VIT®

Vellore Institute of Technology

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CSE2005 OS – LAB 01

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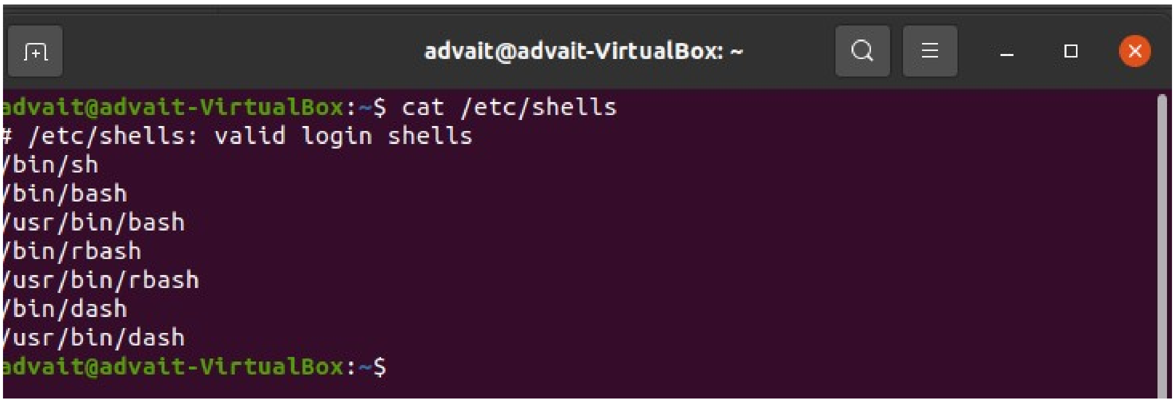
20BCE1143

Shell, Unix, and fork()

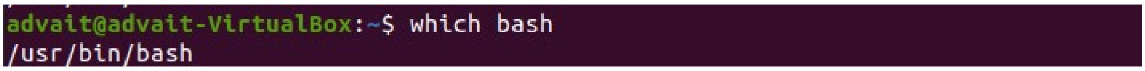
a) Shell Programming

1. Types of Shells available to the system



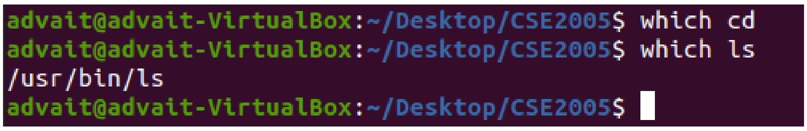
```
advait@advait-VirtualBox:~$ cat /etc/shells
# /etc/shells: valid login shells
/bin/sh
/bin/bash
/usr/bin/bash
/bin/rbash
/usr/bin/rbash
/bin/dash
/usr/bin/dash
advait@advait-VirtualBox:~$
```

2. Show where the bash file is located



```
advait@advait-VirtualBox:~$ which bash
/usr/bin/bash
```

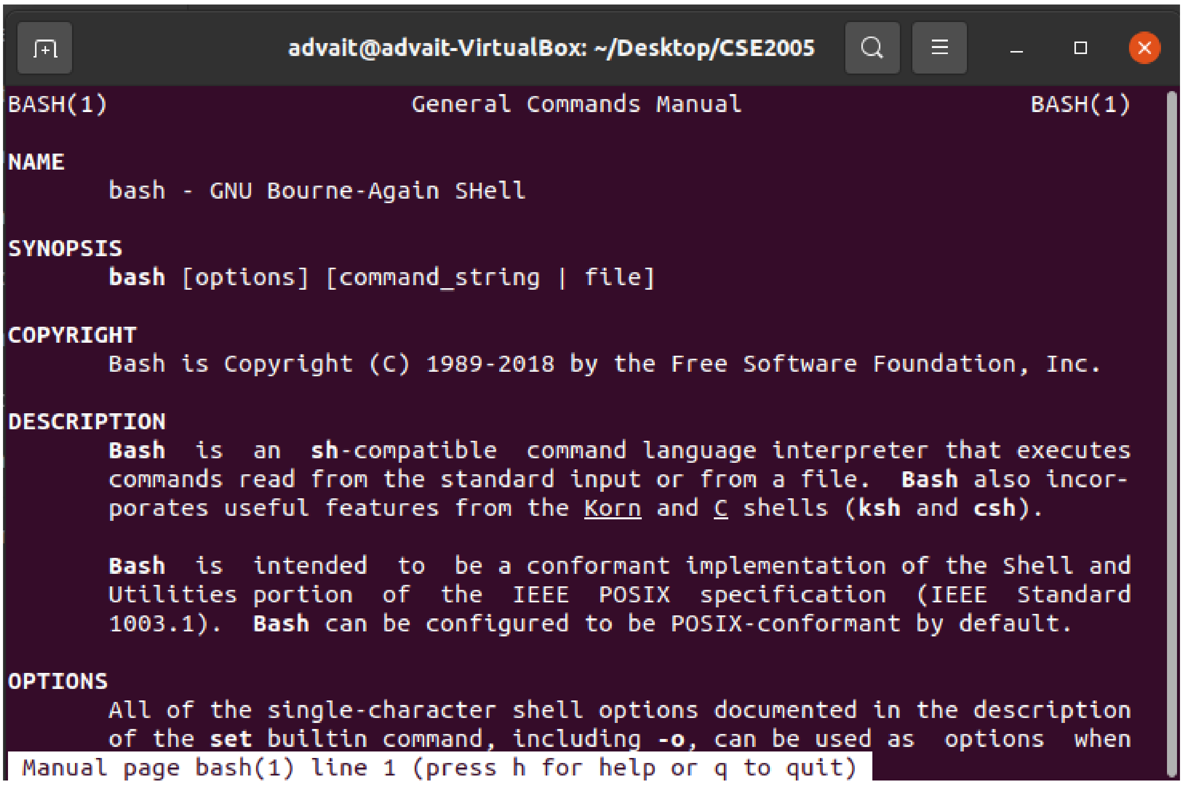
3. Contrasting non-shell programs with shell programs



```
advait@advait-VirtualBox:~/Desktop/CSE2005$ which cd
advait@advait-VirtualBox:~/Desktop/CSE2005$ which ls
/usr/bin/ls
advait@advait-VirtualBox:~/Desktop/CSE2005$ 
```

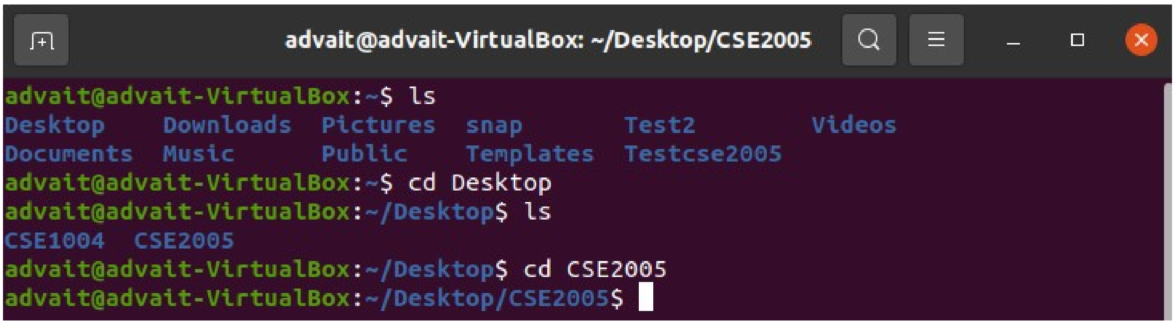
(cd is not shell, while ls is a shell program)

4. man (manual command) , gives manual for the thing (eg. Bash manual page 1)



