

Universidad Mariano Gálvez de Guatemala

Facultad de Ingeniería en Sistemas

Arquitectura de computadoras II

Ing. Carlos Suruy



Lenguaje Ensamblador (debug)

Nombre: Francisco Jacob Martínez Díaz

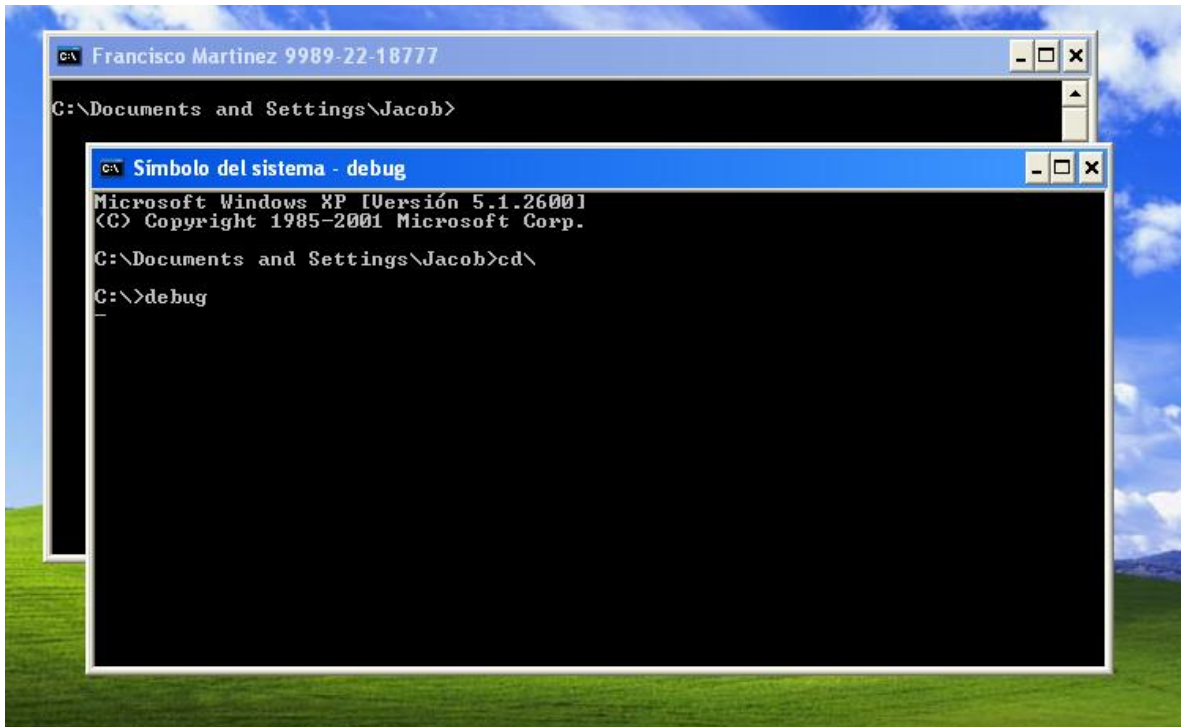
Carné: 9989-22-18777

Guatemala, 15 de agosto de 2025

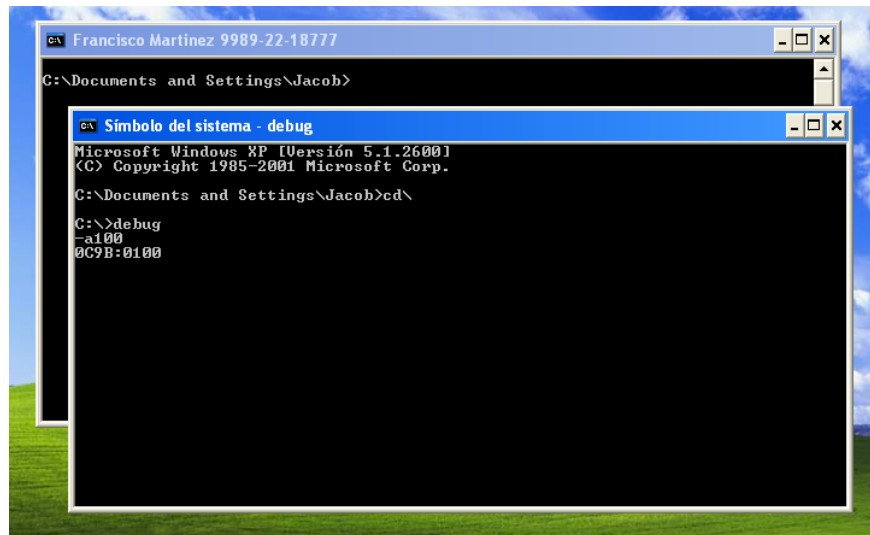
## EJEMPLO 1

Programa que realiza la suma de 3 números hexadecimales y guardarlo en el registro AX en el depurador de Windows (DEBUG). EJ: AX=2+3+4 RESULTADO: AX=9

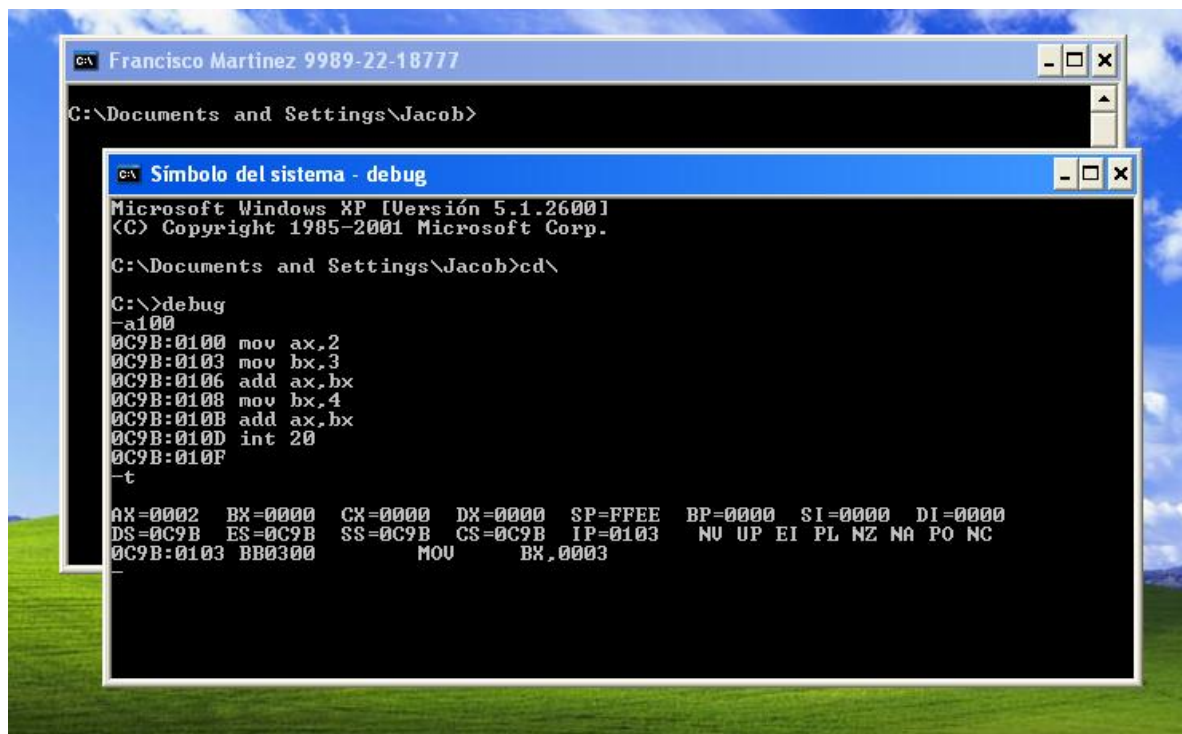
**Pasos 1, 2, 3:**



**Paso 4:**



## Paso 5:



The screenshot shows a Windows XP desktop with a blue sky and green grass background. A command prompt window titled "Francisco Martinez 9989-22-18777" is open, showing the directory "C:\Documents and Settings\Jacob>". Overlaid on top of it is a debugger window titled "Símbolo del sistema - debug". The debugger window displays the following text:

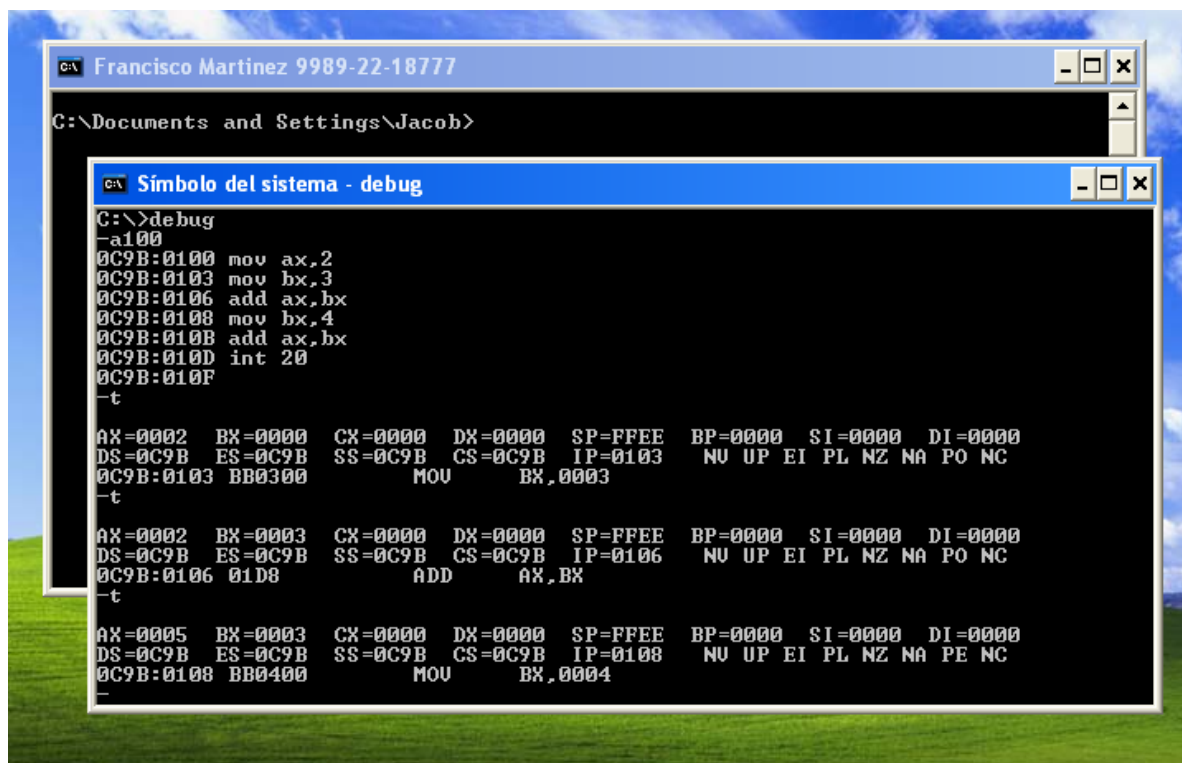
```
Microsoft Windows XP [Versión 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\Jacob>cd\

C:\>debug
-a100
0C9B:0100 mov ax,2
0C9B:0103 mov bx,3
0C9B:0106 add ax,bx
0C9B:0108 mov bx,4
0C9B:010B add ax,bx
0C9B:010D int 20
0C9B:010F
-t

AX=0002 BX=0000 CX=0000 DX=0000 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=0103  NU UP EI PL NZ NA PO NC
0C9B:0103 BB0300      MOV     BX,0003
-
```

