VISVESVARAYA TECHNOLOGICAL UNIVERSITY

“JnanaSangama”, Belgaum -590014, Karnataka.

LAB REPORT
on

UNIX SHELL AND SYSTEM PROGRAMMING

Submitted by

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in partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE AND ENGINEERING

B.M.S. COLLEGE OF ENGINEERING
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B. M. S. College of Engineering,

Bull Temple Road, Bangalore 560019
(Affiliated To Visvesvaraya Technological University, Belgaum)

Department of Computer Science and Engineering

CERTIFICATE

This is to certify that the Lab work entitled "**Unix Shell and System Programming**" carried out by **Arnav Sharma (1BM20CS023),** who is bonafide student of **B. M. S. College of Engineering.** It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year 2022. The Lab report has been approved as it satisfies the academic requirements in respect of a **Unix Shell and System Programming- (20CS5PCUSP)** work prescribed for the said degree.

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Experiment 1

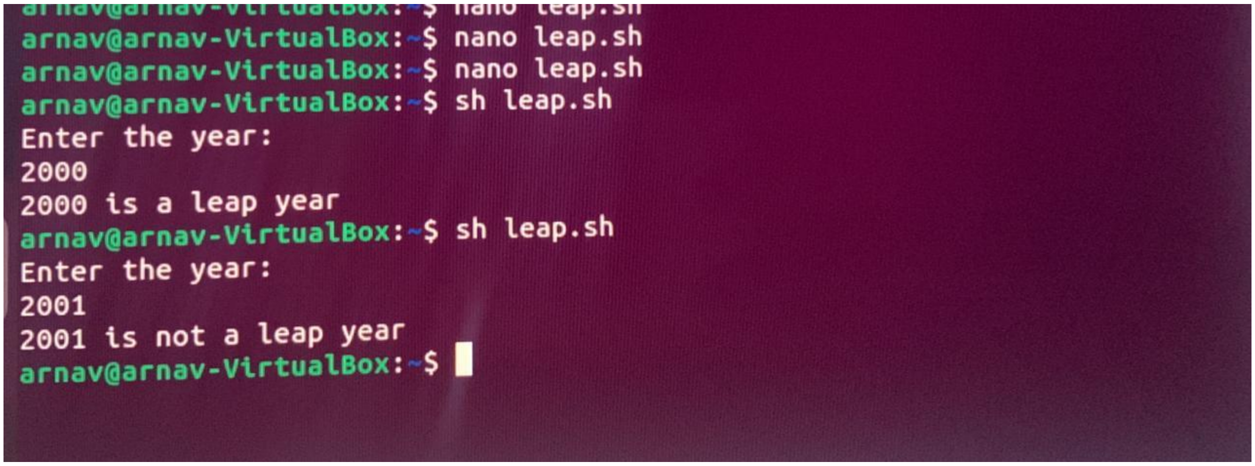
Aim of the program

Shell script to find if the given year is leap or not

Program

```
#!/bin/bash
echo "Enter an Year: "
read year

if [ $((year % 4)) -eq 0 ]
then
  if [ $((year % 100)) -eq 0 ]
    then
    if [ $((year % 400)) -eq 0 ]
          then
        echo "$year is a leap year"
    else
           echo "$year is not a leap year"
    fi
  else
  echo "$year is a leap year"
  fi
else
 echo "$year is not a leap year"
fi
```

Output



```
arnav@arnav-VirtualBox:~$ nano leap.sh
arnav@arnav-VirtualBox:~$ nano leap.sh
arnav@arnav-VirtualBox:~$ nano leap.sh
arnav@arnav-VirtualBox:~$ sh leap.sh
Enter the year:
2000
2000 is a leap year
arnav@arnav-VirtualBox:~$ sh leap.sh
Enter the year:
2001
2001 is not a leap year
arnav@arnav-VirtualBox:~$ 
```

Experiment 2

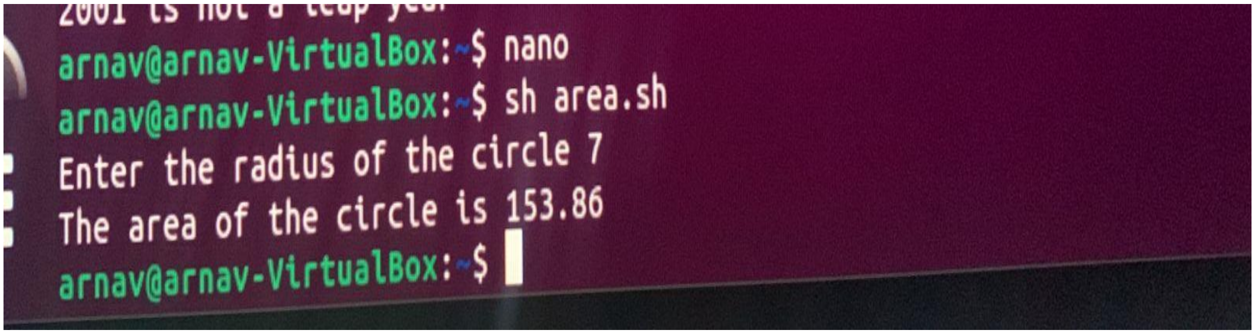
Aim of the program

Shell script to find the area of a circle

Program

```
#!/bin/bash


echo "\nEnter the radius of a circle : "
read r
echo "The area of the circle is : "
echo “3,14*$radius*$radius”|bc
```

Output



```
2001 is not a leap year
arnav@arnav-VirtualBox:~$ nano
arnav@arnav-VirtualBox:~$ sh area.sh
Enter the radius of the circle 7
The area of the circle is 153.86
arnav@arnav-VirtualBox:~$
```

