Fall Semester 2021-2022

Microprocessor and Interfacing

Lab Report

Digital Assignment-4

Experiment No: 5 Task No: 4

Course Code: CSE2006

Slot: L7+L8

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EXPERIMENT 5:

Aim:

1. Write an ALP Program to find LCM of a given numbers
2. Write an ALP program to find the average of N numbers.
3. Write an ALP to find the greatest among two numbers.

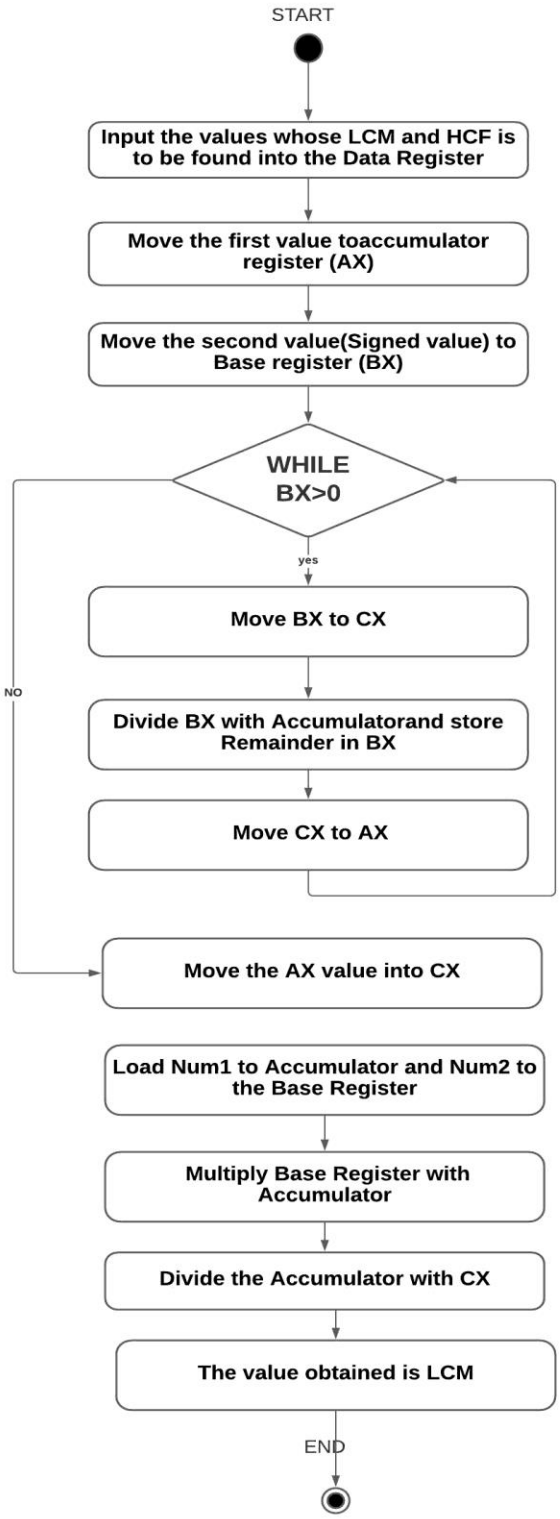
Tool Used: emu8086 simulator

1. Write an ALP Program to find LCM of a given numbers

Algorithm:

- Input the values whose LCM and HCF is to be found into the Data Register
- Move the first value to accumulator register (AX).
- Move the second value(Signed value) to Base register (BX).
- Create a while loop until until BX becomes 0
- Move BX to CX.
- Divide BX with Accumulator and store Remainder in BX
- Move CX to AX and repeat the While loop
- After the While loop ends the value in AX is HCF
- Move the AX value into CX
- Load Num1 to Accumulator and Num2 to the Base Register
- Multiply Base Register with Accumulator
- Divide the Accumulator with CX(HCF)
- The value obtained is LCM(stored in AX)
- Halt the overall process.

