UCS 1512 - Microprocessor Lab

End Semester Practical Examination - Batch 7

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1.a A block of 10 data is stored in the memory from XX00 to XX09 . Write an ALP using 8086 to transfer the data to the memory location YY00 to YY09 in the reverse order.

AIM :

To program and execute the ALP for transferring a block of 10 data in memory from XX00 to XX09 to the memory location YY00 to YY09 in 8086 using an emulator.

Algorithm:

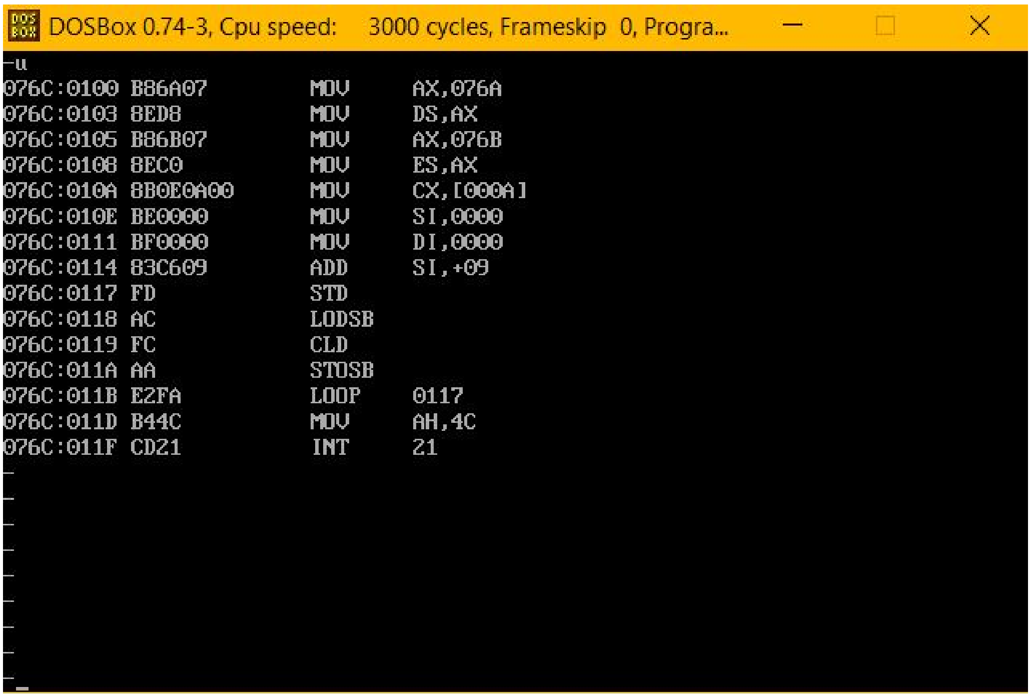
- Move the address of data segment to register DS .
- Move the address of extra segment to register ES.
- Initialize count as 10 to transfer 10 block data.
- Move offset of source(XX00 to XX09) to source index register(SI).
- Move offset of destination(YY00 to YY09) to destination index register(DI)
- Now increment SI register by 9 to point it to the last data of the block.
- Now start a loop.
- Set direction flag to 1 navigate in reverse order for source index register.
- Load a value into AL.
- Set direction flag to 0 to navigate in forward direction for destination index register.
- Store the value in the destination.
- Loop until count becomes zero.
- Terminate the program.

