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Subject: Computer Organization And Assembly
Language

Lab Report: 4

Submitted To Respected Sir: Usman Abbasi

Introduction:

We are going to write a few codes today just like we've written in the previous 2 reports.

The codes which we are going to write today are as follow:

Today's Code:

1: Simple Addition

2: SWAP

3: LOOP

So first of all we'll create .asm file with the code written in them and setup the dosbox. Here is the short preview of setting up the dosbox.

Setting UP Dos-Box:

Mounting the drive.

```
Z:\>SET BLASTER=A220 I7 D1 H5 T6

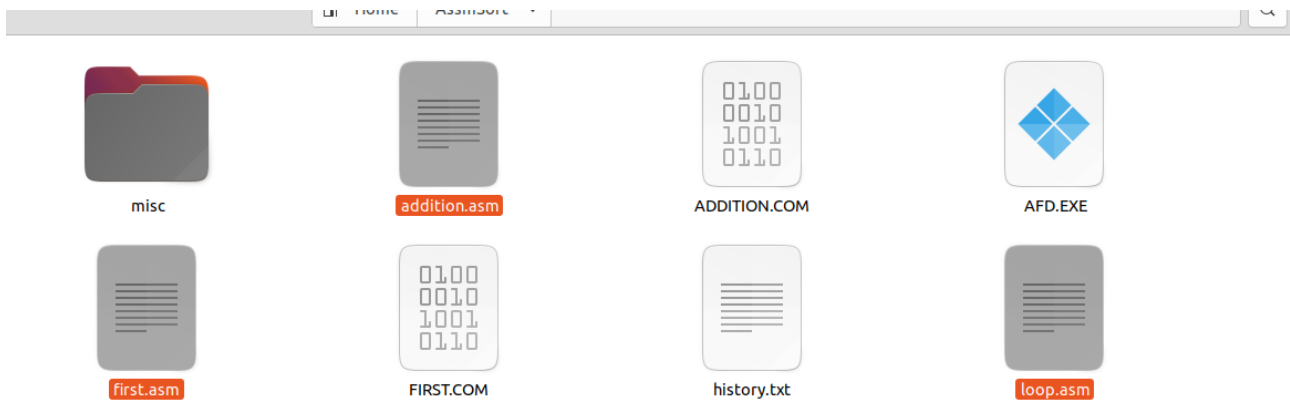
Z:\>mount x ~/AssmSoft
Drive X is mounted as local directory /home/divine/AssmSoft/

Z:\>_
```

Now we write x:,

```
Z:\>x:
X:\>
```

Now we'll create 3 files and write the code of each program of assembly language in the respective files and save them with the extension .asm



Now we will assemble these files in the dosbox.

```
X:\>nasm addition.asm -o addition.com
nasm: fatal: unable to open input file 'addition.asm'

X:\>nasm addition.asm -o addition.com

X:\>nasm swap.asm -o swap.com

X:\>nasm loop.asm -o loop.com

X:\>
```

As you can see three compiled files are created.



Now we will look at the code of each program separately,

1: Addition:

We will have the simplest code of additon at the start here is the code.

Code:

```
[org 0x010000]
mov ax, 5
mov bx, 10
add bx, ax
```

mov ax, 0x4c00

int 0x21

Execution:

The execution of addition program in dosbox is as follow:

CMD >				1															
				DS:0000 CD 20 FF 9F 00 EA F0 FE															
				DS:0008 AD DE 1B 05 C5 06 00 00															
0100 B80500 MOV AX,0005				DS:0010 18 01 10 01 18 01 92 01															
0103 B80A00 MOV BX,000A				DS:0018 01 01 01 00 02 FF FF FF															
0106 01C3 ADD BX,AX				DS:0020 FF FF FF FF FF FF FF FF															
0108 B8004C MOV AX,4C00				DS:0028 FF FF FF FF EB 19 C0 11															
010B CD21 INT 21				DS:0030 A2 01 14 00 18 00 F5 19															
010D C3 RET				DS:0038 FF FF FF FF 00 00 00 00															
010E 89D0 MOV AX,DX				DS:0040 05 00 00 00 00 00 00 00															
0110 89DA MOV DX,BX				DS:0048 00 00 00 00 00 00 00 00															
2				0 1 2 3 4 5 6 7 8 9 A B C D E F															
DS:0000				CD 20 FF 9F 00 EA F0 FE AD DE 1B 05 C5 06 00 00															
DS:0010				18 01 10 01 18 01 92 01 01 01 01 00 02 FF FF FF															
DS:0020				FF FF FF FF FF FF FF FF FF FF FF FF EB 19 C0 11															
DS:0030				A2 01 14 00 18 00 F5 19 FF FF FF FF 00 00 00 00															
DS:0040				05 00 00 00 00 00 00 00 00 00 00 00 00 00 00															
				= f.Ω≡■ ÷|..†... .....ff. δ.L. ó.....J.															

CMD >				1															
				DS:0000 CD 20 FF 9F 00 EA F0 FE															
				DS:0008 AD DE 1B 05 C5 06 00 00															
0100 B80500 MOV AX,0005				DS:0010 18 01 10 01 18 01 92 01															
0103 B80A00 MOV BX,000A				DS:0018 01 01 01 00 02 FF FF FF															
0106 01C3 ADD BX,AX				DS:0020 FF FF FF FF FF FF FF FF															
0108 B8004C MOV AX,4C00				DS:0028 FF FF FF FF EB 19 C0 11															
010B CD21 INT 21				DS:0030 A2 01 14 00 18 00 F5 19															
010D C3 RET				DS:0038 FF FF FF FF 00 00 00 00															
010E 89D0 MOV AX,DX				DS:0040 05 00 00 00 00 00 00 00															
0110 89DA MOV DX,BX				DS:0048 00 00 00 00 00 00 00 00															
0112 EB04 JMP 0118																			
2				0 1 2 3 4 5 6 7 8 9 A B C D E F															
DS:0000				CD 20 FF 9F 00 EA F0 FE AD DE 1B 05 C5 06 00 00															
DS:0010				18 01 10 01 18 01 92 01 01 01 01 00 02 FF FF FF															
DS:0020				FF FF FF FF FF FF FF FF FF FF FF FF EB 19 C0 11															
DS:0030				A2 01 14 00 18 00 F5 19 FF FF FF FF 00 00 00 00															
DS:0040				05 00 00 00 00 00 00 00 00 00 00 00 00 00															
				= f.Ω≡■ ÷|..†... .....ff. δ.L. ó.....J.															
1 Step				2ProcStep				3Retrieve				4Help ON				5BRK Menu			
6				7 up				8 dn				9 le				10 ri			