Flow Chart:


START
Input the values whose LCM and HCF is to be found into the Data Register
Move the first value toaccumulator register (AX)
Move the second value(Signed value) to Base register (BX)
WHILE BX>0
yes
NO
Move BX to CX
Divide BX with Accumulatorand store Remainder in BX
Move CX to AX
Move the AX value into CX
Load Num1 to Accumulator and Num2 to the Base Register
Multiply Base Register with Accumulator
Divide the Accumulator with CX
The value obtained is LCM
END

Design and Calculations:

Input the values whose LCM and HCF is to be found into the Data Register.Move the first value to accumulator register (AX).Move the second value(Signed value) to Base register (BX).Create a while loop until until BX becomes 0.Move BX to CX. Divide BX with Accumulator and store Remainder in BX.Move CX to AX and repeat the While loop.After the While loop ends the value in AX is HCF.Move the AX value into CX.Load Num1 to Accumulator and Num2 to the Base Register .Multiply Base Register with Accumulator.Divide the Accumulator with CX(HCF).The value obtained is LCM(stored in AX)

Number 1 : 24H = (36) Decimal

Number 2 : 0FH = (15) Decimal

HCF

3 | 36 , 15

12 , 5

∴ HCF = 3 Decimal

= (3)H

LCM = $\frac{\text{Number 1} \times \text{Number 2}}{\text{HCF}}$

$= \frac{\cancel{36}^{12} \times 15}{\cancel{3}} = 180$

(B4) Hexa

Program Code:

```
ASSUME CS:CODE DS:DATA
DATA SEGMENT
NUM1 DW 24H
NUM2 DW 0FH
HCF DW ?
LCM DW ?
ENDS
CODE SEGMENT
ASSUME DS:DATA CS:CODE
START:
MOV AX,DATA
MOV DS,AX
MOV AX,NUM1
MOV BX,NUM2
WHILE:MOV DX,0
MOV CX,BX
DIV BX
MOV BX,DX
MOV AX,CX
CMP BX,0
JNE WHILE
```

