MASM Programs

BASIC ARITHMETIC OPERATIONS
STRING DISPLAY
STRING CONCATENATENATENATION
SORTING
SEARCHING

Commands to be followed in DOS box to run MASM programs

```
mount c c:\masm
edit pgmname.asm
masm pgmname.asm
link pgmname.obj
debug pgmname.exe
```

16 BIT ADDITION

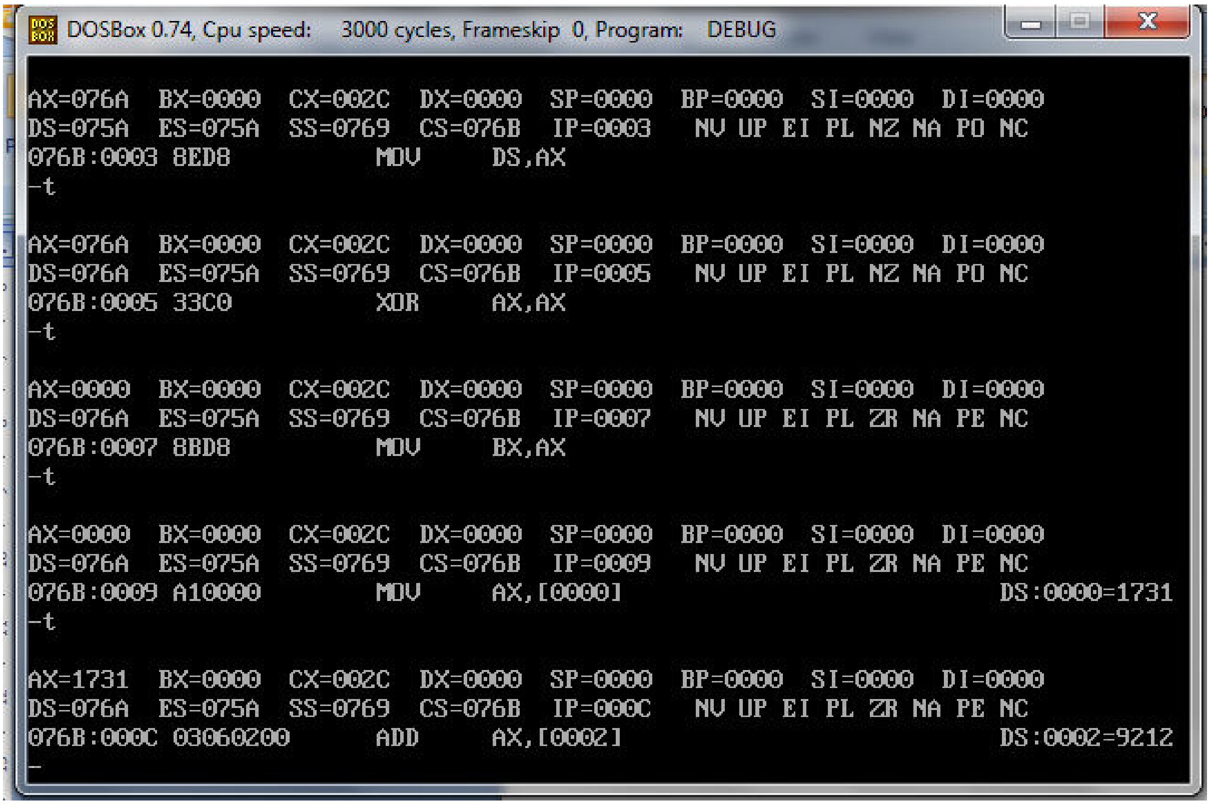
ALGORITHM

Step I : Initialize the data segment.
Step II : Get the first number in AX register.
Step III : Get the second number in BX register.
Step IV : Add the two numbers.
Step V : Display the result.

PROGRAM

```
DATA SEGMENT
N1 DW 1731H
N2 DW 9212H
N3 DW ?
DATA ENDS
CODE SEGMENT
ASSUME CS :CODE;DS:DATA
START:
MOV AX,DATA
MOV DS,AX
   XOR AX,AX
      MOV BX,AX
       MOV AX,N1
       ADD AX,N2
       MOV N3,AX
       JNC STOP
       INC BX
STOP:
       MOV CX,AX
       MOV AH,4CH
       INT 21H
CODE ENDS
END START
```

OUTPUT

- 

DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG

```
AX=076A  BX=0000  CX=002C  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=075A  ES=075A  SS=0769  CS=076B  IP=0003   NV UP EI PL NZ NA PO NC
076B:0003 8ED8          MOV     DS,AX
-t

AX=076A  BX=0000  CX=002C  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=076A  ES=075A  SS=0769  CS=076B  IP=0005   NV UP EI PL NZ NA PO NC
076B:0005 33C0          XOR     AX,AX
-t

AX=0000  BX=0000  CX=002C  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=076A  ES=075A  SS=0769  CS=076B  IP=0007   NV UP EI PL ZR NA PE NC
076B:0007 8BD8          MOV     BX,AX
-t

AX=0000  BX=0000  CX=002C  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=076A  ES=075A  SS=0769  CS=076B  IP=0009   NV UP EI PL ZR NA PE NC
076B:0009 A10000        MOV     AX,[0000]                          DS:0000=1731
-t

AX=1731  BX=0000  CX=002C  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=076A  ES=075A  SS=0769  CS=076B  IP=000C   NV UP EI PL ZR NA PE NC
076B:000C 03060200      ADD     AX,[0002]                          DS:0002=9212
-
```

