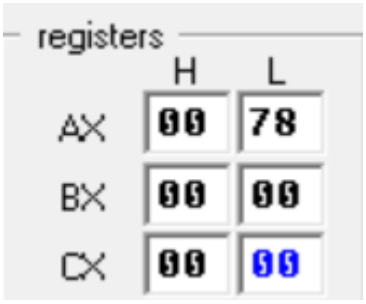
Assembly Report (Lab 1)

Problem 1

- **The functionality of program** : calculates factorial using Ax as an accumulator and CX as multiplier and loop counter

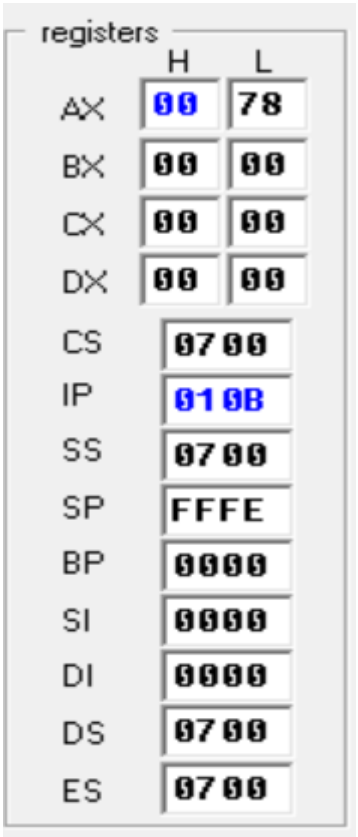
- **What happens to the AX and CX registers**: When the program starts, AX is initialized to 1 and CX is initialized to 5 (the number stored at 'data'). During each iteration of the loop, AX is multiplied by the current value of CX and CX is automatically decremented by 1 by the LOOP instruction. This continues until CX becomes zero. At the end of execution, AX contains 120 (0078h), which is the factorial of 5, and CX contains 0000h, indicating the loop has finished.



- Code:

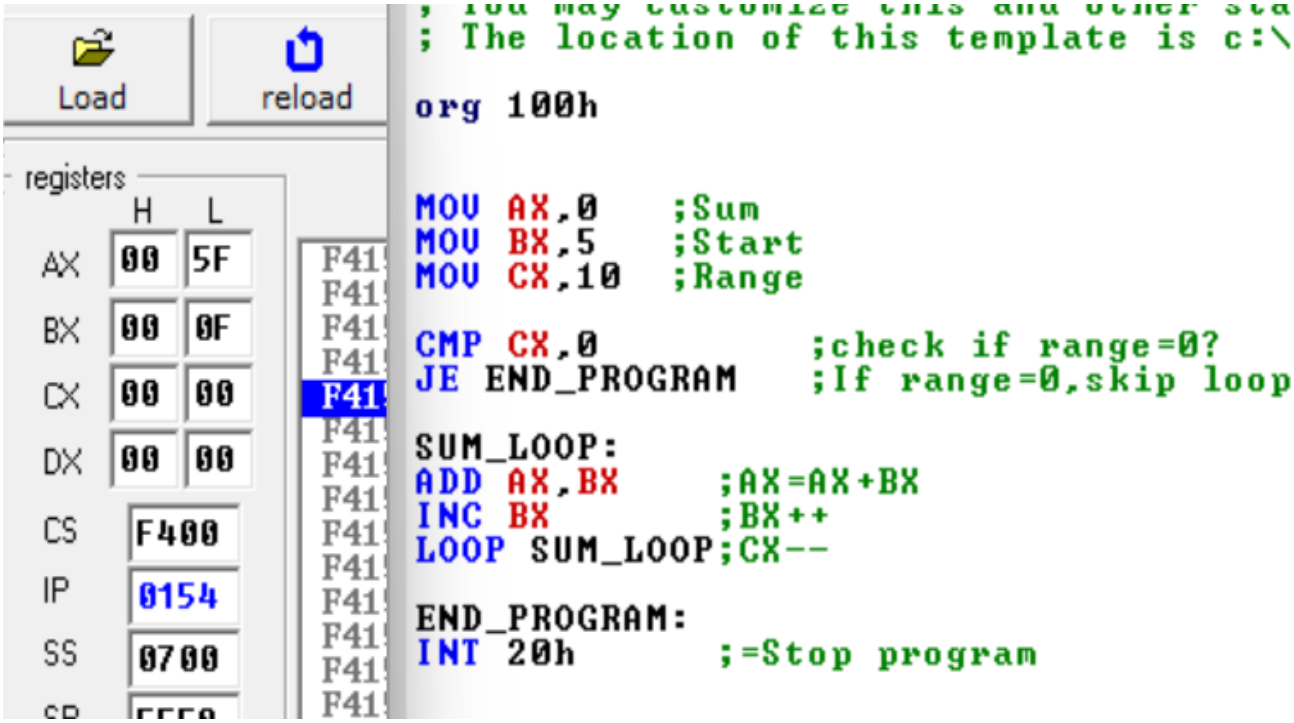
```
05 ORG 100h
06 MOV AX, 1
07 MOV CX, data
08 START_LOOP:
09 MUL CX
10 LOOP START_LOOP
11 data DW 0005h
12 END
13
```

- Values of registers after execution:



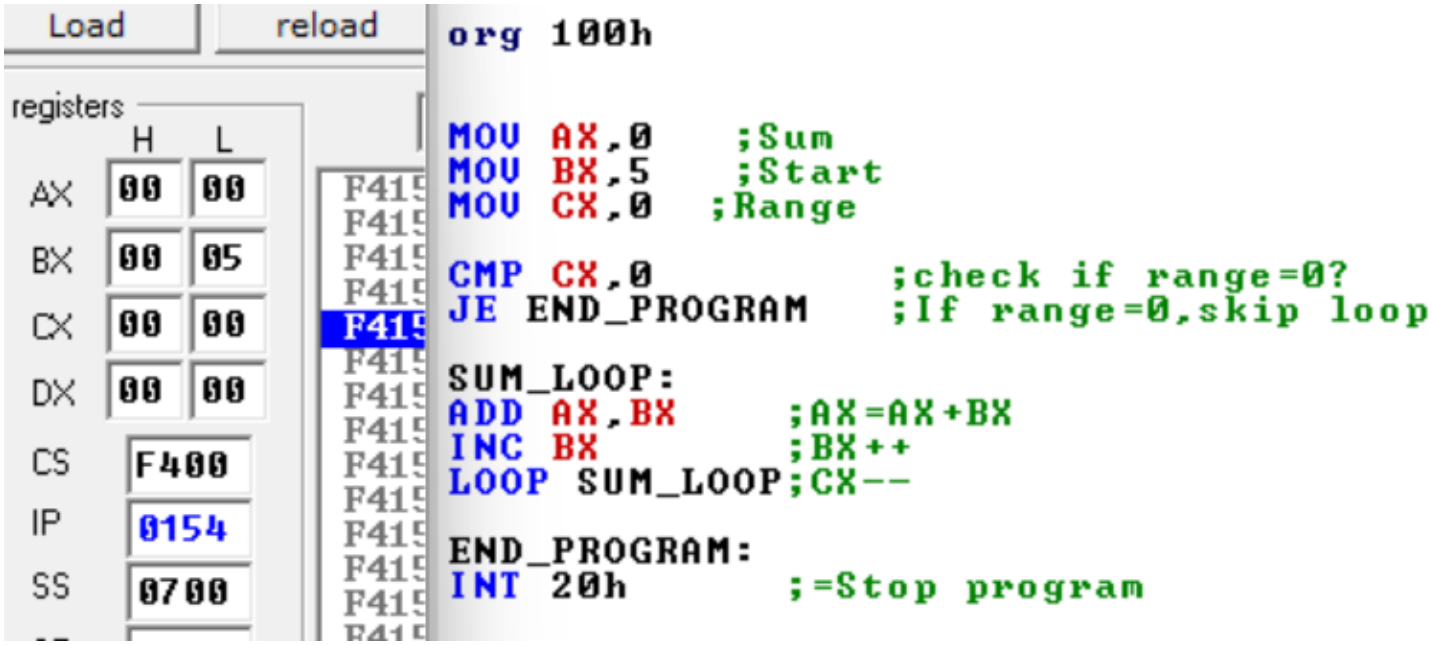
Problem 2

Code and execution:



After code execution: AX=5F (95 in decimal), BX=0F(15 in decimal), CX=0

- **Validations made** check if range=0 then Ax will be the same



Problem 3

Code and execution:

```
05
06  ORG 100h
07
08
09  MOV SI,500h   ;SI=result memory
10  MOV BX,0      ;byte index
11  MOV CX,10     ;10 bytes to add
12  CLC           ;Clear carry first
13
14  ADD_LOOP:
15      MOV AL,A[BX]     ;AL=A[i]
16      ADC AL,B[BX]     ;AL=AL+B[i]+carry
17      MOV [SI+BX],AL   ;SI+i=AL
18      INC BX           ;i++
19      LOOP ADD_LOOP    ;CX--
20
21  ;Store final carry
22  MOV AL,0
23  ADC AL,0
24  MOV [SI+BX],AL
25
26  INT 20h
27
28  A DB 0C7h,096h,047h,04Eh,046h,082h,00Fh,022h,0BDh,0CFh
29  B DB 00Dh,0EFh,007h,06Dh,0BAh,07Ch,01Eh,06Bh,000h,040h
```

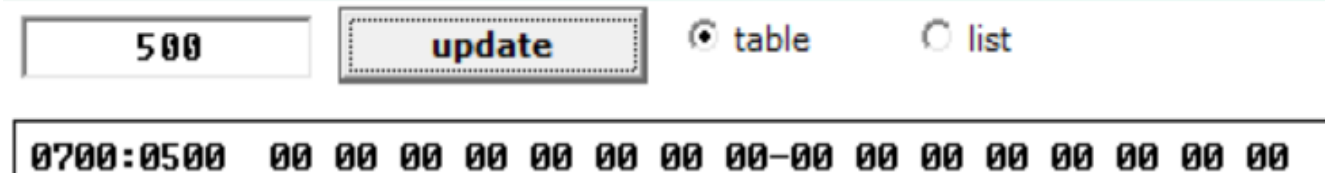
- After code execution: result stored in memory address 500 is:
  (1 0F BD 8D 2D FF 00 BB 4F 85 D4)

The result stored in memory appears reversed because the 8086 processor uses little-endian format, meaning the least significant byte is stored at the lowest memory address. Reversing the stored result yields the number in normal most-to-least significant byte order, matching the expected output

Different test Cases:

- A and B = 0:

```
28 A DB 0h,0h,0h,0h,0h,0h,0h,0h,0h,0h
29 B DB 0h,0h,0h,0h,0h,0h,0h,0h,0h,0h
```



- A and B = FF:

```
27
28 A DB 0FFh,0FFh,0FFh,0FFh,0FFh,0FFh,0FFh,0FFh,0FFh,0FFh
29 B DB 0FFh,0FFh,0FFh,0FFh,0FFh,0FFh,0FFh,0FFh,0FFh,0FFh
```

- A and B = random values:

```
28 A DB 0C7h,096h,047h,04Eh,046h,082h,00Fh,022h,0BDh,0CFh
29 B DB 00Dh,0EFh,007h,06Dh,0BAh,07Ch,01Eh,06Bh,000h,040h
```