MOV HCF,AX

MOV CX,AX

MOV AX,NUM1

MOV BX,NUM2

MUL BX

DIV CX

MOV LCM,AX

MOV BX,0

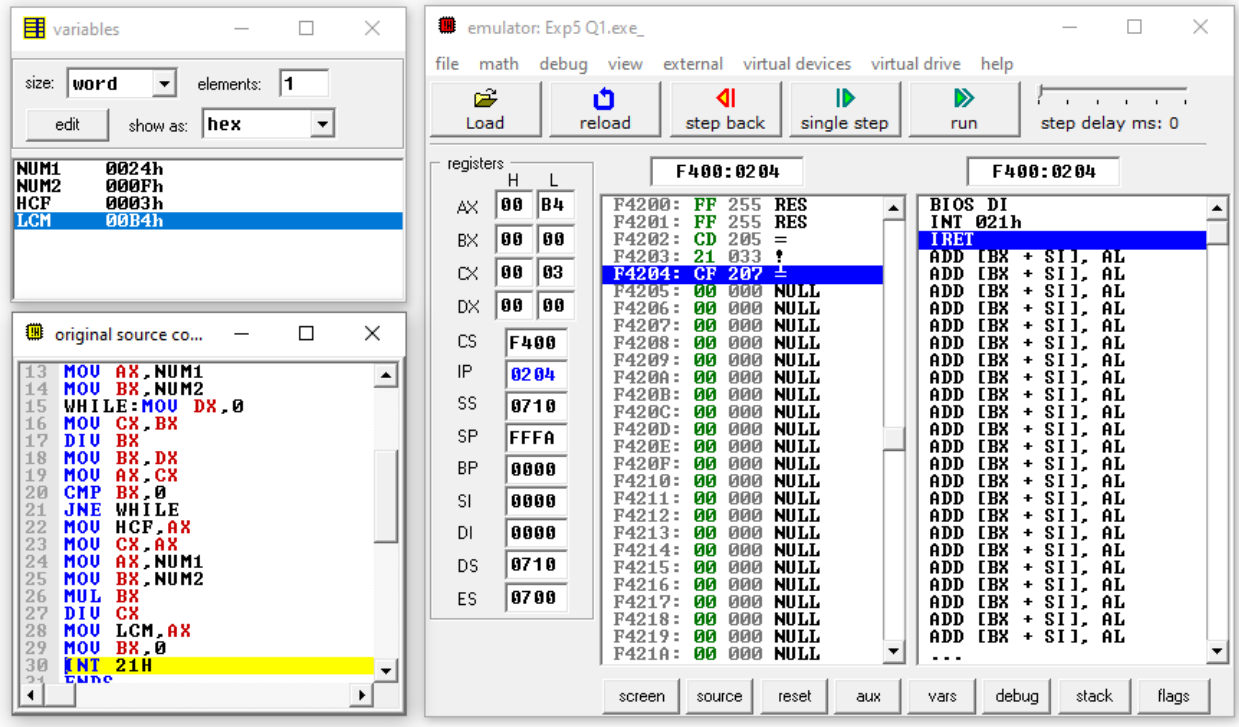
INT 21H

ENDS

END START

```
ASSUME CS:CODE DS:DATA
DATA SEGMENT
NUM1 DW 24H
NUM2 DW 0FH
HCF DW ?
LCM DW ?
ENDS
CODE SEGMENT
ASSUME DS:DATA CS:CODE
START:
MOV AX,DATA
MOV DS,AX
MOV AX,NUM1
MOV BX,NUM2
WHILE:MOV DX,0
MOV CX,BX
DIV BX
MOV BX,DX
MOV AX,CX
CMP BX,0
JNE WHILE
MOV HCF,AX
MOV CX,AX
MOV AX,NUM1
MOV BX,NUM2
MUL BX
DIV CX
MOV LCM,AX
MOV BX,0
INT 21H
ENDS
END START
```

Output:



Result and Inference:

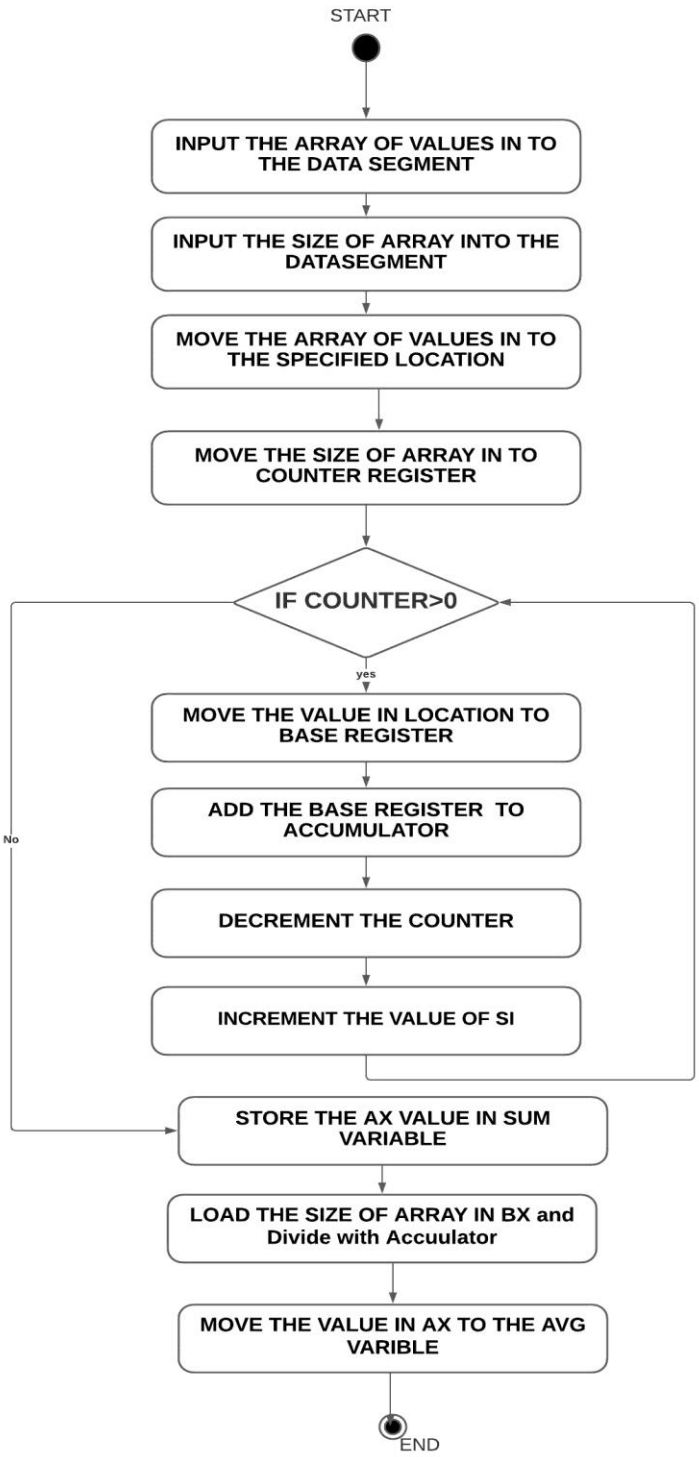
-The HCF of the 2 input values in Stored in CX and LCM is stored in AX and Variable we can see that HCF is 0003H and LCM is 00B4H