ALP:

```
assume ds:data,cs:code,es:extra
data segment
     source db 01h,10h,20h,30h,40h,50h,60h,70h,80h,90h
     count dw 000Ah
data ends
extra segment
     dest db ?
extra ends
code segment
org 0100h
start : mov ax,data
          mov ds,ax
          mov ax,extra
          mov es,ax
          mov cx,count
          mov si,offset source
          mov di,offset dest
          add si,09h    ;increment source offset by 9 to point at end
loop1:
          std ; set the direction flag
          lodsb ; load a byte from si into al
          cld ; clear the direction flag
          stosb ; Store byte into di from al
          loop loop1

          mov ah,4ch
          int 21h
code ends
end start
```

Output Snapshot:


DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Progra...

```
-u
076C:0100 B86A07        MOV     AX,076A
076C:0103 8ED8          MOV     DS,AX
076C:0105 B86B07        MOV     AX,076B
076C:0108 8EC0          MOV     ES,AX
076C:010A 8B0E0A00      MOV     CX,[000A]
076C:010E BE0000        MOV     SI,0000
076C:0111 BF0000        MOV     DI,0000
076C:0114 83C609        ADD     SI,+09
076C:0117 FD            STD
076C:0118 AC            LODSB
076C:0119 FC            CLD
076C:011A AA            STOSB
076C:011B E2FA          LOOP    0117
076C:011D B44C          MOV     AH,4C
076C:011F CD21          INT     21
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```

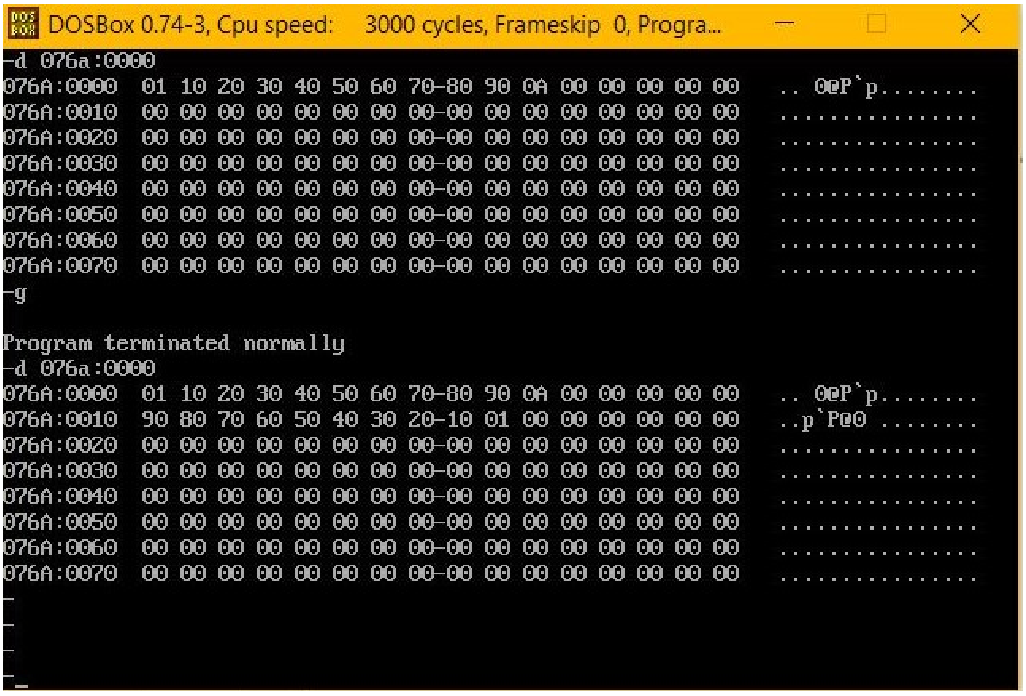
DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Progra...

```
-d 076a:0000
076A:0000  01 10 20 30 40 50 60 70-80 90 0A 00 00 00 00 00   .. 0@P`p........
076A:0010  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0020  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0030  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0040  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0050  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0060  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0070  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
-g

Program terminated normally
-d 076a:0000
076A:0000  01 10 20 30 40 50 60 70-80 90 0A 00 00 00 00 00   .. 0@P`p........
076A:0010  90 80 70 60 50 40 30 20-10 01 00 00 00 00 00 00   ..p`P@0 ........
076A:0020  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0030  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0040  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0050  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0060  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0070  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
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```

Result:

Transferring a block of 10 data in memory from XX00 to XX09 to the memory location YY00 to YY09 is executed and verified using an emulator.

