

1.

```

INCLUDE Irvine32.inc
.data
var1 word 1
var2 word 9

.code
main PROC
    mov ax, var1    ; LINE1
    mov bx, var2    ; LINE2
    xchg ax, bx     ; LINE3
    mov var1, ax    ; LINE4
    mov var2, bx    ; LINE5
    call DumpRegs
    exit
main ENDP
END main
    
```

LINE1:

```

Registers
EAX = 00190001 EBX = 0039A000 ECX = 00401005 EDX = 00401005 ESI = 00401005
EDI = 00401005 EIP = 00401016 ESP = 0019FF74 EBP = 0019FF80 EFL = 00000246

00405002 = 0009
    
```

LINE2:

```

Registers
EAX = 00190001 EBX = 00390009 ECX = 00401005 EDX = 00401005 ESI = 00401005
EDI = 00401005 EIP = 0040101D ESP = 0019FF74 EBP = 0019FF80 EFL = 00000246
    
```

LINE3:

```

Registers
EAX = 00190009 EBX = 00390001 ECX = 00401005 EDX = 00401005 ESI = 00401005
EDI = 00401005 EIP = 0040101F ESP = 0019FF74 EBP = 0019FF80 EFL = 00000246

00405000 = 0001
    
```

LINE4:

Autos			
Name	Value	Type	
ax	0x0009	unsigned short	
bx	0x0001	unsigned short	
var1	0x0009	unsigned short	
var2	0x0009	unsigned short	

LINE5:

Autos			
Name	Value	Type	
bx	0x0001	unsigned short	
var2	0x0001	unsigned short	

2.

```
INCLUDE Irvine32.inc
.data
Rval DWORD ?
Xval DWORD 26
Yval DWORD 30
Zval DWORD 40

.code
main proc
    mov eax, Xval    ; LINE1
    neg eax         ; LINE2
    mov ebx, Yval   ; LINE3
    sub ebx, Zval   ; LINE4
    add eax, ebx    ; LINE5
    inc eax        ; LINE6
    mov Rval, eax  ; LINE7
    exit
main ENDP
END main
```

LINE1:

Registers

EAX = 0000001A EBX = 0021F000 ECX = 00401005 EDX = 00401005 ESI = 00401005  
EDI = 00401005 EIP = 00401015 ESP = 0019FF74 EBP = 0019FF80 EFL = 00000246

Autos

Name	Value	Type
Xval	0x0000001a	unsigned long
eax	0x0000001a	unsigned long

LINE2:

Registers

EAX = FFFFFFFE6 EBX = 0021F000 ECX = 00401005 EDX = 00401005 ESI = 00401005  
EDI = 00401005 EIP = 00401017 ESP = 0019FF74 EBP = 0019FF80 EFL = 00000293

00404008 = 0000001E

LINE3:

Registers

EAX = FFFFFFFE6 EBX = 0000001E ECX = 00401005 EDX = 00401005 ESI = 00401005  
EDI = 00401005 EIP = 0040101D ESP = 0019FF74 EBP = 0019FF80 EFL = 00000293

0040400C = 00000028

Autos

Name	Value	Type
Yval	0x0000001e	unsigned long
Zval	0x00000028	unsigned long
ebx	0x0000001e	unsigned long

LINE4:

Registers		
EAX	=	FFFFFFE6
EBX	=	FFFFFFF6
ECX	=	00401005
EDX	=	00401005
ESI	=	00401005
EDI	=	00401005
EIP	=	00401023
ESP	=	0019FF74
EBP	=	0019FF80
EFL	=	00000287

  

Autos		
Name	Value	Type
Zval	0x00000028	unsigned long
eax	0xffffffe6	unsigned long
ebx	0xffffffff6	unsigned long

LINE5:

Registers		
EAX	=	FFFFFFDC
EBX	=	FFFFFFF6
ECX	=	00401005
EDX	=	00401005
ESI	=	00401005
EDI	=	00401005
EIP	=	00401025
ESP	=	0019FF74
EBP	=	0019FF80
EFL	=	00000283

  

Autos		
Name	Value	Type
eax	0xfffffddc	unsigned long
ebx	0xffffffff6	unsigned long

LINE6:

Registers		
EAX	=	FFFFFFDD
EBX	=	FFFFFFF6
ECX	=	00401005
EDX	=	00401005
ESI	=	00401005
EDI	=	00401005
EIP	=	00401026
ESP	=	0019FF74
EBP	=	0019FF80
EFL	=	00000287

00404000 = 00000000

  

Autos		
Name	Value	Type
Rval	0x00000000	unsigned long
eax	0xfffffdd	unsigned long

LINE7:

Registers		
EAX	=	FFFFFFDD
EBX	=	FFFFFFF6
ECX	=	00401005
EDX	=	00401005
ESI	=	00401005
EDI	=	00401005
EIP	=	0040102B
ESP	=	0019FF74
EBP	=	0019FF80
EFL	=	00000287

  

Autos		
Name	Value	Type
Rval	0xfffffdd	unsigned long
eax	0xfffffdd	unsigned long

3.

```
INCLUDE Irvine32.inc
.data
var1 DWORD 5
var2 DWORD 10
var3 DWORD 20
var4 DWORD ?

.code
main proc
    mov eax, var1      ; LINE1
    mul var2           ; LINE2
    add eax, var3      ; LINE3
    dec eax            ; LINE4
    mov var4, eax      ; LINE5
    exit
main ENDP
END main
```

LINE5:

Autos		
Name	Value	Type
eax	0x00000045	unsigned long
var4	0x00000045	unsigned long

LINE1:

Registers										
EAX =	00000005	EBX = 00328000	ECX = 00401005	EDX = 00401005	ESI = 00401005	EDI = 00401005	EIP = 00401015	ESP = 0019FF74	EBP = 0019FF80	EFL = 00000246
00404004 = 0000000A										
Autos										
Name	Value	Type								
eax	0x00000005	unsigned long								
var1	0x00000005	unsigned long								
var2	0x0000000a	unsigned long								

LINE2:

Registers										
EAX =	00000032	EBX = 00328000	ECX = 00401005	EDX = 00000000	ESI = 00401005	EDI = 00401005	EIP = 0040101B	ESP = 0019FF74	EBP = 0019FF80	EFL = 00000202
00404008 = 00000014										
Autos										
Name	Value	Type								
eax	0x00000032	unsigned long								
var2	0x0000000a	unsigned long								
var3	0x00000014	unsigned long								

LINE3:

Registers										
EAX =	00000046	EBX = 00328000	ECX = 00401005	EDX = 00000000	ESI = 00401005	EDI = 00401005	EIP = 00401021	ESP = 0019FF74	EBP = 0019FF80	EFL = 00000202
Autos										
Name	Value	Type								
eax	0x00000046	unsigned long								
var3	0x00000014	unsigned long								

LINE4:

Registers										
EAX =	00000045	EBX = 00328000	ECX = 00401005	EDX = 00000000	ESI = 00401005	EDI = 00401005	EIP = 00401022	ESP = 0019FF74	EBP = 0019FF80	EFL = 00000202
0040400C = 00000000										

4.

```
INCLUDE Irvine32.inc
.data
var1 WORD 40
var2 WORD 10
var4 WORD ?
.code
main proc
    mov ax, var1    ; LINE1
    mov bx, 5      ; LINE2
    mul bx         ; LINE3
    mov bx, var2   ; LINE4
    sub bx, 3      ; LINE5
    div bx         ; LINE6
    mov var4, ax   ; LINE7
    exit
main ENDP
END main
```

LINE1:

Registers  
EAX = 00190028 EBX = 002CB000 ECX = 00401005 EDX = 00401005 ESI = 00401005  
EDI = 00401005 EIP = 00401016 ESP = 0019FF74 EBP = 0019FF80 EFL = 00000246

Autos

Name	Value	Type
ax	0x0028	unsigned short
bx	0xb000	unsigned short
var1	0x0028	unsigned short

LINE2:

Registers  
EAX = 00190028 EBX = 002C0005 ECX = 00401005 EDX = 00401005 ESI = 00401005  
EDI = 00401005 EIP = 0040101A ESP = 0019FF74 EBP = 0019FF80 EFL = 00000246

Autos

Name	Value	Type
bx	0x0005	unsigned short

LINE3:

Registers  
EAX = 001900C8 EBX = 002C0005 ECX = 00401005 EDX = 00400000 ESI = 00401005  
EDI = 00401005 EIP = 0040101D ESP = 0019FF74 EBP = 0019FF80 EFL = 00000202

00404002 = 000A

Autos

Name	Value	Type
bx	0x0005	unsigned short
var2	0x000a	unsigned short

LINE4:

Registers  
EAX = 001900C8 EBX = 002C000A ECX = 00401005 EDX = 00400000 ESI = 00401005  
EDI = 00401005 EIP = 00401024 ESP = 0019FF74 EBP = 0019FF80 EFL = 00000202

Autos

Name	Value	Type
bx	0x000a	unsigned short
var2	0x000a	unsigned short

LINE5:

Registers				
EAX = 001900C8	EBX = 002C0007	ECX = 00401005	EDX = 00400000	ESI = 00401005
EDI = 00401005	EIP = 00401028	ESP = 0019FF74	EBP = 0019FF80	EFL = 00000202