## Paso 6:



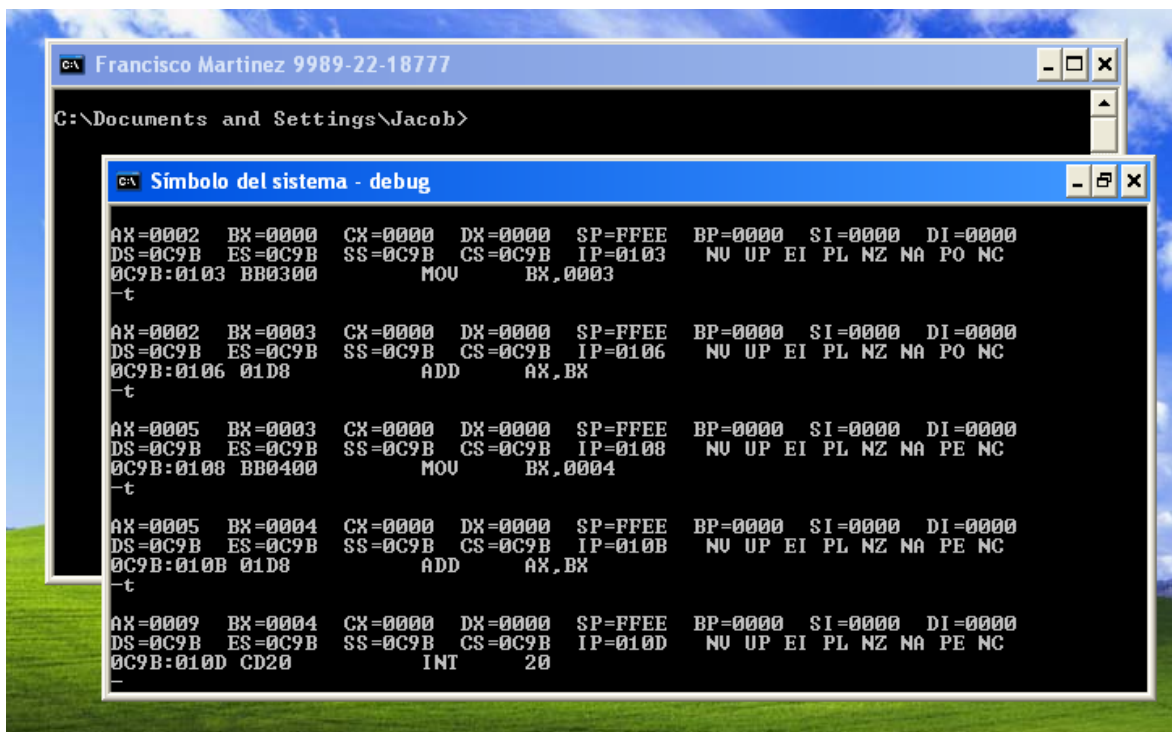
The screenshot shows a Windows XP desktop with a blue sky and green grass background. A command prompt window titled "Francisco Martinez 9989-22-18777" is open, showing the directory "C:\Documents and Settings\Jacob>". Overlaid on top of it is a debugger window titled "Símbolo del sistema - debug". The debugger window displays the following text:

```
C:\>debug
-a100
0C9B:0100 mov ax,2
0C9B:0103 mov bx,3
0C9B:0106 add ax,bx
0C9B:0108 mov bx,4
0C9B:010B add ax,bx
0C9B:010D int 20
0C9B:010F
-t

AX=0002 BX=0000 CX=0000 DX=0000 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=0103  NU UP EI PL NZ NA PO NC
0C9B:0103 BB0300      MOV     BX,0003
-t

AX=0002 BX=0003 CX=0000 DX=0000 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=0106  NU UP EI PL NZ NA PO NC
0C9B:0106 01D8      ADD     AX,BX
-t

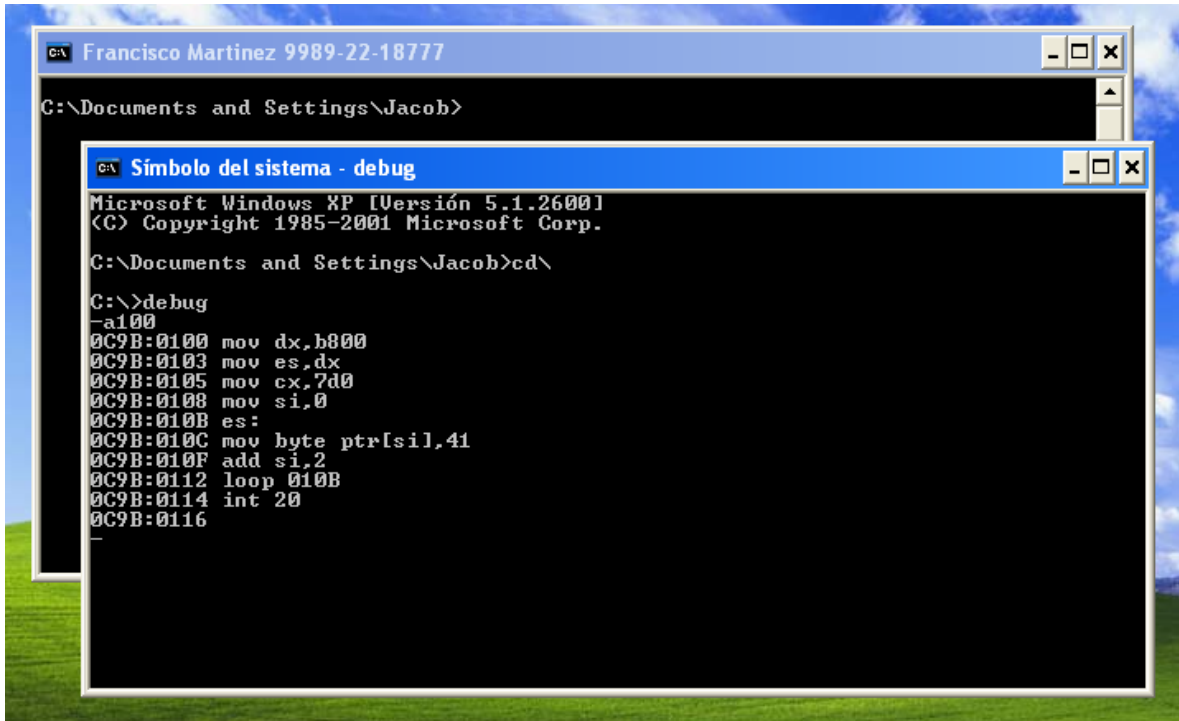
AX=0005 BX=0003 CX=0000 DX=0000 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=0108  NU UP EI PL NZ NA PE NC
0C9B:0108 BB0400      MOV     BX,0004
-
```



## EJEMPLO 2

Hacer un programa que muestre en toda la pantalla la letra A (mayuscula).

**Paso 1:** Escribir el código en el debug.



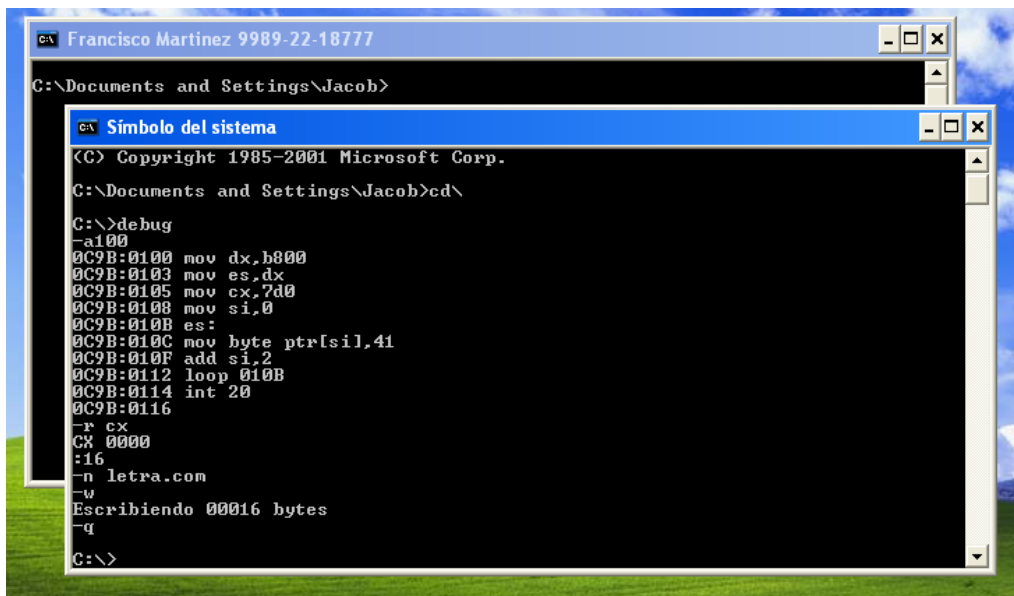
The screenshot shows a Windows XP desktop with a blue sky and green grass background. There are two windows open. The top window is a command prompt titled "Francisco Martinez 9989-22-18777" with the directory "C:\Documents and Settings\Jacob>". The bottom window is titled "Símbolo del sistema - debug" and contains the following text:

```
Microsoft Windows XP [Versión 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\Jacob>cd\

C:\>debug
-a100
0C9B:0100 mov dx,b800
0C9B:0103 mov es,dx
0C9B:0105 mov cx,7d0
0C9B:0108 mov si,0
0C9B:010B es:
0C9B:010C mov byte ptr[si],41
0C9B:010F add si,2
0C9B:0112 loop 010B
0C9B:0114 int 20
0C9B:0116
```