1.b Write ALPs using 8086 to perform 32 bit addition and subtraction.

AIM :

To program and execute the ALP for 32-bit addition and subtraction in 8086 using an emulator.

32-Bit Addition:

Algorithm:

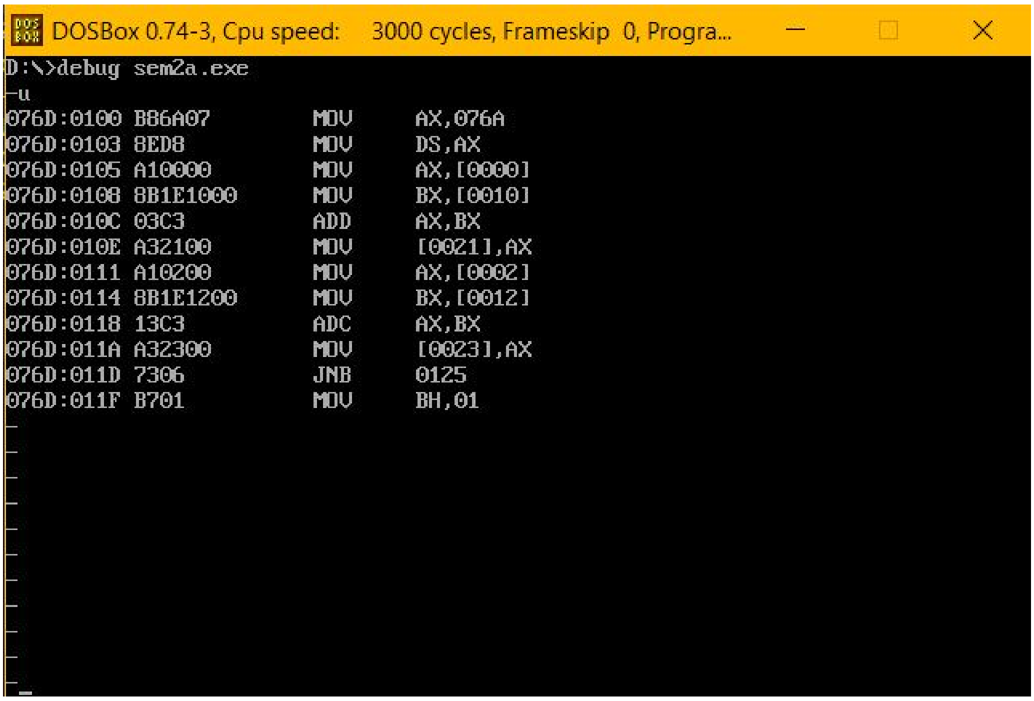
- Move the address of data segment to register DS.
- Move the lower order nibble(16-bit) of op1 into AX register
- Move the lower order nibble(16-bit) of op2 into BX register
- Add AX and BX registers
- Move the value in AX register into lower nibble(16-bit) of the result.
- Move the higher order nibble(16-bit) of op1 into AX register
- Move the higher order nibble(16-bit) of op2 into BX register
- Add AX and BX registers with carry using ADC instruction.
- Move the value in AX register into higher nibble(16-bit) of the result.
- Check for the carry , if there is carry produced store 1 in carry.
- Terminate the program.