2) Write an ALP program to find the average of N numbers.

Algorithm

- Input the Array of Values in Data Segment
- Input the Size of the Array in Data segment
- Take SUM and AVG in DataSegment
- Move all the values of the Array to a specified Memory Location(SI) in Code Segment
- Move the size of Array from Data segment in to Counter Register
- Now Run a loop and Add move the values in SI location of to Base Register and add that to Accumulator .Increment the SI value and
- Decrement the Counter Register
- Repeat the Process until the Counter becomes 0
- The Sum is stored in Accumulator.
- Move Size of Array in to BX
- -Divide the Sum with BX
- -Move the value to AVG

Flow chart:


START
INPUT THE ARRAY OF VALUES IN TO THE DATA SEGMENT
INPUT THE SIZE OF ARRAY INTO THE DATASEGMENT
MOVE THE ARRAY OF VALUES IN TO THE SPECIFIED LOCATION
MOVE THE SIZE OF ARRAY IN TO COUNTER REGISTER
IF COUNTER>0
yes
No
MOVE THE VALUE IN LOCATION TO BASE REGISTER
ADD THE BASE REGISTER TO ACCUMULATOR
DECREMENT THE COUNTER
INCREMENT THE VALUE OF SI
STORE THE AX VALUE IN SUM VARIABLE
LOAD THE SIZE OF ARRAY IN BX and Divide with Accuulator
MOVE THE VALUE IN AX TO THE AVG VARIBLE
END

Design and Calculations:

Input the Array of Values(001H, 023H, 045H, 067H, 042H, 04BH, 012H, 0EFH) in Data Segment .Input the Size of the Array(8) in Data segment.Move all the values of the Array to a specified Memory Location(SI) in Code Segment.Move the size of Array from Data segment in to Counter Register.Now Run a loop and Add move the values in SI location of to Base Register and add that to Accumulator .Increment the SI value and Decrement the Counter Register.Repeat the Process until the Counter becomes 0 .The Sum is stored in Accumulator. Move Size of Array in to BX.Divide the Sum with BX.Move the value to AVG

Sum of the values in the Array with n numbers

Average

Values:

01H, 23H, 45H, 67H, 42H, 4BH, 12H, EFH

01H + 23H = 24H

24H + 45H = 69H

69H + 67H = D0H

D0H + 42H = 112H

112H + 4BH = 15DH

15DH + 12H = 16FH

16FH + EFH = 25EH

∴ Sum of Values = 25EH

Average

= 25EH / 8H

= 4BH

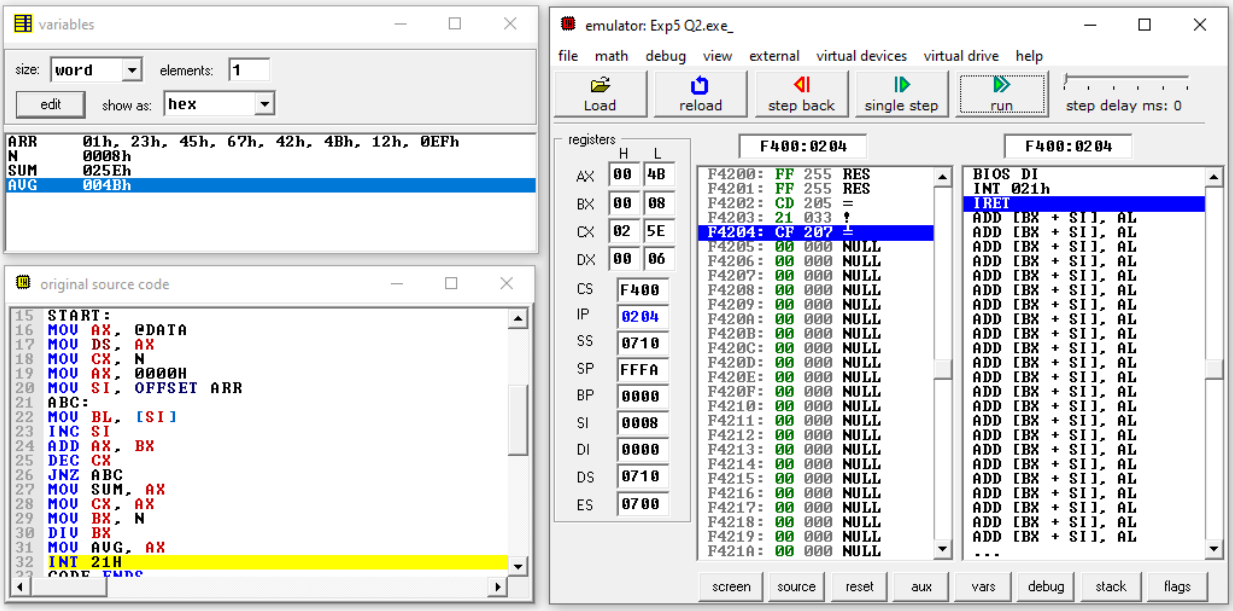
Program Code:

```
ASSUME CS: CODE ,DS: DATA
DATA SEGMENT
   ARR DB 001H, 023H, 045H, 067H, 042H, 04BH,
012H, 0EFH
   N DW 08H
   SUM DW 01 DUP (?)
   AVG DW 01 DUP (?)
   DATA ENDS
CODE SEGMENT
   START:
   MOV AX, @DATA
   MOV DS, AX
   MOV CX, N
   MOV AX, 0000H
   MOV SI, OFFSET ARR
   ABC:
   MOV BL, [SI]
   INC SI
   ADD AX, BX
   DEC CX
   JNZ ABC
```

```
    MOV SUM, AX
    MOV CX, AX
    MOV BX, N
    DIV BX
    MOV AVG, AX
    INT 21H
    CODE ENDS
END START
```

```
ASSUME CS: CODE ,DS: DATA



DATA SEGMENT
    ARR DB 001H, 023H, 045H, 067H, 042H, 04BH, 012H, 0EFH
    N DW 08H
    SUM DW 01 DUP (?)
    AVG DW 01 DUP (?)
    DATA ENDS


CODE SEGMENT
    START:
    MOV AX, @DATA
    MOV DS, AX
    MOV CX, N
    MOV AX, 0000H
    MOV SI, OFFSET ARR
    ABC:
    MOV BL, [SI]
    INC SI
    ADD AX, BX
    DEC CX
    JNZ ABC
    MOV SUM, AX
    MOV CX, AX
    MOV BX, N
    DIV BX
    MOV AVG, AX
    INT 21H
    CODE ENDS


END START
```

Output:



Result and Inference:

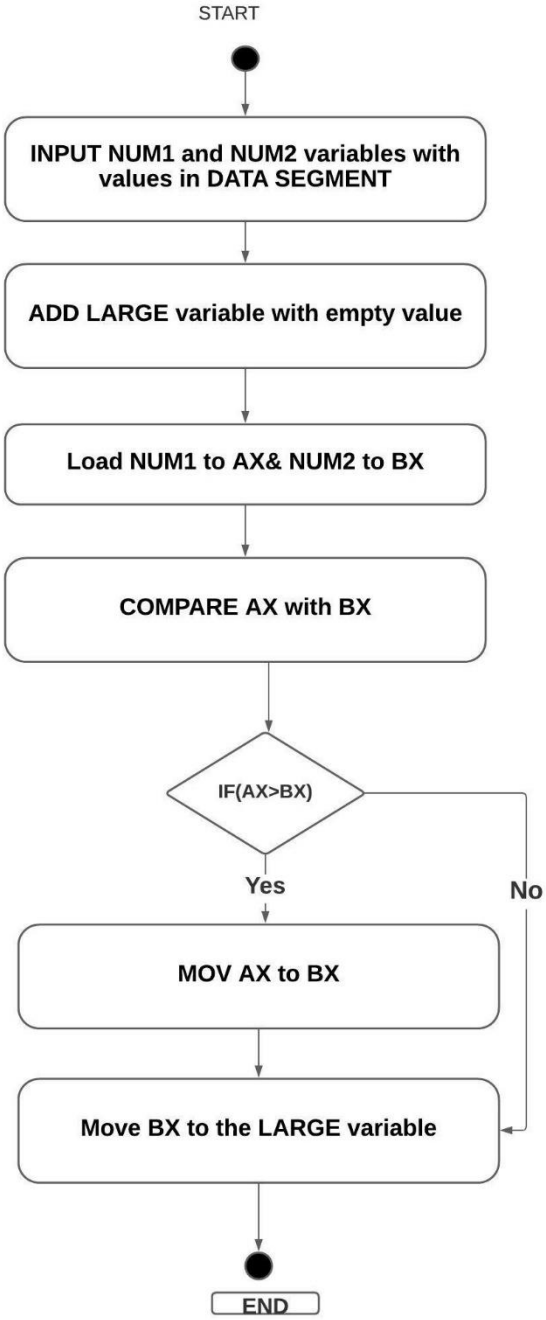
-The sum of the Values is stored in CX, and Average is Stored in Accumulator. In the Variables We can see the value of Sum(25EH) and Average(4BH)

3) Write an ALP to find the greatest among two numbers.

ALGORITHM

- Input the 2 numbers NUM1 and NUM2 in the Data segment
- Move NUM1 into AX and NUM2 into BX
- Compare AX with BX
- If carry is obtained(ie if AX is smaller than BX) .Jump to Next
- Move AX to BX (if BX greater than AX)
- Next Loop: Move the BX value to LARGE variable

FLOWCHART


START
INPUT NUM1 and NUM2 variables with values in DATA SEGMENT
ADD LARGE variable with empty value
Load NUM1 to AX& NUM2 to BX
COMPARE AX with BX
IF(AX>BX)
Yes
No
MOV AX to BX
Move BX to the LARGE variable
END

Design and Calculations:

Input the 2 numbers NUM1 and NUM2 in the Data segment.Then move NUM1 into AX and NUM2 into BX.Compare AX with BX .If carry is obtained(ie if AX is smaller than BX) .Jump to Next.Move AX to BX (if BX greater than AX).In Next Loop Move the BX value to LARGE variable

Program Code:

```
DATA SEGMENT

NUM1 DW 1529H
NUM2 DW 1231H
LARGE DW ?

DATA ENDS

CODE SEGMENT
    ASSUME DS:DATA,CS:CODE
START:
    MOV AX,DATA
    MOV DS,AX
    MOV CX, 01h
    MOV BX, NUM2
```

UP:

MOV AX, NUM1

CMP AX, BX

JL NXT

MOV BX,AX

NXT:

MOV LARGE,BX

INT 21H

CODE ENDS

END START

edit: C:\emu8086\MySource\Exp5 Q3.asm

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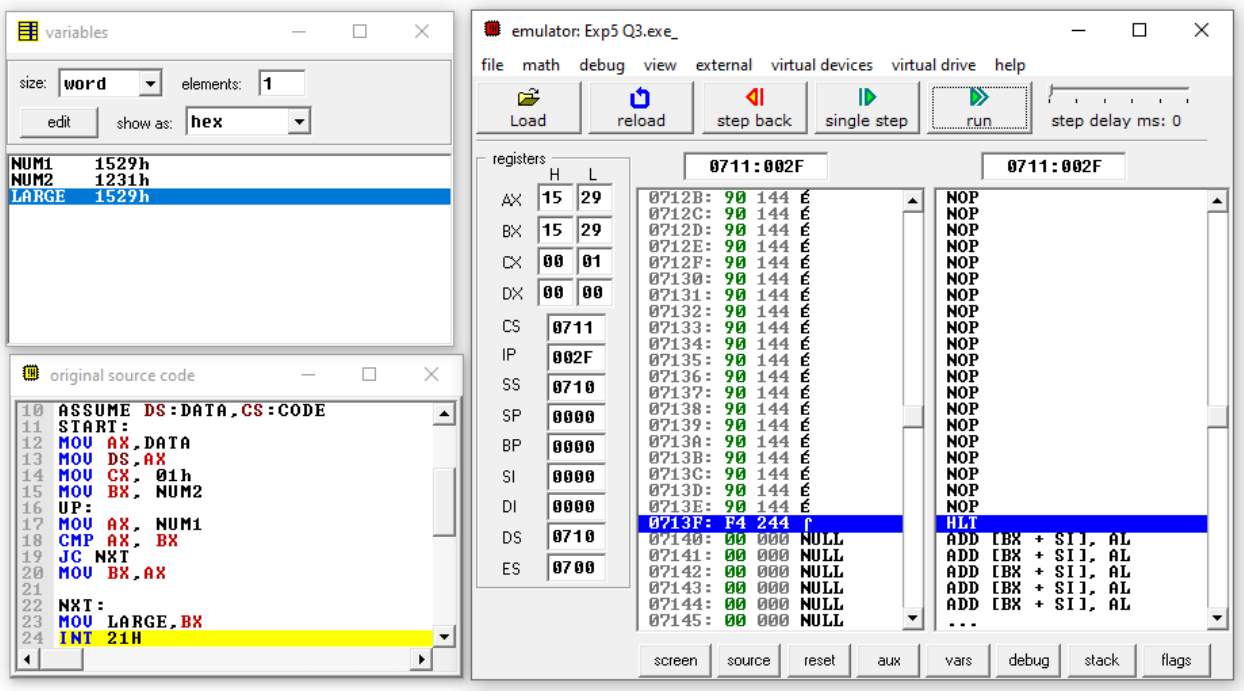
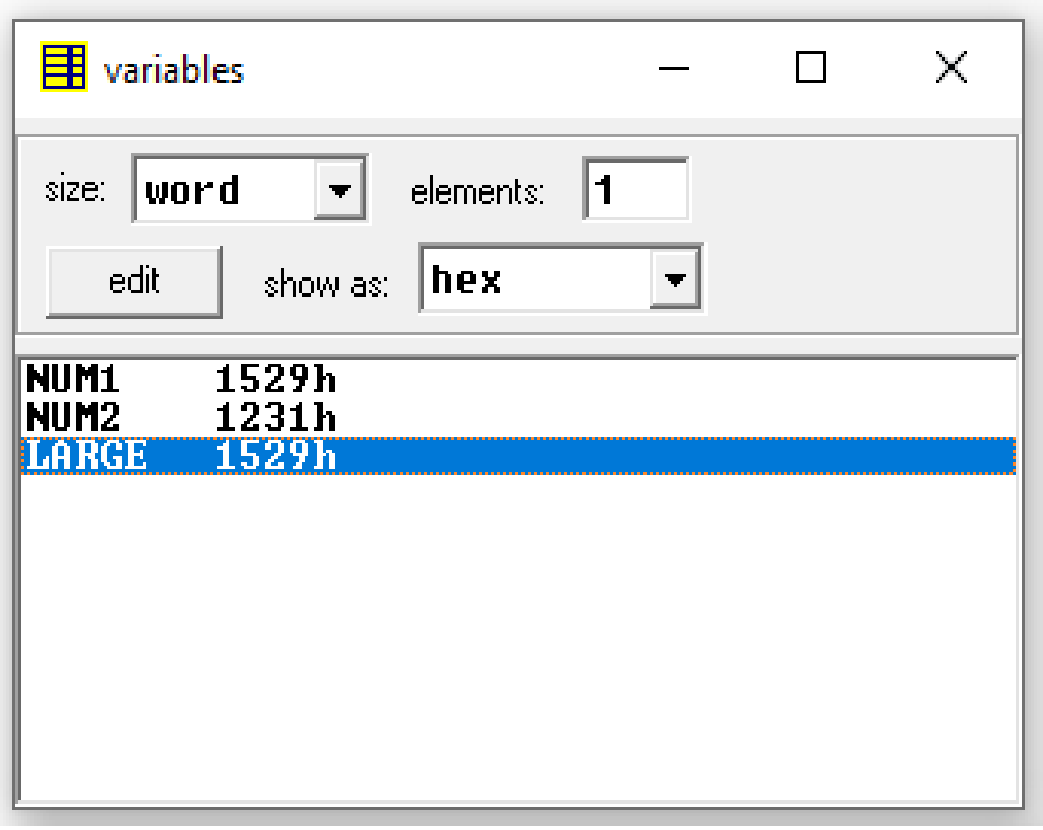
```
DATA SEGMENT

NUM1 DW 1529H
NUM2 DW 1231H
LARGE DW ?

DATA ENDS

CODE SEGMENT
        ASSUME DS:DATA,CS:CODE
START:
        MOV AX,DATA
        MOV DS,AX
        MOV CX, 01h
        MOV BX, NUM2
UP:
MOV AX, NUM1
CMP AX, BX
JL NXT
MOV BX,AX

NXT:
MOV LARGE,BX
INT 21H
CODE ENDS
END START
```

