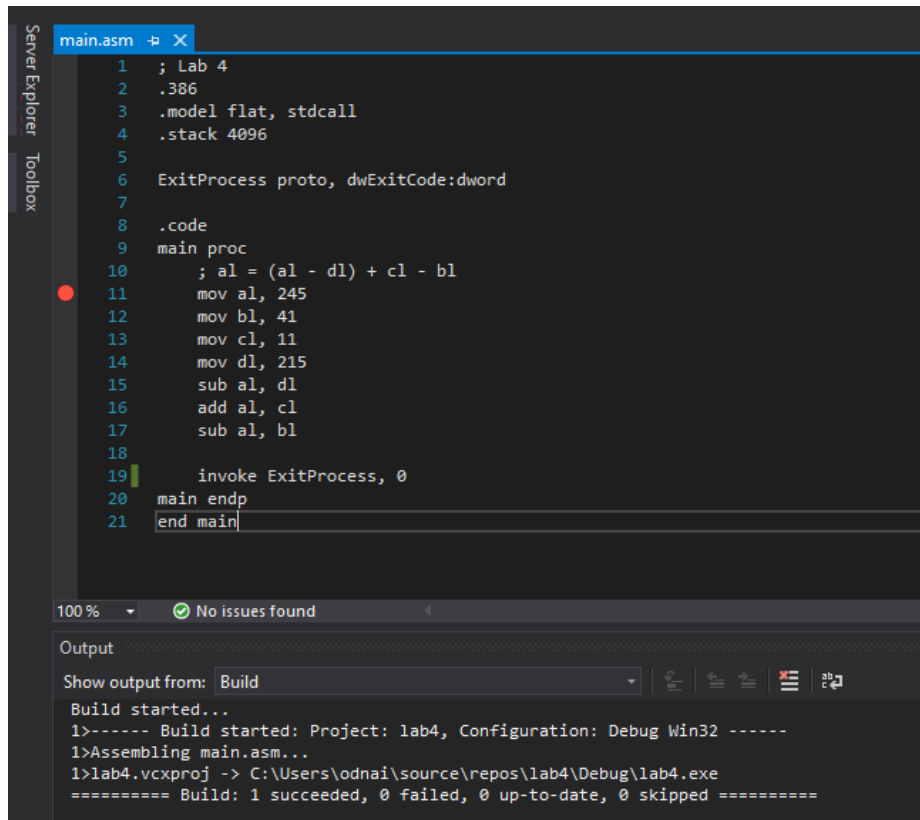


CSC 3210  
Computer Organization and Programming  
Lab 4  
Answer Sheet

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Section: CRN 90913; 11:00-12:40

Debug through each line of code.  
Take a screenshot that includes code and a register window.  
Record the register content.  
and explain the register contents.

screenshot of code where build was successful:



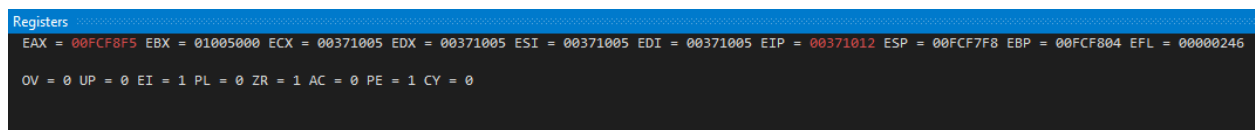
The screenshot shows the Visual Studio IDE with the assembly file 'main.asm' open. The code is as follows:

```
1 ; Lab 4
2 .386
3 .model flat, stdcall
4 .stack 4096
5
6 ExitProcess proto, dwExitCode:dword
7
8 .code
9 main proc
10 ; al = (al - dl) + cl - bl
11 mov al, 245
12 mov bl, 41
13 mov cl, 11
14 mov dl, 215
15 sub al, dl
16 add al, cl
17 sub al, bl
18
19 invoke ExitProcess, 0
20 main endp
21 end main
```

Below the code editor, the 'Output' window shows the build results:

```
100% No issues found
Output
Show output from: Build
Build started...
1>----- Build started: Project: lab4, Configuration: Debug Win32 -----
1>Assembling main.asm...
1>lab4.vcxproj -> C:\Users\odnai\source\repos\lab4\Debug\lab4.exe
===== Build: 1 succeeded, 0 failed, 0 up-to-date, 0 skipped =====
```

Line number: 11  
Instruction: `mov al, 245`  
Register values: `EAX = 00FCF8F5`  
Screenshot:



The screenshot shows the Windows Register window with the following values:

```
Registers
EAX = 00FCF8F5 EBX = 01005000 ECX = 00371005 EDX = 00371005 ESI = 00371005 EDI = 00371005 EIP = 00371012 ESP = 00FCF7F8 EBP = 00FCF804 EFL = 00000246
OV = 0 UP = 0 EI = 1 PL = 0 ZR = 1 AC = 0 PE = 1 CY = 0
```

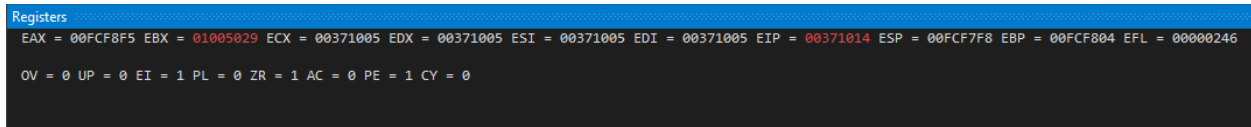
**Explanation:** EAX register is 32-bit long, and AL register is only 8-bit long. When you mov 245 (hex = F5) to the AL register, it only updates the first 8-bit in the EAX register. The rest is garbage value.