ALP:

```
assume ds:data,cs:code ; 32-bit add
data segment
      opr1 dd 12345678h
      org 0010h
      opr2 dd 55555555h
      org 0020h
      carry db ?
      res dd ?
data ends
code segment
org 0100h
start:
      mov ax,data
      mov ds,ax

      mov ax,word ptr opr1
      mov bx,word ptr opr2
      add ax,bx
      mov word ptr res,ax
      mov ax,word ptr opr1 + 2
      mov bx,word ptr opr2 + 2
      adc ax,bx
      mov word ptr res + 2,ax
      jnc here
      mov bh,01h
      mov carry,bh
here :   mov ah,4ch
      int 21h
code ends
end start
```

Output Snapshot:


DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Progra...

```
D:\>debug sem2a.exe
-u
076D:0100 B86A07        MOV     AX,076A
076D:0103 8ED8          MOV     DS,AX
076D:0105 A10000        MOV     AX,[0000]
076D:0108 8B1E1000      MOV     BX,[0010]
076D:010C 03C3          ADD     AX,BX
076D:010E A32100        MOV     [0021],AX
076D:0111 A10200        MOV     AX,[0002]
076D:0114 8B1E1200      MOV     BX,[0012]
076D:0118 13C3          ADC     AX,BX
076D:011A A32300        MOV     [0023],AX
076D:011D 7306          JNB     0125
076D:011F B701          MOV     BH,01
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```

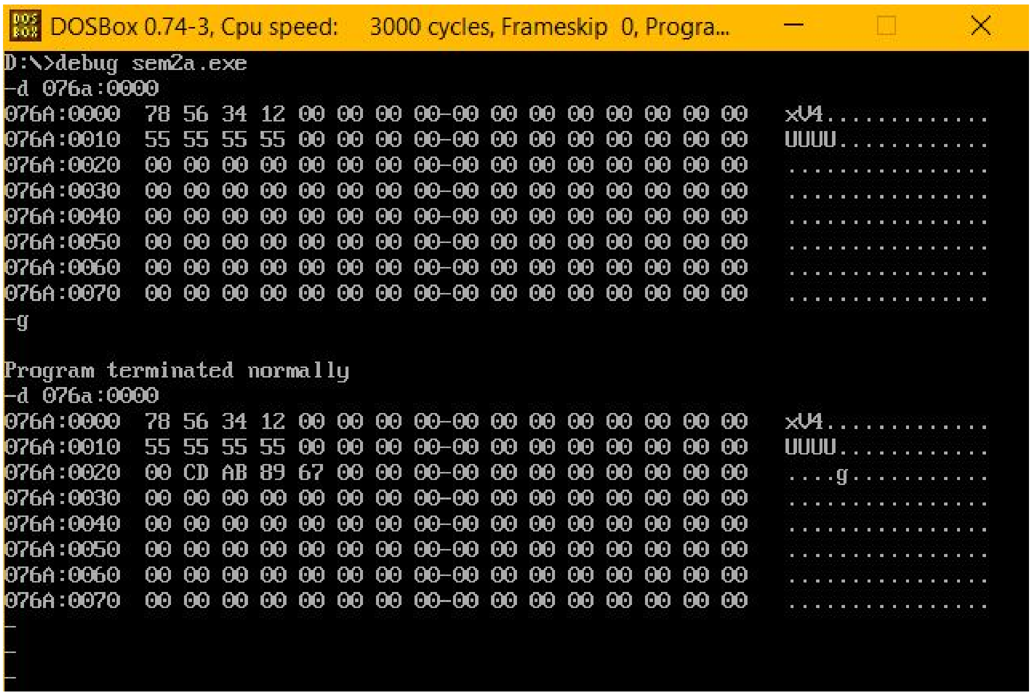
DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Progra...

```
D:\>debug sem2a.exe
-d 076a:0000
076A:0000  78 56 34 12 00 00 00 00-00 00 00 00 00 00 00 00   xV4.............
076A:0010  55 55 55 55 00 00 00 00-00 00 00 00 00 00 00 00   UUUU............
076A:0020  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0030  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0040  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0050  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0060  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0070  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
-g

Program terminated normally
-d 076a:0000
076A:0000  78 56 34 12 00 00 00 00-00 00 00 00 00 00 00 00   xV4.............
076A:0010  55 55 55 55 00 00 00 00-00 00 00 00 00 00 00 00   UUUU............
076A:0020  00 CD AB 89 67 00 00 00-00 00 00 00 00 00 00 00   ....g...........
076A:0030  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0040  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0050  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0060  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0070  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
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```