AX	4C00	SI	0000	CS	F000	IP	14A0	Stack	+0 42BD	Flags	7004							
BX	000F	DI	0000	DS	19F5				+2 06C5									
CX	000D	BP	0000	ES	19F5	HS	19F5		+4 7004	OF	DF	IF	SF	ZF	AF	PF	CF	
DX	0000	SP	FFF2	SS	19F5	FS	19F5		+6 010D	0	0	0	0	0	0	1	0	

[illegible][illegible][illegible]

[illegible]

AX 0000	SI 0000	CS 19F5	IP 0100	Stack +0 0000	Flags 7202																		
BX 0000	DI 0000	DS 19F5		+2 20CD																			
CX 0000	BP 0000	ES 19F5	HS 19F5	+4 9FFF	OF DF IF SF ZF AF PF CF																		
DX 0000	SP FFFE	SS 19F5	FS 19F5	+6 EA00	0 0 1 0 0 0 0 0																		
CMD >				1												0 1 2 3 4 5 6 7							
> Program terminated OK				DS:0000												CD 20 FF 9F 00 EA FF FF							
				DS:0008												AD DE 1B 05 C5 06 00 00							
0100 B80500				MOV		AX,0005		DS:0010												18 01 10 01 18 01 92 01			
0103 BB0A00				MOV		BX,000A		DS:0018												01 01 01 00 02 FF FF FF			
0106 01C3				ADD		BX,AX		DS:0020												FF FF FF FF FF FF FF FF			
0108 B8004C				MOV		AX,4C00		DS:0028												FF FF FF FF EB 19 E4 11			
010B CD21				INT		21		DS:0030												A2 01 14 00 18 00 F5 19			
010D C3				RET				DS:0038												FF FF FF FF 00 00 00 00			
010E 89D0				MOV		AX,DX		DS:0040												05 00 00 00 00 00 00 00			
0110 89DA				MOV		DX,BX		DS:0048												00 00 00 00 00 00 00 00			
2				0 1 2 3 4 5 6 7				8 9 A B C D E F															
DS:0000				CD 20 FF 9F 00 EA FF FF				AD DE 1B 05 C5 06 00 00				= f.Ω i |.+....											
DS:0010				18 01 10 01 18 01 92 01				01 01 01 00 02 FF FF FF				.....f.											
DS:0020				FF FF FF FF FF FF FF FF				FF FF FF FF EB 19 E4 11				δ.Σ.											
DS:0030				A2 01 14 00 18 00 F5 19				FF FF FF FF 00 00 00 00				ó.....J.											
DS:0040				05 00 00 00 00 00 00 00				00 00 00 00 00 00 00 00				..... .....										

2: SWAP:

Here will swap the two variables by using the simple concept of using the third variable.

Have a look on the code of Swapping.

Code:

```
[org 0x010000]
mov ax, 5
mov bx, 10
mov cx, ax
mov ax, bx
mov bx, cx
mov ax, 0x4c00
int 0x21
```

Execution Of Swapping:

Have a look on the execution of swapping code.

DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Program: AFD -

AX 0000	SI 0000	CS 19F5	IP 0100	Stack +0 0000	Flags 7202
BX 0000	DI 0000	DS 19F5		+2 20CD	
CX 0011	BP 0000	ES 19F5	HS 19F5	+4 9FFF	OF DF IF SF ZF AF PF CF
DX 0000	SP FFFE	SS 19F5	FS 19F5	+6 EA00	0 0 1 0 0 0 0 0

CMD >				1							
				DS:0000 CD 20 FF 9F 00 EA F0 FE							
				DS:0008 AD DE 1B 05 C5 06 00 00							
				DS:0010 18 01 10 01 18 01 92 01							
				DS:0018 01 01 01 00 FF 00 01 FF							
				DS:0020 FF FF FF FF FF FF FF FF							
				DS:0028 FF FF FF FF EB 19 C0 11							
				DS:0030 A2 01 14 00 18 00 F5 19							
				DS:0038 FF FF FF FF 00 00 00 00							
				DS:0040 05 00 00 00 00 00 00 00							
				DS:0048 00 00 00 00 00 00 00 00							

2				0 1 2 3 4 5 6 7 8 9 A B C D E F																= f.Ω≡ ■ ÷ | . + ... .....ft. δ. L. ó.....J.
DS:0000				CD 20 FF 9F 00 EA F0 FE AD DE 1B 05 C5 06 00 00																
DS:0010				18 01 10 01 18 01 92 01 01 01 01 00 FF 00 01 FF																
DS:0020				FF FF FF FF FF FF FF FF FF FF FF FF EB 19 C0 11																
DS:0030				A2 01 14 00 18 00 F5 19 FF FF FF FF 00 00 00 00																
DS:0040				05 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00																