Experiment 3

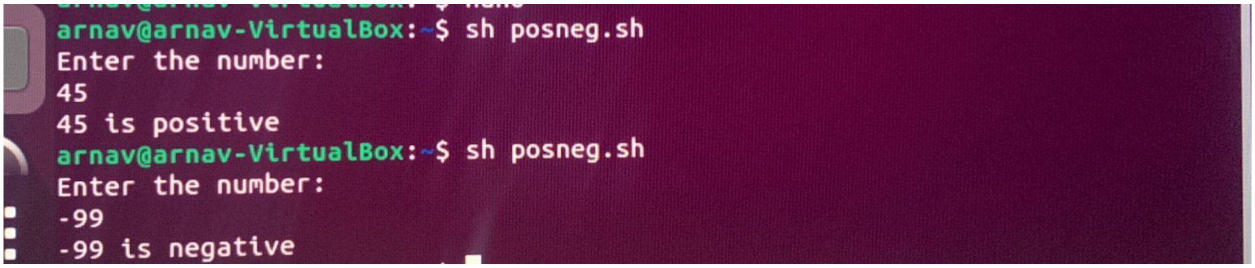
Aim of the program

Shell script to check whether the number is zero/ positive/negative

Program

```
#!/bin/bash
echo "Enter first number : "
read num

if [ $num -gt 0 ]
then
   echo "$num is positive"
elif [ $num -lt 0 ]
then
   echo "$num is negative"
else
   echo "$num is zero"
fi
```

Output



```
arnav@arnav-VirtualBox:~$ nano
arnav@arnav-VirtualBox:~$ sh posneg.sh
Enter the number:
45
45 is positive
arnav@arnav-VirtualBox:~$ sh posneg.sh
Enter the number:
-99
-99 is negative
```

Experiment 4

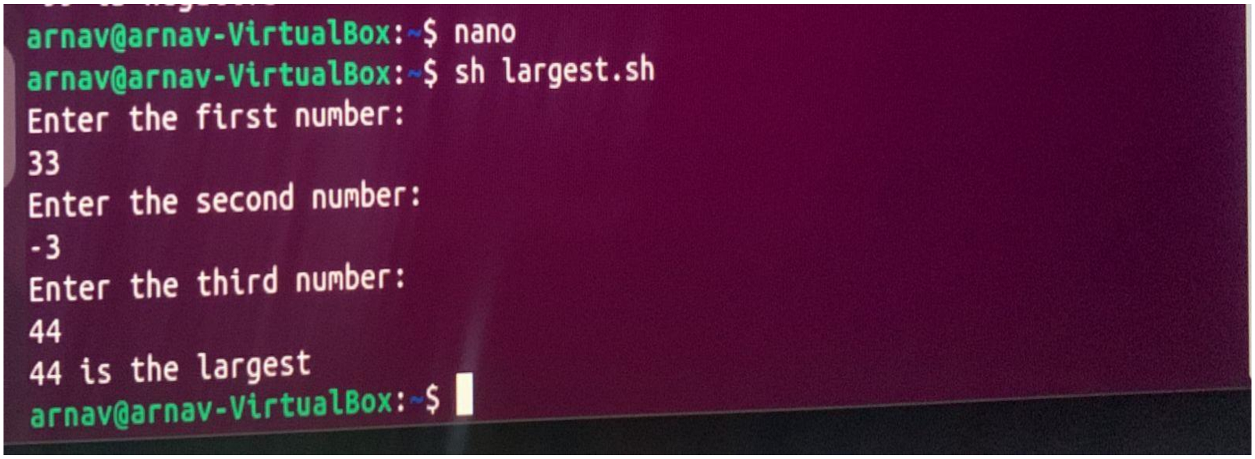
Aim of the program

Shell script to find the biggest of three numbers

Program

```
#!/bin/bash
echo "Enter first number : "
read num1
echo "Enter second number : "
read num2
echo "Enter third number : "
read num3

if [ $num1 -gt $num2 ] && [ $num1 -gt $num3 ]
then
   echo "\n$num1 is the greatest"
elif [ $num2 -gt $num1 ] && [ $num2 -gt $num3 ]
then
   echo "\n$num2 is the greatest"
else
   echo "\n$num3 is the greatest"
fi
```

Output



```
arnav@arnav-VirtualBox:~$ nano
arnav@arnav-VirtualBox:~$ sh largest.sh
Enter the first number:
33
Enter the second number:
-3
Enter the third number:
44
44 is the largest
arnav@arnav-VirtualBox:~$ 
```

Experiment 5

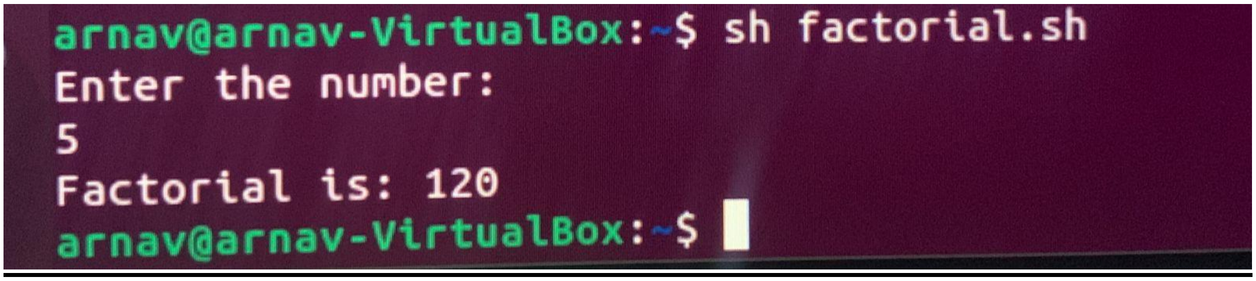
Aim of the program

Shell script to find the factorial of a number

Program

```
#!/bin/bash
read -p "Enter a number : " num
fact=1

for((i=2;i<=num;i++))
{
  fact=$((fact*i))
}

echo $Factorial is: fact
```

Output



```
arnav@arnav-VirtualBox:~$ sh factorial.sh
Enter the number:
5
Factorial is: 120
arnav@arnav-VirtualBox:~$ 
```

