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**SECTION : 3B**

**ROLL NO : 20P-0147**

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## **How to install Dosbox and how to download NASM in Ubuntu ?**

**Step 1: First of all, you need to update your ubuntu system by giving the below command**

```
sudo apt update
```

```
shoaib@shoaib-HP-348-G3: ~  
(base) shoaib@shoaib-HP-348-G3:~$ sudo apt update  
[sudo] password for shoaib:  
Hit:1 http://ppa.launchpad.net/deadsnakes/ppa/ubuntu focal InRelease  
Hit:2 http://packages.microsoft.com/repos/code stable InRelease  
Hit:3 http://pk.archive.ubuntu.com/ubuntu focal InRelease  
Hit:4 http://security.ubuntu.com/ubuntu focal-security InRelease  
Hit:5 http://pk.archive.ubuntu.com/ubuntu focal-updates InRelease  
Hit:6 http://pk.archive.ubuntu.com/ubuntu focal-backports InRelease  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
30 packages can be upgraded. Run 'apt list --upgradable' to see them.  
(base) shoaib@shoaib-HP-348-G3:~$
```

## Step 2: Command to Install Dosbox

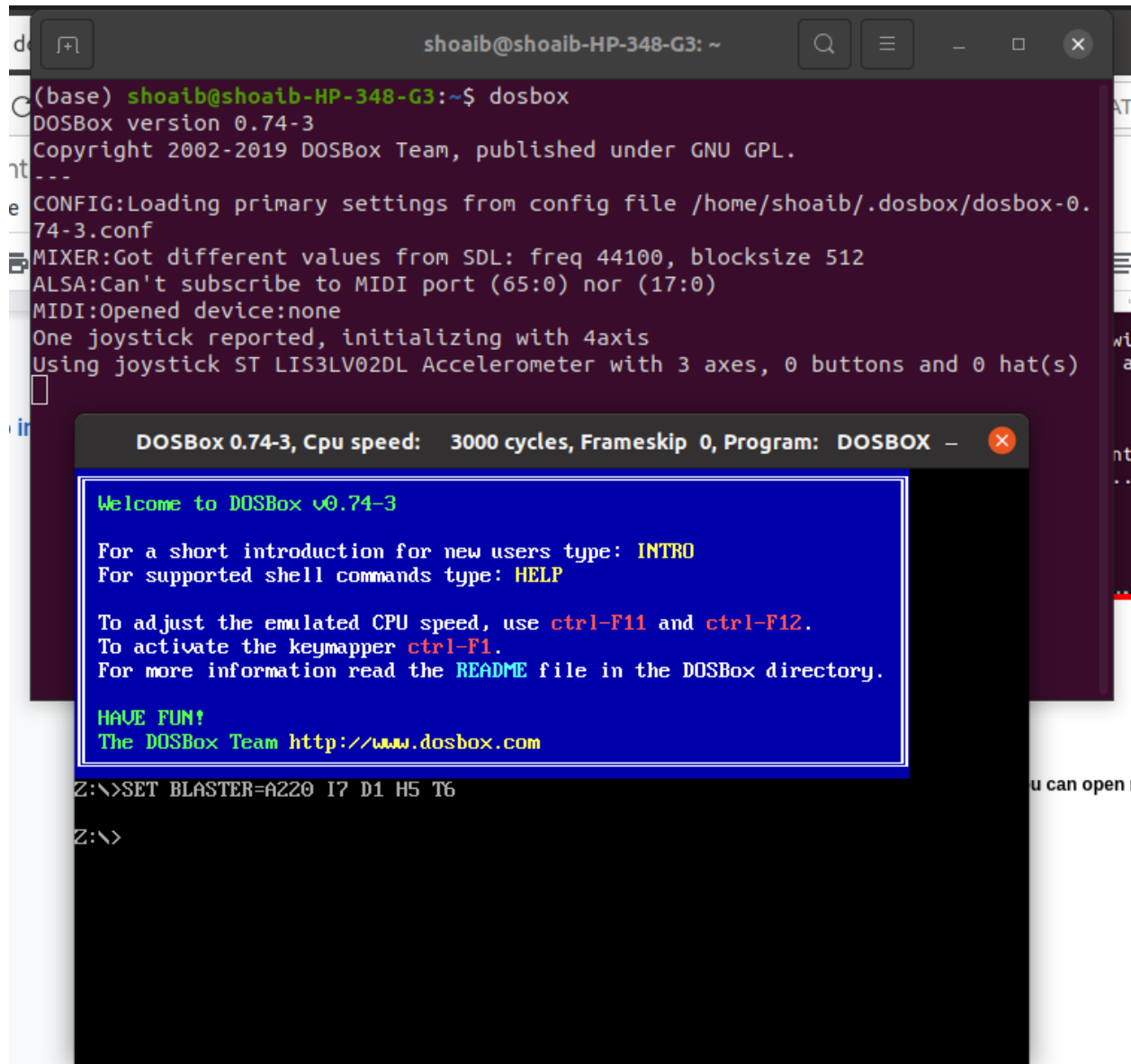
- Dosbox is a kind of debugger you can say. Dosbox executes the program line by line.