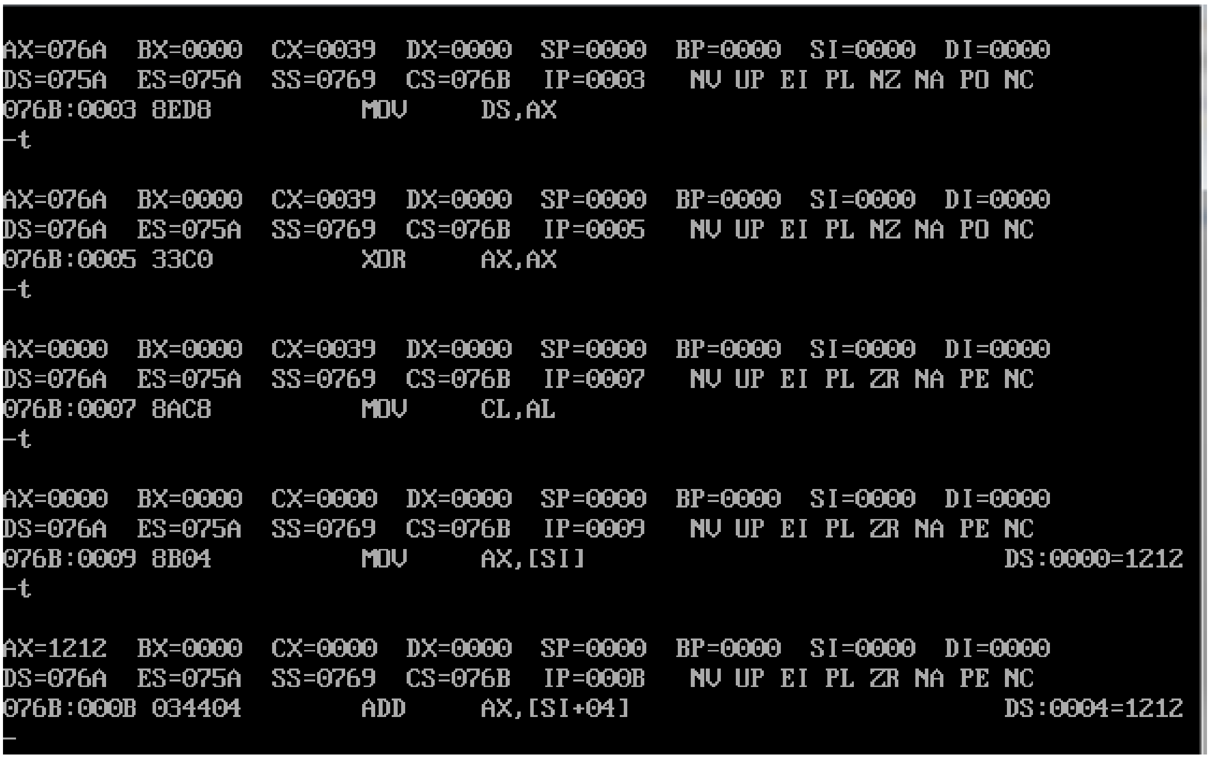
32 BIT ADDITION

ALGORITHM

Step II : Load the LSB of first number into AX register.
Step III : Load the MSB of first number into BX register.
Step IV : Load the LSB of the second number into CX register.
Step V : Load the MSB of the second number into DX register.
Step VI : Add the LSBs of two number.

-
- **PROGRAM**
- DATA SEGMENT
- LIST DD 12121212H,12121212H
- N3 DW ?
- N4 DW ?
- DATA ENDS
- CODE SEGMENT
- ASSUME CS :CODE;DS:DATA
- START:
-     MOV AX,DATA
-     MOV DS,AX
-     XOR AX,AX
-     MOV CL,AL
-     MOV AX,[SI]
-     ADD AX,[SI+4]
-     MOV BX,AX
-     MOV N3,BX
-     MOV AX,[SI+2]

- ADD AX,[SI+6]
- MOV DX,AX
- MOV N4,DX
- JNC STOP
- INC CL
- STOP:
- MOV AX,4CH
- INT 21H
- CODE ENDS
- END START
    - **OUTPUT**
    -



```
AX=076A  BX=0000  CX=0039  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=075A  ES=075A  SS=0769  CS=076B  IP=0003   NV UP EI PL NZ NA PO NC
076B:0003 8ED8          MOV     DS,AX
-t

AX=076A  BX=0000  CX=0039  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=076A  ES=075A  SS=0769  CS=076B  IP=0005   NV UP EI PL NZ NA PO NC
076B:0005 33C0          XOR     AX,AX
-t

AX=0000  BX=0000  CX=0039  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=076A  ES=075A  SS=0769  CS=076B  IP=0007   NV UP EI PL ZR NA PE NC
076B:0007 8AC8          MOV     CL,AL
-t

AX=0000  BX=0000  CX=0000  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=076A  ES=075A  SS=0769  CS=076B  IP=0009   NV UP EI PL ZR NA PE NC
076B:0009 8B04          MOV     AX,[SI]                            DS:0000=1212
-t

AX=1212  BX=0000  CX=0000  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=076A  ES=075A  SS=0769  CS=076B  IP=000B   NV UP EI PL ZR NA PE NC
076B:000B 034404        ADD     AX,[SI+04]                         DS:0004=1212
-
```