Experiment 6

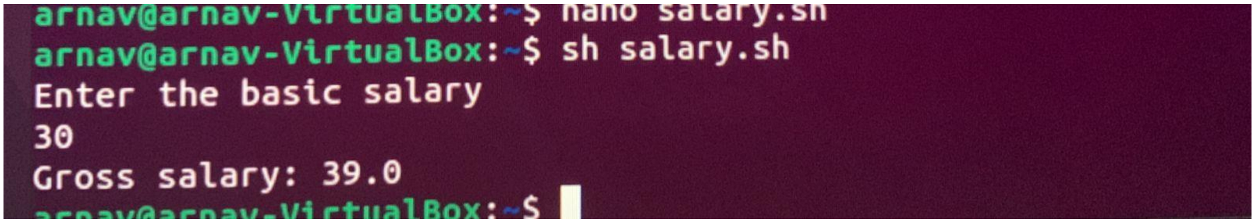
Aim of the program

Shell script to compute the gross salary of an employee

Program

```
#!/bin/bash
echo "\nEnter name of Employee :"
read name

echo "\nEnter DA :"
read da

echo "\nEnter HRA:"
read hra
echo "\nEnter basic"
read basic
sal=$(( $da + $hra + $basic ))
echo "Gross Salary: $sal"
```

Output



```
arnav@arnav-VirtualBox:~$ nano salary.sh
arnav@arnav-VirtualBox:~$ sh salary.sh
Enter the basic salary
30
Gross salary: 39.0
arnav@arnav-VirtualBox:~$
```

Experiment 7

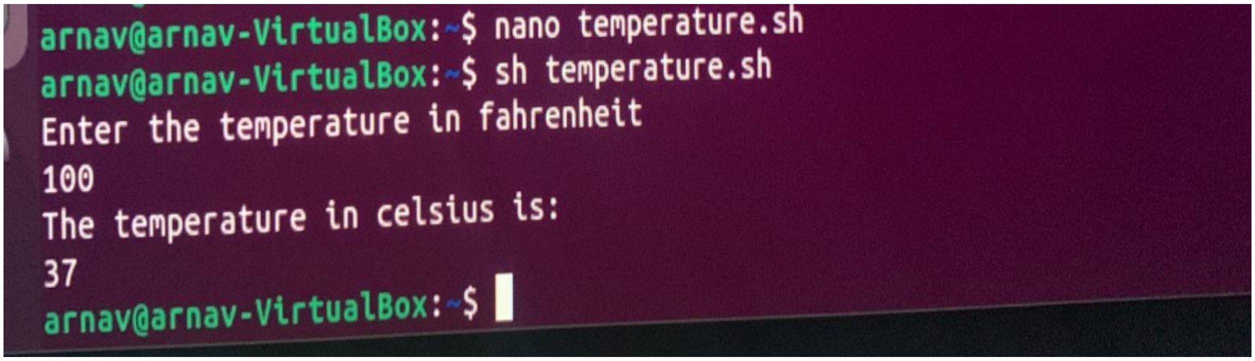
Aim of the program

Shell script to convert the temperature Fahrenheit to Celsius

Program

```
#!/bin/bash
echo "Enter temperature in fahrenheit : "
read f
echo “The temperature in celsius is: “
# formula c=(5/9)*(f-32)
c=$(echo "scale=2;(5/9)*($f-32)"|bc)
echo "$f °F = $c °C"
```

Output



```
arnav@arnav-VirtualBox:~$ nano temperature.sh
arnav@arnav-VirtualBox:~$ sh temperature.sh
Enter the temperature in fahrenheit
100
The temperature in celsius is:
37
arnav@arnav-VirtualBox:~$ 
```

Experiment 8

Aim of the program

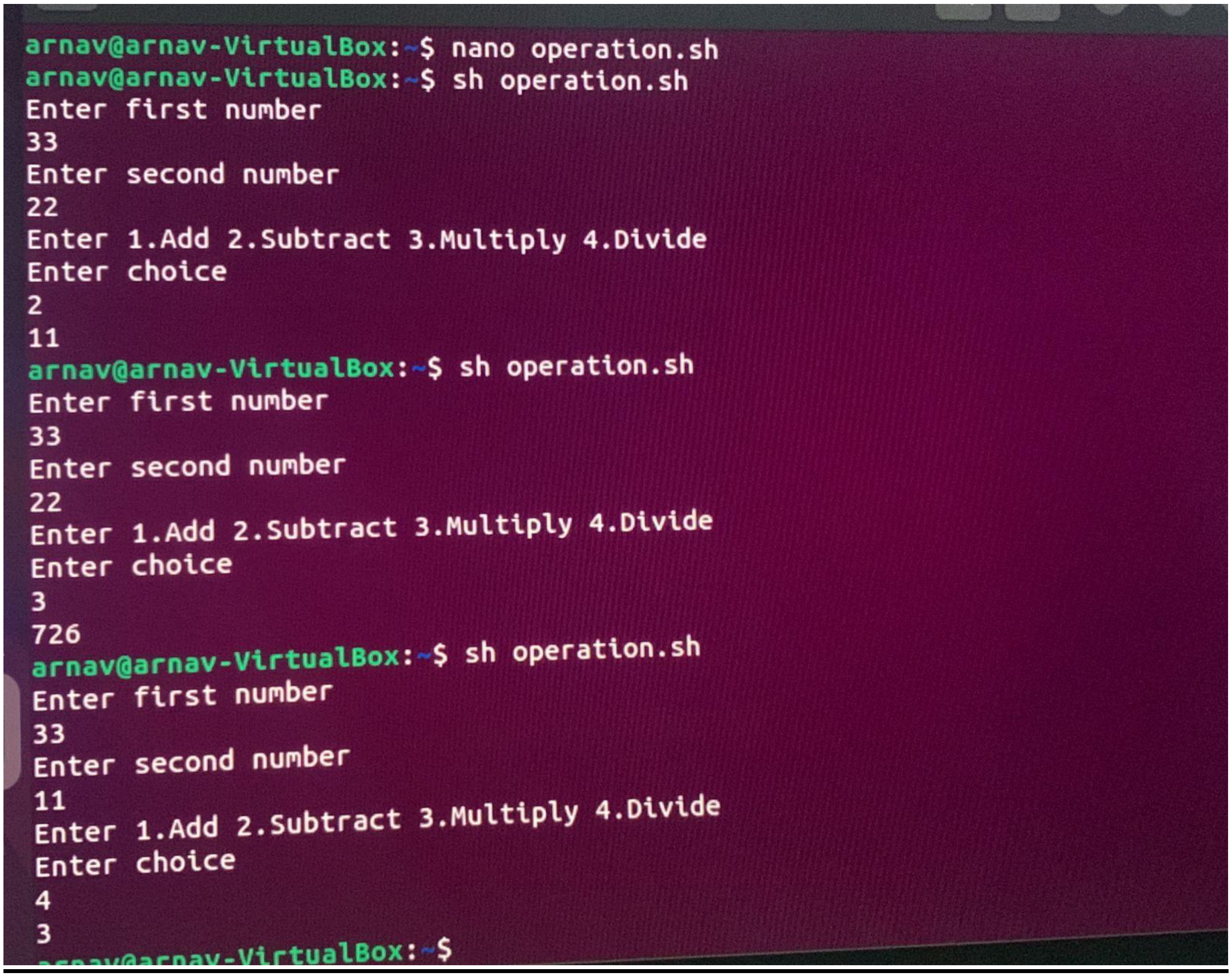
Shell script to perform arithmetic operations on given two numbers