**sudo apt install dosbox**

```
shoaib@shoaib-HP-348-G3: ~  
(base) shoaib@shoaib-HP-348-G3:~$ sudo apt install dosbox  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
The following packages were automatically installed and are no longer required:  
  chromium-codecs-ffmpeg-extra gstreamer1.0-vaapi  
  libgstreamer-plugins-bad1.0-0 libllvm11 libva-wayland2  
Use 'sudo apt autoremove' to remove them.  
The following NEW packages will be installed:  
  dosbox  
0 upgraded, 1 newly installed, 0 to remove and 30 not upgraded.  
Need to get 887 kB of archives.  
After this operation, 2,784 kB of additional disk space will be used.  
Get:1 http://pk.archive.ubuntu.com/ubuntu focal/universe amd64 dosbox amd64 0.74-3-1build1 [887 kB]  
Fetched 887 kB in 3s (273 kB/s)  
Selecting previously unselected package dosbox.  
(Reading database ... 193738 files and directories currently installed.)  
Preparing to unpack .../dosbox_0.74-3-1build1_amd64.deb ...  
Unpacking dosbox (0.74-3-1build1) ...  
Setting up dosbox (0.74-3-1build1) ...  
Processing triggers for mime-support (3.64ubuntu1) ...  
Processing triggers for hicolor-icon-theme (0.17-2) ...  
Processing triggers for gnome-themes-standard (3.36-0.4ubuntu1) ...
```

## Step 3 : Launching Dosbox.

- All you need to do now, open your terminal and type dosbox or you can open menu and search for the dosbox



The image shows a terminal window with the following output:

```
(base) shoaib@shoaib-HP-348-G3:~$ dosbox
DOSBox version 0.74-3
Copyright 2002-2019 DOSBox Team, published under GNU GPL.
---
CONFIG:Loading primary settings from config file /home/shoaib/.dosbox/dosbox-0.74-3.conf
MIXER:Got different values from SDL: freq 44100, blocksize 512
ALSA:Can't subscribe to MIDI port (65:0) nor (17:0)
MIDI:Opened device:none
One joystick reported, initializing with 4axis
Using joystick ST LIS3LV02DL Accelerometer with 3 axes, 0 buttons and 0 hat(s)
```