16 BIT SUBTRACTION

ALGORITHM

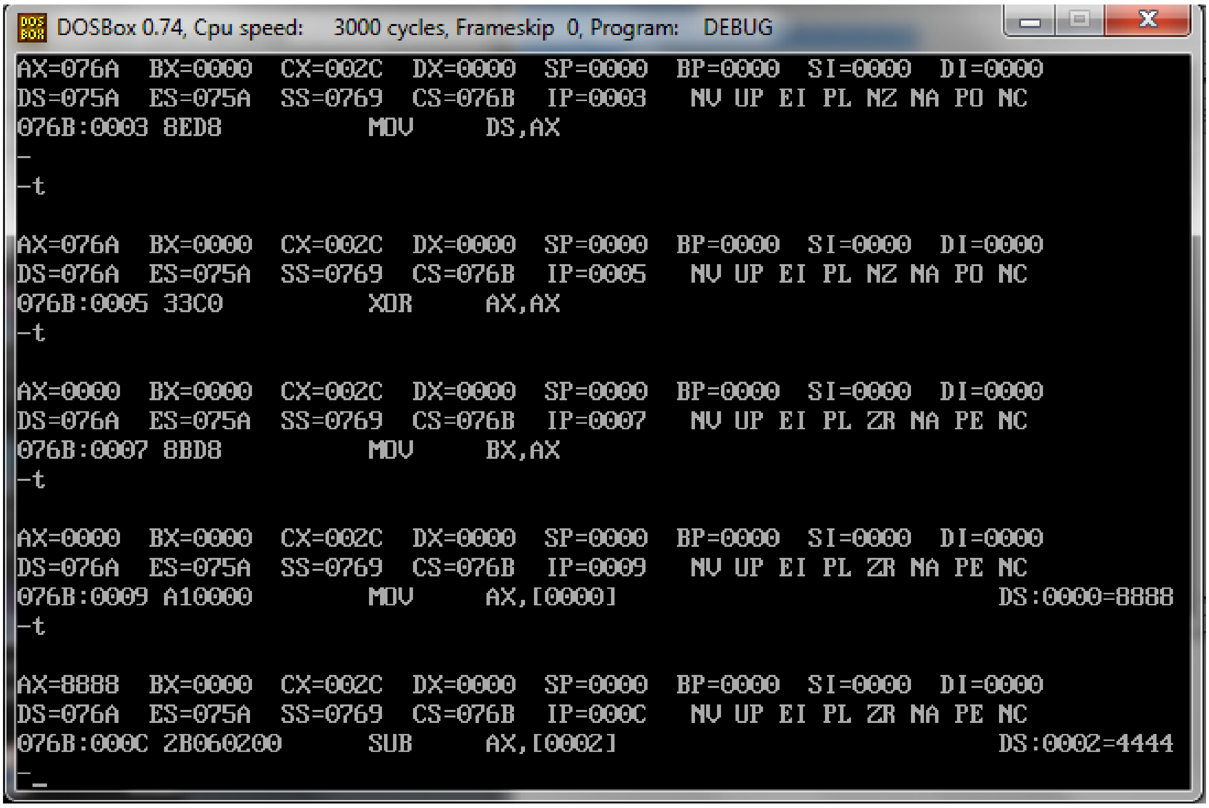
Step I : Initialize the data segment.
Step II : Get the first number in AX register.
Step III : Get the second number in BX register.
Step IV : Add the two numbers.
Step V : Display the result.
Step VI : Stop

PROGRAM

```
DATA SEGMENT
N1 DW 8888H
N2 DW 4444H
N3 DW ?
DATA ENDS
CODE SEGMENT
ASSUME CS :CODE;DS:DATA
START:
        MOV AX,DATA
 MOV DS,AX
```

```
        XOR AX,AX
        MOV BX,AX
        MOV AX,N1
        SUB AX,N2
        MOV N3,AX
        JNC STOP
        INC BX
STOP:
        MOV CX,AX
        MOV AH,4CH
        INT 21H
CODE ENDS
END START
```

OUTPUT


DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG

```
AX=076A  BX=0000  CX=002C  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=075A  ES=075A  SS=0769  CS=076B  IP=0003   NV UP EI PL NZ NA PO NC
076B:0003 8ED8          MOV     DS,AX
-
-t

AX=076A  BX=0000  CX=002C  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=076A  ES=075A  SS=0769  CS=076B  IP=0005   NV UP EI PL NZ NA PO NC
076B:0005 33C0          XOR     AX,AX
-t

AX=0000  BX=0000  CX=002C  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=076A  ES=075A  SS=0769  CS=076B  IP=0007   NV UP EI PL ZR NA PE NC
076B:0007 8BD8          MOV     BX,AX
-t

AX=0000  BX=0000  CX=002C  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=076A  ES=075A  SS=0769  CS=076B  IP=0009   NV UP EI PL ZR NA PE NC
076B:0009 A10000        MOV     AX,[0000]                     DS:0000=8888
-t

AX=8888  BX=0000  CX=002C  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=076A  ES=075A  SS=0769  CS=076B  IP=000C   NV UP EI PL ZR NA PE NC
076B:000C 2B060200      SUB     AX,[0002]                     DS:0002=4444
-_
```