Program

```
#!/bin/bash
echo "Enter 2 Numbers : "
read a
read b

echo "Enter Operation : \n"
echo "1) Addition"
echo "2) Subtraction"
echo "3) Multiplication"
echo "4) Division(Quotient)"
echo "5) Modulus(Remainder)\n"
read op

case $op in
  1)echo "scale=3; $a + $b" | bc -l;;
  2)echo "scale=3; $a - $b" | bc -l  ;;
  3)echo "scale=3; $a \* $b" | bc -l;;
  4)echo "scale=3; $a / $b" | bc -l ;;
  5)echo "scale=3; $a % $b" | bc -l;;
  *)echo "Choose a valid option"
```

esac

Output



```
arnav@arnav-VirtualBox:~$ nano operation.sh
arnav@arnav-VirtualBox:~$ sh operation.sh
Enter first number
33
Enter second number
22
Enter 1.Add 2.Subtract 3.Multiply 4.Divide
Enter choice
2
11
arnav@arnav-VirtualBox:~$ sh operation.sh
Enter first number
33
Enter second number
22
Enter 1.Add 2.Subtract 3.Multiply 4.Divide
Enter choice
3
726
arnav@arnav-VirtualBox:~$ sh operation.sh
Enter first number
33
Enter second number
11
Enter 1.Add 2.Subtract 3.Multiply 4.Divide
Enter choice
4
3
arnav@arnav-VirtualBox:~$
```

Experiment 9

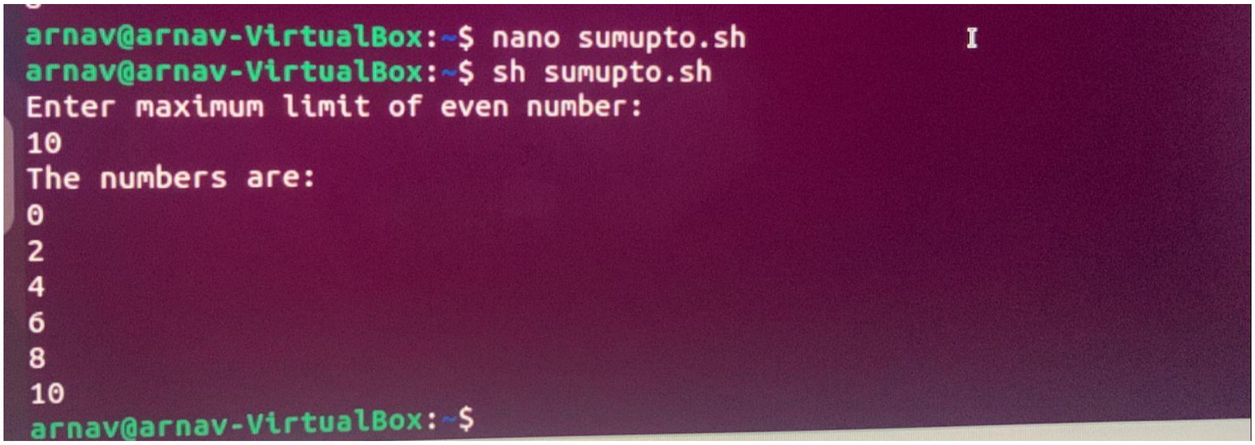
Aim of the program

Shell script to find the sum of even numbers up to n

Program

```
#!/bin/bash
sum=0
read -p "Enter maximum limit of Even Numbers : " m
for ((i = 0; i < m; i++)); do
    if [[ $i%2 -eq 0 ]]; then
        sum=$(expr $sum + $i)
    fi
done
```

Output



```
arnav@arnav-VirtualBox:~$ nano sumupto.sh
arnav@arnav-VirtualBox:~$ sh sumupto.sh
Enter maximum limit of even number:
10
The numbers are:
0
2
4
6
8
10
arnav@arnav-VirtualBox:~$
```

