

Lab 8 – Assembly Programming

CS1050 Computer Organization and Digital Design

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Lab Task

- In this lab, we will use the Microprocessor Simulator (a.k.a. smz32), to develop and simulate Assembly programs.
- Try to understand the source code for add two numbers and modify the Assembly code to subtract, divide and multiply the two numbers.
- Get familiar with Assembly programming and the simulator by running several more samples.
- Modify an existing example to program signal lights to make them real by controlling the time that each light stays on.
- Modify a program to show the last two digits of index number using 2, 7-segment displays.
- Develop a new Assembly program to multiply all integers from 1 to 5 and show the final answer as a hexadecimal value using 2, 7-segment displays.

Assembly code to subtract two numbers

AL 00000100 04 +004	IP 00001010 0A +010		A				CLO	Assemble	Slower	Continue
BL 00000010 02 +002	SP 10111111 BF -065		A	H				Step	Faster	Cpu Reset
CL 00000000 00 +000	SR 00000000 00 +000		B	↑	K	N		Run F9	STOP	Show Ram
DL 00000000 00 +000	IS02									

END Program has halted.

☐ Write Run Log ☐ Log Assembler Activity

Source Code	List File	Configuration	Tokens	Run Log
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```
; ===== WORK OUT 6 subtract 2 =====
CLO                ; Close unwanted windows.
MOV AL,6           ; Copy a 6 into the AL register.
MOV BL,2           ; Copy a 2 into the BL register.
SUB AL,BL          ; Subtract BL from AL. Answer goes into AL.
END                ; Program ends
; ===== Program Ends =====
```

Assembly code to divide two numbers

AL 00000011 03 +003	IP 00001010 0A +010		A				CLO	Assemble	Slower	Continue
BL 00000010 02 +002	SP 10111111 BF -065		A	H!			LO	Step	Faster	Cpu Reset
CL 00000000 00 +000	SR 00000000 00 +000		B	↑	K	N		Run F9	STOP	Show Ram
DL 00000000 00 +000	ISOZ									

END Program has halted.

☐ Write Run Log ☐ Log Assembler Activity

Source Code | List File | Configuration | Tokens | Run Log

```
; ===== WORK OUT 6 divided by 2 =====  
CLO                ; Close unwanted windows.  
MOV AL,6           ; Copy a 6 into the AL register.  
MOV BL,2           ; Copy a 2 into the BL register.  
DIV AL,BL          ; Divide AL by BL. Answer goes into AL.  
END                ; Program ends  
; ===== Program Ends =====
```

Assembly code to multiply two numbers

AL 00000110 06 +006	IP 00001010 0A +010		A				CLO	Assemble	Slower	Continue
BL 00000010 02 +002	SP 10111111 BF -065		A	H!			LO	Step	Faster	Cpu Reset
CL 00000000 00 +000	SR 00000000 00 +000		B	↑	K	N		Run F9	STOP	Show Ram
DL 00000000 00 +000	ISOZ									

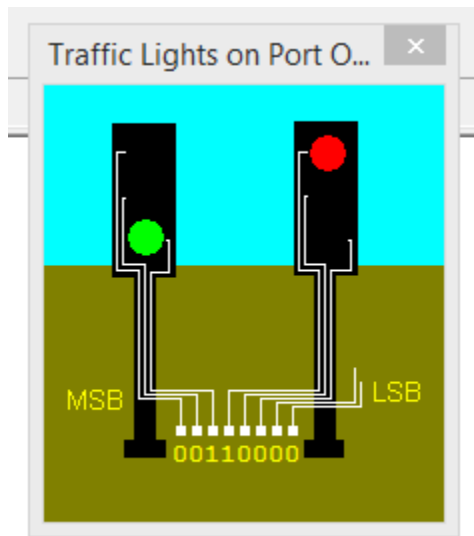
END Program has halted.

☐ Write Run Log ☐ Log Assembler Activity

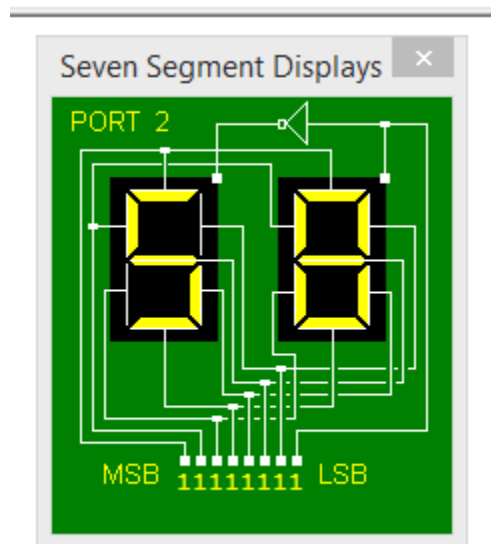
Source Code | List File | Configuration | Tokens | Run Log

```
; ===== WORK OUT 3 multiply by 2 =====  
CLO                ; Close unwanted windows.  
MOV AL,3           ; Copy a 3 into the AL register.  
MOV BL,2           ; Copy a 2 into the BL register.  
MUL AL,BL          ; Multiply AL by BL. Answer goes into AL.  
END                ; Program ends  
; ===== Program Ends =====
```

Traffic Lights



Display last 2 digits of index number using 2, 7-segment displays



Display final answer of multiply all integers from 1 to 5 in hexadecimal using 2, 7-segment displays

