Assignment 3

Question 1

Objective

Write a fast sub-routine to multiply 9 by 15.

Tool / Experimental setup considered

- Used Jubin's 8085 Simulator.

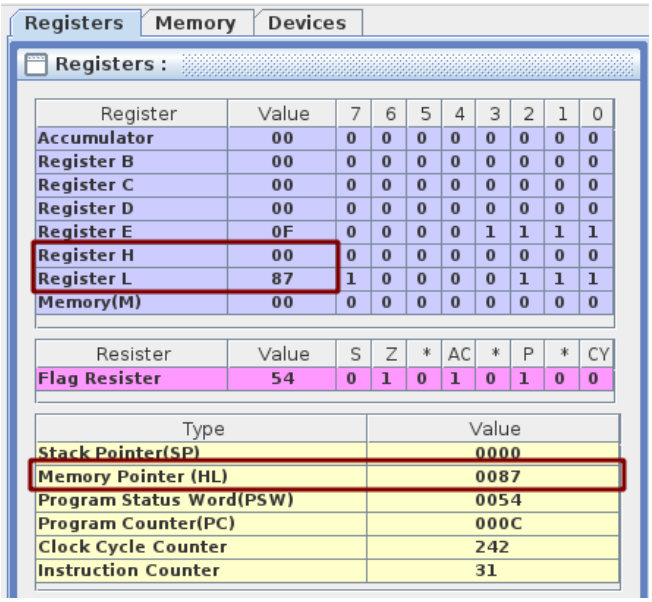
Procedure

We can add 15, 9 times to get 9*15 because multiplication is nothing but repeated addition.

Program

```
LXI H,0000H
MVI E,0FH
MVI B,09H
LOOP:
  DAD D ; HL <- HL + DE
  DCR B ; Decrease B (1-byte)
  JNZ LOOP
HLT
```

Experimentation



Conclusion

9*15 = 135 which in hex is `0x87` . Above we can see that the value in the H-L pair is `0087h` . Hence, our program was able to calculate 9 times 15.

Question 2

Objective

Write a subroutine to sort a 5-element byte array (Any algorithm will do).

Tool / Experimental setup considered

- Used Jubin's 8085 Simulator.

Procedure

Performing a simple bubble sort, where we compare adjacent elements and swaps them if they are in the wrong order. The pass through the list is repeated until the list is sorted.

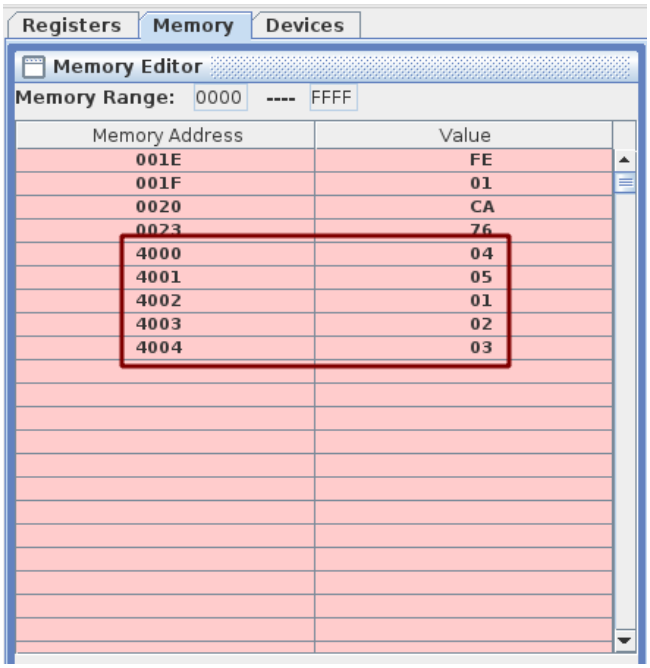
Program

```
# ORG 4000h
# ARR: DB 04,05,01,02,03
# LEN EQU 5

# ORG 0000h

MAIN:
  LXI H,ARR
  MVI D,00
  MOV C,LEN
  DCR C
CHECK:
  MOV A,M
  INX H
  CMP M
  JC NEXT
  JZ NEXT
  CALL SWAP
SWAP:
  MOV B,M
  MOV M,A
  DCX H
```