Line number: 12

Instruction: mov bl, 41

Register values: EBX = 01005029

Screenshot:



```
Registers
EAX = 00FCF8F5 EBX = 01005029 ECX = 00371005 EDX = 00371005 ESI = 00371005 EDI = 00371005 EIP = 00371014 ESP = 00FCF7F8 EBP = 00FCF804 EFL = 00000246
OV = 0 UP = 0 EI = 1 PL = 0 ZR = 1 AC = 0 PE = 1 CY = 0
```

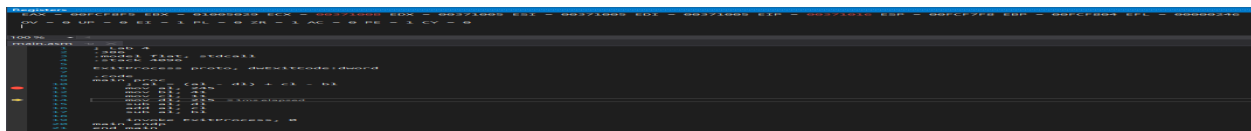
**Explanation:** Similar to EAX and AL, EBX register is 32-bit long, and BL register is only 8-bit long. When you mov 41 (hex = 29) to the BL register, it only updates the first 8-bit in the EBX register. The rest is garbage value.

Line number: 13

Instruction: mov cl, 11

Register values: ECX = 0037100B

Screenshot:



```
Registers
EAX = 00FCF8F5 EBX = 01005029 ECX = 0037100B EDX = 00371007 ESI = 00371005 EDI = 00371005 EIP = 00371018 ESP = 00FCF7F8 EBP = 00FCF804 EFL = 00000246
OV = 0 UP = 0 EI = 1 PL = 0 ZR = 1 AC = 0 PE = 1 CY = 0
```

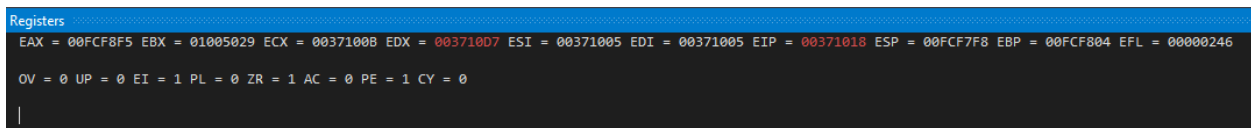
**Explanation:** Similar to both EAX, EBX and AL, BL, ECX register is 32-bit long, and CL register is only 8-bit long. When you mov 11 (hex = B) to the CL register, it only updates the first 8-bit in the ECX register. The rest is garbage value.

Line number: 14

Instruction: mov dl, 215

Register values: EDX = 003710D7

Screenshot:



```
Registers
EAX = 00FCF8F5 EBX = 01005029 ECX = 0037100B EDX = 003710D7 ESI = 00371005 EDI = 00371005 EIP = 00371018 ESP = 00FCF7F8 EBP = 00FCF804 EFL = 00000246
OV = 0 UP = 0 EI = 1 PL = 0 ZR = 1 AC = 0 PE = 1 CY = 0
```

**Explanation:** Similar to EAX, EBX, ECX and AL, BL, CL, EDX register is 32-bit long, and DL register is only 8-bit long. When you mov 215 (hex = D7) to the DL register, it only updates the first 8-bit in the EDX register. The rest is garbage value.

Line number: 15

Instruction: sub al, dl

Register values: EAX = 00FCF81E

Screenshot:

```
Registers
EAX = 00FCF81E EBX = 01005029 ECX = 0037100B EDX = 00371007 ESI = 00371005 EDI = 00371005 EIP = 0037101A ESP = 00FCF7F8 EBP = 00FCF804 EFL = 00000216
OV = 0 UP = 0 EI = 1 PL = 0 ZR = 0 AC = 1 PE = 1 CY = 0
```

Explanation: Subtracting AL(245) from DL(215) and updating the AL register with 1E.

AL = F5(245); DL = D7(215)

245 - 215 = 30; F5 - D7 = 1E

Line number: 16

Instruction: add al, cl

Register values: EAX = 00FCF829

Screenshot:

```
Registers
EAX = 00FCF829 EBX = 01005029 ECX = 0037100B EDX = 00371007 ESI = 00371005 EDI = 00371005 EIP = 0037101C ESP = 00FCF7F8 EBP = 00FCF804 EFL = 00000212
OV = 0 UP = 0 EI = 1 PL = 0 ZR = 0 AC = 1 PE = 0 CY = 0
|
```

Explanation: Adding AL(1E) with CL(0B) and updating the AL register with 29.

AL = 1E(30); CL = 0B(11)

30 + 11 = 41; 1E + 0B = 29

Line number: 17

Instruction: sub al, bl

Register values: EAX = 00FCF800

Screenshot:

```
Registers
EAX = 00FCF800 EBX = 01005029 ECX = 0037100B EDX = 00371007 ESI = 00371005 EDI = 00371005 EIP = 0037101E ESP = 00FCF7F8 EBP = 00FCF804 EFL = 00000246
OV = 0 UP = 0 EI = 1 PL = 0 ZR = 1 AC = 0 PE = 1 CY = 0
|
```

Explanation: Subtracting AL(245) from DL(215) and updating the AL register with 1E.

AL = 41(29); BL = 41(BL)

41 - 41 = 0; 29 - 29 = 00

End Results:

AL = (AL - DL) + CL - BL = 00