1 Step 2ProcStep 3Retrieve 4Help ON 5BRK Menu 6 7 up 8 dn 9 le 10 ri

DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Program: AFD

AX 0005	SI 0000	CS 19F5	IP 0103	Stack +0 0000	Flags 7200
BX 0000	DI 0000	DS 19F5		+2 20CD	
CX 0011	BP 0000	ES 19F5	HS 19F5	+4 9FFF	OF DF IF SF ZF AF PF CF
DX 0000	SP FFFE	SS 19F5	FS 19F5	+6 EA00	0 0 1 0 0 0 0 0

CMD >

0100 B80500	MOV	AX,0005
0103 BB0A00	MOV	BX,000A
0106 89C1	MOV	CX,AX
0108 89D8	MOV	AX,BX
010A 89CB	MOV	BX,CX
010C B8004C	MOV	AX,4C00
010F CD21	INT	21
0111 DAEB	ESC	15,BL
0113 0431	ADD	AL,31

1	0	1	2	3	4	5	6	7
DS:0000	CD	20	FF	9F	00	EA	F0	FE
DS:0008	AD	DE	1B	05	C5	06	00	00
DS:0010	18	01	10	01	18	01	92	01
DS:0018	01	01	01	00	FF	00	01	FF
DS:0020	FF	FF	FF	FF	FF	FF	FF	FF
DS:0028	FF	FF	FF	FF	EB	19	C0	11
DS:0030	A2	01	14	00	18	00	F5	19
DS:0038	FF	FF	FF	FF	00	00	00	00
DS:0040	05	00	00	00	00	00	00	00
DS:0048	00	00	00	00	00	00	00	00

2	0	1	2	3	4	5	6	7
DS:0000	CD	20	FF	9F	00	EA	F0	FE
DS:0010	18	01	10	01	18	01	92	01
DS:0020	FF	FF	FF	FF	FF	FF	FF	FF
DS:0030	A2	01	14	00	18	00	F5	19
DS:0040	05	00	00	00	00	00	00	00

= f.Ω■ ÷|..†...

.....ff.

δ.L.

ó.....J.

.....

DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Program: AFD

AX 0005	SI 0000	CS 19F5	IP 0106	Stack +0 0000	Flags 7200
BX 000A	DI 0000	DS 19F5		+2 20CD	
CX 0011	BP 0000	ES 19F5	HS 19F5	+4 9FFF	OF DF IF SF ZF AF PF CF
DX 0000	SP FFFE	SS 19F5	FS 19F5	+6 EA00	0 0 1 0 0 0 0 0

CMD >

0103 BB0A00	MOV	BX,000A
0106 89C1	MOV	CX,AX
0108 89D8	MOV	AX,BX
010A 89CB	MOV	BX,CX
010C B8004C	MOV	AX,4C00
010F CD21	INT	21
0111 DAEB	ESC	15,BL
0113 0431	ADD	AL,31
0115 D2	DB	D2

1	0	1	2	3	4	5	6	7
DS:0000	CD	20	FF	9F	00	EA	F0	FE
DS:0008	AD	DE	1B	05	C5	06	00	00
DS:0010	18	01	10	01	18	01	92	01
DS:0018	01	01	01	00	FF	00	01	FF
DS:0020	FF	FF	FF	FF	FF	FF	FF	FF
DS:0028	FF	FF	FF	FF	EB	19	C0	11
DS:0030	A2	01	14	00	18	00	F5	19
DS:0038	FF	FF	FF	FF	00	00	00	00
DS:0040	05	00	00	00	00	00	00	00
DS:0048	00	00	00	00	00	00	00	00

2	0	1	2	3	4	5	6	7
DS:0000	CD	20	FF	9F	00	EA	F0	FE
DS:0010	18	01	10	01	18	01	92	01
DS:0020	FF	FF	FF	FF	FF	FF	FF	FF
DS:0030	A2	01	14	00	18	00	F5	19
DS:0040	05	00	00	00	00	00	00	00

= f.Ω■ ÷|..†...

.....ff.

δ.L.

ó.....J.

.....

1 Step 2ProcStep 3Retrieve 4Help ON 5BRK Menu 6 7 up 8 dn 9 le 10 ri

```

AX 0005 SI 0000 CS 19F5 IP 0108 Stack +0 0000 Flags 7200
BX 000A DI 0000 DS 19F5          +2 20CD
CX 0005 BP 0000 ES 19F5 HS 19F5   +4 9FFF OF DF IF SF ZF AF PF CF
DX 0000 SP FFFE SS 19F5 FS 19F5   +6 EA00  0 0 1 0 0 0 0 0

```

CMD >

```

0106 89C1      MOV    CX,AX
0108 89D8      MOV    AX,BX
010A 89CB      MOV    BX,CX
010C B8004C    MOV    AX,4C00
010F CD21      INT     21
0111 DAEB      ESC     15,BL
0113 0431      ADD     AL,31
0115 D2        DB      D2
0116 31C0      XOR     AX,AX

```

```

1      0 1 2 3 4 5 6 7
DS:0000 CD 20 FF 9F 00 EA F0 FE
DS:0008 AD DE 1B 05 C5 06 00 00
DS:0010 18 01 10 01 18 01 92 01
DS:0018 01 01 01 00 FF 00 01 FF
DS:0020 FF FF FF FF FF FF FF FF
DS:0028 FF FF FF FF EB 19 C0 11
DS:0030 A2 01 14 00 18 00 F5 19
DS:0038 FF FF FF FF 00 00 00 00
DS:0040 05 00 00 00 00 00 00 00
DS:0048 00 00 00 00 00 00 00 00

```

```

2      0 1 2 3 4 5 6 7 8 9 A B C D E F
DS:0000 CD 20 FF 9F 00 EA F0 FE AD DE 1B 05 C5 06 00 00
DS:0010 18 01 10 01 18 01 92 01 01 01 01 00 FF 00 01 FF
DS:0020 FF FF FF FF FF FF FF FF FF FF FF FF EB 19 C0 11
DS:0030 A2 01 14 00 18 00 F5 19 FF FF FF FF 00 00 00 00
DS:0040 05 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

```

```

= f.Ω≡  i | . . † . . .
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δ. L.
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.....

