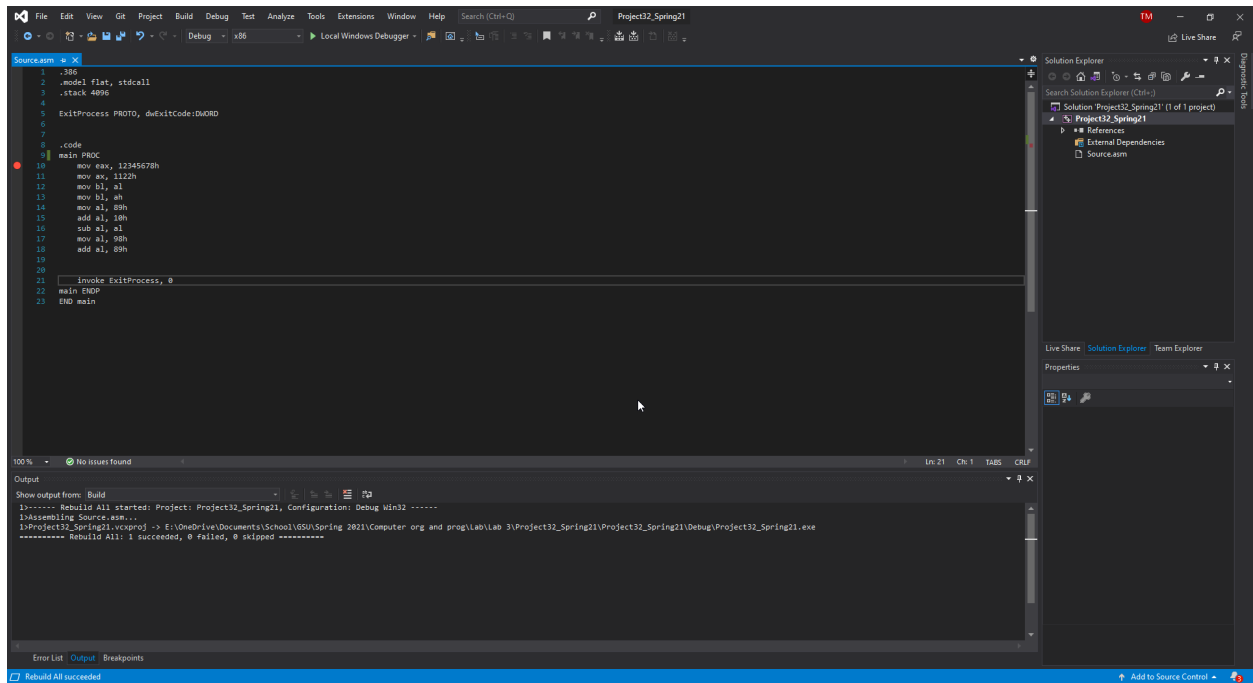


Lab 3

Tracy Michaels

Section 018

Part A)



CSC 3210
Computer Organization and Programming
Lab 3 (b)
Answer Sheet

Student Name: Tracy Michaels

Section: 018

Debug through each line of code and explain the register content and flags.

(We already answered line 10 to 13 for your reference. Start writing your answer from Line 14)

Line: 10

Instruction: `mov eax, 12345678h`

Register value: EAX = 12345678

Explanation: 12345678 is a hexadecimal value which is 32-bit in binary. EAX register is also 32-bit.

Line 11:

Instruction: `mov ax, 1122h`

Register value: EAX = 12341122h

Explanation: 1122 is hexadecimal and it is 16-bit in binary. this mov instruction only updates AX (16 bit) register, a part of EAX register. That's why you can see that the upper portion of EAX register is NOT updated.

Line 12:

Instruction: `mov bl, al`

Register value: EBX = _____ 22

Explanation: AL register is 8-bit long. When you mov the content of al register (22) to BL register, it only updates the first 8-bit of the EBX register. The rest contains the garbage value.

Line 13:

Instruction: `mov bl, ah`

Register value: `EBX = _____ 11`

Explanation: Ah register is 8-bit long. When you move the content of AH register (11) to BL register, it only updates the first 8-bit of the EBX register. The rest contains the garbage value.

Line 14:

Instruction: `mov al, 89h`

What Register value of EAX register, after executing line 14.

- Register value: `EAX = 12341189h`

Explain the content of the EAX register.