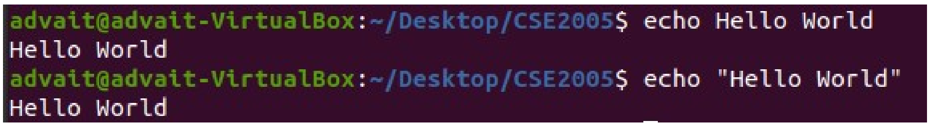
```
BASH(1)                    General Commands Manual                   BASH(1)

NAME
       bash - GNU Bourne-Again SHell

SYNOPSIS
       bash [options] [command_string | file]

COPYRIGHT
       Bash is Copyright (C) 1989-2018 by the Free Software Foundation, Inc.

DESCRIPTION
       Bash  is  an  sh-compatible  command language interpreter that executes
       commands read from the standard input or from a file.  Bash also incor-
       porates useful features from the Korn and C shells (ksh and csh).

       Bash  is  intended  to  be a conformant implementation of the Shell and
       Utilities portion  of  the  IEEE  POSIX  specification  (IEEE  Standard
       1003.1).  Bash can be configured to be POSIX-conformant by default.

OPTIONS
       All of the single-character shell options documented in the description
       of the set builtin command, including -o, can be used as  options  when
 Manual page bash(1) line 1 (press h for help or q to quit)
```

5. showcasing cd (change directory) command



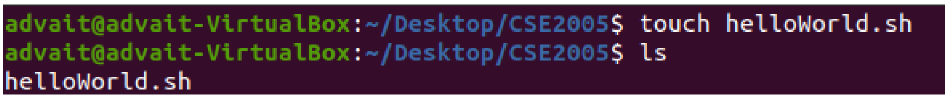
```
advait@advait-VirtualBox:~$ ls
Desktop    Downloads  Pictures  snap       Test2        Videos
Documents  Music      Public    Templates  Testcse2005
advait@advait-VirtualBox:~$ cd Desktop
advait@advait-VirtualBox:~/Desktop$ ls
CSE1004  CSE2005
advait@advait-VirtualBox:~/Desktop$ cd CSE2005
advait@advait-VirtualBox:~/Desktop/CSE2005$ 
```

6. echo (similar to print command)



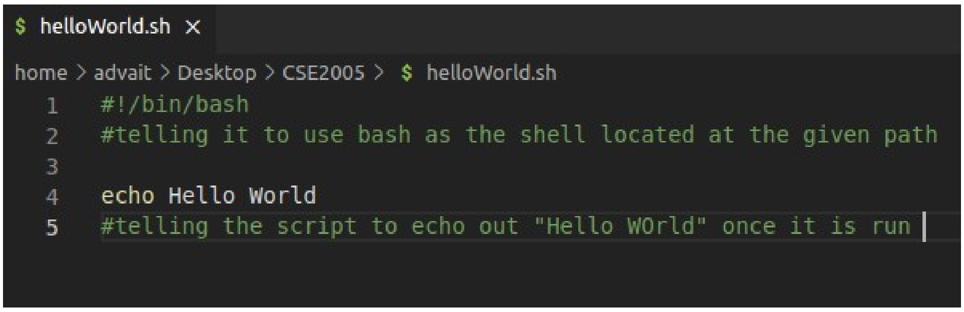
```
advait@advait-VirtualBox:~/Desktop/CSE2005$ echo Hello World
Hello World
advait@advait-VirtualBox:~/Desktop/CSE2005$ echo "Hello World"
Hello World
```

7. touch command to create shell executable



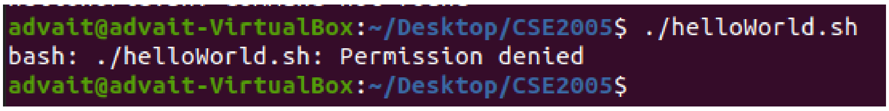
```
advait@advait-VirtualBox:~/Desktop/CSE2005$ touch helloWorld.sh
advait@advait-VirtualBox:~/Desktop/CSE2005$ ls
helloWorld.sh
```

8. Selecting shell with #! shbang



```
#!/bin/bash
#telling it to use bash as the shell located at the given path

echo Hello World
#telling the script to echo out "Hello WOrld" once it is run
```

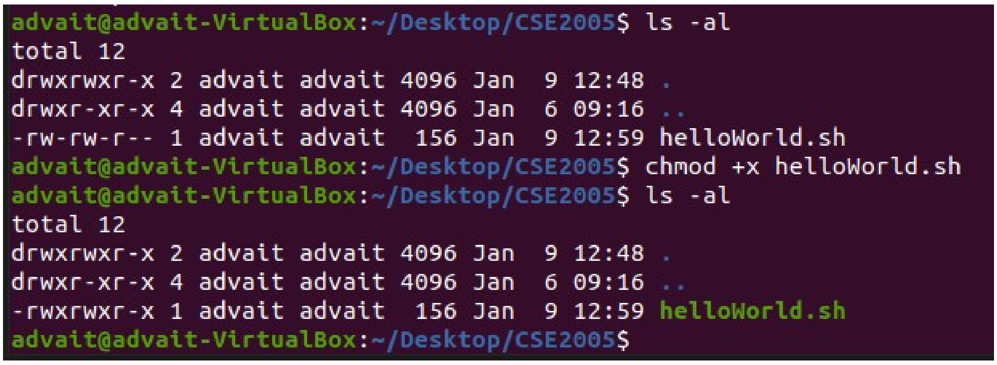
9. Running shell file



```
advait@advait-VirtualBox:~/Desktop/CSE2005$ ./helloWorld.sh
bash: ./helloWorld.sh: Permission denied
advait@advait-VirtualBox:~/Desktop/CSE2005$
```

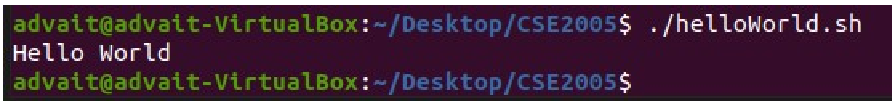
(permission denied as creating with touch)

10. chmod to change file perms



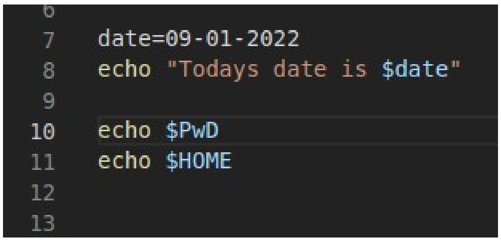
```
advait@advait-VirtualBox:~/Desktop/CSE2005$ ls -al
total 12
drwxrwxr-x 2 advait advait 4096 Jan  9 12:48 .
drwxr-xr-x 4 advait advait 4096 Jan  6 09:16 ..
-rw-rw-r-- 1 advait advait  156 Jan  9 12:59 helloWorld.sh
advait@advait-VirtualBox:~/Desktop/CSE2005$ chmod +x helloWorld.sh
advait@advait-VirtualBox:~/Desktop/CSE2005$ ls -al
total 12
drwxrwxr-x 2 advait advait 4096 Jan  9 12:48 .
drwxr-xr-x 4 advait advait 4096 Jan  6 09:16 ..
-rwxrwxr-x 1 advait advait  156 Jan  9 12:59 helloWorld.sh
advait@advait-VirtualBox:~/Desktop/CSE2005$
```

(notice the change in helloWorld.sh in first and second execution of ls -al)