```

```

1 Step 2ProcStep 3Retrieve 4Help ON 5RRK Menu 6 7 un 8 dn 9 le 10 ri

```

```

AX 000A SI 0000 CS 19F5 IP 010A Stack +0 0000 Flags 7200
BX 000A DI 0000 DS 19F5          +2 20CD
CX 0005 BP 0000 ES 19F5 HS 19F5   +4 9FFF OF DF IF SF ZF AF PF CF
DX 0000 SP FFFE SS 19F5 FS 19F5   +6 EA00  0 0 1 0 0 0 0 0

```

CMD >

```

0108 89D8      MOV    AX,BX
010A 89CB      MOV    BX,CX
010C B8004C    MOV    AX,4C00
010F CD21      INT     21
0111 DAEB      ESC     15,BL
0113 0431      ADD     AL,31
0115 D2        DB      D2
0116 31C0      XOR     AX,AX
0118 8956E4    MOV    [BP-1C],DX

```

```

1      0 1 2 3 4 5 6 7
DS:0000 CD 20 FF 9F 00 EA F0 FE
DS:0008 AD DE 1B 05 C5 06 00 00
DS:0010 18 01 10 01 18 01 92 01
DS:0018 01 01 01 00 FF 00 01 FF
DS:0020 FF FF FF FF FF FF FF FF
DS:0028 FF FF FF FF EB 19 C0 11
DS:0030 A2 01 14 00 18 00 F5 19
DS:0038 FF FF FF FF 00 00 00 00
DS:0040 05 00 00 00 00 00 00 00
DS:0048 00 00 00 00 00 00 00 00

```

```

2      0 1 2 3 4 5 6 7 8 9 A B C D E F
DS:0000 CD 20 FF 9F 00 EA F0 FE AD DE 1B 05 C5 06 00 00
DS:0010 18 01 10 01 18 01 92 01 01 01 01 00 FF 00 01 FF
DS:0020 FF FF FF FF FF FF FF FF FF FF FF FF EB 19 C0 11
DS:0030 A2 01 14 00 18 00 F5 19 FF FF FF FF 00 00 00 00
DS:0040 05 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

```

```

= f.Ω≡  i | . . † . . .
.....ff. ....
δ. L.
ó.....J. ....
.....

```

[illegible]

CPU				Stack				Flags									
AX	4C00	SI	0000	CS	19F5	IP	010F	+0	0000	7200							
BX	0005	DI	0000	DS	19F5			+2	20CD								
CX	0005	BP	0000	ES	19F5	HS	19F5	+4	9FFF	OF	DF	IF	SF	ZF	AF	PF	CF
DX	0000	SP	FFFE	SS	19F5	FS	19F5	+6	EAO0	0	0	1	0	0	0	0	0

CMD >				1															
				DS:0000 CD 20 FF 9F 00 EA F0 FE															
				DS:0008 AD DE 1B 05 C5 06 00 00															
010C B8004C MOV AX,4C00				DS:0010 18 01 10 01 18 01 92 01															
010F CD21 INT 21				DS:0018 01 01 01 00 FF 00 01 FF															
0111 DAEB ESC 15,BL				DS:0020 FF FF FF FF FF FF FF FF															
0113 0431 ADD AL,31				DS:0028 FF FF FF FF EB 19 C0 11															
0115 D2 DB D2				DS:0030 A2 01 14 00 18 00 F5 19															
0116 31C0 XOR AX,AX				DS:0038 FF FF FF FF 00 00 00 00															
0118 8956E4 MOV [BP-1C],DX				DS:0040 05 00 00 00 00 00 00 00															
011B 8946E6 MOV [BP-1A],AX				DS:0048 00 00 00 00 00 00 00 00															
011E C746F60000 MOV [BP-0A],0000																			

2																	
DS:0000	CD	20	FF	9F	00	EA	F0	FE	AD	DE	1B	05	C5	06	00	00	= f.Ω■ i | . + ...
DS:0010	18	01	10	01	18	01	92	01	01	01	01	00	FF	00	01	FF	.....ff.
DS:0020	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	EB	19	C0	11	δ.L.
DS:0030	A2	01	14	00	18	00	F5	19	FF	FF	FF	FF	00	00	00	00	ó.....J.
DS:0040	05	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....

```

DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Program: AFD -
AX 0000 SI 0000 CS 19F5 IP 0100 Stack +0 0000 Flags 7202
BX 0000 DI 0000 DS 19F5 +2 20CD
CX 0000 BP 0000 ES 19F5 HS 19F5 +4 9FFF OF DF IF SF ZF AF PF CF
DX 0000 SP FFFE SS 19F5 FS 19F5 +6 EA00 0 0 1 0 0 0 0 0

CMD >
> Program terminated OK
0100 B80500 MOV AX,0005
0103 BB0A00 MOV BX,000A
0106 89C1 MOV CX,AX
0108 89D8 MOV AX,BX
010A 89CB MOV BX,CX
010C B8004C MOV AX,4C00
010F CD21 INT 21
0111 DAEB ESC 15,BL

1 0 1 2 3 4 5 6 7
DS:0000 CD 20 FF 9F 00 EA FF FF
DS:0008 AD DE 1B 05 C5 06 00 00
DS:0010 18 01 10 01 18 01 92 01
DS:0018 01 01 01 00 FF 00 01 FF
DS:0020 FF FF FF FF FF FF FF FF
DS:0028 FF FF FF FF EB 19 E4 11
DS:0030 A2 01 14 00 18 00 F5 19
DS:0038 FF FF FF FF 00 00 00 00
DS:0040 05 00 00 00 00 00 00 00
DS:0048 00 00 00 00 00 00 00 00

2 0 1 2 3 4 5 6 7 8 9 A B C D E F
DS:0000 CD 20 FF 9F 00 EA FF FF AD DE 1B 05 C5 06 00 00 = f.Ω i|.†...
DS:0010 18 01 10 01 18 01 92 01 01 01 01 00 FF 00 01 FF .....f. ....
DS:0020 FF FF FF FF FF FF FF FF FF FF FF FF EB 19 E4 11 δ.Σ.
DS:0030 A2 01 14 00 18 00 F5 19 FF FF FF FF 00 00 00 00 ó.....J. ....
DS:0040 05 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....