Below the terminal window, a DOSBox window is open with the title "DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Program: DOSBOX". The window contains 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
```

Below the DOSBox window, the terminal shows the command `Z:\>SET BLASTER=A220 I7 D1 H5 T6` and the prompt `Z:\>`.

- Or go to menu and search for the Dosbox as i did below.

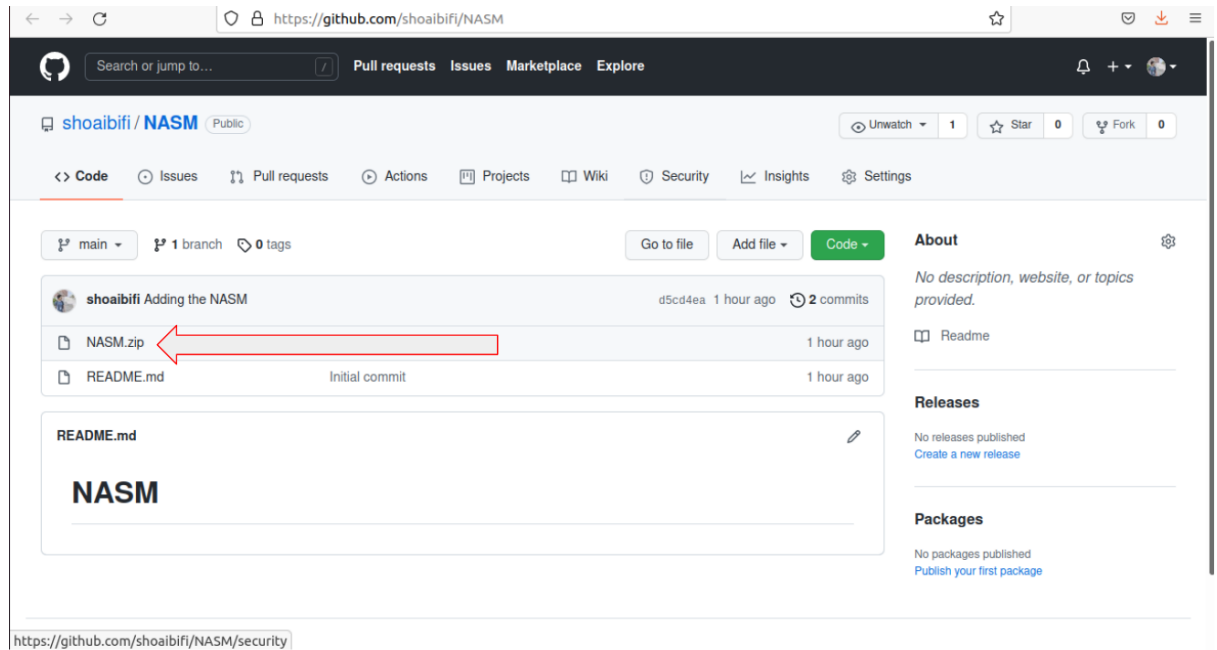


## STEP 4: Downloading NASM.

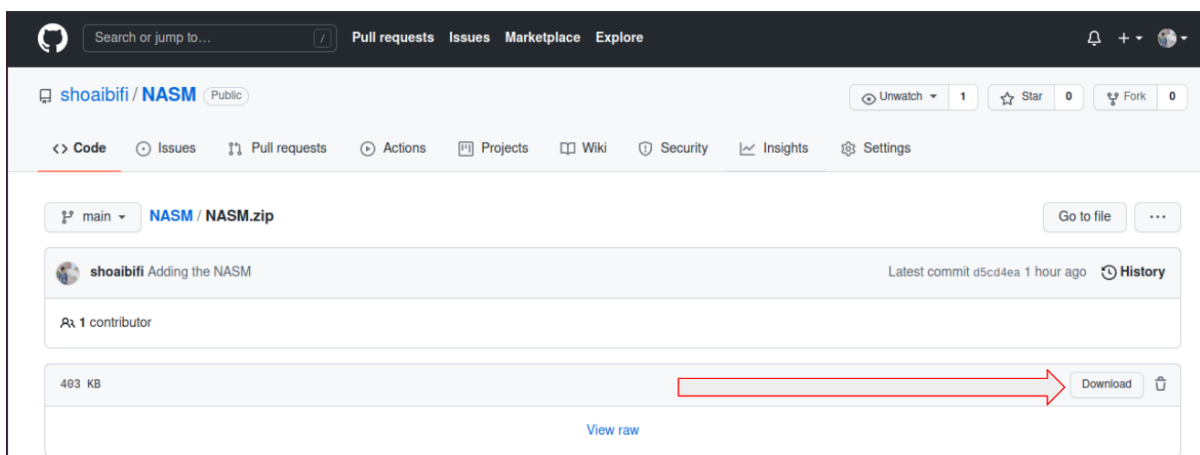
- NASM is an assembler which assembles the .ASM file into the .COM file and the assembled .COM file will be opened in the DOSBOX debugger.
- For Downloading NASM i will provide the link to my github account from there you can download it.

<https://github.com/shoaibifi/NASM>

- By clicking on the above link you will be on my github account
- Now click on the NASM.Zip file.



- Now click on download and after clicking on it the NASM will be downloaded.



## **STEP 5: Using DOSBOX.**

- **Open Dosbox**
- **Dosbox is a virtual Machine it doesn't have its own Hard Disk.**
- **The assembly code we wrote is actually in our physical machine.**
- **Now we want to run our assembly code into this virtual machine (DOSBOX)**
- **So now we will create a mount point. It means that mount the C drive of this virtual machine into the path we're giving.**
- **Now all you need to do is that the NASM you downloaded move it to the home directory by giving the below command to on Dosbox.**