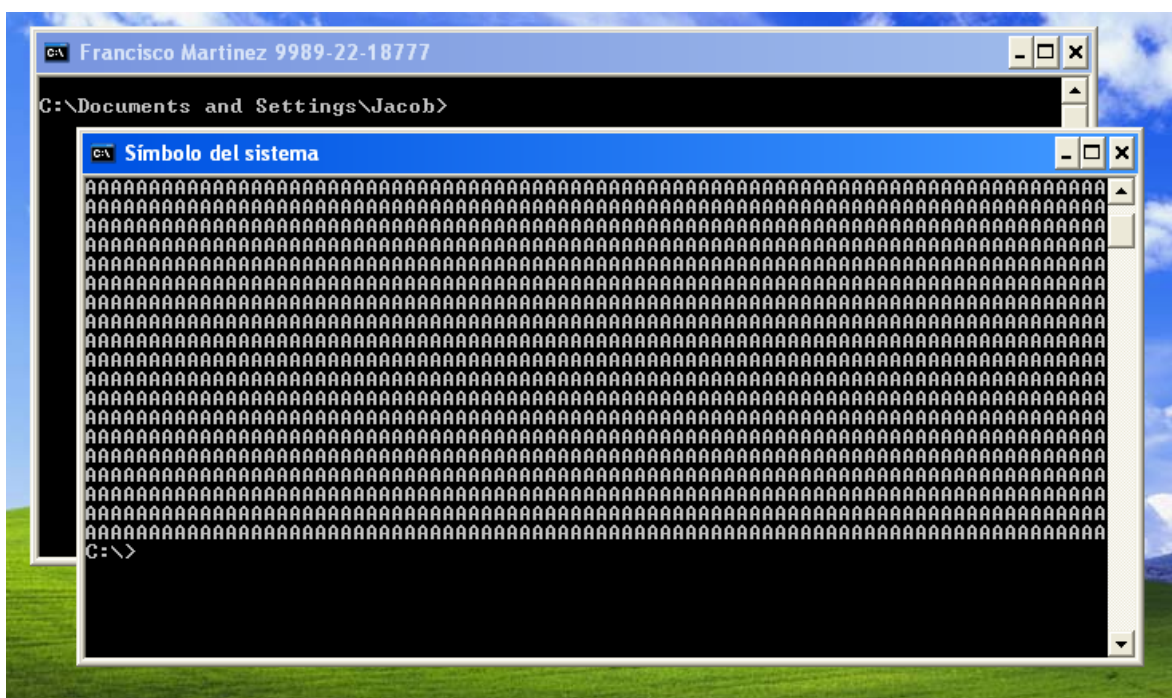
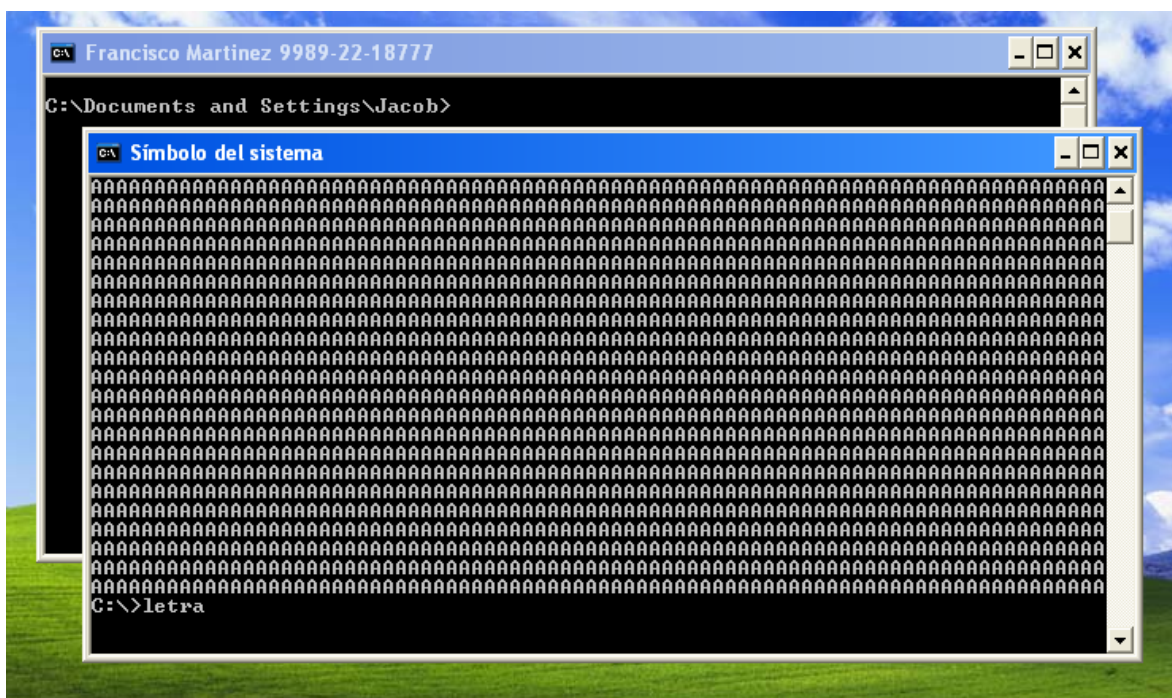
**Paso 2:** Guardar el programa.



The screenshot shows the same Windows XP desktop as before. The command prompt window is still open. The "Símbolo del sistema" window now shows the assembly code from the previous step, followed by the command to save the file:

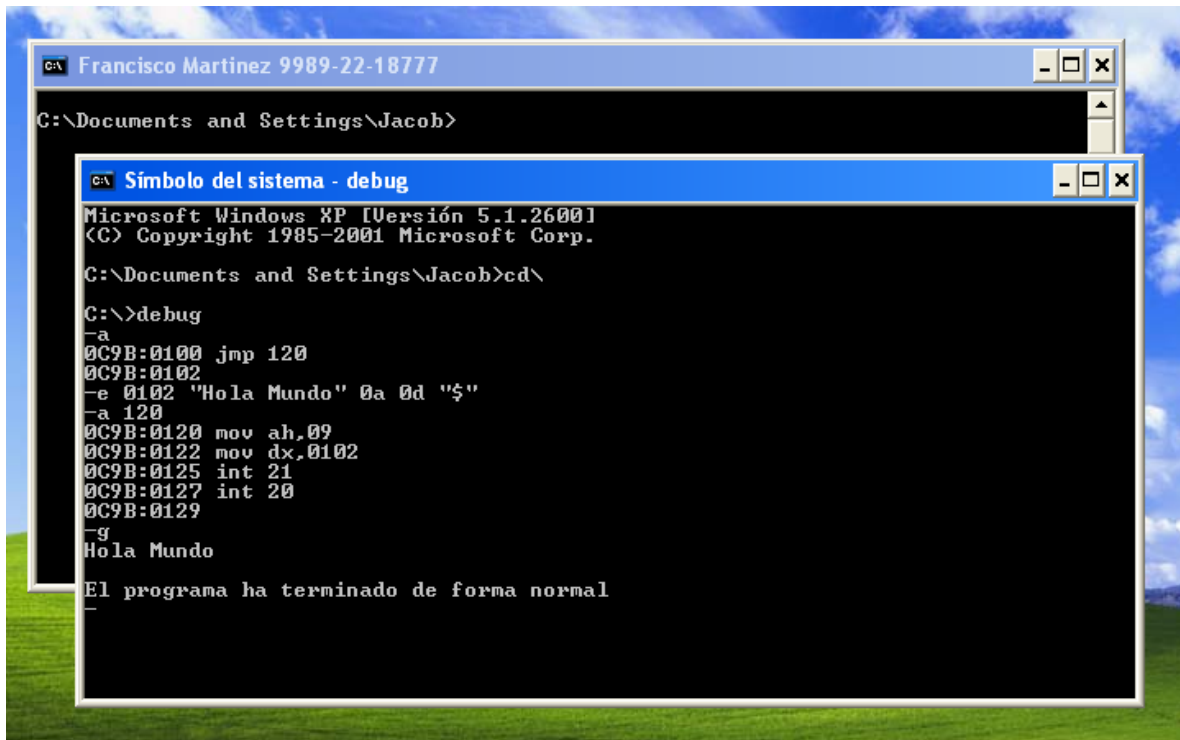
```
0C9B:0116
-r cx
CX 0000
:16
-n letra.com
-w
Escribiendo 00016 bytes
-q
C:\>
```

### Paso 3: Ejecutar el programa.



### EJEMPLO 3

Este programa imprimirá una cadena del clásico “Hola mundo”