```

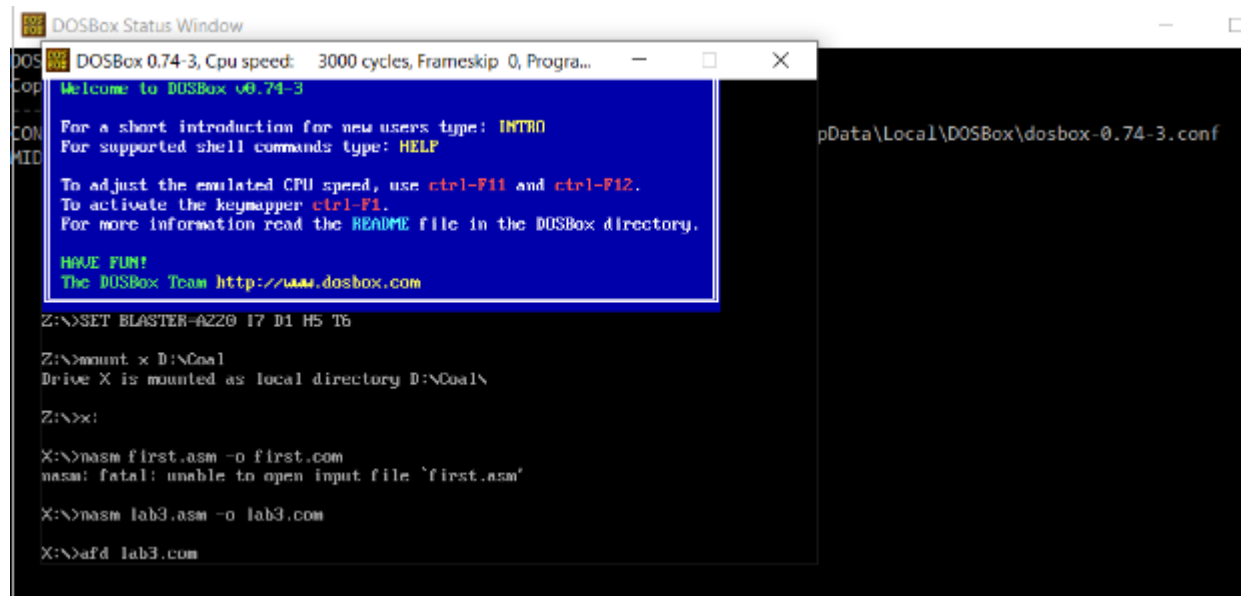
Square of six by adding six to the accumulator six times:

Code:

Have a look on a code:

```
[org 0x0100] ;  
mov ax, 6 ;  
add ax, 6 ;  
add ax, 6 ;  
add ax, 6 ;  
add ax, 6 ;  
add ax, 6 ;  
mov ax, 0x4c00 ;  
int 0x21 ; interept
```

Execution:



The screenshot shows the DOSBox 0.74-3 interface. A command prompt window is open, displaying the following commands and output:

```
Z:\>SET BLASTER=A220 I7 D1 H5 T6  
  
Z:\>mount x D:\Coal  
Drive X is mounted as local directory D:\Coal\  
  
Z:\>x:  
  
X:\>nasm first.asm -o first.com  
nasm: fatal: unable to open input file 'first.asm'  
  
X:\>nasm lab3.asm -o lab3.com  
  
X:\>afd lab3.com
```

A blue dialog box titled "DOSBox Status Window" is overlaid on the command prompt, displaying the following text:

```
Welcome to DOSBox v0.74-3  
  
For a short introduction for new users type: INTRO  
For supported shell commands type: HELP  
  
To adjust the emulated CPU speed, use ctrl-F11 and ctrl-F12.  
To activate the keymapper ctrl-F1.  
For more information read the README file in the DOSBox directory.  
  
HAVE FUN!  
The DOSBox Team http://www.dosbox.com
```

The background of the DOSBox window shows the file path `pData\Local\DOSBox\dosbox-0.74-3.conf`.

AX 4C00	SI 0000	CS 19F5	IP 0115	Stack +0 0000	Flags 7214
BX 0000	DI 0000	DS 19F5		+2 20CD	
CX 0017	BP 0000	ES 19F5	HS 19F5	+4 9FFF	OF DF IF SF ZF AF PF CF
DX 0000	SP FFFE	SS 19F5	FS 19F5	+6 EA00	0 0 1 0 0 1 1 0
CMD >				1	0 1 2 3 4 5 6 7
0112 B8004C	MOV	AX,4C00	DS:0000	CD 20 FF 9F 00 EA F0 FE	
0115 CD21	INT	21	DS:0008	AD DE 1B 05 C5 06 00 00	
0117 C08956E489	ROR	B/[E456+BX+DI],89	DS:0010	18 01 10 01 18 01 92 01	
011C 46	INC	SI	DS:0018	01 01 01 00 02 FF FF FF	
011D E6C7	OUT	[C7],AL	DS:0020	FF FF FF FF FF FF FF FF	
011F 46	INC	SI	DS:0028	FF FF FF FF EB 19 C0 11	
0120 F60000	TEST	[BX+SI],00	DS:0030	A2 01 14 00 18 00 F5 19	
0123 8B46F6	MOV	AX,[BP-0A]	DS:0038	FF FF FF FF 00 00 00 00	
0126 D1E0	SHL	AX,1	DS:0040	05 00 00 00 00 00 00 00	
			DS:0048	00 00 00 00 00 00 00 00	
2	0 1 2 3 4 5 6 7	8 9 A B C D E F			
DS:0000	CD 20 FF 9F 00 EA F0 FE	AD DE 1B 05 C5 06 00 00	= f.Ω≡■ ÷|..†...		
DS:0010	18 01 10 01 18 01 92 01	01 01 01 00 02 FF FF FF	.....ff.		
DS:0020	FF FF FF FF FF FF FF FF	FF FF FF FF EB 19 C0 11	δ.L.		
DS:0030	A2 01 14 00 18 00 F5 19	FF FF FF FF 00 00 00 00	ó.....J.		
DS:0040	05 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....	