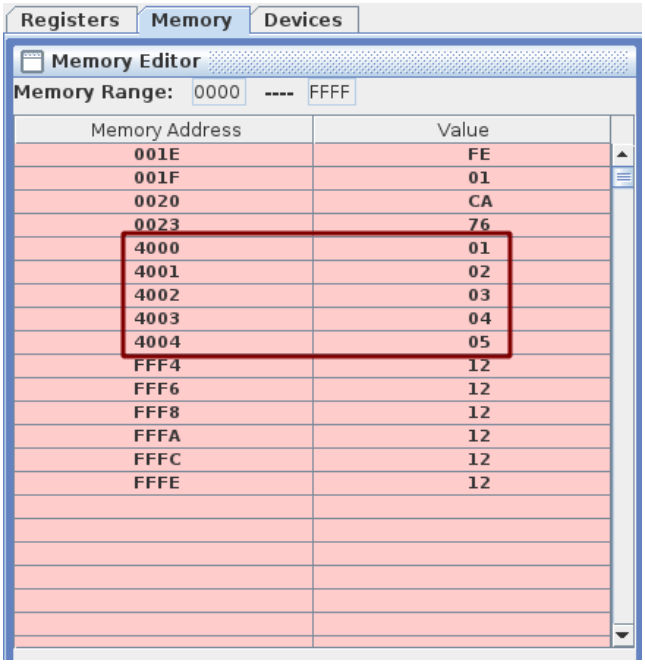
```
    MOV M,B
    INX H
    MVI D,01

  NEXT:
    DCR C
    JNZ CHECK
    MOV A,D
    CPI 01
    JZ MAIN
    HLT
```

Experimentation

Before sorting (just assembling the code)



After sorting



Conclusion

Finally we can see in the memory range `4000` to `4004` that the numbers are all sorted, hence our code worked.

Question 3

Objective

Write a sub-routine to STORE all the registers (`A` , `F` , `B` , `C` , `D` , `E` , `H` , `L` , `I` , `SPL` , `SPH` , `PCL` , `PC` , in that order) starting from location `MYREGISTERS` .

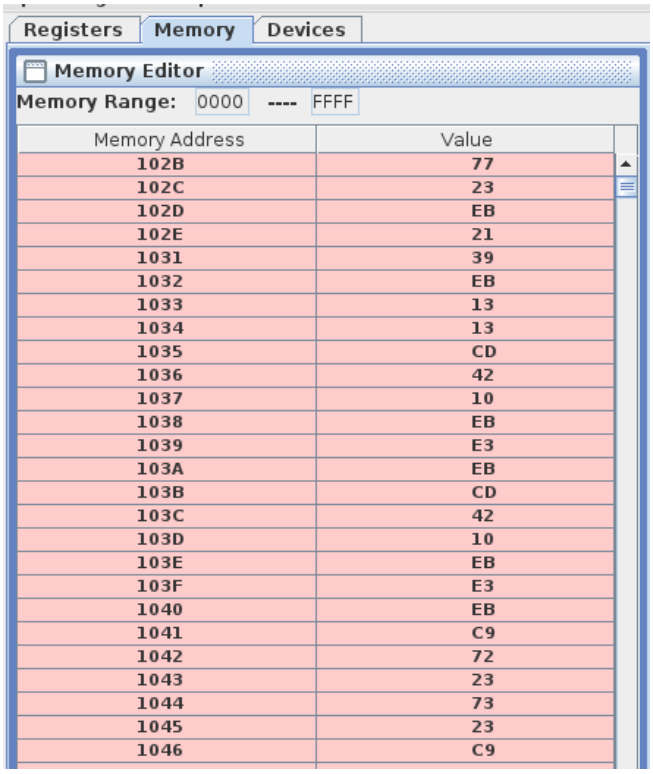
Tool / Experimental setup considered

- Used Jubin's 8085 Simulator.

Program

```
# ORG 1000H
# MYREG EQU 2000H
        MVI A,10
        LXI B,1001
        LXI D,2002
        LXI H,3003
        SIM
        LXI SP,F001h
        CALL MAIN
        HLT

MAIN:
  PUSH H
  PUSH D
  PUSH B
  PUSH PSW
  LXI H,MYREG
  POP D
  CALL STORE
  POP D
  CALL STORE
  POP D
  CALL STORE
  POP D
  CALL STORE
  RIM
  MOV M,A
  INX H
  XCHG
  LXI H,0000
  DAD SP
  XCHG
  INX D
  INX D
  CALL STORE
  XCHG
  XTHL
  XCHG
  CALL STORE
  XCHG
  XTHL
  XCHG
  RET

STORE:
  MOV M,D
  INX H
  MOV M,E
  INX H
  RET
```

Experimentation



Conclusion

It is storing all the registers in that order mentioned in the question.