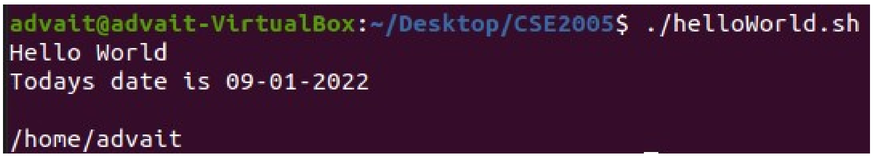


```
advait@advait-VirtualBox:~/Desktop/CSE2005$ ./helloWorld.sh
Hello World
advait@advait-VirtualBox:~/Desktop/CSE2005$
```

11. set $variable

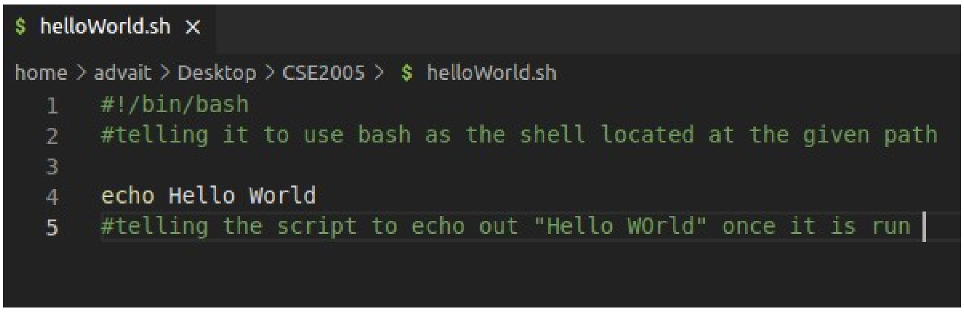


```
date=09-01-2022
echo "Todays date is $date"

echo $PwD
echo $HOME
```



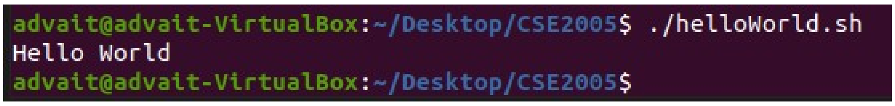
```
advait@advait-VirtualBox:~/Desktop/CSE2005$ ./helloWorld.sh
Hello World
Todays date is 09-01-2022

/home/advait
```

12. # (pound/hash) comments



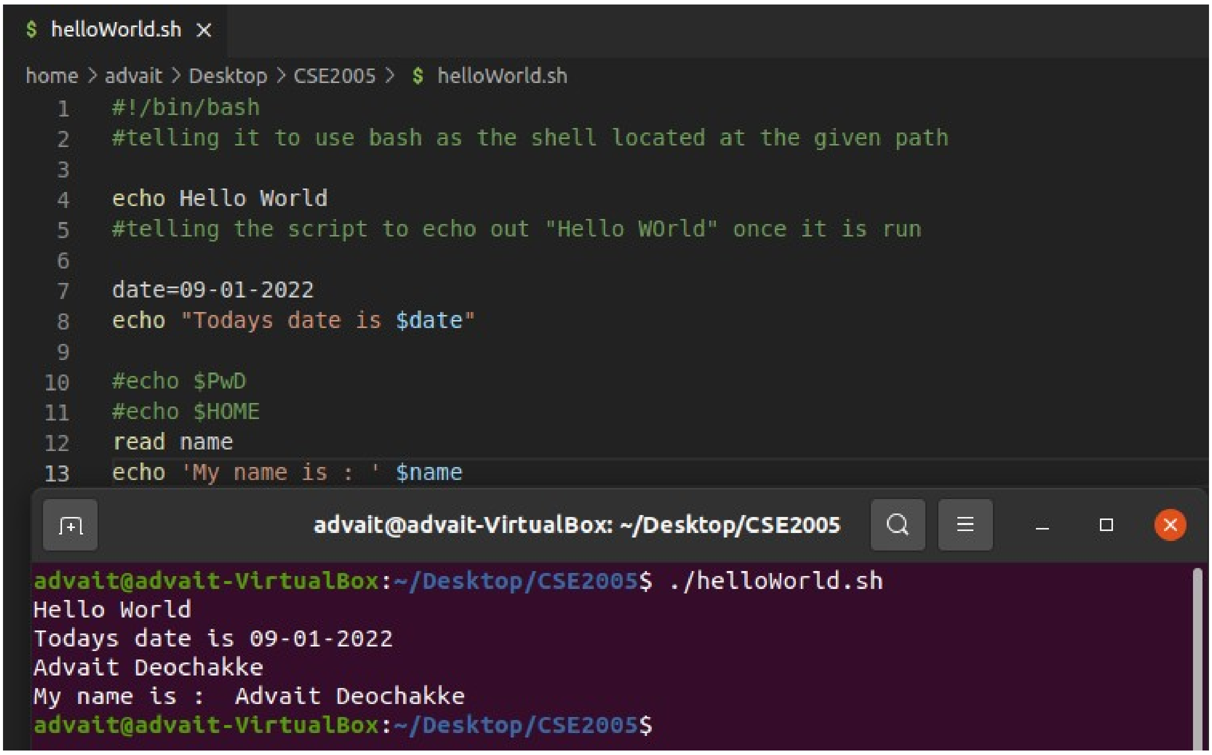
```
#!/bin/bash
#telling it to use bash as the shell located at the given path

echo Hello World
#telling the script to echo out "Hello WOrld" once it is run
```

(notice how the text preceded by only # is not taken into account)



```
advait@advait-VirtualBox:~/Desktop/CSE2005$ ./helloWorld.sh
Hello World
advait@advait-VirtualBox:~/Desktop/CSE2005$
```

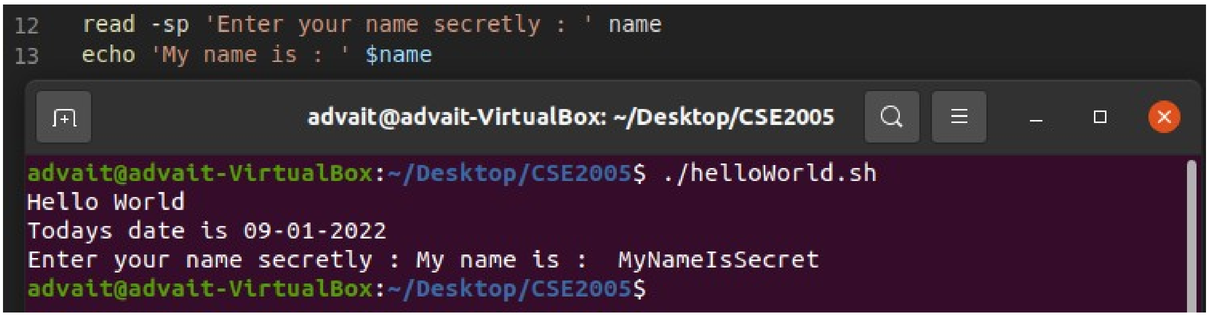
13. read


$ helloWorld.sh ×
home > advait > Desktop > CSE2005 > $ helloWorld.sh
advait@advait-VirtualBox: ~/Desktop/CSE2005

```
#!/bin/bash
#telling it to use bash as the shell located at the given path

echo Hello World
#telling the script to echo out "Hello WOrld" once it is run

date=09-01-2022
echo "Todays date is $date"

#echo $PwD
#echo $HOME
read name
echo 'My name is : ' $name
```

```
advait@advait-VirtualBox:~/Desktop/CSE2005$ ./helloWorld.sh
Hello World
Todays date is 09-01-2022
Advait Deochakke
My name is :  Advait Deochakke
advait@advait-VirtualBox:~/Desktop/CSE2005$
```