Output:


variables
size: word
elements: 1
edit
show as: hex
NUM1 1529h
NUM2 1231h
LARGE 1529h
original source code
ASSUME DS:DATA,CS:CODE
START:
MOV AX,DATA
MOV DS,AX
MOV CX, 01h
MOV BX, NUM2
UP:
MOV AX, NUM1
CMP AX, BX
JC NXT
MOV BX,AX
NXT:
MOV LARGE,BX
INT 21H
emulator: Exp5 Q3.exe_
file math debug view external virtual devices virtual drive help
Load
reload
step back
single step
run
step delay ms: 0
registers
H L
AX 15 29
BX 15 29
CX 00 01
DX 00 00
CS 0711
IP 002F
SS 0710
SP 0000
BP 0000
SI 0000
DI 0000
DS 0710
ES 0700
0711:002F
0711:002F
0712B: 90 144 É NOP
0712C: 90 144 É NOP
0712D: 90 144 É NOP
0712E: 90 144 É NOP
0712F: 90 144 É NOP
07130: 90 144 É NOP
07131: 90 144 É NOP
07132: 90 144 É NOP
07133: 90 144 É NOP
07134: 90 144 É NOP
07135: 90 144 É NOP
07136: 90 144 É NOP
07137: 90 144 É NOP
07138: 90 144 É NOP
07139: 90 144 É NOP
0713A: 90 144 É NOP
0713B: 90 144 É NOP
0713C: 90 144 É NOP
0713D: 90 144 É NOP
0713E: 90 144 É NOP
0713F: F4 244 ⌠ HLT
07140: 00 000 NULL ADD [BX + SI], AL
07141: 00 000 NULL ADD [BX + SI], AL
07142: 00 000 NULL ADD [BX + SI], AL
07143: 00 000 NULL ADD [BX + SI], AL
07144: 00 000 NULL ADD [BX + SI], AL
07145: 00 000 NULL ...
screen
source
reset
aux
vars
debug
stack
flags


variables
size: word
elements: 1
edit
show as: hex
NUM1 1529h
NUM2 1231h
LARGE 1529h

Result and Inference:

Since AX is greater than BX. AX is moved to BX and BX value is moved to LARGE variable(1529H)