Experiment 10

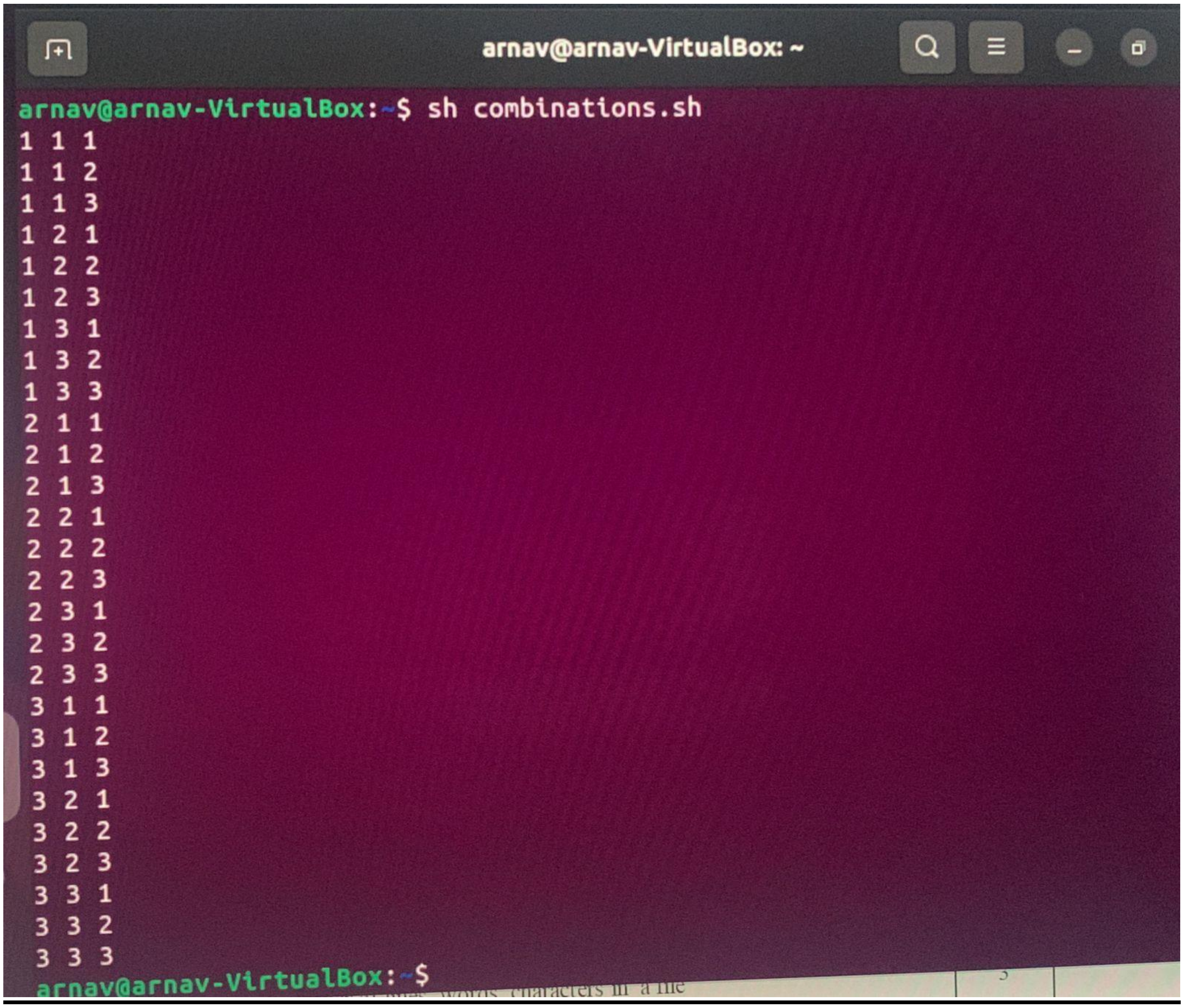
Aim of the program

Shell script to print the combinations of numbers 123

Program

```
for ((i = 1; i <= 3; i++)); do
    for ((j = 1; j <= 3; j++)); do
        for ((k = 1; k <= 3; k++)); do
            echo $i $j $k
        done
    done
done
```

Output



```
arnav@arnav-VirtualBox:~$ sh combinations.sh
1 1 1
1 1 2
1 1 3
1 2 1
1 2 2
1 2 3
1 3 1
1 3 2
1 3 3
2 1 1
2 1 2
2 1 3
2 2 1
2 2 2
2 2 3
2 3 1
2 3 2
2 3 3
3 1 1
3 1 2
3 1 3
3 2 1
3 2 2
3 2 3
3 3 1
3 3 2
3 3 3
arnav@arnav-VirtualBox:~$
```

Experiment 11

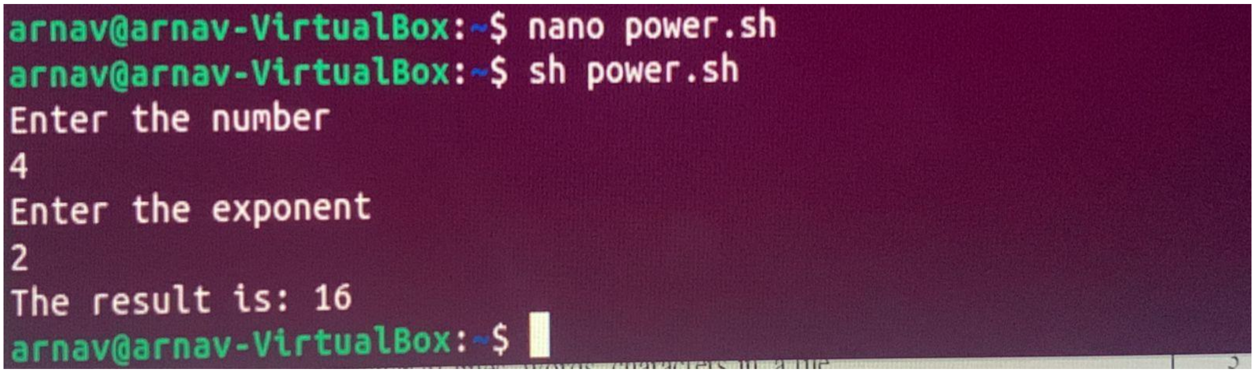
Aim of the program

Shell script to find the power of a number

Program

```
#!/bin/bash
read -p "Enter the number : " a
read -p "Enter the exponent : " b

res=1
for ((i = 1; i <= b; i++)); do
    res=$(expr $res \* $a)
done
echo $res
```

Output



```
arnav@arnav-VirtualBox:~$ nano power.sh
arnav@arnav-VirtualBox:~$ sh power.sh
Enter the number
4
Enter the exponent
2
The result is: 16
arnav@arnav-VirtualBox:~$
```