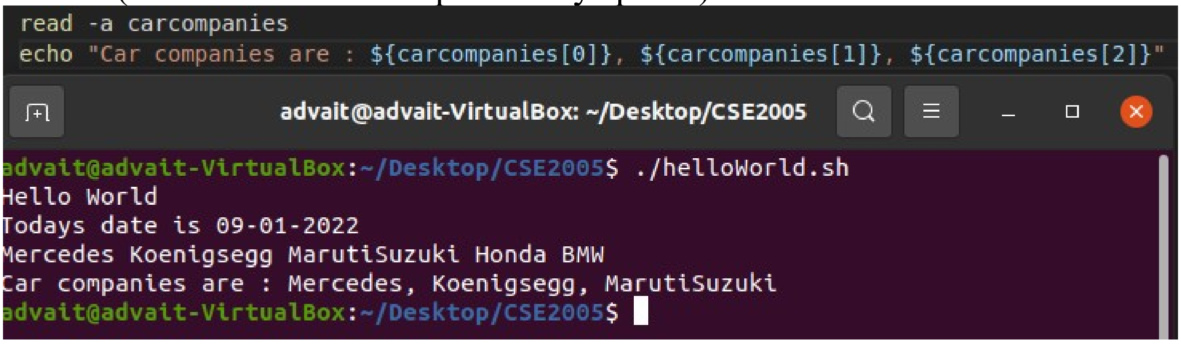
14. read -sp (read password silently)



```
read -sp 'Enter your name secretly : ' name
echo 'My name is : ' $name
```

```
advait@advait-VirtualBox:~/Desktop/CSE2005$ ./helloWorld.sh
Hello World
Todays date is 09-01-2022
Enter your name secretly : My name is :  MyNameIsSecret
advait@advait-VirtualBox:~/Desktop/CSE2005$
```

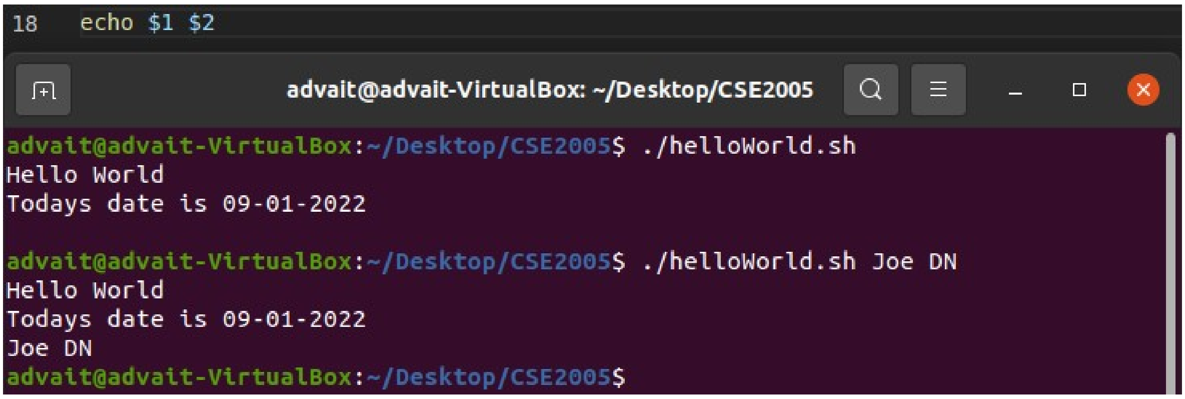
15. read -a (read list on words separated by spaces)



```
read -a carcompanies
echo "Car companies are : ${carcompanies[0]}, ${carcompanies[1]}, ${carcompanies[2]}"
```

```
advait@advait-VirtualBox:~/Desktop/CSE2005$ ./helloWorld.sh
Hello World
Todays date is 09-01-2022
Mercedes Koenigsegg MarutiSuzuki Honda BMW
Car companies are : Mercedes, Koenigsegg, MarutiSuzuki
advait@advait-VirtualBox:~/Desktop/CSE2005$
```

16. passing arguments

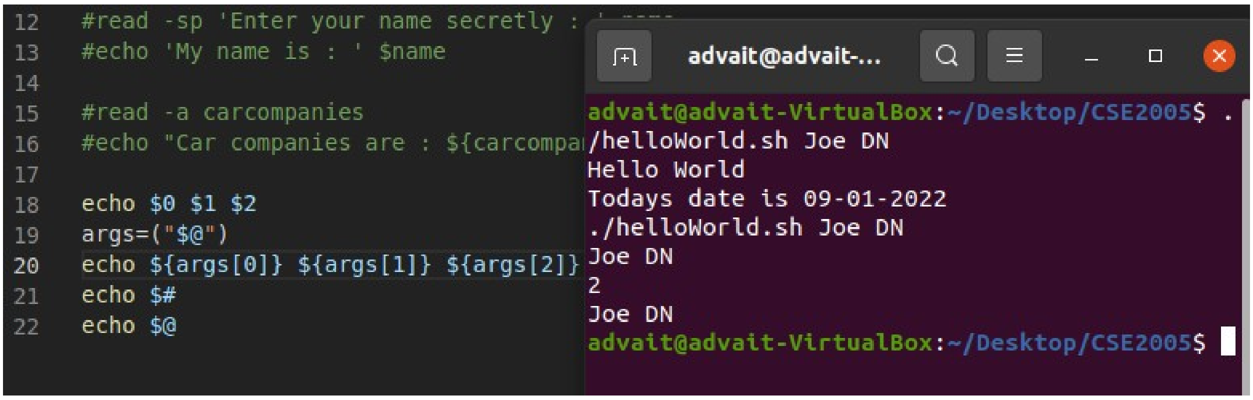


```
echo $1 $2
```

```
advait@advait-VirtualBox:~/Desktop/CSE2005$ ./helloWorld.sh
Hello World
Todays date is 09-01-2022

advait@advait-VirtualBox:~/Desktop/CSE2005$ ./helloWorld.sh Joe DN
Hello World
Todays date is 09-01-2022
Joe DN
advait@advait-VirtualBox:~/Desktop/CSE2005$
```

where \$1 and \$2 are taken as the 1st and 2nd input on the line when we execute shell (bonus: ./helloWorld.sh would be considered as the 0th input, \$0)

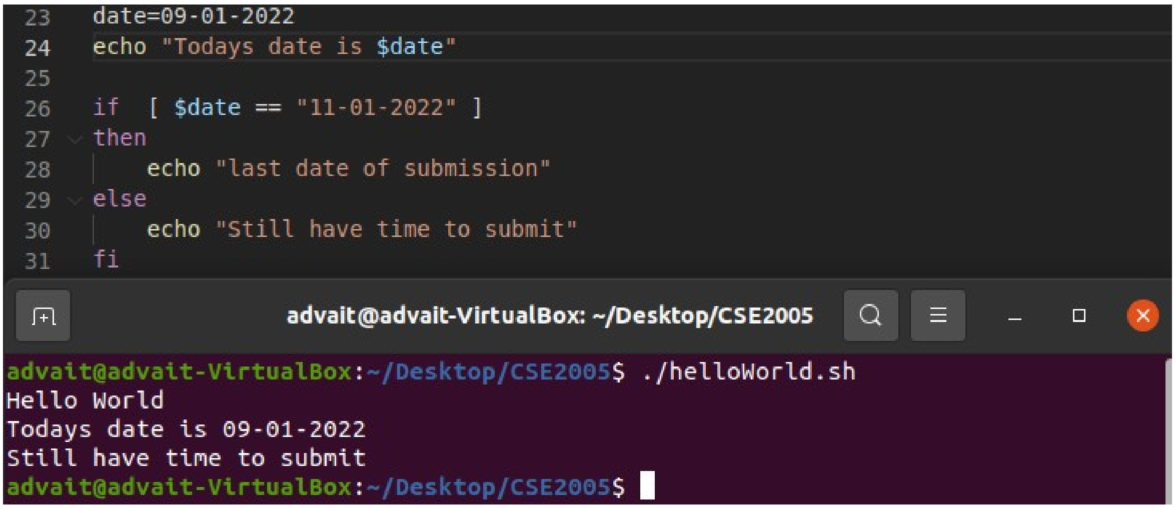
17. storing arguments passed as arrays with \$@ (ignore the comments)



```
#read -sp 'Enter your name secretly : '
#echo 'My name is : ' $name

#read -a carcompanies
#echo "Car companies are : ${carcompa

echo $0 $1 $2
args=("$@")
echo ${args[0]} ${args[1]} ${args[2]}
echo $#
echo $@
```

```
advait@advait-VirtualBox:~/Desktop/CSE2005$ .
/helloWorld.sh Joe DN
Hello World
Todays date is 09-01-2022
./helloWorld.sh Joe DN
Joe DN
2
Joe DN
advait@advait-VirtualBox:~/Desktop/CSE2005$
```