  

Autos		
Name	Value	Type
bx	0x0007	unsigned short

LINE6:

Registers				
EAX = 0019001C	EBX = 002C0007	ECX = 00401005	EDX = 00400004	ESI = 00401005
EDI = 00401005	EIP = 0040102B	ESP = 0019FF74	EBP = 0019FF80	EFL = 00000202

  

00404004 = 0000

Autos		
Name	Value	Type
ax	0x001c	unsigned short
bx	0x0007	unsigned short
var4	0x0000	unsigned short

LINE7:

Autos		
Name	Value	Type
ax	0x001c	unsigned short
var4	0x001c	unsigned short

5.

```
INCLUDE Irvine32.inc
.data
    var1 WORD 40
    var2 WORD 10
    var4 WORD ?
.code
main proc
    mov eax, 10h    ;LINE1
    mov ebx, 20h    ;LINE2
    mov ecx, 2h     ;LINE3
    mov edx, 0h     ;LINE4
    mul bx          ;LINE5
    exit
main ENDP
END main
```

Changing LINE 5 to trace the output.

i. a. LINE5:mul bx

```
Registers
EAX = 00000200 EBX = 00000020 ECX = 00000002 EDX = 00000000 ESI = 00401005
EDI = 00401005 EIP = 00401027 ESP = 0019FF74 EBP = 0019FF80 EFL = 00000206
```

b. LINE5:mul cx

```
Registers
EAX = 00000020 EBX = 00000020 ECX = 00000002 EDX = 00000000 ESI = 00401005
EDI = 00401005 EIP = 00401027 ESP = 0019FF74 EBP = 0019FF80 EFL = 00000202
```

c. LINE5:mul ax

```
Registers
EAX = 00000100 EBX = 00000020 ECX = 00000002 EDX = 00000000 ESI = 00401005
EDI = 00401005 EIP = 00401027 ESP = 0019FF74 EBP = 0019FF80 EFL = 00000206
```

d. LINE5:div bx

```
Registers
EAX = 00000000 EBX = 00000020 ECX = 00000002 EDX = 00000010 ESI = 00401005
EDI = 00401005 EIP = 00401027 ESP = 0019FF74 EBP = 0019FF80 EFL = 00000246
```

e. LINE5:div cx

```
Registers
EAX = 00000008 EBX = 00000020 ECX = 00000002 EDX = 00000000 ESI = 00401005
EDI = 00401005 EIP = 00401027 ESP = 0019FF74 EBP = 0019FF80 EFL = 00000246
```

f. LINE5:div ax

```
Registers
EAX = 00000001 EBX = 00000020 ECX = 00000002 EDX = 00000000 ESI = 00401005
EDI = 00401005 EIP = 00401027 ESP = 0019FF74 EBP = 0019FF80 EFL = 00000246
```

5. Changing LINE 5 to trace the output.

ii. a. LINE5:mul ebx

```
Registers  
EAX = 00000200 EBX = 00000020 ECX = 00000002 EDX = 00000000 ESI = 00401005  
EDI = 00401005 EIP = 00401026 ESP = 0019FF74 EBP = 0019FF80 EFL = 00000206
```

b. LINE5:mul ecx

```
Registers  
EAX = 00000020 EBX = 00000020 ECX = 00000002 EDX = 00000000 ESI = 00401005  
EDI = 00401005 EIP = 00401026 ESP = 0019FF74 EBP = 0019FF80 EFL = 00000202
```

c. LINE5:mul eax

```
Registers  
EAX = 00000100 EBX = 00000020 ECX = 00000002 EDX = 00000000 ESI = 00401005  
EDI = 00401005 EIP = 00401026 ESP = 0019FF74 EBP = 0019FF80 EFL = 00000206
```

d. LINE5:div ebx

```
Registers  
EAX = 00000000 EBX = 00000020 ECX = 00000002 EDX = 00000010 ESI = 00401005  
EDI = 00401005 EIP = 00401026 ESP = 0019FF74 EBP = 0019FF80 EFL = 00000246
```

e. LINE5:div ecx

```
Registers  
EAX = 00000008 EBX = 00000020 ECX = 00000002 EDX = 00000000 ESI = 00401005  
EDI = 00401005 EIP = 00401026 ESP = 0019FF74 EBP = 0019FF80 EFL = 00000246
```

f. LINE5:div eax

```
Registers  
EAX = 00000001 EBX = 00000020 ECX = 00000002 EDX = 00000000 ESI = 00401005  
EDI = 00401005 EIP = 00401026 ESP = 0019FF74 EBP = 0019FF80 EFL = 00000246
```