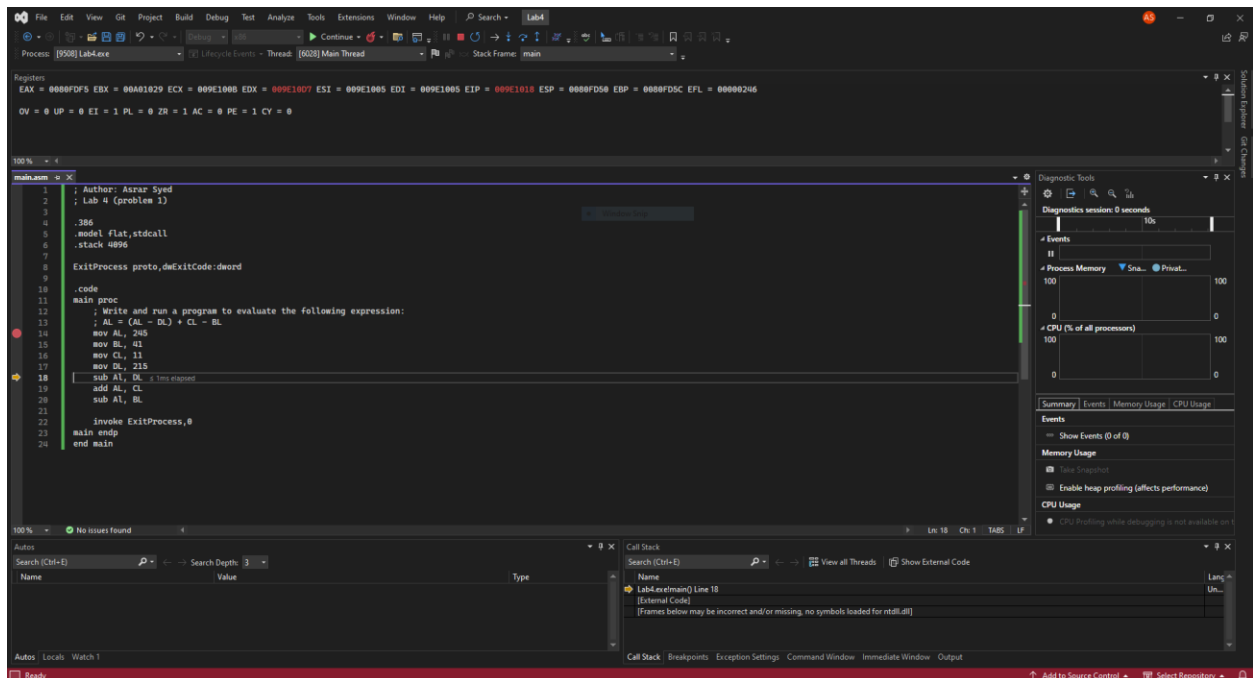
Line number: 16

Instruction: **mov CL, 11**

Register value: **ECX = 009E100B | CL = 0B (11 in decimal)**

Flags: **None changed**

Explanation: **Move the value 11 into the 8-bit CL register, i.e. loading the first 8-bits of the ECX register with this value.**