```
mount c /home/shoaib/NASM
```

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

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

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

Z:\>mount c /home/shoaib/NASM
Drive C is mounted as local directory /home/shoaib/NASM/

Z:\>
```

➤ Now we have to go to the C drive for that we will give the below command.

**C:**

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

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

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

Z:\>mount c /home/shoaib/NASM
Drive C is mounted as local directory /home/shoaib/NASM/

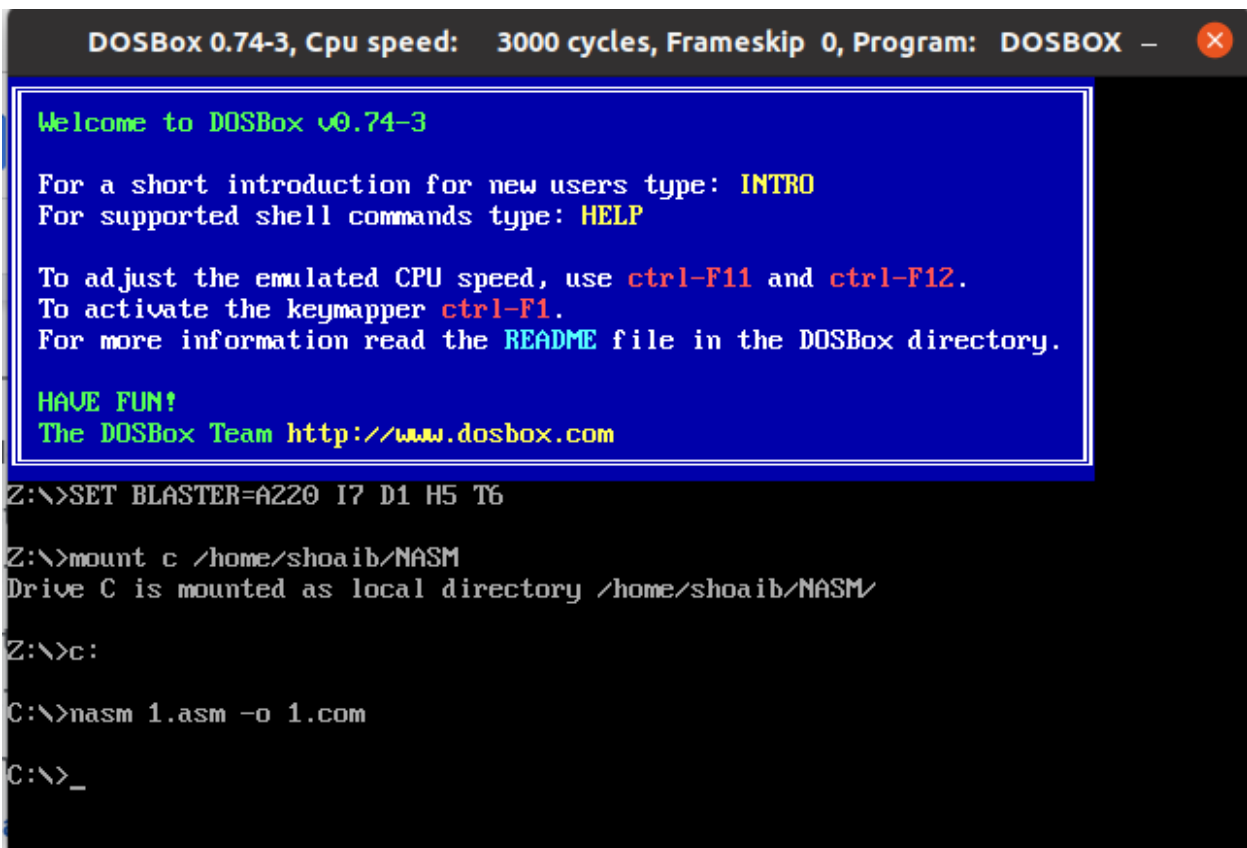
Z:\>c:

C:\>_
```



- Now we are in the C drive of this virtual machine (Dosbox).
- Now one thing you have to do is that the .ASM code you're writing in any IDE for example you've written your assembly code in visual studio so now you have to save this .ASM file into the NASM folder which is currently present in the your home directory.
- Now we will assemble our .ASM file into the .COM by giving the below command

**nasm 1.asm -o 1.com**



The screenshot shows a DOSBox 0.74-3 window. The title bar reads "DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Program: DOSBOX". The main window has a blue background with white text. It displays a welcome message and instructions for new users. Below the instructions, the command prompt shows the following sequence of commands and outputs:

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

Z:\>mount c /home/shoaib/NASM
Drive C is mounted as local directory /home/shoaib/NASM/

Z:\>c:

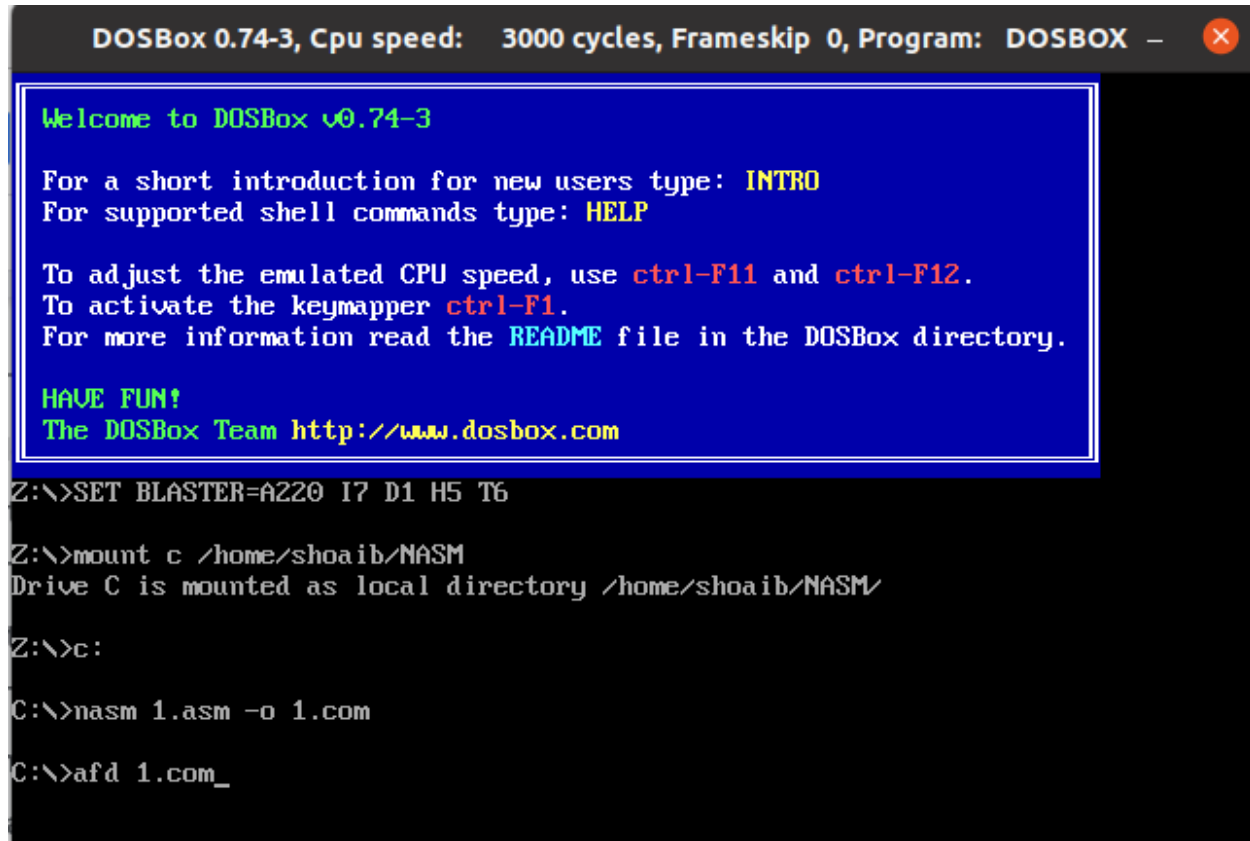
C:\>nasm 1.asm -o 1.com

C:\>_
```