32 BIT SUBTRACTION

ALGORITHM

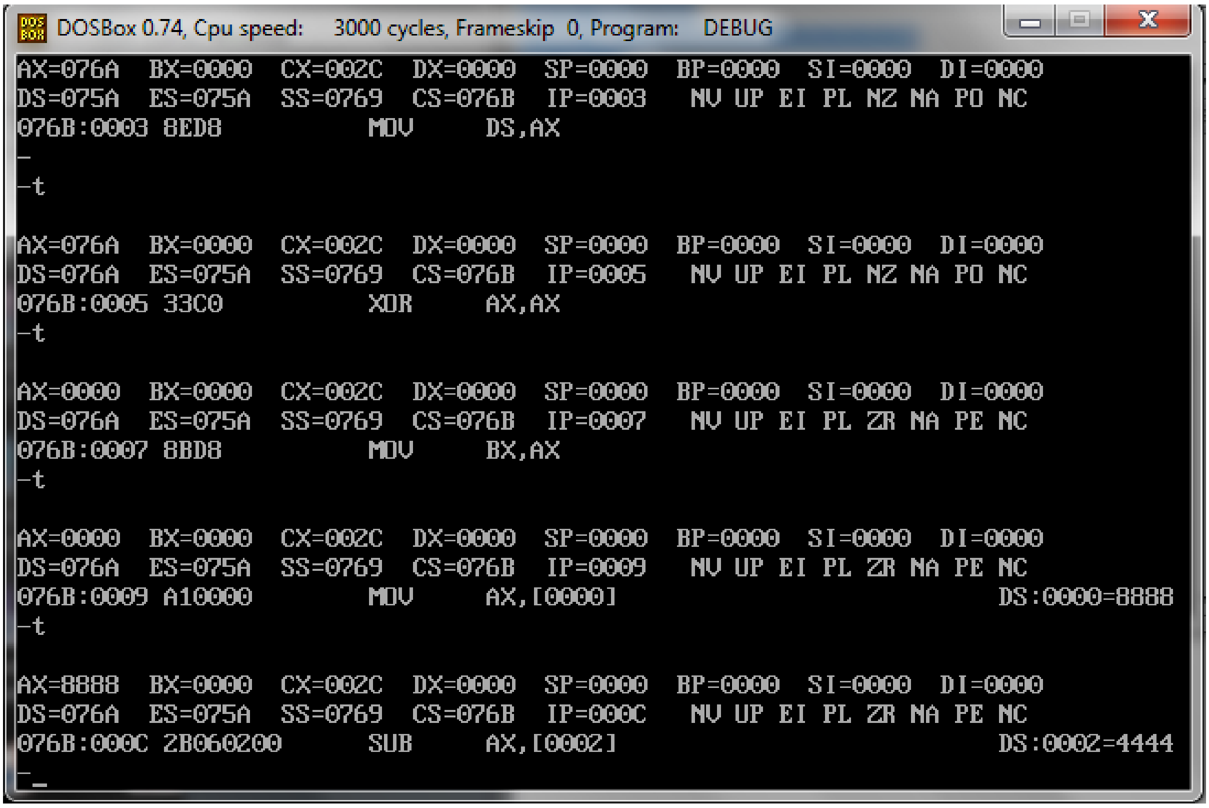
- Step I : Initialize the data segment.
- Step II : Load the LSB of first number into AX register.
- Step III : Load the MSB of first number into BX register.
- Step IV : Load the LSB of the second number into CX register.
- Step V : Load the MSB of the second number into DX register.

PROGRAM

```
DATA SEGMENT
LIST DD 12121212H,12121212H
N3 DW ?
N4 DW ?
DATA ENDS
CODE SEGMENT
ASSUME CS :CODE;DS:DATA
```

```
START:
        MOV AX,DATA
        MOV DS,AX
        XOR AX,AX
        MOV CL,AL
        MOV AX,[SI]
        ADD AX,[SI+4]
        MOV BX,AX
        MOV N3,BX
        MOV AX,[SI+2]
        ADD AX,[SI+6]
        MOV DX,AX
        MOV N4,DX
        JNC STOP
INC CL
STOP:
        MOV AX,4CH
        INT 21H
CODE ENDS
END START
```

OUTPUT


DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG

```
AX=076A  BX=0000  CX=002C  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=075A  ES=075A  SS=0769  CS=076B  IP=0003   NV UP EI PL NZ NA PO NC
076B:0003 8ED8          MOV     DS,AX
-
-t

AX=076A  BX=0000  CX=002C  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=076A  ES=075A  SS=0769  CS=076B  IP=0005   NV UP EI PL NZ NA PO NC
076B:0005 33C0          XOR     AX,AX
-t

AX=0000  BX=0000  CX=002C  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=076A  ES=075A  SS=0769  CS=076B  IP=0007   NV UP EI PL ZR NA PE NC
076B:0007 8BD8          MOV     BX,AX
-t

AX=0000  BX=0000  CX=002C  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=076A  ES=075A  SS=0769  CS=076B  IP=0009   NV UP EI PL ZR NA PE NC
076B:0009 A10000        MOV     AX,[0000]                          DS:0000=8888
-t

AX=8888  BX=0000  CX=002C  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=076A  ES=075A  SS=0769  CS=076B  IP=000C   NV UP EI PL ZR NA PE NC
076B:000C 2B060200      SUB     AX,[0002]                          DS:0002=4444
-_
```

16 BIT MULTIPLICATION

ALGORITHM

Step I : Initialize the data segment.