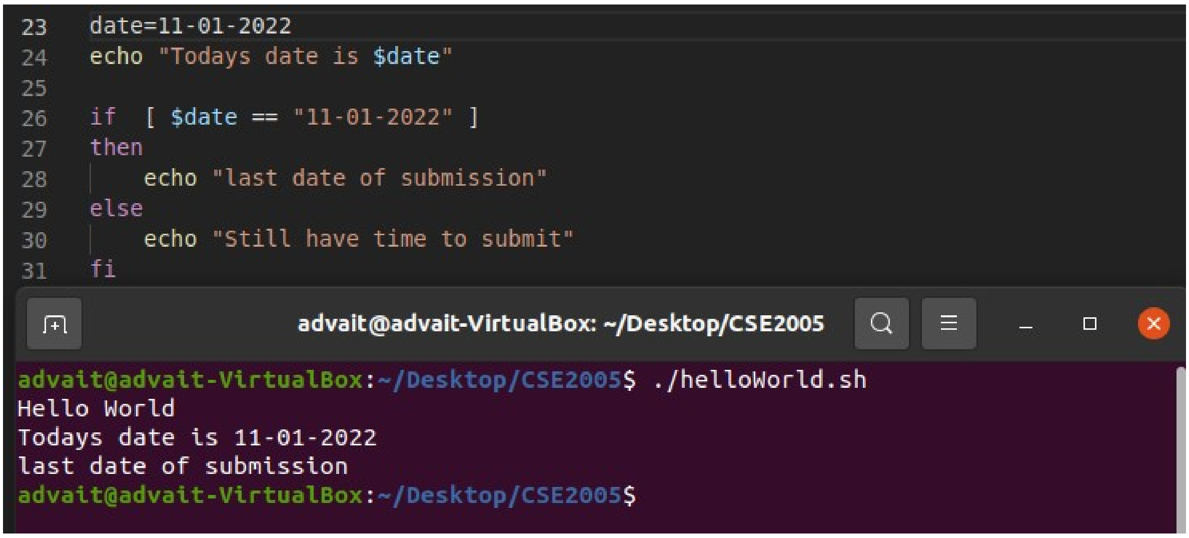
18. if then



```
date=09-01-2022
echo "Todays date is $date"

if  [ $date == "11-01-2022" ]
then
    echo "last date of submission"
else
    echo "Still have time to submit"
fi
```

```
advait@advait-VirtualBox:~/Desktop/CSE2005$ ./helloWorld.sh
Hello World
Todays date is 09-01-2022
Still have time to submit
advait@advait-VirtualBox:~/Desktop/CSE2005$ 
```

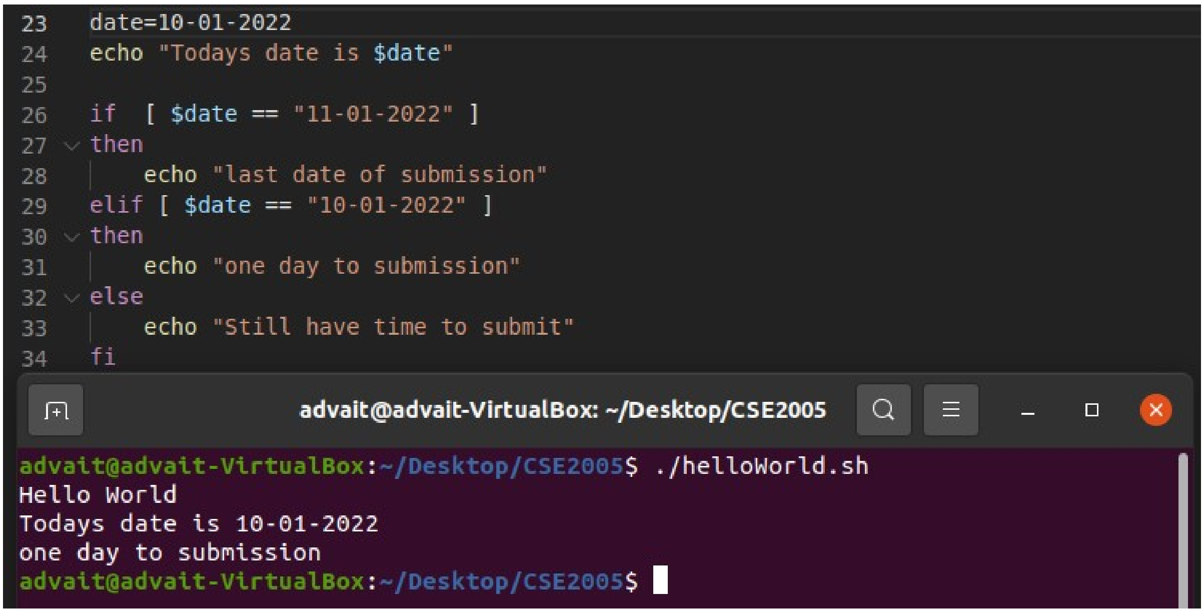
19. if then else



```
date=11-01-2022
echo "Todays date is $date"

if  [ $date == "11-01-2022" ]
then
    echo "last date of submission"
else
    echo "Still have time to submit"
fi
```

```
advait@advait-VirtualBox:~/Desktop/CSE2005$ ./helloWorld.sh
Hello World
Todays date is 11-01-2022
last date of submission
advait@advait-VirtualBox:~/Desktop/CSE2005$
```

20. elif

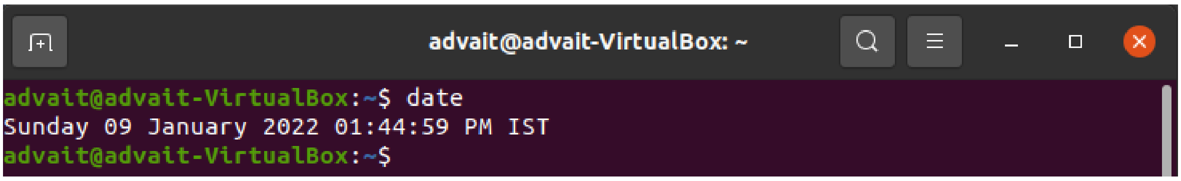


```
date=10-01-2022
echo "Todays date is $date"

if  [ $date == "11-01-2022" ]
then
    echo "last date of submission"
elif [ $date == "10-01-2022" ]
then
    echo "one day to submission"
else
    echo "Still have time to submit"
fi
```

```
advait@advait-VirtualBox:~/Desktop/CSE2005$ ./helloWorld.sh
Hello World
Todays date is 10-01-2022
one day to submission
advait@advait-VirtualBox:~/Desktop/CSE2005$ 
```