The screenshot shows a Windows XP desktop with a blue sky and green grass background. Two windows are open. The top window is a command prompt titled "Francisco Martinez 9989-22-18777" with the command prompt "C:\Documents and Settings\Jacob>". The bottom window is a debugger titled "Símbolo del sistema - debug" showing the following text:

```
Microsoft Windows XP [Versión 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\Jacob>cd\

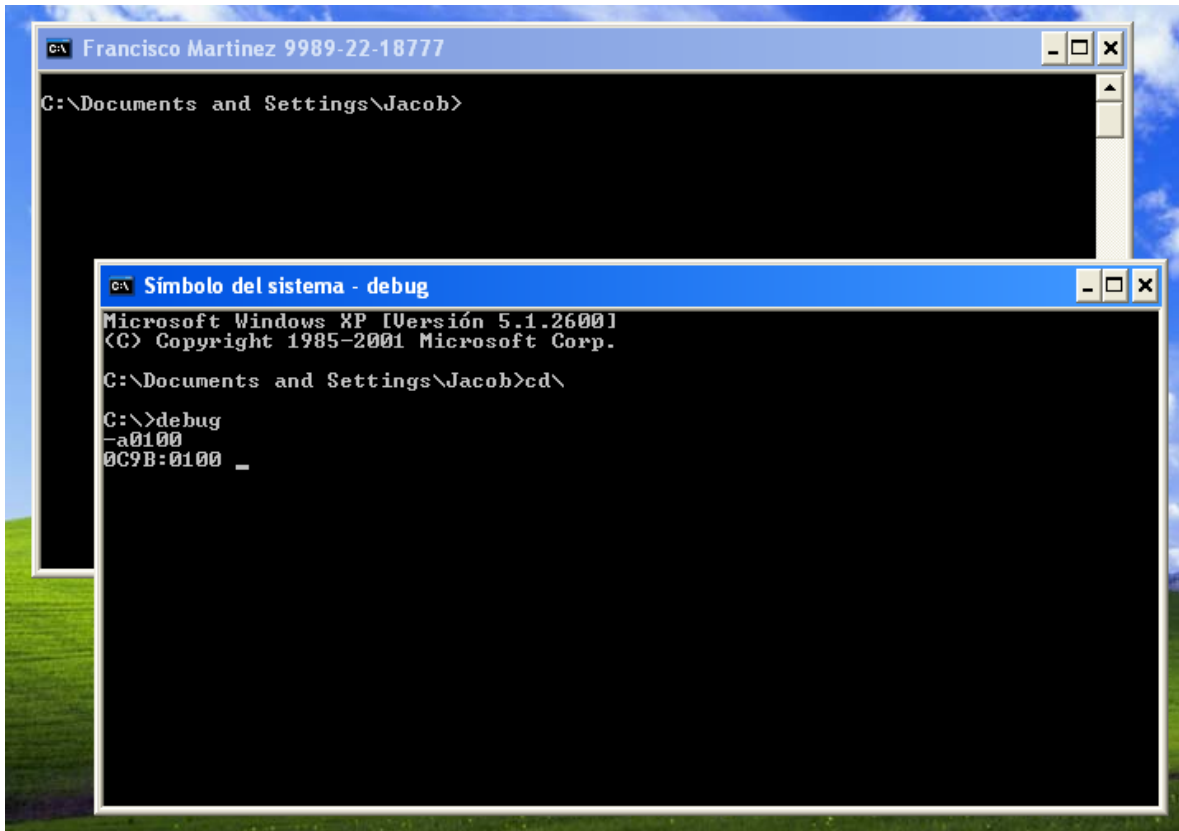
C:\>debug
-a
0C9B:0100 jmp 120
0C9B:0102
-e 0102 "Hola Mundo" 0a 0d "$"
-a 120
0C9B:0120 mov ah,09
0C9B:0122 mov dx,0102
0C9B:0125 int 21
0C9B:0127 int 20
0C9B:0129
-g
Hola Mundo

El programa ha terminado de forma normal
```

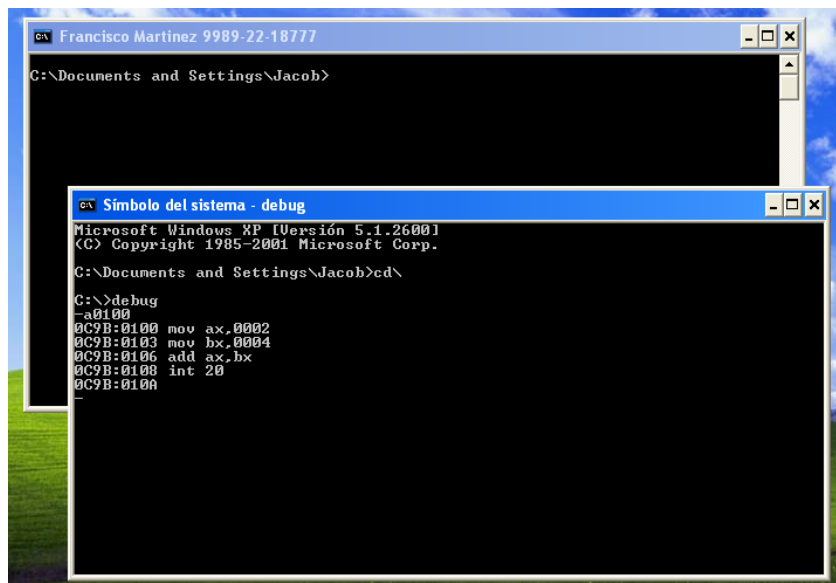
## EJEMPLO 4

Programa para ilustrar lo que hemos estado viendo, lo que haremos será una suma de dos valores que introduciremos directamente en el programa.

**Paso 1:** Ensamblar un programa en el debug.

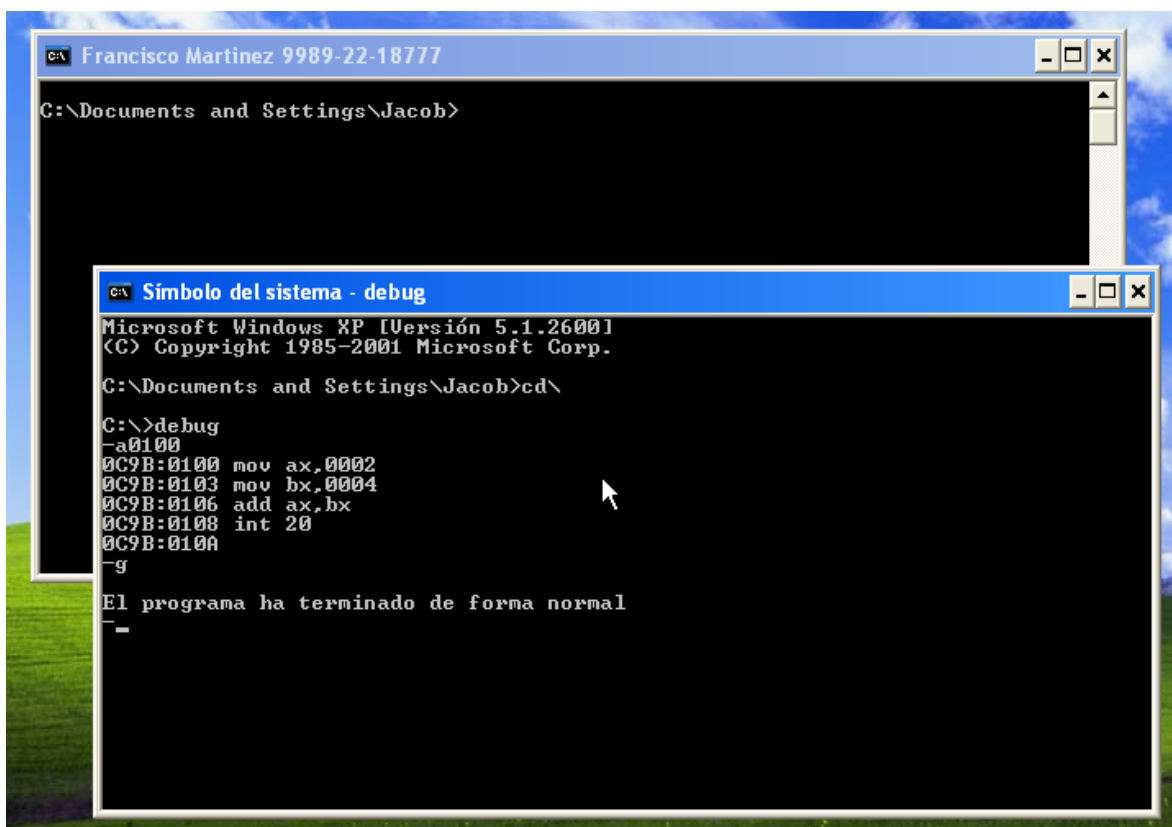


**Paso 2:** Introducir las instrucciones.





**Paso 3:** Ejecutar el programa con el comando “g”



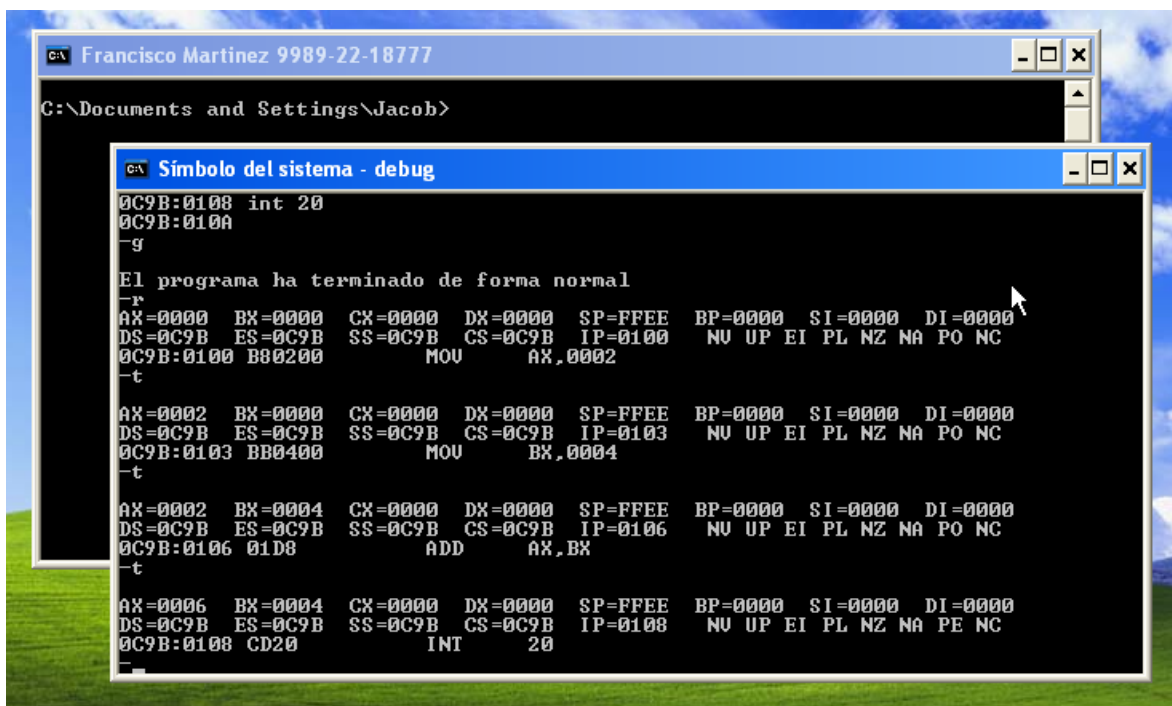
The screenshot shows a Windows XP desktop with a blue sky and green grass background. There are two windows open. The top window is a command prompt titled "Francisco Martinez 9989-22-18777" with the text "C:\Documents and Settings\Jacob>". The bottom window is a debugger titled "Símbolo del sistema - debug" with the following text:

```
Microsoft Windows XP [Versión 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\Jacob>cd\

C:\>debug
-a0100
0C9B:0100 mov ax,0002
0C9B:0103 mov bx,0004
0C9B:0106 add ax,bx
0C9B:0108 int 20
0C9B:010A
-g
El programa ha terminado de forma normal
```