33-Bit Subtraction:

Algorithm:

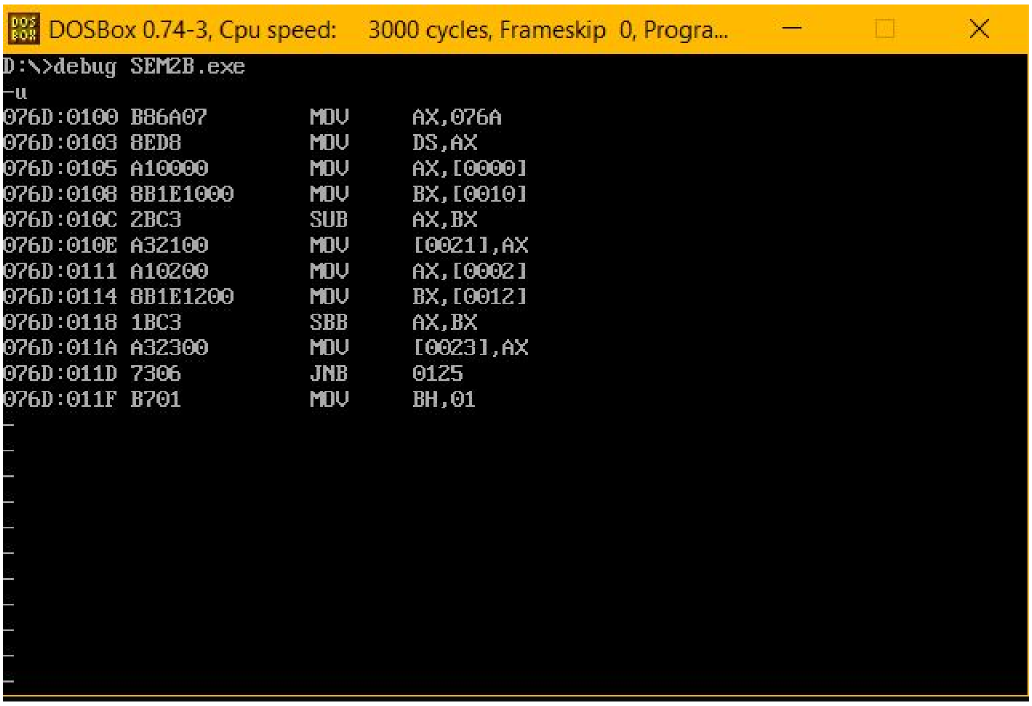
- Move the address of data segment to register DS.
- Move the lower order nibble(16-bit) of op1 into AX register
- Move the lower order nibble(16-bit) of op2 into BX register
- Subtract AX and BX registers using SUB instruction
- Move the value in AX register into lower nibble(16-bit) of the result.
- Move the higher order nibble(16-bit) of op1 into AX register
- Move the higher order nibble(16-bit) of op2 into BX register
- Subtract AX and BX registers with carry using SBB instruction.
- Move the value in AX register into higher nibble(16-bit) of the result.
- Check for the carry , if there is carry produced store 1 in carry.
- Terminate the program.

ALP:

```
assume ds:data,cs:code ; 32-bit add
data segment
      opr1 dd 9ABCDEF0h
      org 0010h
      opr2 dd 12345678h
      org 0020h
      carry db ?
      res dd ?
data ends
code segment
org 0100h
start:
      mov ax,data
      mov ds,ax

      mov ax,word ptr opr1
      mov bx,word ptr opr2
      sub ax,bx
      mov word ptr res,ax
      mov ax,word ptr opr1 + 2
      mov bx,word ptr opr2 + 2
      sbb ax,bx
      mov word ptr res + 2,ax
      jnc here
      mov bh,01h
      mov carry,bh
here :   mov ah,4ch
      int 21h
code ends
end start
```