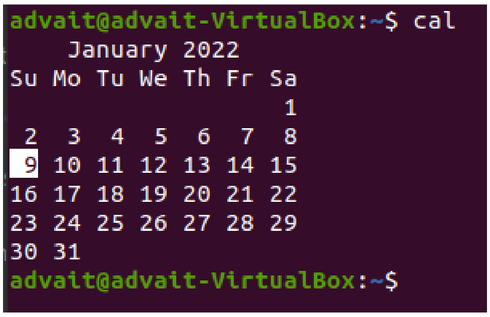
b) Unix/terminal commands

1. date



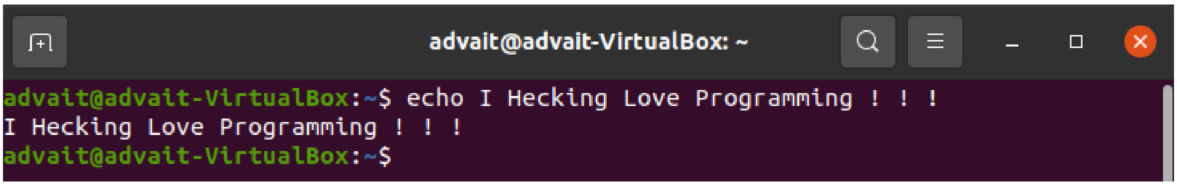
```
advait@advait-VirtualBox:~$ date
Sunday 09 January 2022 01:44:59 PM IST
advait@advait-VirtualBox:~$
```

2. cal



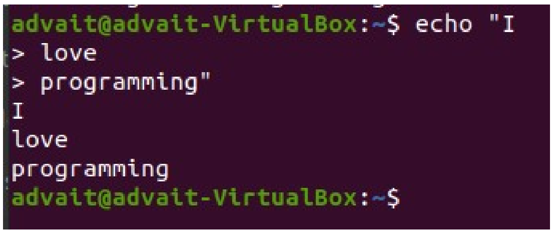
```
advait@advait-VirtualBox:~$ cal
    January 2022
Su Mo Tu We Th Fr Sa
                   1
 2  3  4  5  6  7  8
 9 10 11 12 13 14 15
16 17 18 19 20 21 22
23 24 25 26 27 28 29
30 31
advait@advait-VirtualBox:~$
```

3. echo



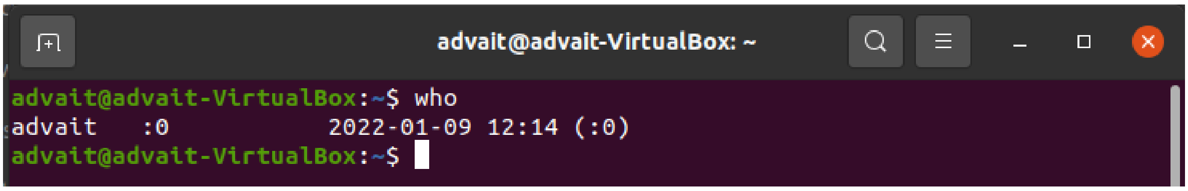
```
advait@advait-VirtualBox:~$ echo I Hecking Love Programming ! ! !
I Hecking Love Programming ! ! !
advait@advait-VirtualBox:~$
```

4. multiline echo



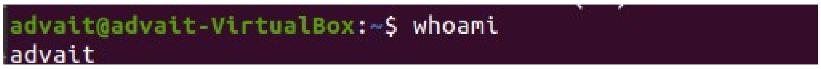
```
advait@advait-VirtualBox:~$ echo "I
> love
> programming"
I
love
programming
advait@advait-VirtualBox:~$
```

5. who



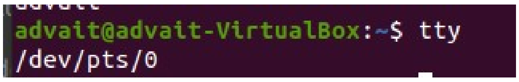
```
advait@advait-VirtualBox:~$ who
advait   :0           2022-01-09 12:14 (:0)
advait@advait-VirtualBox:~$
```

6.whoami



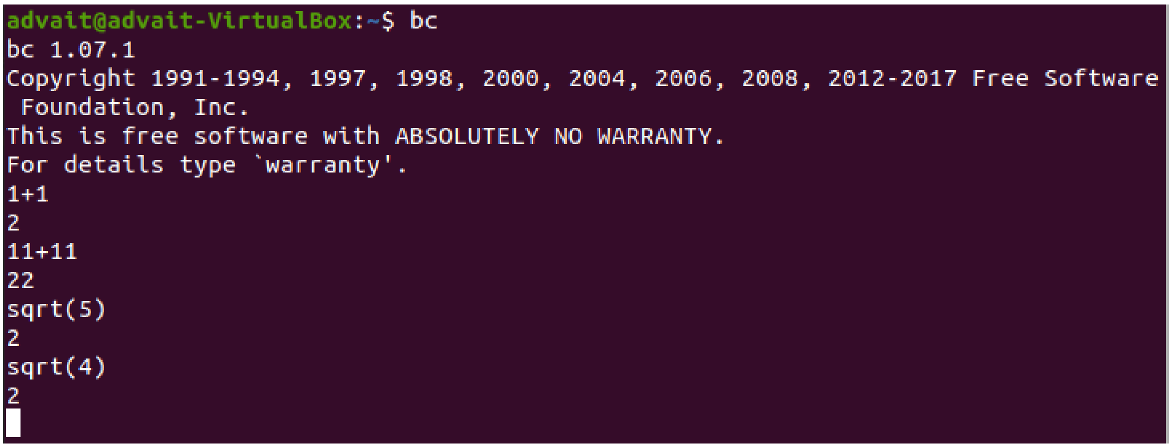
```
advait@advait-VirtualBox:~$ whoami
advait
```

7. tty (TeleTYpewriter)



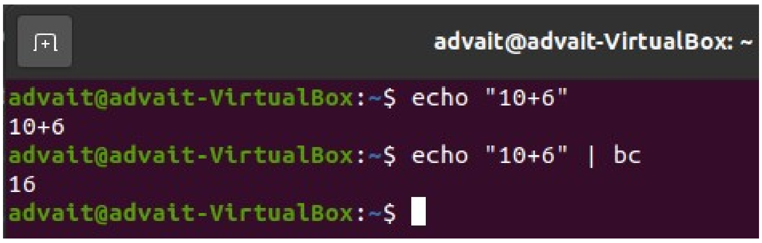
```
advait@advait-VirtualBox:~$ tty
/dev/pts/0
```

8. in-terminal calculator



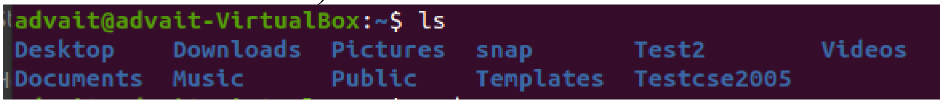
```
advait@advait-VirtualBox:~$ bc
bc 1.07.1
Copyright 1991-1994, 1997, 1998, 2000, 2004, 2006, 2008, 2012-2017 Free Software
 Foundation, Inc.
This is free software with ABSOLUTELY NO WARRANTY.
For details type `warranty'.
1+1
2
11+11
22
sqrt(5)
2
sqrt(4)
2
```

9. in-line calculator (append with ‘ | bc’)



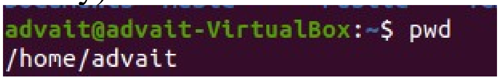
```
advait@advait-VirtualBox:~$ echo "10+6"
10+6
advait@advait-VirtualBox:~$ echo "10+6" | bc
16
advait@advait-VirtualBox:~$
```