**Paso 4:** Utilizar comando “r” para visualizar que se haya realizado la suma.



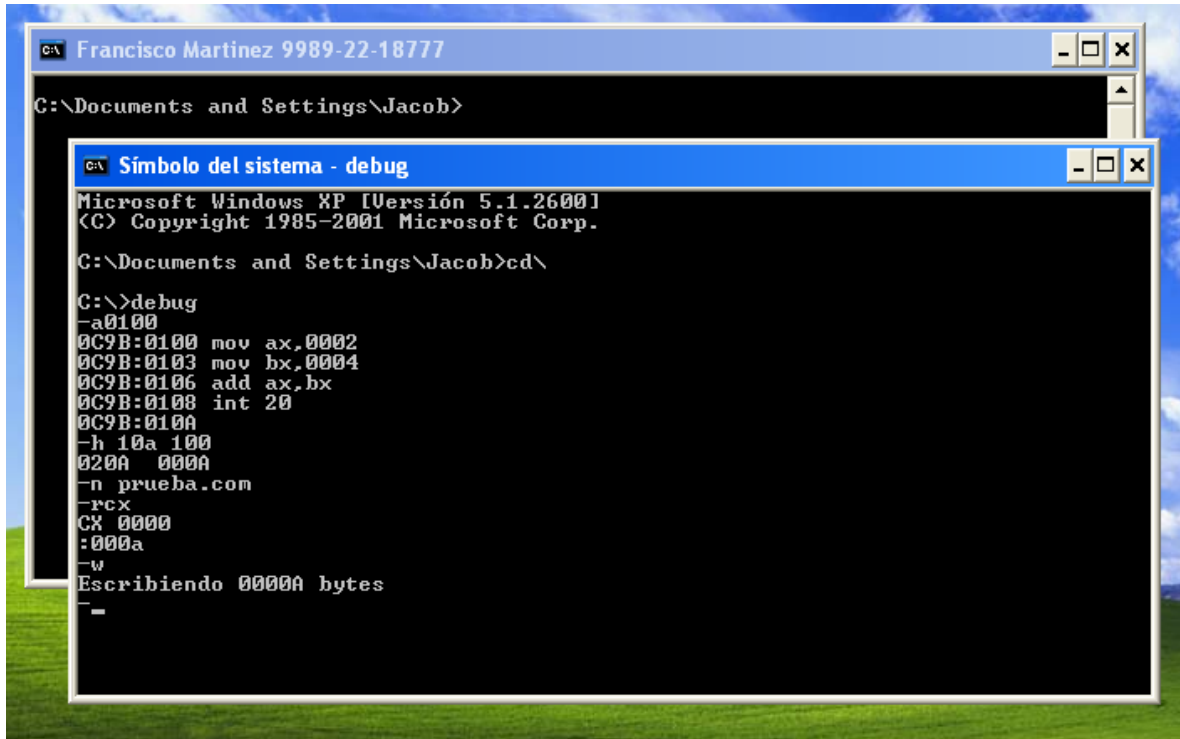
The screenshot shows the same Windows XP desktop as before. The command prompt window is still open. The debugger window now shows the following text:

```
0C9B:0108 int 20
0C9B:010A
-g
El programa ha terminado de forma normal
-r
AX=0000 BX=0000 CX=0000 DX=0000 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=0100 NU UP EI PL NZ NA PO NC
0C9B:0100 B80200 MOV AX,0002
-t
AX=0002 BX=0000 CX=0000 DX=0000 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=0103 NU UP EI PL NZ NA PO NC
0C9B:0103 BB0400 MOV BX,0004
-t
AX=0002 BX=0004 CX=0000 DX=0000 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=0106 NU UP EI PL NZ NA PO NC
0C9B:0106 01D8 ADD AX,BX
-t
AX=0006 BX=0004 CX=0000 DX=0000 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=0108 NU UP EI PL NZ NA PE NC
0C9B:0108 CD20 INT 20
```

## EJEMPLO 5

Guardar y cargar los programas.

**Paso 1:** Ensamblar un programa en el debug.



The screenshot shows a Windows XP desktop with a blue sky and green grass background. There are two windows open. The top window is a command prompt titled "Francisco Martinez 9989-22-18777" with the path "C:\Documents and Settings\Jacob>". The bottom window is a debugger titled "Símbolo del sistema - debug". It displays the following text:

```
Microsoft Windows XP [Versión 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

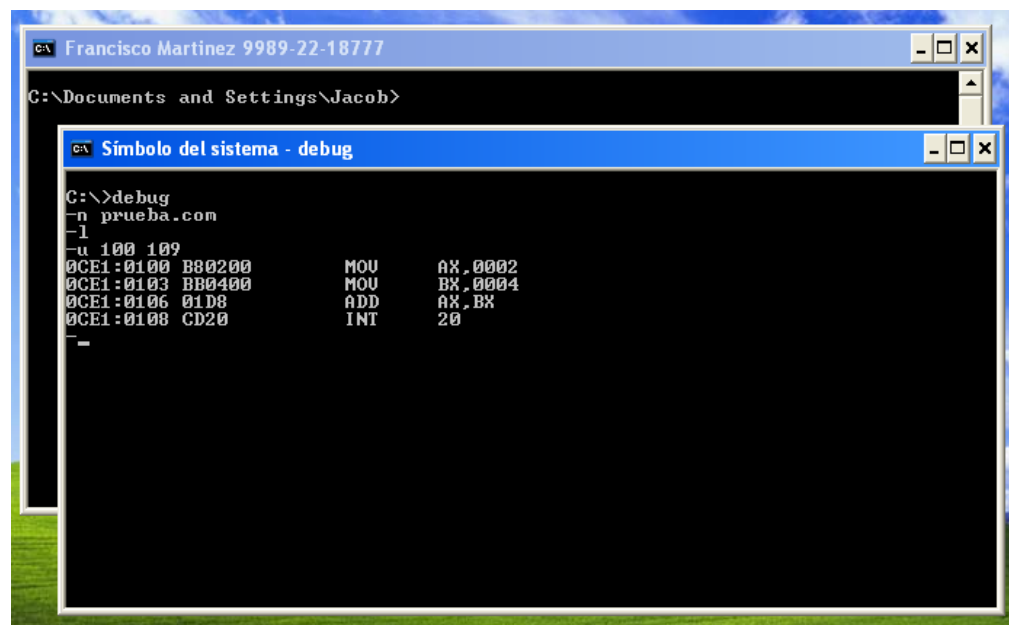
C:\Documents and Settings\Jacob>cd\

C:\>debug
-a0100
0C9B:0100 mov ax,0002
0C9B:0103 mov bx,0004
0C9B:0106 add ax,bx
0C9B:0108 int 20
0C9B:010A
-h 10a 100
020A 000A
-n prueba.com
-rcx
CX 0000
:000a
-w
Escribiendo 0000A bytes
-
```

## EJEMPLO 6

Cargar un archivo ya guardado.

**Pasos:**



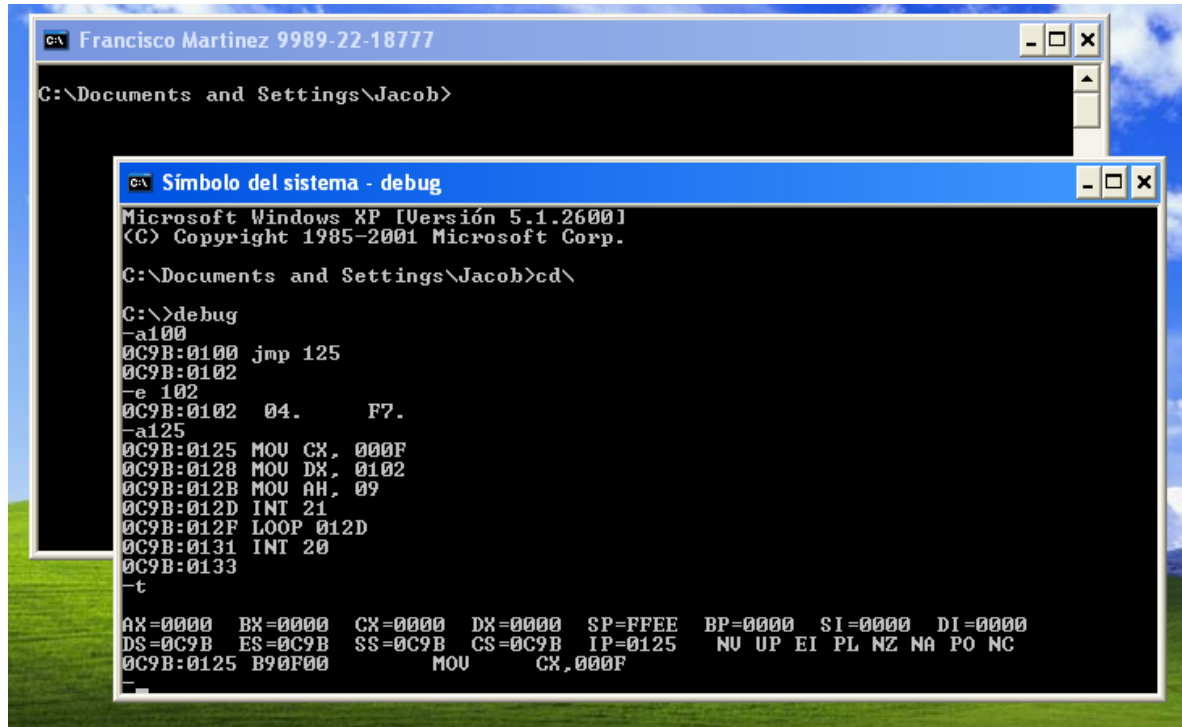
The screenshot shows a Windows XP desktop with a blue sky and green grass background. There are two windows open. The top window is a command prompt titled "Francisco Martinez 9989-22-18777" with the path "C:\Documents and Settings\Jacob>". The bottom window is a debugger titled "Símbolo del sistema - debug". It displays the following text:

```
C:\>debug
-n prueba.com
-l
-u 100 109
0CE1:0100 B80200      MOV     AX,0002
0CE1:0103 BB0400      MOV     BX,0004
0CE1:0106 01D8        ADD     AX,BX
0CE1:0108 CD20        INT     20
-
```

## EJEMPLO 7

Condiciones, ciclos y bifurcaciones.