- Explanation: move the hexadecimal number 89h, which is an 8-bit binary number into the lower part of the EAX register (AL or A Low) while the rest of the EAX register remains unchanged

Line 15:

Instruction: `add al, 10h`

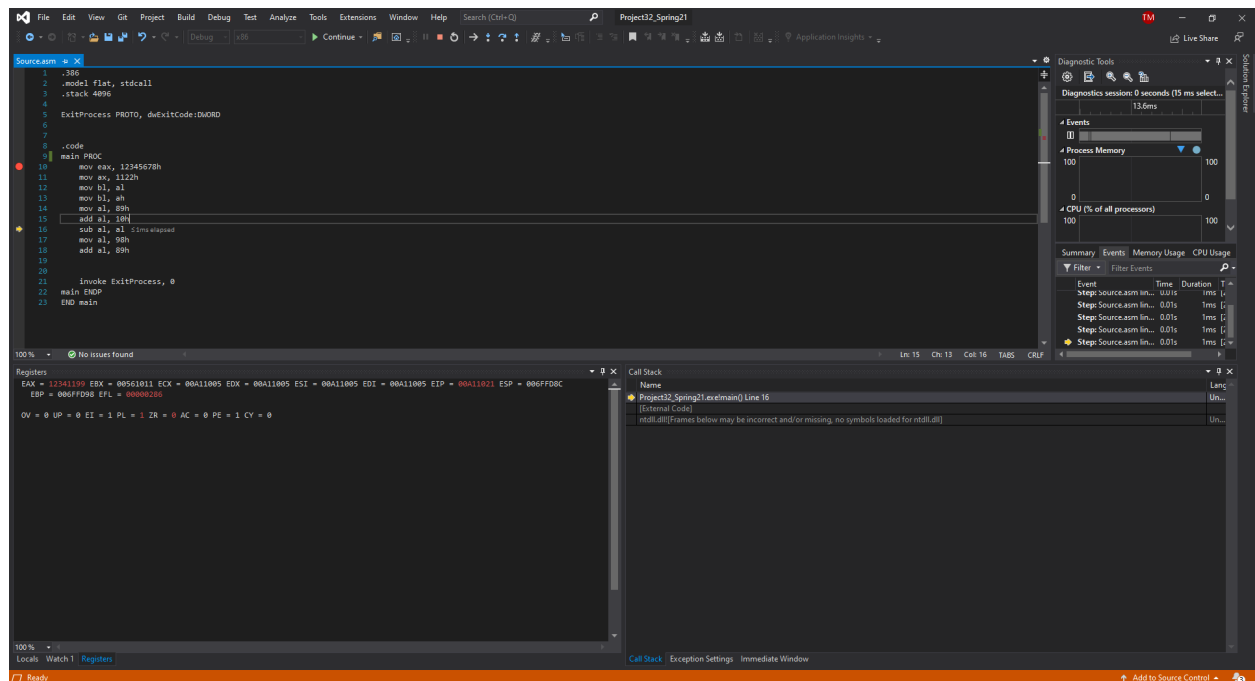
What Register value of EAX, after executing line 15?

- Register Value: `EAX = 12341199h`

Do you see any change in flags?

- Sign Flag changed to a 1
- Zero Flag changed to a 0

Show the step of the hexadecimal addition.



Line 16:

Instruction: sub al, al

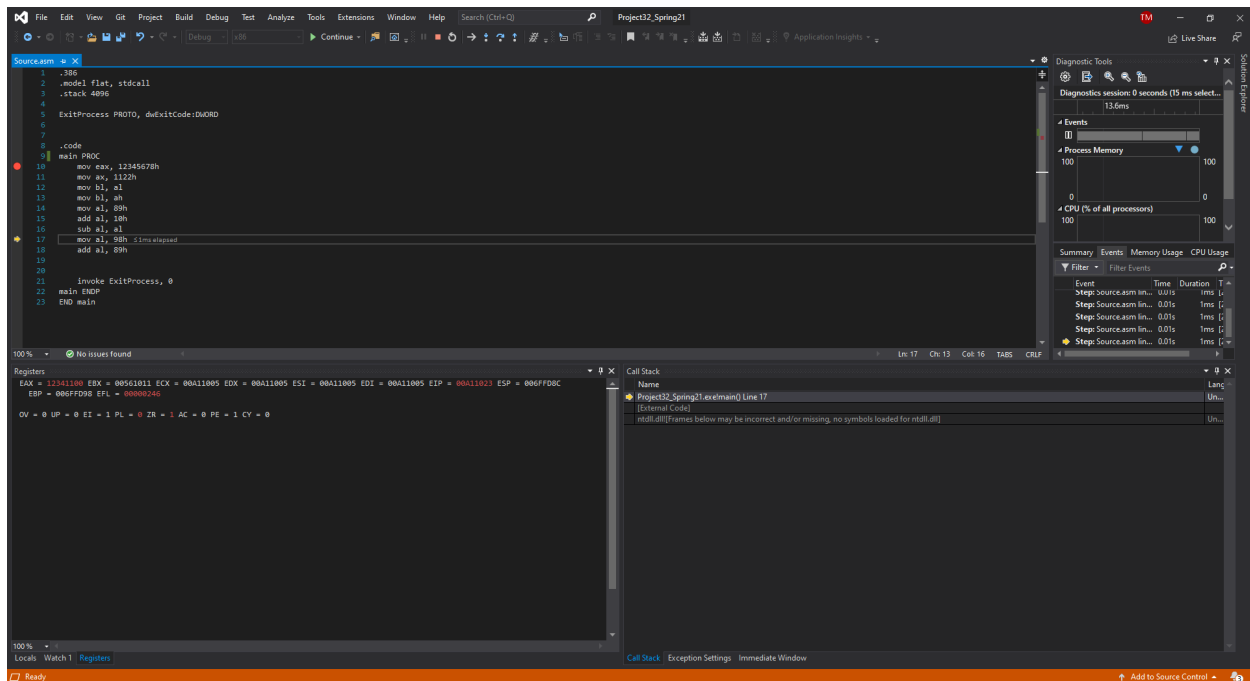
What Register value of EAX, after executing line 15?

- Register Value: EAX = 12341100h

Do you see any change in flags?

- Sign Flag changed to 0
- Zero Flag changed to 1

Show the step of the hexadecimal subtraction.



Line 17, 18:

Instruction:

mov al, 98h

add al, 89h

What Register value of EAX, after executing line 17 and 18?

- Line 17 Register Value: EAX = 12341198h
- Line 18 Register Value: EAX = 12341121h

Do you see any change in flags?

- Overflow Flag changed to a 1
- Zero Flag changed to a 0
- Carry Flag changed to a 1
- Auxiliary Flag Changed to a 1

Show the step of the hexadecimal addition.

Visual Studio Code interface showing a debugging session for a project named "Project12_Spring21".

Source Code (Source.asm):

```
1 .386
2 .model flat, stdcall
3 .stack 4096
4
5 ExitProcess PROTO, dwExitCode:DWORD
6
7
8 .code
9
10 main PROC
11     mov eax, 12345678h
12     mov ax, 1122h
13     mov bl, al
14     mov bl, ah
15     add al, 89h
16     sub al, 10h
17     mov al, 98h
18     add al, 89h
19
20
21     invoke ExitProcess, 0 ;unmanaged
22 main ENDP
23 END main
```

Registers:

100% No issues found

EAX = 12341121 EBX = 00561811 ECK = 00A11805 EDX = 00A11805 ESI = 00A11805 EDI = 00A11805 EIP = 00A11827 ESP = 006FFD0C
EBP = 006FFD08 EPL = 00000A17

OV = 1 UP = 0 EI = 1 PL = 0 ZR = 0 AC = 1 PE = 1 CY = 1

Call Stack:

Name	Lang
Project12_Spring21.exe!main@ Line 21	Un...
(External Code)	Un...
main.dll[[Frames below may be incorrect and/or missing, no symbols loaded for main.dll]]	Un...

Diagnostic Tools:

Diagnostics session: 0 seconds (15 ms select...)

Events: 14ms

Process Memory: 100

CPU (% of all processors): 0

Summary: Events Memory Usage CPU Usage

Event	Time	Duration	T
Step: Source.asm lin...	0.01s	1ms	U
Step: Source.asm lin...	0.01s	1ms	U
Step: Source.asm lin...	0.01s	1ms	U
Step: Source.asm lin...	0.01s	1ms	U

100% Ready

Part C)

Lab 3

$$\text{Problem 1} \quad \frac{0.((0.5 \cdot 3) + (0.5 \cdot 10)) \cdot 500 \cdot 10^6}{2.2 \times 10^9}$$

$$= \frac{3250 \times 10^6}{2.2 \times 10^9} = \frac{3250}{2.2 \times 10^3} = \boxed{1.477 \text{ seconds}}$$

$$\text{Problem 2} \quad 20 \cdot 30 = \boxed{600 \times 10^6 \text{ instructions}}$$