Experiment 12

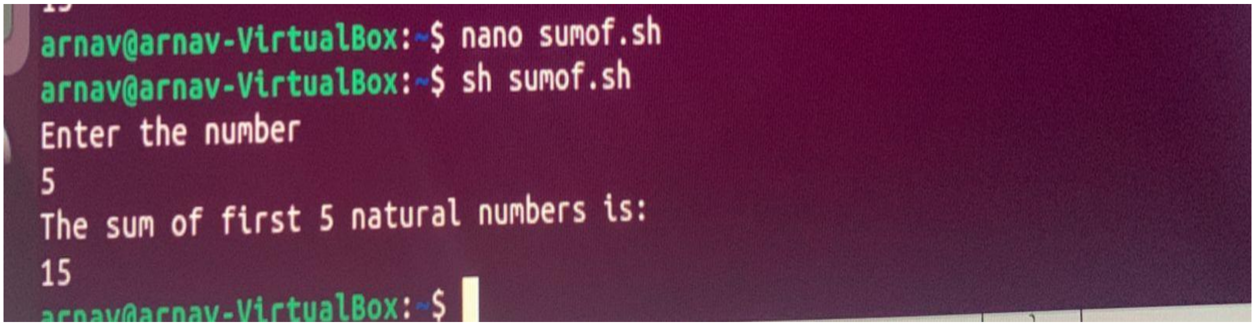
Aim of the program

Shell script to find the sum of n natural numbers

Program

```
#!/bin/bash
echo "Enter the number"
read x
y=0
while [$x -gt 0 ]
do
y = `expr $y + $x`
x = `expr $x - 1`
echo "The sum of first $x natural numbers  is: $y"
```

Output



```
arnav@arnav-VirtualBox:~$ nano sumof.sh
arnav@arnav-VirtualBox:~$ sh sumof.sh
Enter the number
5
The sum of first 5 natural numbers is:
15
arnav@arnav-VirtualBox:~$
```

Experiment 13

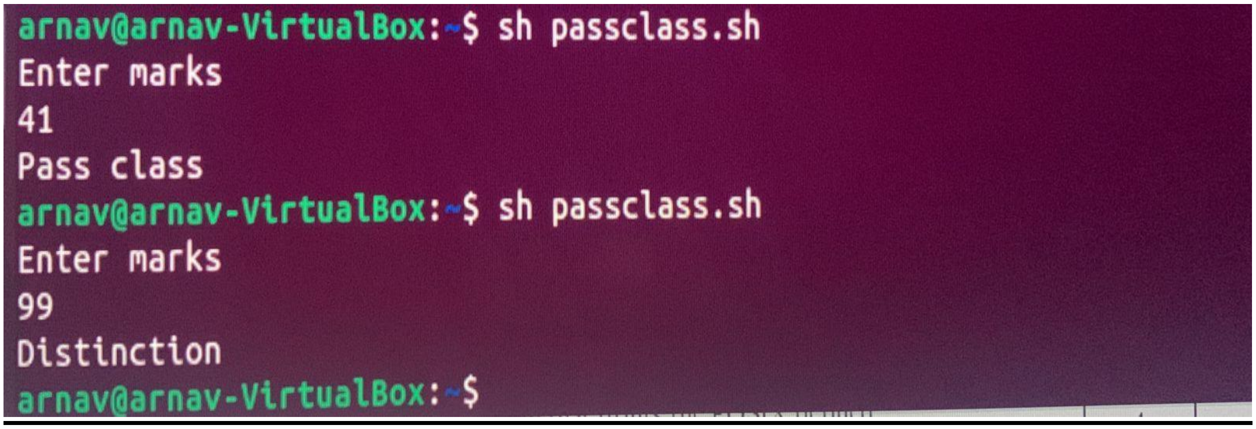
Aim of the program

Shell script to display the pass class of a student

Program

```
read -p "Enter marks : " marks
if [ $marks-ge 90 ]
then
echo "S Grade"
elif [ $per -ge 75 ]
then
echo "A Grade"
elif [ $per -ge  60 ]
then
echo "B Grade"
elif [ $per -le  40 ]
then
echo "Fail"
else
echo "C Grade"
fi
```

Output



```
arnav@arnav-VirtualBox:~$ sh passclass.sh
Enter marks
41
Pass class
arnav@arnav-VirtualBox:~$ sh passclass.sh
Enter marks
99
Distinction
arnav@arnav-VirtualBox:~$
```