Pasos:



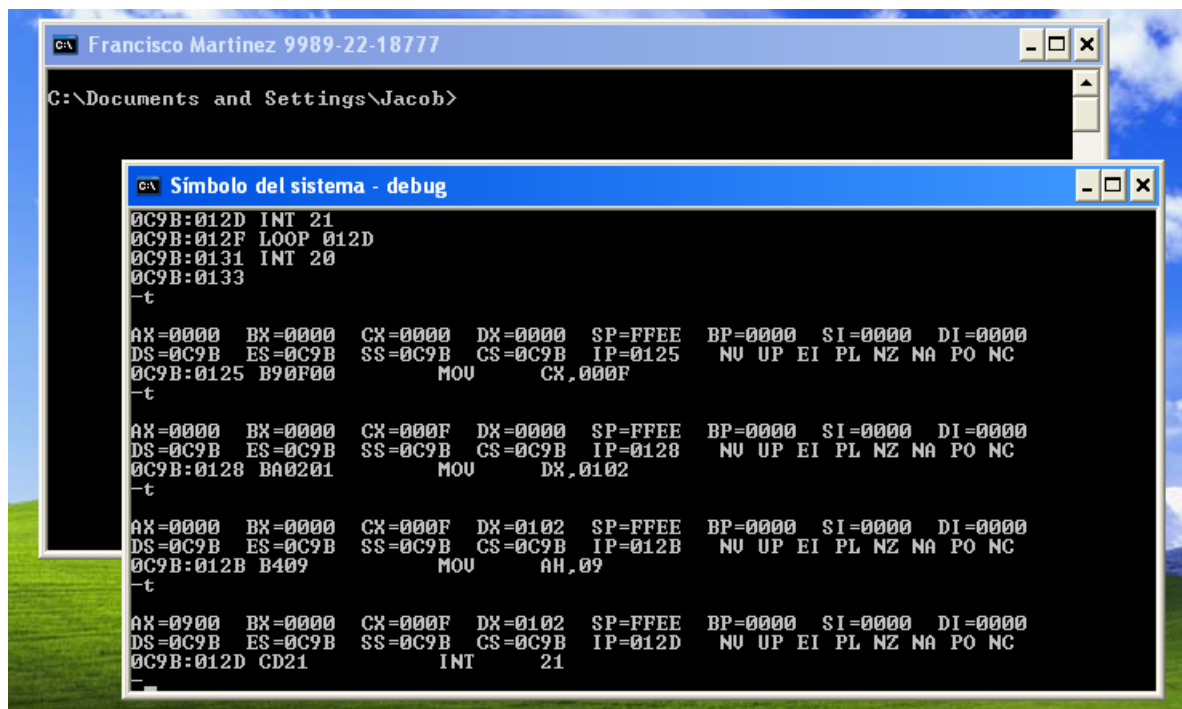
The screenshot shows a Windows XP desktop with a blue sky and green grass background. A command prompt window titled "Francisco Martinez 9989-22-18777" is open, showing the directory "C:\Documents and Settings\Jacob>". Overlaid on top of the command prompt is a debugger window titled "Símbolo del sistema - debug". The debugger window displays the following text:

```
Microsoft Windows XP [Versión 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\Jacob>cd\

C:\>debug
-a100
0C9B:0100 jmp 125
0C9B:0102
-e 102
0C9B:0102 04.      F7.
-a125
0C9B:0125 MOV CX, 000F
0C9B:0128 MOV DX, 0102
0C9B:012B MOV AH, 09
0C9B:012D INT 21
0C9B:012F LOOP 012D
0C9B:0131 INT 20
0C9B:0133
-t

AX=0000 BX=0000 CX=0000 DX=0000 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=0125  NU UP EI PL NZ NA PO NC
0C9B:0125 B90F00      MOV     CX,000F
```



This screenshot shows the same desktop environment as the previous one, but the debugger window has advanced to the next instruction. The text in the debugger window is as follows:

```
0C9B:012D INT 21
0C9B:012F LOOP 012D
0C9B:0131 INT 20
0C9B:0133
-t

AX=0000 BX=0000 CX=0000 DX=0000 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=0125  NU UP EI PL NZ NA PO NC
0C9B:0125 B90F00      MOV     CX,000F
-t

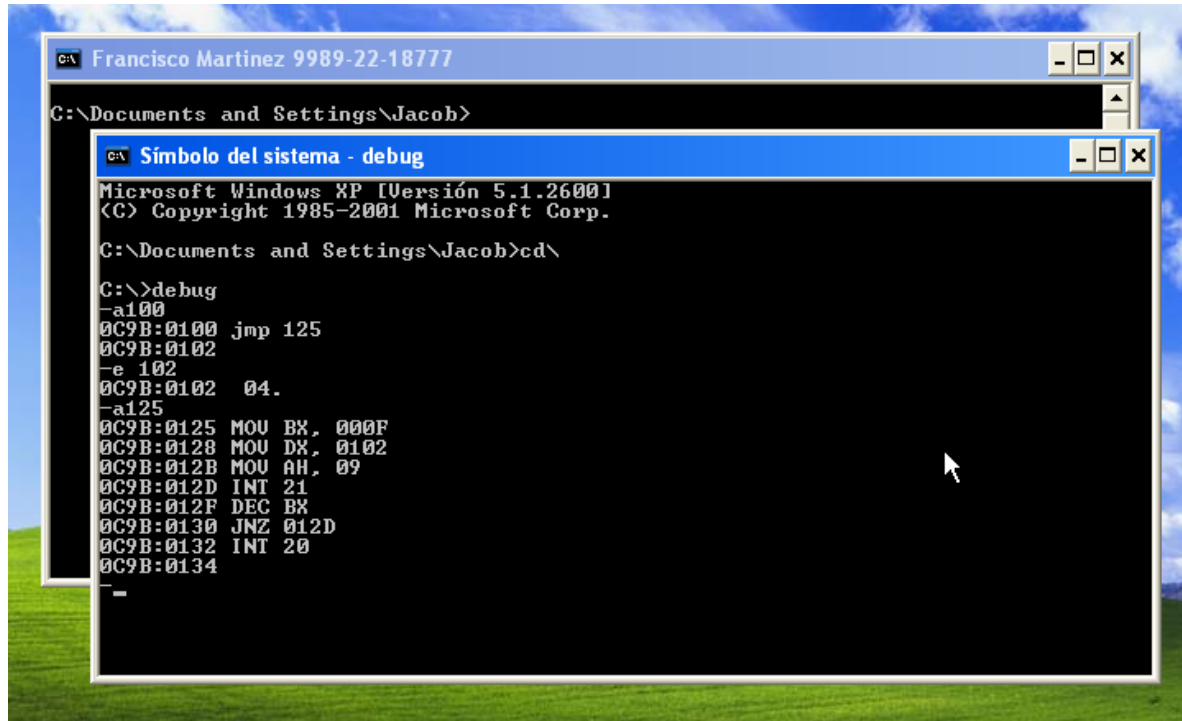
AX=0000 BX=0000 CX=000F DX=0000 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=0128  NU UP EI PL NZ NA PO NC
0C9B:0128 BA0201      MOV     DX,0102
-t

AX=0000 BX=0000 CX=000F DX=0102 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=012B  NU UP EI PL NZ NA PO NC
0C9B:012B B409      MOV     AH,09
-t

AX=0900 BX=0000 CX=000F DX=0102 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=012D  NU UP EI PL NZ NA PO NC
0C9B:012D CD21      INT     21
```

## EJEMPLO 8

Otra forma de realizar la misma función sin el uso del comando LOOP.

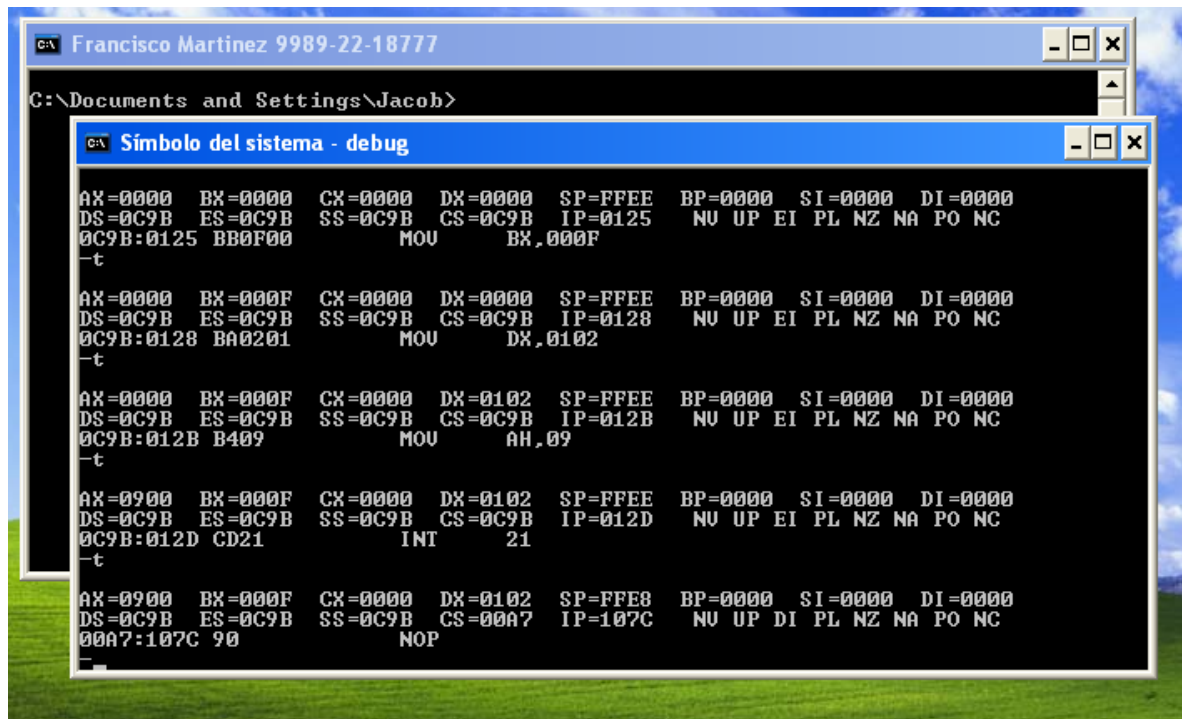


The screenshot shows a Windows XP desktop with a blue sky and green grass background. A command prompt window is open, displaying the path `C:\Documents and Settings\Jacob>`. Overlaid on this is a debugger window titled "Símbolo del sistema - debug". The debugger window shows the following assembly code:

```
Microsoft Windows XP [Versión 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\Jacob>cd\

C:\>debug
-a100
0C9B:0100 jmp 125
0C9B:0102
-e 102
0C9B:0102 04.
-a125
0C9B:0125 MOV BX, 000F
0C9B:0128 MOV DX, 0102
0C9B:012B MOV AH, 09
0C9B:012D INT 21
0C9B:012F DEC BX
0C9B:0130 JNZ 012D
0C9B:0132 INT 20
0C9B:0134
-
```