Step II : Get the first number in AX register.

Step III : Get the second number in BX register.

Step IV : Multiply the two 16 bit numbers.

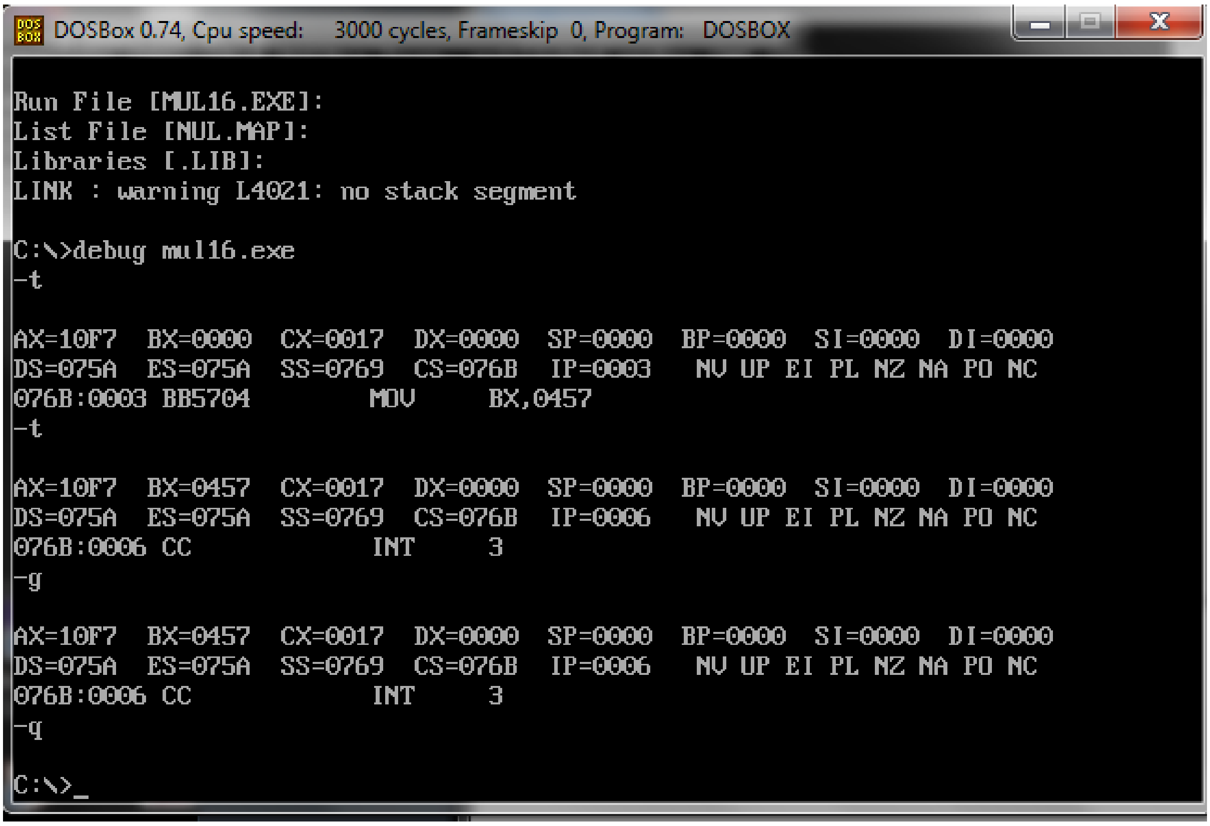
Step V : Display the result.

Step VI : Stop

PROGRAM

```
DATA SEGMENT
N1 DW 8888H
N2 DW 4444H
N3 DW ?
DATA ENDS
CODE SEGMENT
ASSUME CS :CODE;DS:DATA
START:
        MOV AX,4343
        MOV BX,1111
        INT 3
CODE ENDS
END START
```

OUTPUT


DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DOSBOX

```
Run File [MUL16.EXE]:
List File [NUL.MAP]:
Libraries [.LIB]:
LINK : warning L4021: no stack segment

C:\>debug mul16.exe
-t

AX=10F7  BX=0000  CX=0017  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=075A  ES=075A  SS=0769  CS=076B  IP=0003   NV UP EI PL NZ NA PO NC
076B:0003 BB5704        MOV     BX,0457
-t

AX=10F7  BX=0457  CX=0017  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=075A  ES=075A  SS=0769  CS=076B  IP=0006   NV UP EI PL NZ NA PO NC
076B:0006 CC            INT     3
-g

AX=10F7  BX=0457  CX=0017  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=075A  ES=075A  SS=0769  CS=076B  IP=0006   NV UP EI PL NZ NA PO NC
076B:0006 CC            INT     3
-q

C:\>_
```