10. ls (list contents of current dir)



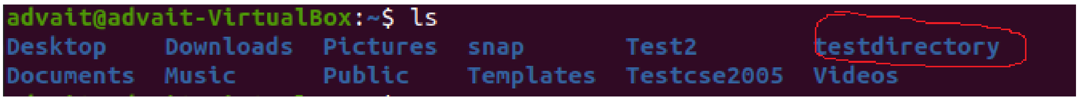
```
advait@advait-VirtualBox:~$ ls
Desktop    Downloads  Pictures  snap       Test2        Videos
Documents  Music      Public    Templates  Testcse2005
```

11. pwd (print working directory)



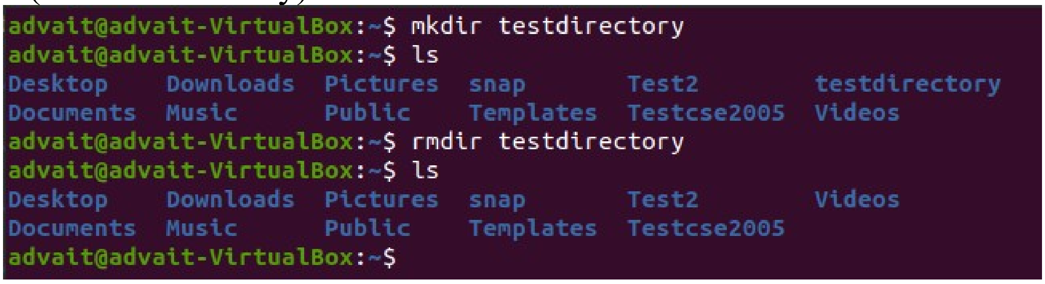
```
advait@advait-VirtualBox:~$ pwd
/home/advait
```

12. mkdir (make directory)



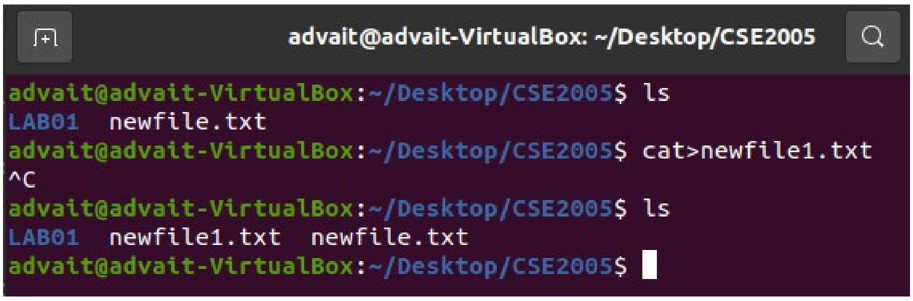
```
advait@advait-VirtualBox:~$ ls
Desktop    Downloads  Pictures  snap       Test2        testdirectory
Documents  Music      Public    Templates  Testcse2005  Videos
```

13. rmdir (remove directory)



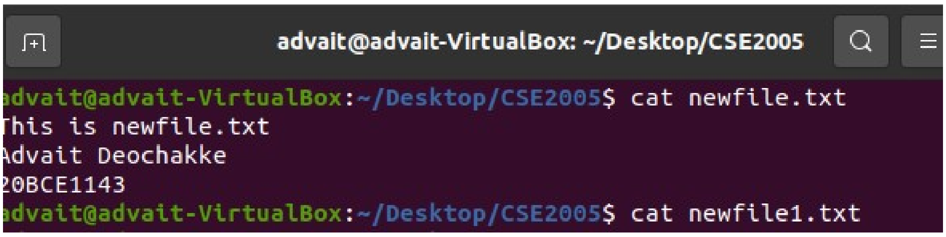
```
advait@advait-VirtualBox:~$ mkdir testdirectory
advait@advait-VirtualBox:~$ ls
Desktop    Downloads  Pictures  snap       Test2        testdirectory
Documents  Music      Public    Templates  Testcse2005  Videos
advait@advait-VirtualBox:~$ rmdir testdirectory
advait@advait-VirtualBox:~$ ls
Desktop    Downloads  Pictures  snap       Test2        Videos
Documents  Music      Public    Templates  Testcse2005
advait@advait-VirtualBox:~$
```

14. cat> (filename) (create file)



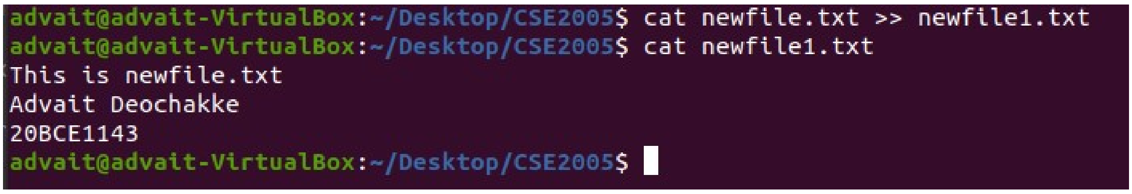
```
advait@advait-VirtualBox:~/Desktop/CSE2005$ ls
LAB01  newfile.txt
advait@advait-VirtualBox:~/Desktop/CSE2005$ cat>newfile1.txt
^C
advait@advait-VirtualBox:~/Desktop/CSE2005$ ls
LAB01  newfile1.txt  newfile.txt
advait@advait-VirtualBox:~/Desktop/CSE2005$ 
```

15. cat (filename) (show file contents)



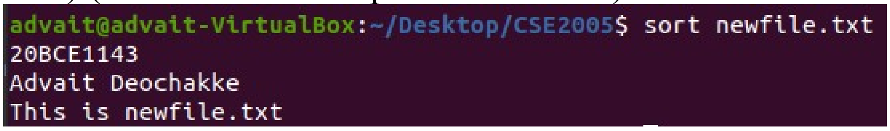
```
dvait@advait-VirtualBox:~/Desktop/CSE2005$ cat newfile.txt
his is newfile.txt
dvait Deochakke
0BCE1143
dvait@advait-VirtualBox:~/Desktop/CSE2005$ cat newfile1.txt
```

16. cat (file 1) >> (file 2) (copy file contents) (ctrl c ctrl v)



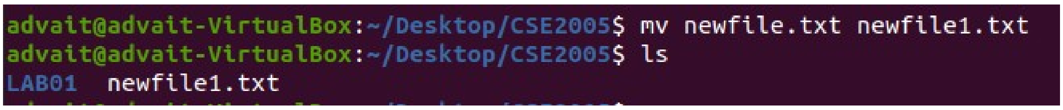
```
advait@advait-VirtualBox:~/Desktop/CSE2005$ cat newfile.txt >> newfile1.txt
advait@advait-VirtualBox:~/Desktop/CSE2005$ cat newfile1.txt
This is newfile.txt
Advait Deochakke
20BCE1143
advait@advait-VirtualBox:~/Desktop/CSE2005$ 
```

17. sort (filename) (sort file lines in alphabetical order)



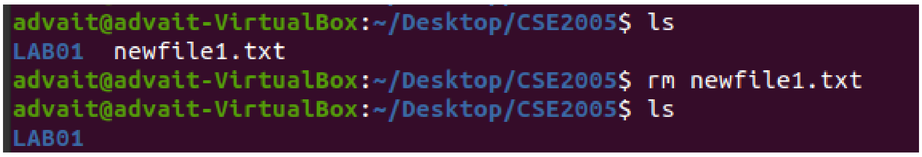
```
advait@advait-VirtualBox:~/Desktop/CSE2005$ sort newfile.txt
20BCE1143
Advait Deochakke
This is newfile.txt
```