The screenshot shows the same Windows XP desktop as the previous one. The command prompt window still displays `C:\Documents and Settings\Jacob>`. The debugger window "Símbolo del sistema - debug" now shows the state of the registers and the next instruction to be executed:

```
AX=0000 BX=0000 CX=0000 DX=0000 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=0125  NU UP EI PL NZ NA PO NC
0C9B:0125 BB0F00      MOV     BX,000F
-t

AX=0000 BX=000F CX=0000 DX=0000 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=0128  NU UP EI PL NZ NA PO NC
0C9B:0128 BA0201      MOV     DX,0102
-t

AX=0000 BX=000F CX=0000 DX=0102 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=012B  NU UP EI PL NZ NA PO NC
0C9B:012B B409      MOV     AH,09
-t

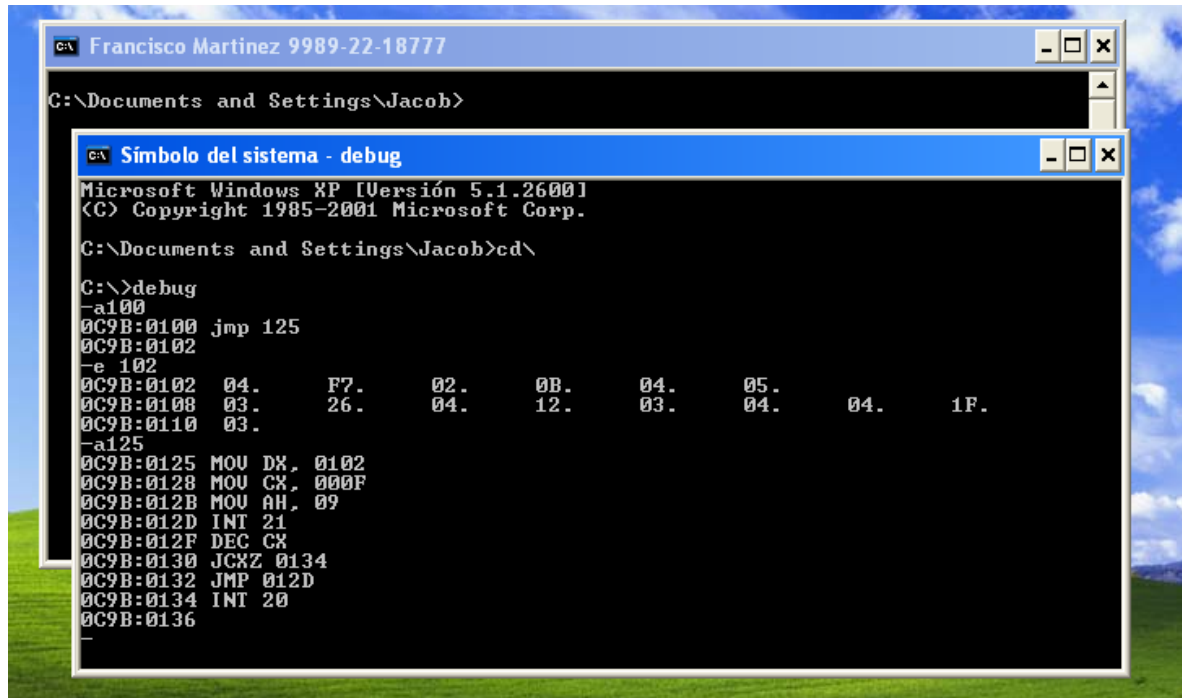
AX=0900 BX=000F CX=0000 DX=0102 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=012D  NU UP EI PL NZ NA PO NC
0C9B:012D CD21      INT     21
-t

AX=0900 BX=000F CX=0000 DX=0102 SP=FFE8 BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=00A7 IP=107C  NU UP DI PL NZ NA PO NC
00A7:107C 90      NOP
-
```

## EJEMPLO 9

Una ultima variante del programa utilizando de nuevo a CX como contador, pero en lugar utilizar LOOP utilizaremos decrementos a CX y comparación de CX a 0.

### Pasos:

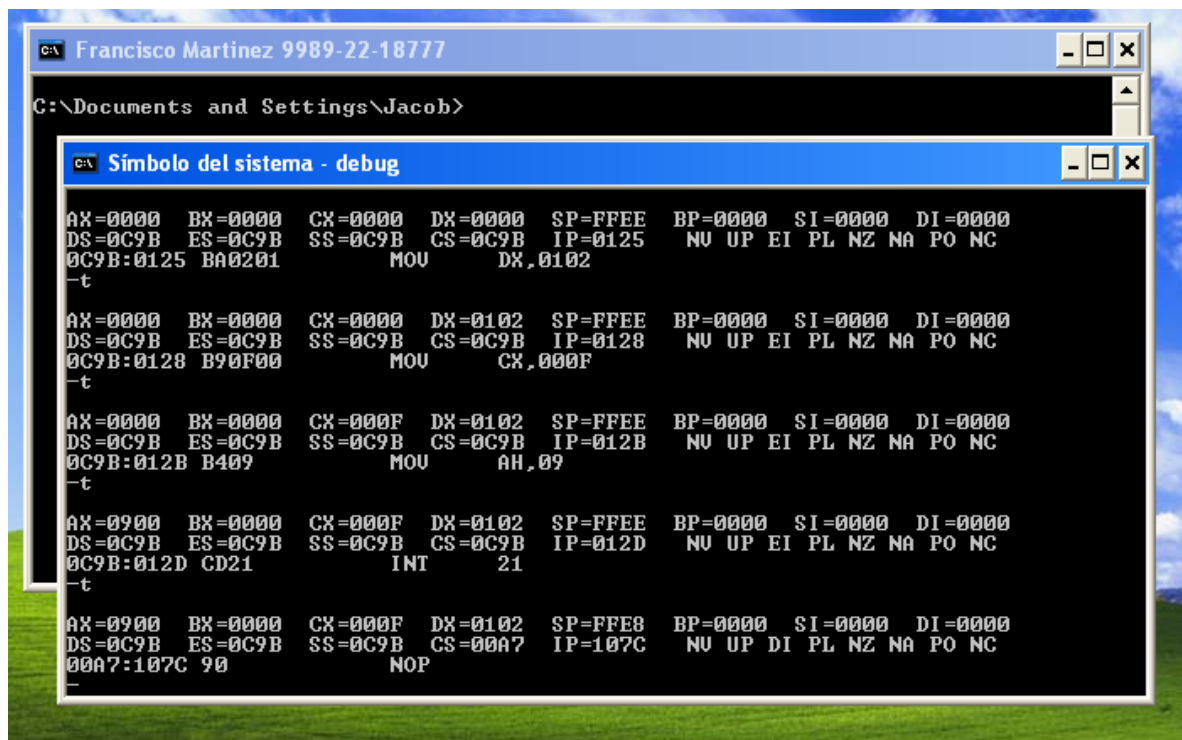


The screenshot shows a Windows XP desktop with a blue sky and green grass background. A command prompt window titled "Francisco Martinez 9989-22-18777" is open, showing the directory "C:\Documents and Settings\Jacob>". Overlaid on this is a debugger window titled "Símbolo del sistema - debug". The debugger window shows the following assembly code:

```
Microsoft Windows XP [Versión 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

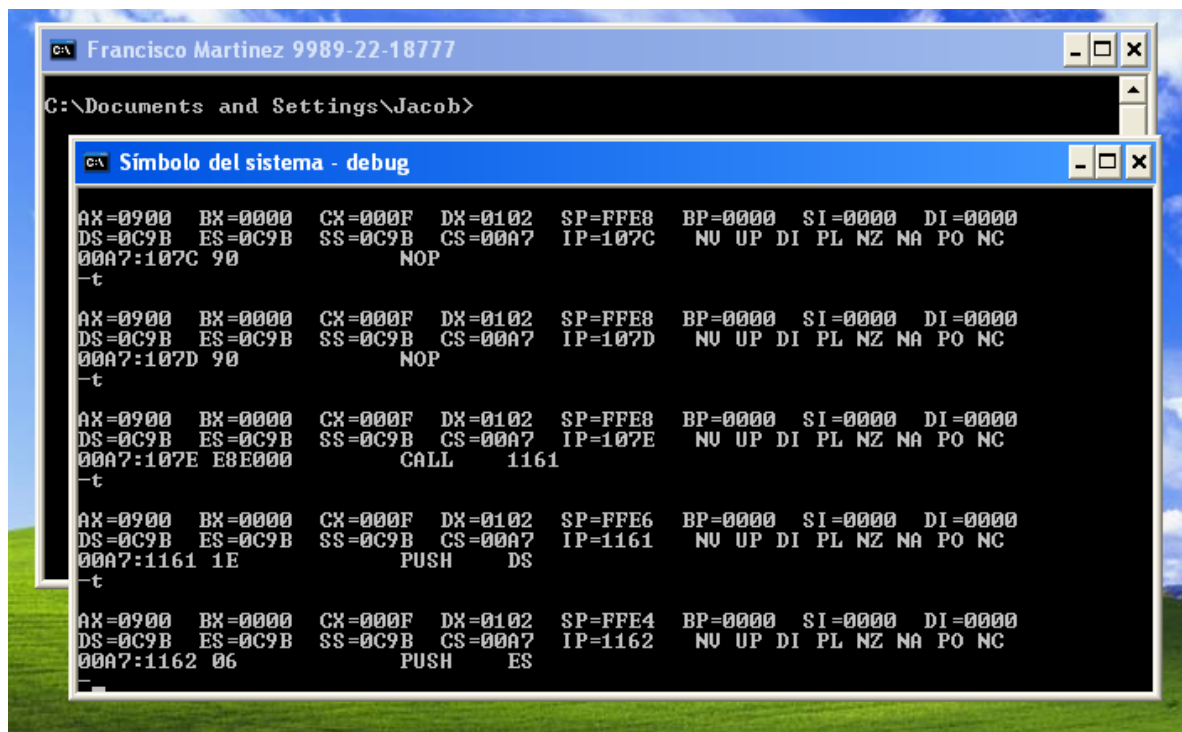
C:\Documents and Settings\Jacob>cd\

C:\>debug
-a100
0C9B:0100 jmp 125
0C9B:0102
-e 102
0C9B:0102 04. F7. 02. 0B. 04. 05. 04. 1F.
0C9B:0108 03. 26. 04. 12. 03. 04.
0C9B:0110 03.
-a125
0C9B:0125 MOV DX, 0102
0C9B:0128 MOV CX, 000F
0C9B:012B MOV AH, 09
0C9B:012D INT 21
0C9B:012F DEC CX
0C9B:0130 JCXZ 0134
0C9B:0132 JMP 012D
0C9B:0134 INT 20
0C9B:0136
-
```