Experiment 14

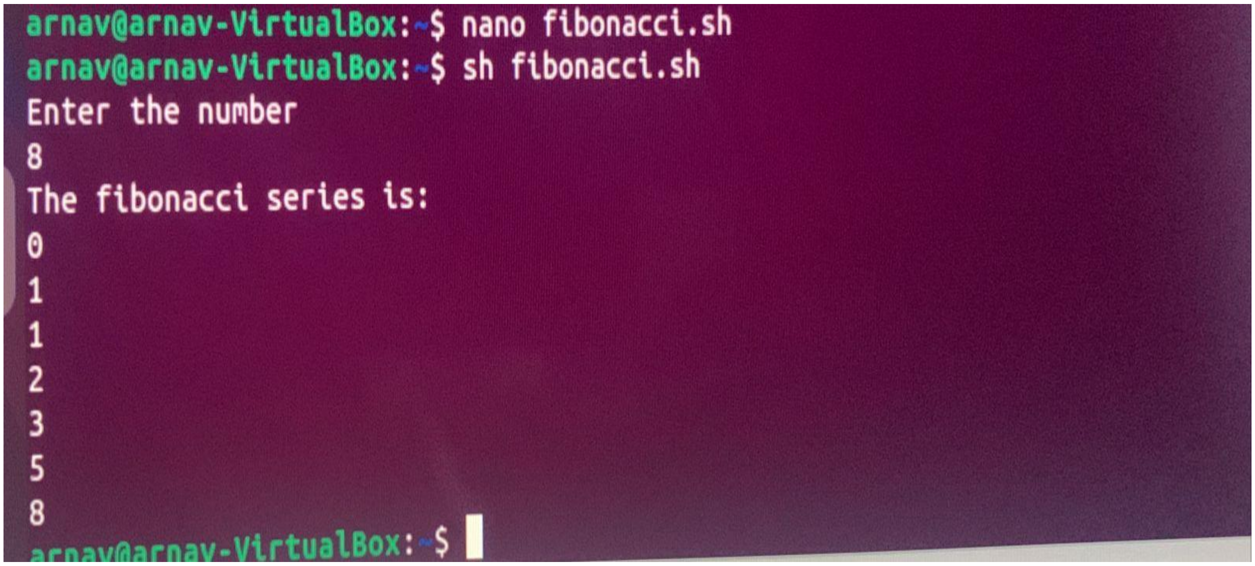
Aim of the program

Shell script to find the Fibonacci series up to n

Program

```
read -p "Enter a number : " N
a=0
b=1
echo "The Fibonacci series is : "

for (( i=0; i<N; i++ ))
do
   echo "$a"
   fib=$((a + b))
   a=$b
   b=$fib

done
```

Output



```
arnav@arnav-VirtualBox:~$ nano fibonacci.sh
arnav@arnav-VirtualBox:~$ sh fibonacci.sh
Enter the number
8
The fibonacci series is:
0
1
1
2
3
5
8
arnav@arnav-VirtualBox:~$
```

Experiment 15

Aim of the program

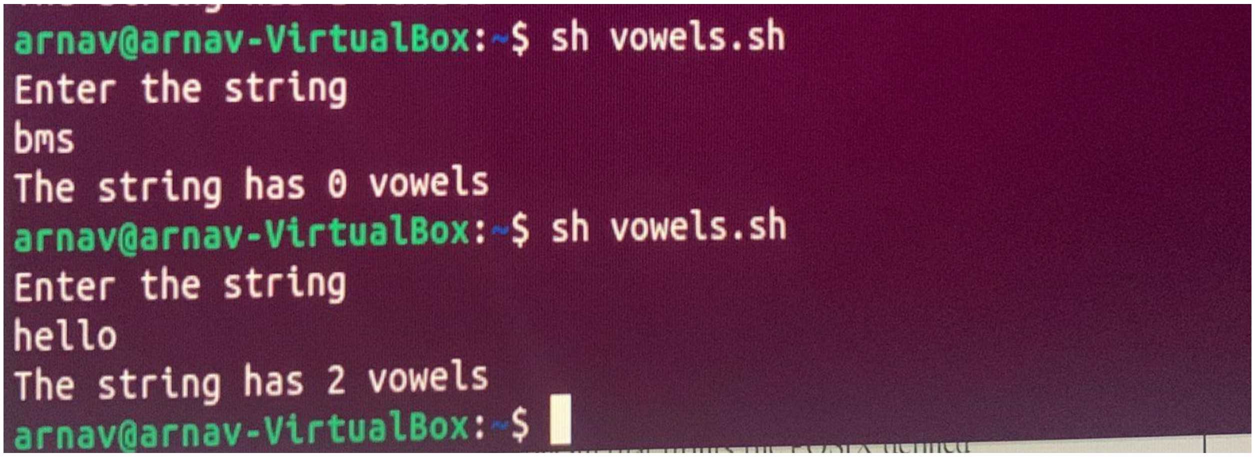
Shell script to count the number of vowels of a string

Program

```
#!/bin/bash
echo "Enter string"
read str
vowel = 0
i=`expr length $str`

while [ $i -gt 0 ]
do
temp = `expr $str|cut -c $i`

case $temp in
a|A) vowel = `expr $vowel + 1`;;
e|E) vowel = `expr $vowel + 1`;;
i|I) vowel = `expr $vowel + 1`;;
o|O) vowel = `expr $vowel + 1`;;
u|U) vowel = `expr $vowel + 1`;;
esac

i = `expr $i - 1`
done
```

```
echo "Number of vowels in string $vowel"
```

Output



```
arnav@arnav-VirtualBox:~$ sh vowels.sh
Enter the string
bms
The string has 0 vowels
arnav@arnav-VirtualBox:~$ sh vowels.sh
Enter the string
hello
The string has 2 vowels
arnav@arnav-VirtualBox:~$ 
```

Experiment 16

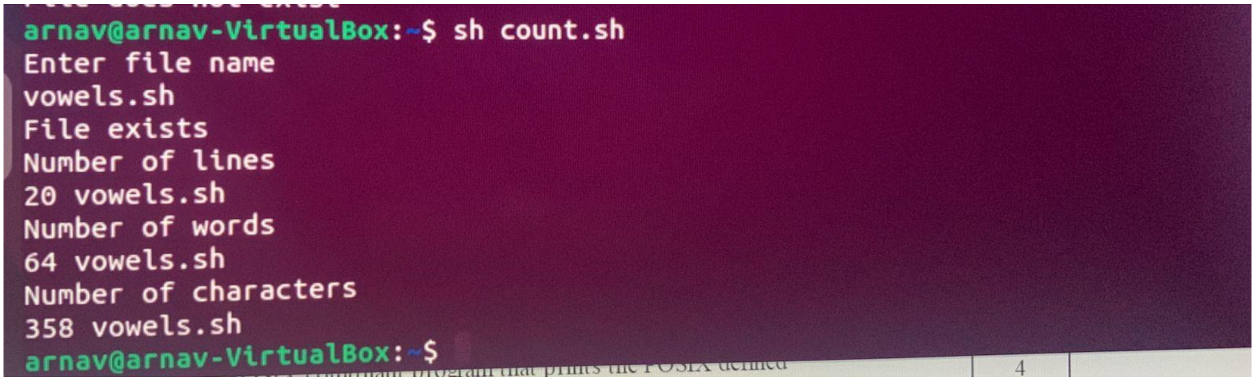
Aim of the program

Shell script to check number of lines, words, characters in a file

Program

```
#!/bin/bash
echo "Enter file name"
read fname
echo "Number of lines in file"
wc -l $fname
echo "Number of words in file"
wc -w $fname
echo "Number of charcaters in file"
wc -m $fname
else
echo "Non existent file"
fi
```