18. mv (file 1) (file 2) (ctrl x ctrl v) (move contents) (removes the original file)



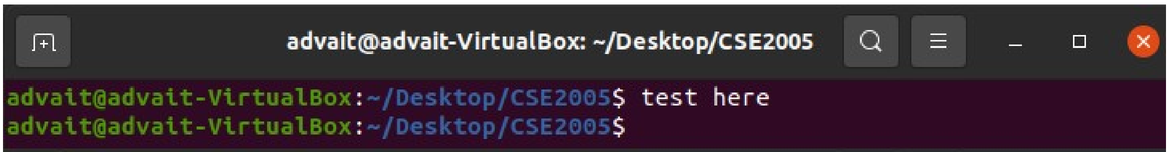
```
advait@advait-VirtualBox:~/Desktop/CSE2005$ mv newfile.txt newfile1.txt
advait@advait-VirtualBox:~/Desktop/CSE2005$ ls
LAB01  newfile1.txt
```

19. rm (filename) (remove file)

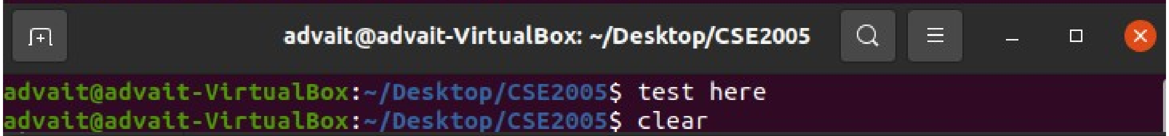


```
advait@advait-VirtualBox:~/Desktop/CSE2005$ ls
LAB01  newfile1.txt
advait@advait-VirtualBox:~/Desktop/CSE2005$ rm newfile1.txt
advait@advait-VirtualBox:~/Desktop/CSE2005$ ls
LAB01
```

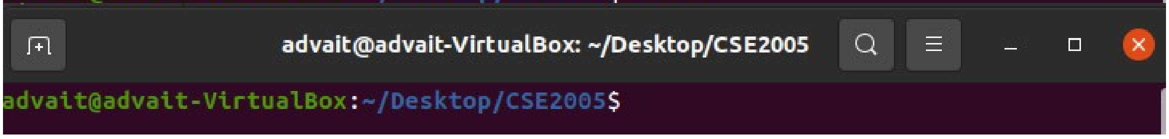
20. clear (removes contents of the screen to default)



```
advait@advait-VirtualBox:~/Desktop/CSE2005$ test here
advait@advait-VirtualBox:~/Desktop/CSE2005$
```

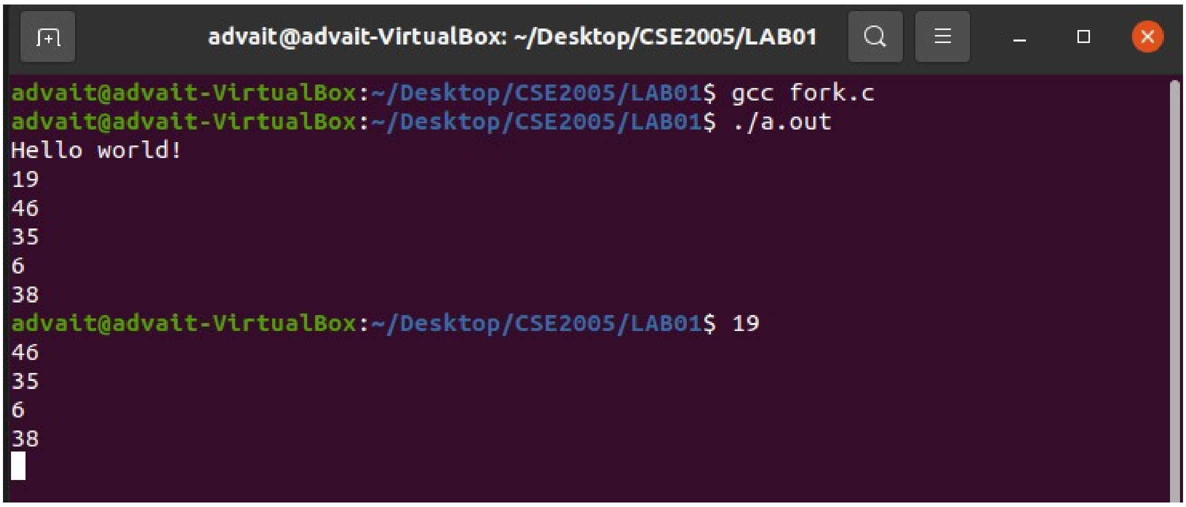


```
advait@advait-VirtualBox:~/Desktop/CSE2005$ test here
advait@advait-VirtualBox:~/Desktop/CSE2005$ clear
```

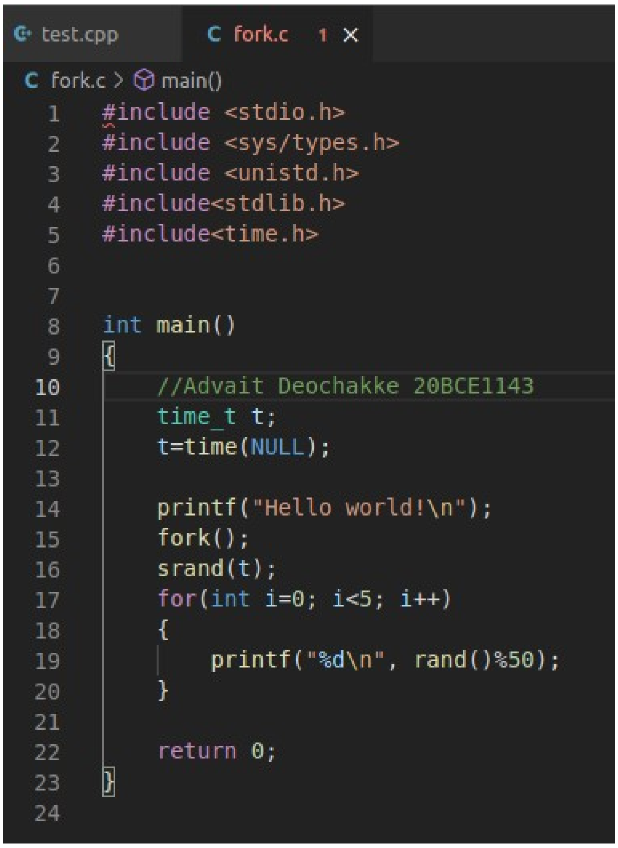


```
advait@advait-VirtualBox:~/Desktop/CSE2005$
```

<u>c) C program to show fork() (printing random numbers, but srand is in seconds and fork childe happens under a second, so unix time doesnt change)</u>



```
advait@advait-VirtualBox:~/Desktop/CSE2005/LAB01$ gcc fork.c
advait@advait-VirtualBox:~/Desktop/CSE2005/LAB01$ ./a.out
Hello world!
19
46
35
6
38
advait@advait-VirtualBox:~/Desktop/CSE2005/LAB01$ 19
46
35
6
38
```



```
#include <stdio.h>
#include <sys/types.h>
#include <unistd.h>
#include<stdlib.h>
#include<time.h>


int main()
{
    //Advait Deochakke 20BCE1143
    time_t t;
    t=time(NULL);

    printf("Hello world!\n");
    fork();
    srand(t);
    for(int i=0; i<5; i++)
    {
        printf("%d\n", rand()%50);
    }

    return 0;
}

```