- Now the .ASM file is compiled to the .COM file. The reason we compiled this file is that we can not open this .ASM file in the Dosbox.
- For opening the .COM file we will give the below command

afd 1.com

- Now this “afd” stands for the “ADVANCE FREE DEBUGGER”.



The screenshot shows a DOSBox window titled "DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Program: DOSBOX". The main window has a blue background with white text. A white-bordered box contains 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
```

Below this box, the command prompt shows the following commands and output:

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

Z:\>mount c /home/shoaib/NASM
Drive C is mounted as local directory /home/shoaib/NASM/

Z:\>c:

C:\>nasm 1.asm -o 1.com

C:\>afd 1.com_
```

- By giving the above command the debugger will be opened as shown in the below picture.

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 0012	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	DS:0000	CD 20 FF 9F 00 EA F0 FE
0103 B80A00	MOV	BX,000A	DS:0008	AD DE 1B 05 C5 06 00 00
0106 01D8	ADD	AX,BX	DS:0010	18 01 10 01 18 01 92 01
0108 B80F00	MOV	BX,000F	DS:0018	01 01 01 00 02 FF FF FF
010B 01D8	ADD	AX,BX	DS:0020	FF FF FF FF FF FF FF FF
010D B8004C	MOV	AX,4C00	DS:0028	FF FF FF FF EB 19 C0 11
0110 CD21	INT	21	DS:0030	A2 01 14 00 18 00 F5 19
0112 EB04	JMP	0118	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	= f.Ω≡ i  ..†...
DS:0010	18	01	10	01	18	01	92	01	01	01	00	02	FF	FF	FF	FF	.....ft. ....
DS:0020	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	.....

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

**Lab Task: Write a program in assembly language that calculates the square of six by adding six to the accumulator six times.**

- In the below pic there is code for the lab task

```

1 [org 0x0100]
2
3 mov ax, 0
4
5
6 outerloop:
7     add ax,6
8
9     cmp ax,36
10
11     jne outerloop
12
13 mov ax, 0x4c00
14
15 int 0x21
16

```

- The below pic taken from the debugger when the accumulator has the 36 (0x24).

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

AX 0024	SI 0000	CS 19F5	IP 0106	Stack +0 0000	Flags 7214
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 1 1 0

CMD >		1	0	1	2	3	4	5	6	7
0103 050600	ADD AX,0006	DS:0000	CD	20	FF	9F	00	EA	FF	FF
0106 3D2400	CMP AX,0024	DS:0008	AD	DE	1B	05	C5	06	00	00
0109 75F8	JNZ 0103	DS:0010	18	01	10	01	18	01	92	01
010B B8004C	MOV AX,4C00	DS:0018	01	01	01	00	02	FF	FF	FF
010E CD21	INT 21	DS:0020	FF	FF	FF	FF	FF	FF	FF	FF
0110 89DA	MOV DX,BX	DS:0028	FF	FF	FF	FF	EB	19	E6	11
0112 EB04	JMP 0118	DS:0030	A2	01	14	00	18	00	F5	19
0114 31D2	XOR DX,DX	DS:0038	FF	FF	FF	FF	00	00	00	00
0116 31C0	XOR AX,AX	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
DS:0010	18	01	10	01	18	01	92	01	01	01	00	02	FF	FF	FF	FF
DS:0020	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	EB	19	E6	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