The screenshot shows the same Windows XP desktop as the previous one. The command prompt window is still open, showing the directory "C:\Documents and Settings\Jacob>". The debugger window titled "Símbolo del sistema - debug" is now showing the state of the registers and the execution of the assembly code:

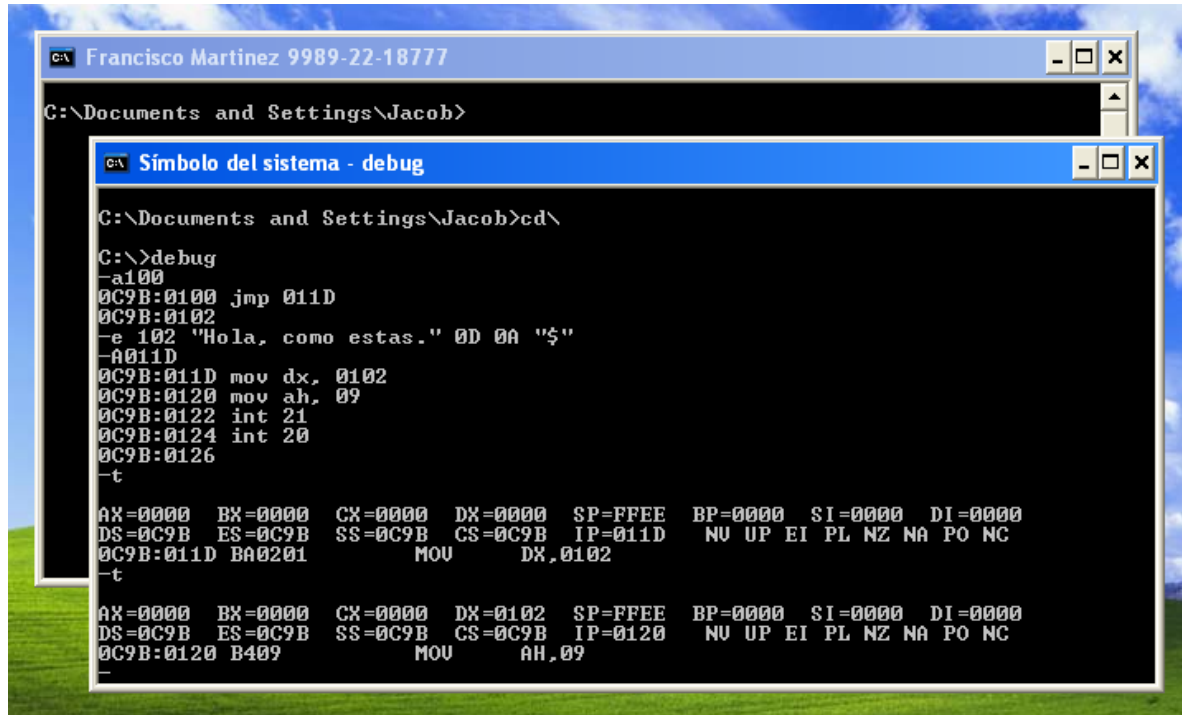
```
AX=0000 BX=0000 CX=0000 DX=0000 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=0125 NU UP EI PL NZ NA PO NC
0C9B:0125 BA0201 MOV DX,0102
-t
AX=0000 BX=0000 CX=0000 DX=0102 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=0128 NU UP EI PL NZ NA PO NC
0C9B:0128 B90F00 MOV CX,000F
-t
AX=0000 BX=0000 CX=000F DX=0102 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=012B NU UP EI PL NZ NA PO NC
0C9B:012B B409 MOV AH,09
-t
AX=0900 BX=0000 CX=000F DX=0102 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=012D NU UP EI PL NZ NA PO NC
0C9B:012D CD21 INT 21
-t
AX=0900 BX=0000 CX=000F DX=0102 SP=FFE8 BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=00A7 IP=107C NU UP DI PL NZ NA PO NC
00A7:107C 90 NOP
-
```



## EJEMPLO 10

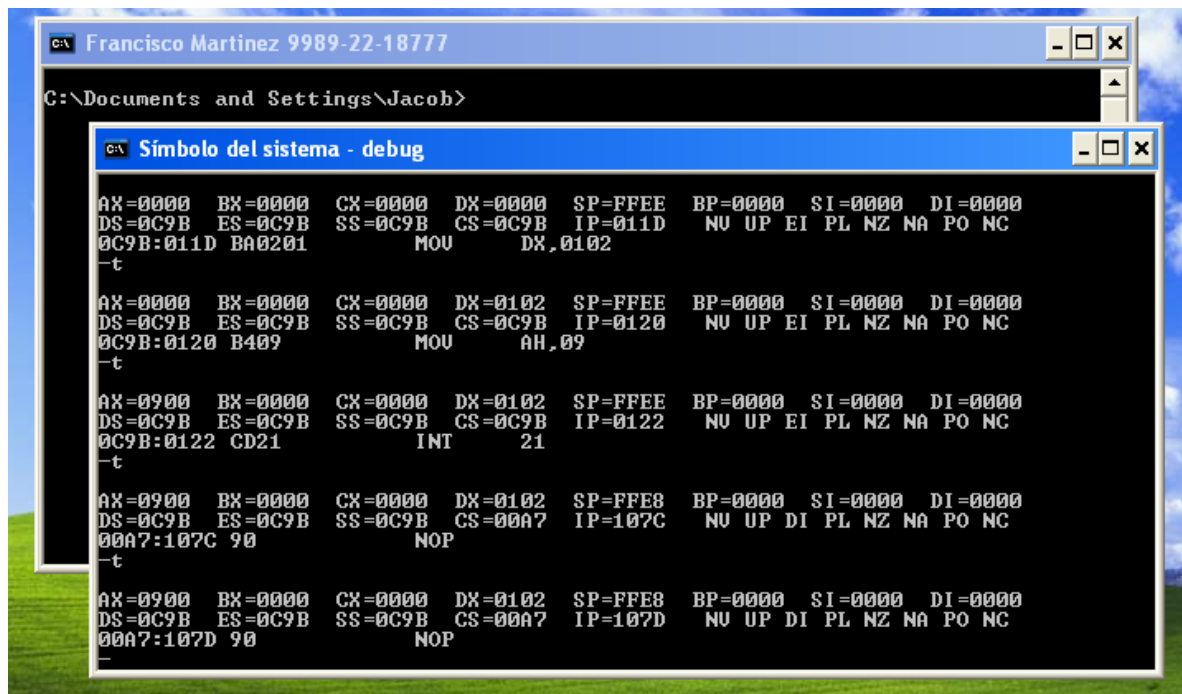
### Interrupciones

#### Pasos:



The screenshot shows a Windows XP desktop with a blue sky background. A command prompt window titled "Francisco Martinez 9989-22-18777" is open, showing the directory "C:\Documents and Settings\Jacob>". Overlaid on this is a debugger window titled "Símbolo del sistema - debug". The debugger window shows the following assembly code and register values:

```
C:\Documents and Settings\Jacob>cd\
C:\>debug
-a100
0C9B:0100 jmp 011D
0C9B:0102
-e 102 "Hola, como estas." 0D 0A "$"
-A011D
0C9B:011D mov dx, 0102
0C9B:0120 mov ah, 09
0C9B:0122 int 21
0C9B:0124 int 20
0C9B:0126
-t
AX=0000 BX=0000 CX=0000 DX=0000 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=011D NU UP EI PL NZ NA PO NC
0C9B:011D BA0201 MOV DX,0102
-t
AX=0000 BX=0000 CX=0000 DX=0102 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=0120 NU UP EI PL NZ NA PO NC
0C9B:0120 B409 MOV AH,09
-
```



The debugger window continues to show the following assembly code and register values:

```
AX=0000 BX=0000 CX=0000 DX=0000 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=011D NU UP EI PL NZ NA PO NC
0C9B:011D BA0201 MOV DX,0102
-t
AX=0000 BX=0000 CX=0000 DX=0102 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=0120 NU UP EI PL NZ NA PO NC
0C9B:0120 B409 MOV AH,09
-t
AX=0900 BX=0000 CX=0000 DX=0102 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=0C9B IP=0122 NU UP EI PL NZ NA PO NC
0C9B:0122 CD21 INT 21
-t
AX=0900 BX=0000 CX=0000 DX=0102 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=00A7 IP=107C NU UP DI PL NZ NA PO NC
00A7:107C 90 NOP
-t
AX=0900 BX=0000 CX=0000 DX=0102 SP=FFEE BP=0000 SI=0000 DI=0000
DS=0C9B ES=0C9B SS=0C9B CS=00A7 IP=107D NU UP DI PL NZ NA PO NC
00A7:107D 90 NOP
-
```