STRING DISPLAY

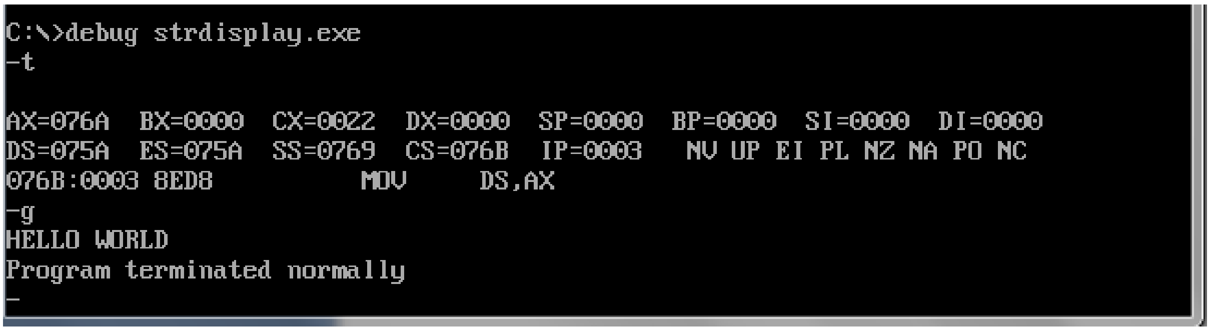
AIM

Write a program to display a given string

PROGRAM

```
DATA SEGMENT
MSG1 DB "HELLO WORLD$"
DATA ENDS
ASSUME CS:CODE; DS:DATA
CODE SEGMENT
START:
        MOV AX,DATA
        MOV DS,AX
        MOV DX,OFFSET MSG1
        MOV AH,09H
        INT 21H
        MOV AH,4CH
        MOV AL,00H
        INT 21H
CODE ENDS
END START
```

OUTPUT



```
C:\>debug strdisplay.exe
-t

AX=076A  BX=0000  CX=0022  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=075A  ES=075A  SS=0769  CS=076B  IP=0003   NV UP EI PL NZ NA PO NC
076B:0003 8ED8          MOV     DS,AX
-g
HELLO WORLD
Program terminated normally
-
```

STRING CONCATENATENATION

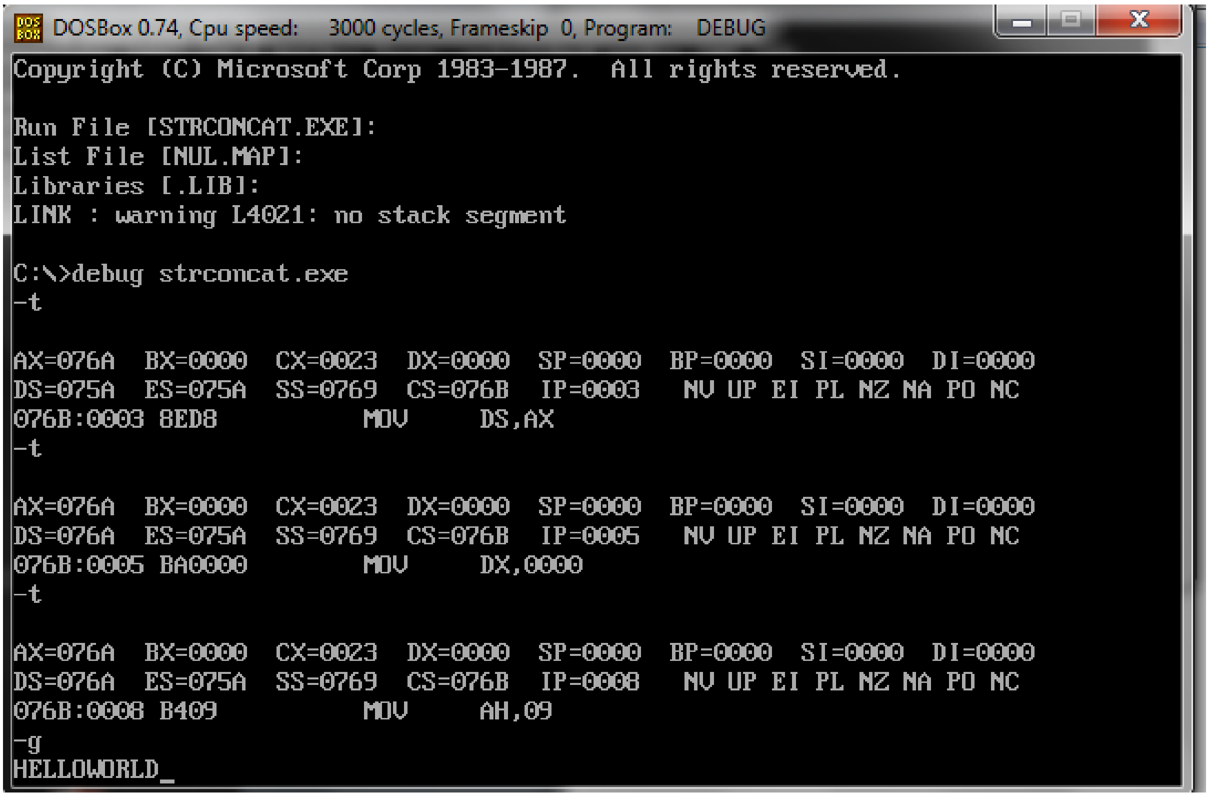
AIM

Write a program to concatenate two strings

PROGRAM

```
DATA SEGMENT
MSG1 DB "HELLO$"
MSG2 DB "WORLD$"
DATA ENDS
ASSUME CS:CODE; DS:DATA
CODE SEGMENT
START:
        MOV AX,DATA
        MOV DS,AX
        MOV DX,OFFSET MSG1
        MOV AH,09H
        INT 21H
        MOV DX,OFFSET MSG2
        MOV AH,09H
        INT 21H
CODE ENDS
END START
```