Output Snapshot:


DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Progra...

```
D:\>debug SEM2B.exe
-u
076D:0100 B86A07        MOV     AX,076A
076D:0103 8ED8          MOV     DS,AX
076D:0105 A10000        MOV     AX,[0000]
076D:0108 8B1E1000      MOV     BX,[0010]
076D:010C 2BC3          SUB     AX,BX
076D:010E A32100        MOV     [0021],AX
076D:0111 A10200        MOV     AX,[0002]
076D:0114 8B1E1200      MOV     BX,[0012]
076D:0118 1BC3          SBB     AX,BX
076D:011A A32300        MOV     [0023],AX
076D:011D 7306          JNB     0125
076D:011F B701          MOV     BH,01
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```

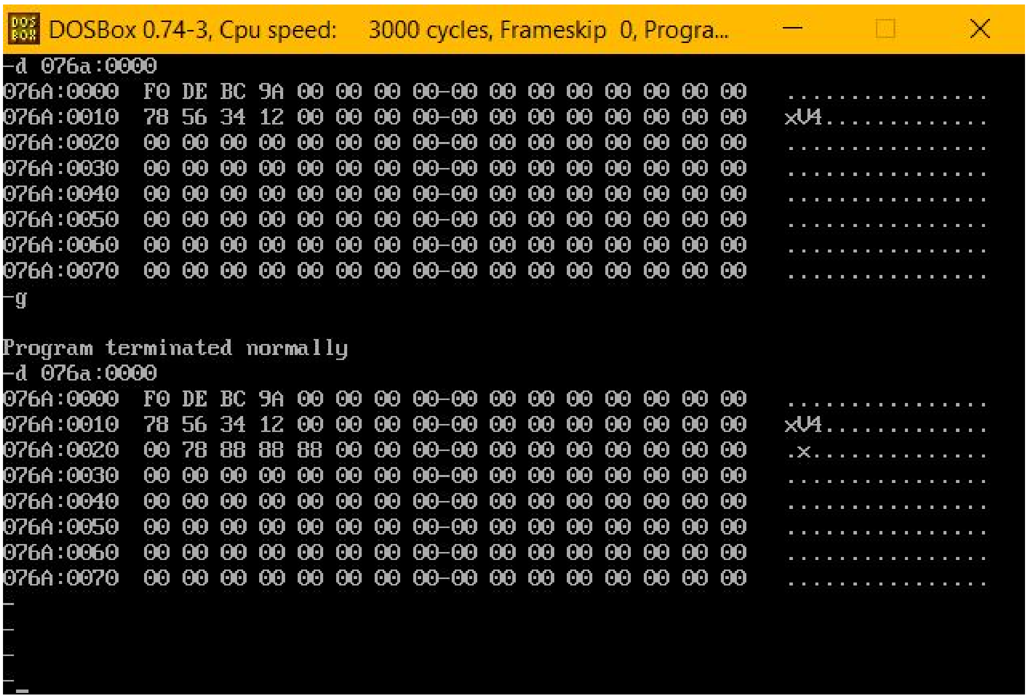
DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Progra...

```
-d 076a:0000
076A:0000  F0 DE BC 9A 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0010  78 56 34 12 00 00 00 00-00 00 00 00 00 00 00 00   xV4.............
076A:0020  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0030  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0040  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0050  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0060  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0070  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
-g

Program terminated normally
-d 076a:0000
076A:0000  F0 DE BC 9A 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0010  78 56 34 12 00 00 00 00-00 00 00 00 00 00 00 00   xV4.............
076A:0020  00 78 88 88 88 00 00 00-00 00 00 00 00 00 00 00   .x..............
076A:0030  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0040  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0050  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0060  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
076A:0070  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
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```

Result:

32-Bit addition and subtraction is executed and verified in 8086 using an emulator.