Loop:

Now we will use the for loop in assembly language. This loop is same loop which we have used in the programming languages. Have a look on the code of it.

Code:

```

mov ax,1
loop1  nop
      cmp ax,1
      je loop1

```

Execution:

Here is the execution of the code:

[illegible]

AX 0000	SI 0002	CS 19F5	IP 010A	Stack +0 0000	Flags 7244
BX 0000	DI 0002	DS 19F5		+2 0000	
CX 009A	BP 0000	ES 19F5	HS 19F5	+4 9FFF	OF DF IF SF ZF AF PF CF
DX 0000	SP FFFE	SS 19F5	FS 19F5	+6 EA00	0 0 1 0 1 0 1 0

CMD >

```

0109 6F          OUTSW
010A 7620        JNA     012C
010C 61          POPA
010D 782C        JS      013B
010F 310A        XDR     [BP+SI],CX
0111 6C          INSB
0112 6F          OUTSW
0113 6F          OUTSW
0114 7031        JO      0147

```

1	0	1	2	3	4	5	6	7
DS:0000	00	00	FF	9F	00	EA	FF	FF
DS:0008	AD	DE	1B	05	C5	06	00	00
DS:0010	18	01	10	01	18	01	92	01
DS:0018	01	01	01	00	FF	00	01	00
DS:0020	01	FF	FF	FF	FF	FF	FF	FF
DS:0028	FF	FF	FF	FF	EB	19	C0	11
DS:0030	A2	01	14	00	18	00	F5	19
DS:0038	FF	FF	FF	FF	00	00	00	00
DS:0040	05	00	00	00	00	00	00	00
DS:0048	00	00	00	00	00	00	00	00

2	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
DS:0000	00	00	FF	9F	00	EA	FF	FF	AD	DE	1B	05	C5	06	00	00
DS:0010	18	01	10	01	18	01	92	01	01	01	00	FF	00	01	00	
DS:0020	01	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	EB	19	C0	11
DS:0030	A2	01	14	00	18	00	F5	19	FF	FF	FF	FF	00	00	00	00
DS:0040	05	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

```

.. f.n  i |..+...
.....ff. ....
.          d.L.
ó.....J. ....
.....

```

AX 0000	SI 0002	CS 19F5	IP 012C	Stack +0 0000	Flags 7244
BX 0000	DI 0002	DS 19F5		+2 0000	
CX 009A	BP 0000	ES 19F5	HS 19F5	+4 9FFF	OF DF IF SF ZF AF PF CF
DX 0000	SP FFFE	SS 19F5	FS 19F5	+6 EA00	0 0 1 0 1 0 1 0

CMD >

```

010A 7620        JNA     012C
012C 7665        JNA     0193
012E 7220        JC      0150
0130 796F        JNS     01A1
0132 7520        JNZ     0154
0134 7761        JA      0197
0136 6E          OUTSB
0137 6E          OUTSB
0138 61          POPA

```

1	0	1	2	3	4	5	6	7
DS:0000	00	00	FF	9F	00	EA	FF	FF
DS:0008	AD	DE	1B	05	C5	06	00	00
DS:0010	18	01	10	01	18	01	92	01
DS:0018	01	01	01	00	FF	00	01	00
DS:0020	01	FF	FF	FF	FF	FF	FF	FF
DS:0028	FF	FF	FF	FF	EB	19	C0	11
DS:0030	A2	01	14	00	18	00	F5	19
DS:0038	FF	FF	FF	FF	00	00	00	00
DS:0040	05	00	00	00	00	00	00	00
DS:0048	00	00	00	00	00	00	00	00

2	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
DS:0000	00	00	FF	9F	00	EA	FF	FF	AD	DE	1B	05	C5	06	00	00
DS:0010	18	01	10	01	18	01	92	01	01	01	00	FF	00	01	00	
DS:0020	01	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	EB	19	C0	11
DS:0030	A2	01	14	00	18	00	F5	19	FF	FF	FF	FF	00	00	00	00
DS:0040	05	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

```

.. f.n  i |..+...
.....ff. ....
.          d.L.
ó.....J. ....
.....

```

AX 0000	SI 0002	CS 19F5	IP 0193	Stack +0 0000	Flags 7244
BX 0000	DI 0002	DS 19F5		+2 0000	
CX 009A	BP 0000	ES 19F5	HS 19F5	+4 9FFF	OF DF IF SF ZF AF PF CF
DX 0000	SP FFFE	SS 19F5	FS 19F5	+6 EA00	0 0 1 0 1 0 1 0

CMD >				1																
				-20-																
012C 7665	JNA	0193		DS:0000	00	00	FF	9F	00	EA	FF	FF								
0193 206571	AND	[DI+71],AH		DS:0008	AD	DE	1B	05	C5	06	00	00								
0196 7561	JNZ	01F9		DS:0010	18	01	10	01	18	01	92	01								
0198 6C	INSB			DS:0018	01	01	01	00	FF	00	01	00								
0199 0AFE	OR	BH,DH		DS:0020	01	FF	FF	FF	FF	FF	FF	FF								
019B 837C0C08	CMP	[SI+0C],0008		DS:0028	FF	FF	FF	FF	EB	19	C0	11								
019F 752B	JNZ	01CC		DS:0030	A2	01	14	00	18	00	F5	19								
01A1 8B4404	MOV	AX,[SI+04]		DS:0038	FF	FF	FF	FF	00	00	00	00								
01A4 8B5406	MOV	DX,[SI+06]		DS:0040	05	00	00	00	00	00	00	00								
				DS:0048	00	00	00	00	00	00	00	00								