OUTPUT



DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: DEBUG

```
Copyright (C) Microsoft Corp 1983-1987.  All rights reserved.

Run File [STRCONCAT.EXE]:
List File [NUL.MAP]:
Libraries [.LIB]:
LINK : warning L4021: no stack segment

C:\>debug strconcat.exe
-t

AX=076A  BX=0000  CX=0023  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=075A  ES=075A  SS=0769  CS=076B  IP=0003   NV UP EI PL NZ NA PO NC
076B:0003 8ED8          MOV     DS,AX
-t

AX=076A  BX=0000  CX=0023  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=076A  ES=075A  SS=0769  CS=076B  IP=0005   NV UP EI PL NZ NA PO NC
076B:0005 BA0000        MOV     DX,0000
-t

AX=076A  BX=0000  CX=0023  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=076A  ES=075A  SS=0769  CS=076B  IP=0008   NV UP EI PL NZ NA PO NC
076B:0008 B409          MOV     AH,09
-g
HELLOWORLD_
```

SORTING

AIM

Write a program to perform sorting

PROGRAM

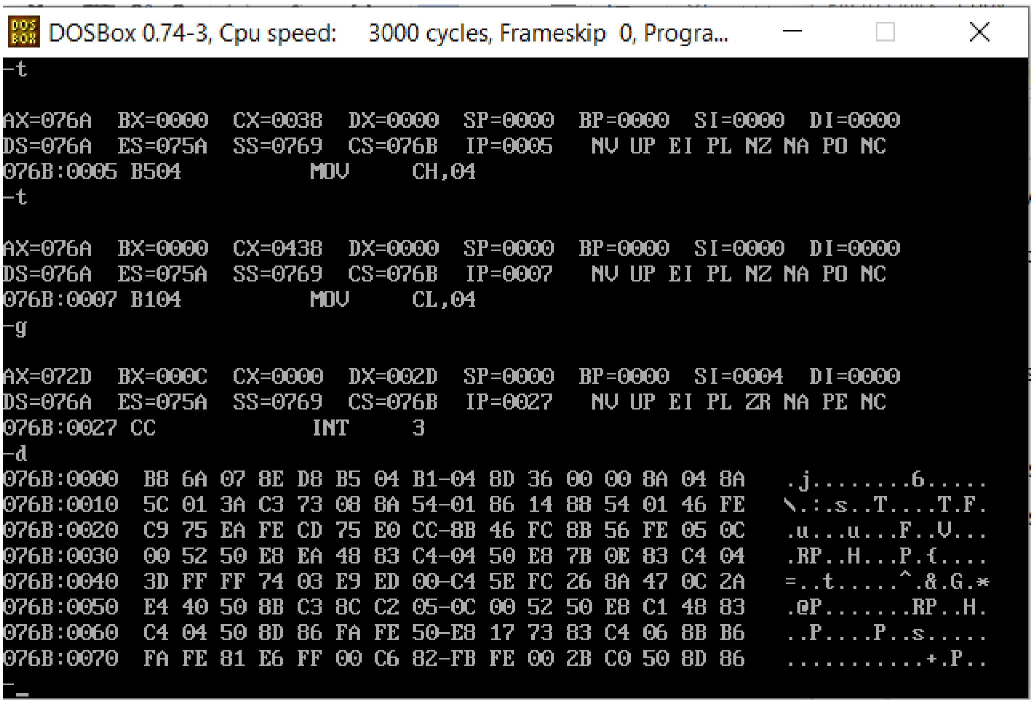
```
DATA SEGMENT
STRING1 DB 99H,12H,56H,45H,36H
DATA ENDS
CODE SEGMENT
ASSUME CS:CODE,DS:DATA
START: MOV AX,DATA
MOV DS,AX
MOV CH,04H
UP2: MOV CL,04H
LEA SI,STRING1

UP1:MOV AL,[SI]
MOV BL,[SI+1]
CMP AL,BL
JNC DOWN
MOV DL,[SI+1]
XCHG [SI],DL
MOV [SI+1],DL

DOWN: INC SI
DEC CL
JNZ UP1
DEC CH
JNZ UP2
INT 3
```