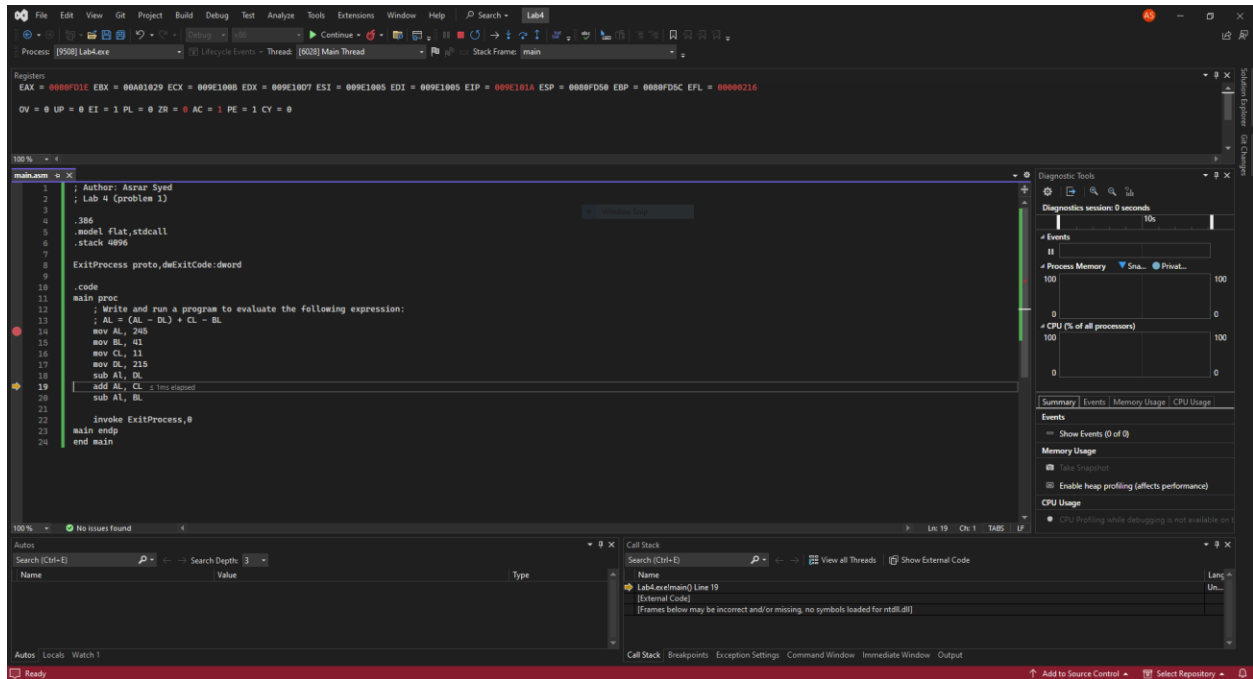
Line number: 17

Instruction: mov DL, 215

Register value: EDX = 009E10D7 | DL = D7 (215 in decimal)

Flags: None changed

Explanation: Move the value 215 into the 8-bit DL register, i.e. loading the first 8-bits of the EDX register with this value.



Line number: 18

Instruction: sub AL, DL

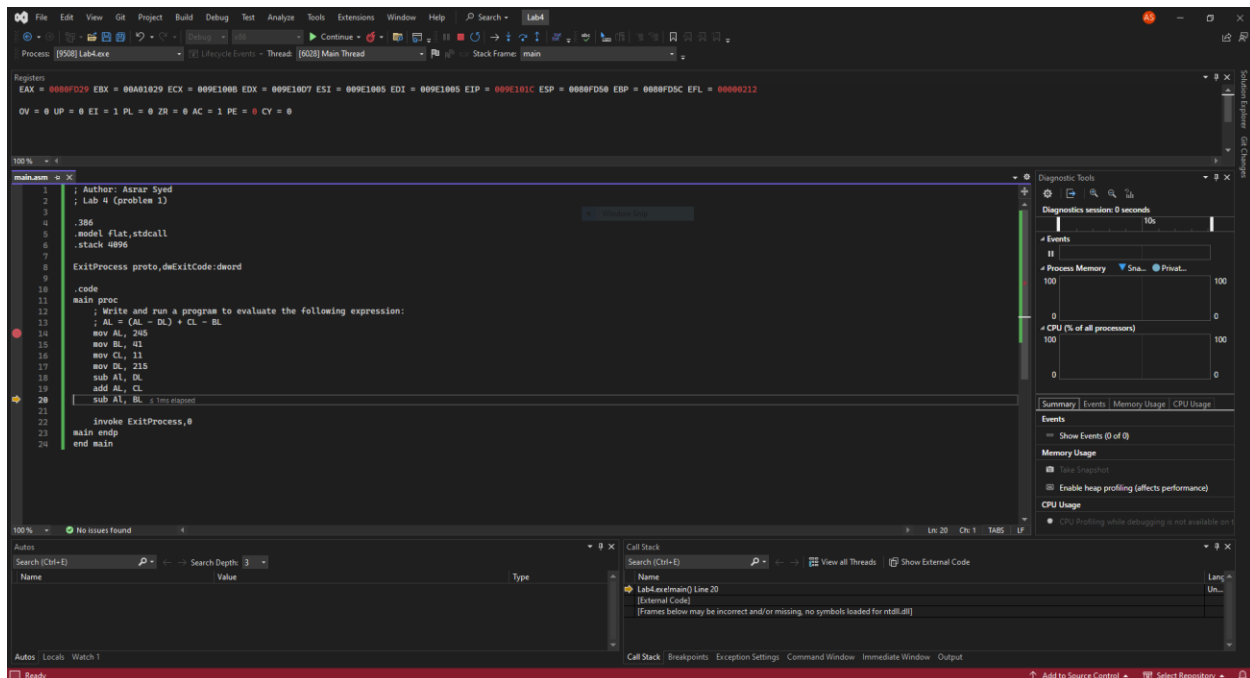
Register value: EAX = 0080FD1E | AL = 1E

Flags: ZR = 0 (Zero Flag) | AC = 1 (Auxiliary Carry Flag)

Explanation: $AL = AL - DL$.