2	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F				
DS:0000	00	00	FF	9F	00	EA	FF	FF	AD	DE	1B	05	C5	06	00	00	..	f.Ω	;	|..†...
DS:0010	18	01	10	01	18	01	92	01	01	01	00	FF	00	01	00		.....ff.	....	...	...
DS:0020	01	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	EB	19	C0	11		.	.....δ.	L.	
DS:0030	A2	01	14	00	18	00	F5	19	FF	FF	FF	FF	00	00	00	00	ó.....J.	....	....	....
DS:0040	05	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....	.....	.....	.....

AX 0000	SI 0002	CS 19F5	IP 0193	Stack +0 0000	Flags 7244
BX 0000	DI 0002	DS 19F5		+2 0000	
CX 009A	BP 0000	ES 19F5	HS 19F5	+4 9FFF	OF DF IF SF ZF AF PF CF
DX 0000	SP FFFE	SS 19F5	FS 19F5	+6 EA00	0 0 1 0 1 0 1 0

CMD >				1																
				-20-																
012C 7665	JNA	0193		DS:0000	00	00	FF	9F	00	EA	FF	FF								
0193 206571	AND	[DI+71],AH		DS:0008	AD	DE	1B	05	C5	06	00	00								
0196 7561	JNZ	01F9		DS:0010	18	01	10	01	18	01	92	01								
0198 6C	INSB			DS:0018	01	01	01	00	FF	00	01	00								
0199 0AFE	OR	BH,DH		DS:0020	01	FF	FF	FF	FF	FF	FF	FF								
019B 837C0C08	CMP	[SI+0C],0008		DS:0028	FF	FF	FF	FF	EB	19	C0	11								
019F 752B	JNZ	01CC		DS:0030	A2	01	14	00	18	00	F5	19								
01A1 8B4404	MOV	AX,[SI+04]		DS:0038	FF	FF	FF	FF	00	00	00	00								
01A4 8B5406	MOV	DX,[SI+06]		DS:0040	05	00	00	00	00	00	00	00								
				DS:0048	00	00	00	00	00	00	00	00								

2	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F				
DS:0000	00	00	FF	9F	00	EA	FF	FF	AD	DE	1B	05	C5	06	00	00	..	f.Ω	;	|..†...
DS:0010	18	01	10	01	18	01	92	01	01	01	00	FF	00	01	00		.....ff.	....	...	...
DS:0020	01	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	EB	19	C0	11		.	.....δ.	L.	
DS:0030	A2	01	14	00	18	00	F5	19	FF	FF	FF	FF	00	00	00	00	ó.....J.	....	....	....
DS:0040	05	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....	.....	.....	.....

DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Program: AND																		
AX 0000	SI 0002	CS 19F5	IP 0196	Stack +0 0000	Flags 7244													
BX 0000	DI 0002	DS 19F5		+2 0000														
CX 009A	BP 0000	ES 19F5	HS 19F5	+4 9FFF	OF	DF	IF	SF	ZF	AF	PF	CF						
DX 0000	SP FFFE	SS 19F5	FS 19F5	+6 EA00	0	0	1	0	1	0	1	0						
CMD >				1	0	1	2	3	4	5	6	7						
0193 206571	AND	[DI+71],AH		DS:0000	00	00	FF	9F	00	EA	FF	FF						
0196 7561	JNZ	01F9		DS:0008	AD	DE	1B	05	C5	06	00	00						
0198 6C	INSB			DS:0010	18	01	10	01	18	01	92	01						
0199 0AFE	OR	BH,DH		DS:0018	01	01	01	00	FF	00	01	00						
019B 837C0C08	CMP	[SI+0C],0008		DS:0020	01	FF	FF	FF	FF	FF	FF	FF						
019F 752B	JNZ	01CC		DS:0028	FF	FF	FF	FF	EB	19	C0	11						
01A1 8B4404	MOV	AX,[SI+04]		DS:0030	A2	01	14	00	18	00	F5	19						
01A4 8B5406	MOV	DX,[SI+06]		DS:0038	FF	FF	FF	FF	00	00	00	00						
01A7 BB9F46	MOV	BX,469F		DS:0040	05	00	00	00	00	00	00	00						
				DS:0048	00	00	00	00	00	00	00	00						
2	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F		
DS:0000	00	00	FF	9F	00	EA	FF	FF	AD	DE	1B	05	C5	06	00	00	.. f.Ω i |..+...	
DS:0010	18	01	10	01	18	01	92	01	01	01	01	00	FF	00	01	00ff.	
DS:0020	01	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	EB	19	C0	11	. δ.L.	
DS:0030	A2	01	14	00	18	00	F5	19	FF	FF	FF	FF	00	00	00	00	ó.....J.	
DS:0040	05	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	

DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Program: AND																	
AX 0000	SI 0002	CS 19F5	IP 0196	Stack +0 0000	Flags 7244												
BX 0000	DI 0002	DS 19F5		+2 0000													
CX 009A	BP 0000	ES 19F5	HS 19F5	+4 9FFF	OF	DF	IF	SF	ZF	AF	PF	CF					
DX 0000	SP FFFE	SS 19F5	FS 19F5	+6 EA00	0	0	1	0	1	0	1	0					
CMD >				1	0	1	2	3	4	5	6	7					
0193 206571	AND	[DI+71],AH		DS:0000	00	00	FF	9F	00	EA	FF	FF					
0196 7561	JNZ	01F9		DS:0008	AD	DE	1B	05	C5	06	00	00					
0198 6C	INSB			DS:0010	18	01	10	01	18	01	92	01					
0199 0AFE	OR	BH,DH		DS:0018	01	01	01	00	FF	00	01	00					
019B 837C0C08	CMP	[SI+0C],0008		DS:0020	01	FF	FF	FF	FF	FF	FF	FF					
019F 752B	JNZ	01CC		DS:0028	FF	FF	FF	FF	EB	19	C0	11					
01A1 8B4404	MOV	AX,[SI+04]		DS:0030	A2	01	14	00	18	00	F5	19					
01A4 8B5406	MOV	DX,[SI+06]		DS:0038	FF	FF	FF	FF	00	00	00	00					
01A7 BB9F46	MOV	BX,469F		DS:0040	05	00	00	00	00	00	00	00					
				DS:0048	00	00	00	00	00	00	00	00					
2	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
DS:0000	00	00	FF	9F	00	EA	FF	FF	AD	DE	1B	05	C5	06	00	00	.. f.Ω i |..+...
DS:0010	18	01	10	01	18	01	92	01	01	01	01	00	FF	00	01	00ff.
DS:0020	01	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	EB	19	C0	11	. δ.L.
DS:0030	A2	01	14	00	18	00	F5	19	FF	FF	FF	FF	00	00	00	00	ó.....J.
DS:0040	05	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	

AX 0000	SI 0002	CS 19F5	IP 0198	Stack +0 0000	Flags 7244
BX 0000	DI 0002	DS 19F5		+2 0000	
CX 009A	BP 0000	ES 19F5	HS 19F5	+4 9FFF	OF DF IF SF ZF AF PF CF
DX 0000	SP FFFE	SS 19F5	FS 19F5	+6 EA00	0 0 1 0 1 0 1 0

[illegible][illegible]

DOSBox 0.74-5, Cpu speed: 3000 cycles, Frameskip: 0, Program: AFD -					
AX 0000	SI 0002	CS 19F5	IP 0199	Stack +0 0000	Flags 7244
EBX 0000	DI 0003	DS 19F5		+2 0000	
CX 009A	BP 0000	ES 19F5	HS 19F5	+4 9F00	OF DF IF SF ZF AF PF CF
DX 0000	SP FFFE	SS 19F5	FS 19F5	+6 EA00	0 0 1 0 1 0 1 0

CMD >				1 0 1 2 3 4 5 6 7																
0198	6C	INSB		DS:0000	00	00	00	9F	00	EA	FF	FF								
0199	0AFE	OR	BH,DH	DS:0008	AD	DE	1B	05	C5	06	00	00								
019B	837C0C08	CMP	[SI+0C1],0008	DS:0010	18	01	10	01	18	01	92	01								
019F	752B	JNZ	01CC	DS:0018	01	01	01	00	FF	00	01	00								
01A1	8B4404	MOV	AX,[SI+041]	DS:0020	01	FF	FF	FF	FF	FF	FF	FF								
01A4	8B5406	MOV	DX,[SI+061]	DS:0028	FF	FF	FF	FF	EB	19	C0	11								
01A7	BB9F46	MOV	BX,469F	DS:0030	A2	01	14	00	18	00	F5	19								
01AA	8CD1	MOV	CX,SS	DS:0038	FF	FF	FF	FF	00	00	00	00								
01AC	9A260CE71C	CALL	1CE7:0C26	DS:0040	05	00	00	00	00	00	00	00								
				DS:0048	00	00	00	00	00	00	00	00								

[illegible]

CPU Registers																Stack																Flags															
AX 0000	SI 0002	CS 19F5	IP 019B	Stack +0 0000												Flags 7244																															
EBX 0000	DI 0003	DS 19F5	+2 0000																																												
CX 009A	BP 0000	ES 19F5	HS 19F5	+4 9F00												OF	DF	IF	SF	ZF	AF	PF	CF																								
DX 0000	SP FFFE	SS 19F5	FS 19F5	+6 EA00												0	0	1	0	1	0	1	0																								

CMD >				1																				
				0000	0	1	2	3	4	5	6	7												
0199 0AFE	OR	BH,DH	DS:0000	00	00	00	9F	00	EA	FF	FF													
019B 837C0C08	CMP	[SI+0C],0008	DS:0008	AD	DE	1B	05	C5	06	00	00													
019F 752B	JNZ	01CC	DS:0010	18	01	10	01	18	01	92	01													
01A1 8B4404	MOV	AX,[SI+04]	DS:0018	01	01	01	00	FF	00	01	00													
01A4 8B5406	MOV	DX,[SI+06]	DS:0020	01	FF	FF	FF	FF	FF	FF	FF													
01A7 BB9F46	MOV	BX,469F	DS:0028	FF	FF	FF	FF	EB	19	C0	11													
01AA 8CD1	MOV	CX,SS	DS:0030	A2	01	14	00	18	00	F5	19													
01AC 9A260CE71C	CALL	1CE7:0C26	DS:0038	FF	FF	FF	FF	00	00	00	00													
01B1 85C0	TEST	AX,AX	DS:0040	05	00	00	00	00	00	00	00													
				DS:0048	00	00	00	00	00	00	00													

2																																	
0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F																		
DS:0000	00	00	00	9F	00	EA	FF	FF	AD	DE	1B	05	C5	06	00	00	...f.Ω	i|..+...															
DS:0010	18	01	10	01	18	01	92	01	01	01	01	00	FF	00	01	00	.....ft.	....														
DS:0020	01	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	EB	19	C0	11	.	δ.L.															
DS:0030	A2	01	14	00	18	00	F5	19	FF	FF	FF	FF	00	00	00	00	ó.....J.	....														
DS:0040	05	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....	.....													