CODE ENDS
END START

OUTPUT



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

```
-t

AX=076A  BX=0000  CX=0038  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=076A  ES=075A  SS=0769  CS=076B  IP=0005   NV UP EI PL NZ NA PO NC
076B:0005 B504          MOV     CH,04
-t

AX=076A  BX=0000  CX=0438  DX=0000  SP=0000  BP=0000  SI=0000  DI=0000
DS=076A  ES=075A  SS=0769  CS=076B  IP=0007   NV UP EI PL NZ NA PO NC
076B:0007 B104          MOV     CL,04
-g

AX=072D  BX=000C  CX=0000  DX=002D  SP=0000  BP=0000  SI=0004  DI=0000
DS=076A  ES=075A  SS=0769  CS=076B  IP=0027   NV UP EI PL ZR NA PE NC
076B:0027 CC            INT     3
-d
076B:0000  B8 6A 07 8E D8 B5 04 B1-04 8D 36 00 00 8A 04 8A   .j........6.....
076B:0010  5C 01 3A C3 73 08 8A 54-01 86 14 88 54 01 46 FE   \.:.s..T....T.F.
076B:0020  C9 75 EA FE CD 75 E0 CC-8B 46 FC 8B 56 FE 05 0C   .u...u...F..V...
076B:0030  00 52 50 E8 EA 48 83 C4-04 50 E8 7B 0E 83 C4 04   .RP..H...P.{....
076B:0040  3D FF FF 74 03 E9 ED 00-C4 5E FC 26 8A 47 0C 2A   =..t.....^.&.G.*
076B:0050  E4 40 50 8B C3 8C C2 05-0C 00 52 50 E8 C1 48 83   .@P.......RP..H.
076B:0060  C4 04 50 8D 86 FA FE 50-E8 17 73 83 C4 06 8B B6   ..P....P..s.....
076B:0070  FA FE 81 E6 FF 00 C6 82-FB FE 00 2B C0 50 8D 86   ...........+.P..
-_
```

SEARCHING

AIM

Write a program to perform searching

PROGRAM

DATA SEGMENT
STRING1 DB 11H,22H,33H,44H,55H
MSG1 DB "FOUND$"
MSG2 DB "NOT FOUND$"
SE DB 33H
DATA ENDS

PRINT MACRO MSG
MOV AH, 09H
LEA DX, MSG
INT 21H
INT 3
ENDM

CODE SEGMENT
ASSUME CS:CODE, DS:DATA
START:
MOV AX, DATA
MOV DS, AX
MOV AL, SE

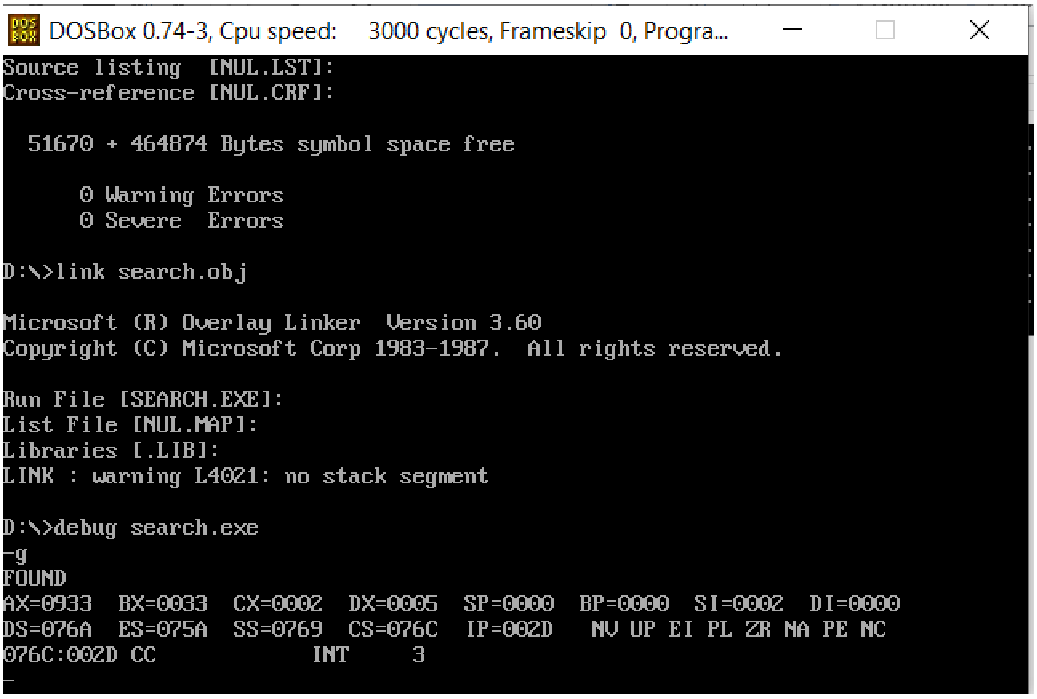
```
LEA SI, STRING1
MOV CX, 04H

UP:
MOV BL,[SI]
CMP AL, BL
JZ FO
INC SI
DEC CX
JNZ UP
PRINT MSG2
JMP END1

FO:
PRINT MSG1

END1:
INT 3
CODE ENDS
END START
```

OUTPUT


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

```
Source listing  [NUL.LST]:
Cross-reference [NUL.CRF]:

  51670 + 464874 Bytes symbol space free

      0 Warning Errors
      0 Severe  Errors

D:\>link search.obj

Microsoft (R) Overlay Linker  Version 3.60
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Run File [SEARCH.EXE]:
List File [NUL.MAP]:
Libraries [.LIB]:
LINK : warning L4021: no stack segment

D:\>debug search.exe
-g
FOUND
AX=0933  BX=0033  CX=0002  DX=0005  SP=0000  BP=0000  SI=0002  DI=0000
DS=076A  ES=075A  SS=0769  CS=076C  IP=002D   NV UP EI PL ZR NA PE NC
076C:002D CC            INT     3
-
```