$1E = F5 - D7$ (30 = 245 – 215, in decimal format)

Math was done... subtracting DL with whatever was in AL and loading it into AL.



Line number: 19

Instruction: add AL, CL

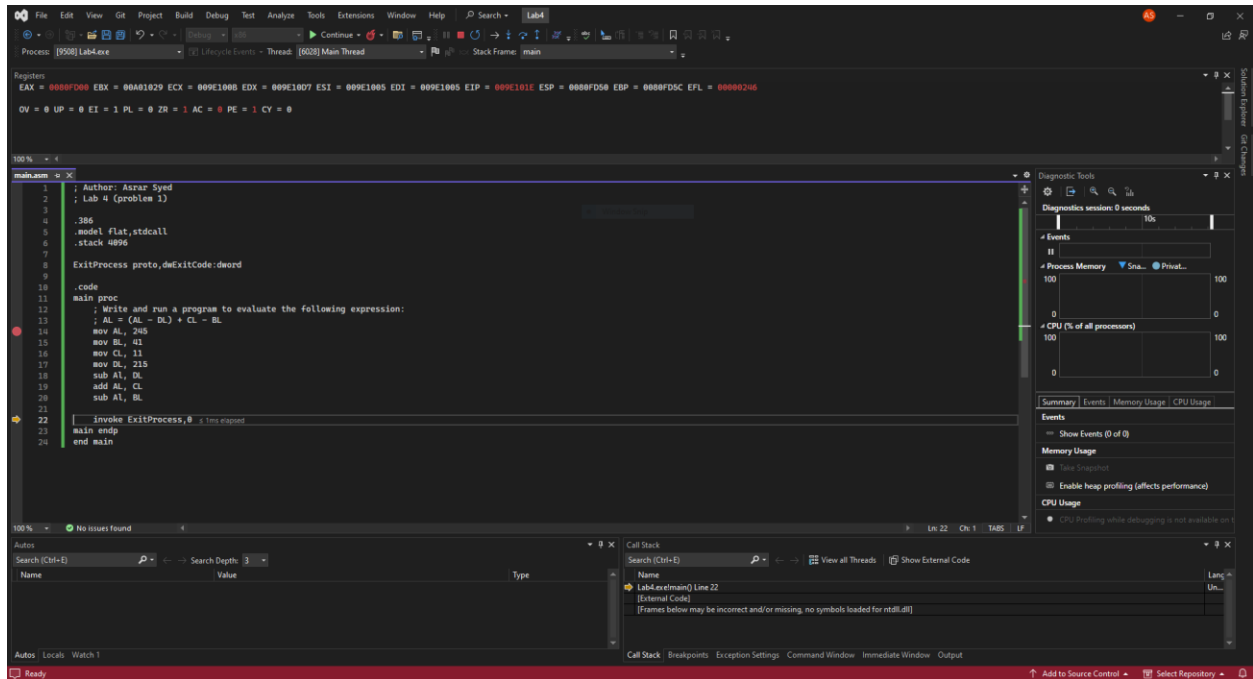
Register value: EAX = 0080FD29 | AL = 29

Flags: PE = 0 (Parity Flag - Odd)

Explanation: AL = AL + CL.

29 = 1E + 0B (41 = 30 + 11, in decimal format)

Math was done... adding CL with whatever was in AL and loading it into AL.



Line number: 20

Instruction: sub AL, BL

Register value: EAX = 0080FD00 | AL = 00

Flags: ZR = 1 (Zero Flag) | AC = 0 (Auxiliary Carry Flag) | PE = 1 (Parity Flag - Even)

Explanation: $AL = AL - BL$.

$00 = 29 - 29$ ($0 = 41 - 41$, in decimal format)

Math was done... subtracting BL with whatever was in AL and loading it into AL.