Output



```
arnav@arnav-VirtualBox:~$ sh count.sh
Enter file name
vowels.sh
File exists
Number of lines
20 vowels.sh
Number of words
64 vowels.sh
Number of characters
358 vowels.sh
arnav@arnav-VirtualBox:~$
```

Experiment 17

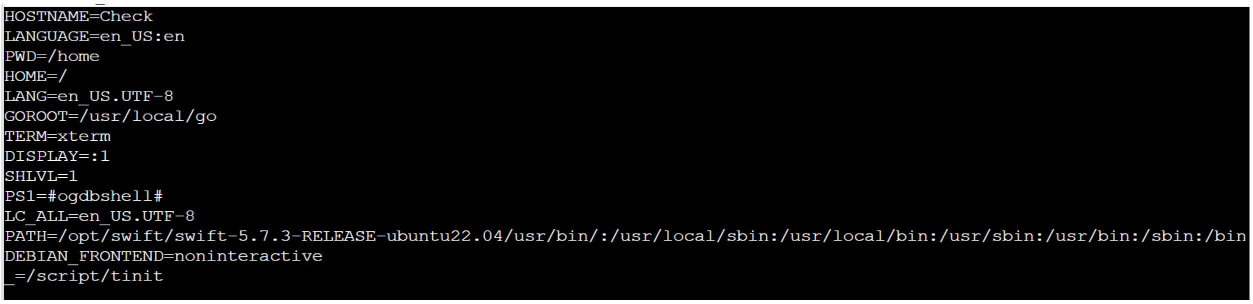
Aim of the program

Write a C/C++ program to that outputs the contents of its environment list

Program

```
#include<stdio.h>
int main(int
argc, char* argv[ ])
{
int i;
char **ptr;
extern char
**environ;
for( ptr =
environ; *ptr != 0; ptr++ ) /*echo all env strings*/
printf(“%s\n”,
*ptr);
return 0;
}
```

Output



```
HOSTNAME=Check
LANGUAGE=en_US:en
PWD=/home
HOME=/
LANG=en_US.UTF-8
GOROOT=/usr/local/go
TERM=xterm
DISPLAY=:1
SHLVL=1
PS1=#ogdbshell#
LC_ALL=en_US.UTF-8
PATH=/opt/swift/swift-5.7.3-RELEASE-ubuntu22.04/usr/bin/:/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin
DEBIAN_FRONTEND=noninteractive
_=/script/tinit
```

Experiment 18

Aim of the program

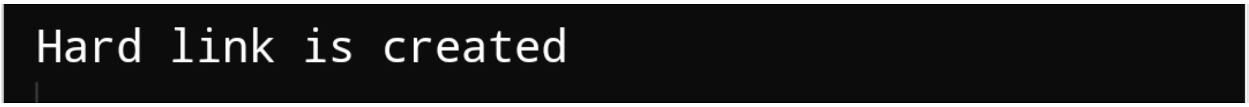
Write a C/C++ program to emulate the Unix **ln** command

Program

```
#include<stdio.h>
#include<sys/types.h>
#include<unistd.h>
#include<string.h>
int main(int argc, char * argv[])
{
if(argc < 3 || argc > 4 || (argc == 4 && strcmp(argv[1],”-s”)))
{
printf(“Usage: ./a.out [-s] <org_file> <new_link>\n”);
return 1;
}
if(argc == 4)
{
if((symlink(argv[2],argv[3])) == -1)
printf(“Cannot create symbolic link\n”) ;
else
printf(“Symbolic link created\n”) ;
}
else
{
```

```
if((link(argv[1],argv[2])) == -1)
printf(“Cannot create hard link\n”) ;
else
printf(“Hard link created\n”) ;
}
return 0;
}
```

<u>Output</u>



```
Hard link is created
```

Experiment 19

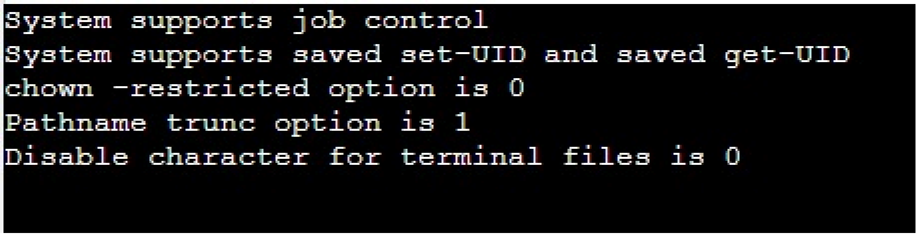
Aim of the program

Write a C/C++ POSIX compliant program that prints the POSIX defined Configuration options supported on any given system using feature test macros.

Program

```
#define _POSIX_SOURCE
#define _POSIX_C_SOURCE 199309L
#include<stdio.h>
#include<unistd.h>
int main()
{
#ifdef _POSIX_JOB_CONTROL
printf(“System supports job control\n”);
#else
printf(“System does not support job control \n”);
#endif
#ifdef _POSIX_SAVED_IDS
printf(“System supports saved set-UID and saved set-GID\n”);
#else
printf(“System does not support saved set-UID and saved set-GID \n”);
#endif
#ifdef _POSIX_CHOWN_RESTRICTED
printf(“chown_restricted option is %d\n”,_POSIX_CHOWN_RESTRICTED);
#else
printf("System does not support chown_restricted option \n");
#endif
#ifdef _POSIX_NO_TRUNC
printf("Pathname trunc option is %d\n",_POSIX_NO_TRUNC);
#else
printf("System does not support system-wide pathname trunc option \n");
#endif
#ifdef _POSIX_VDISABLE
printf("Disable character for terminal files is %d\n",_POSIX_VDISABLE);
#else
printf("System does not support _POSIX_VDISABLE \n");
#endif
return 0;
}
```

Output



```
System supports job control
System supports saved set-UID and saved get-UID
chown -restricted option is 0
Pathname trunc option is 1
Disable character for terminal files is 0
```

Experiment 20

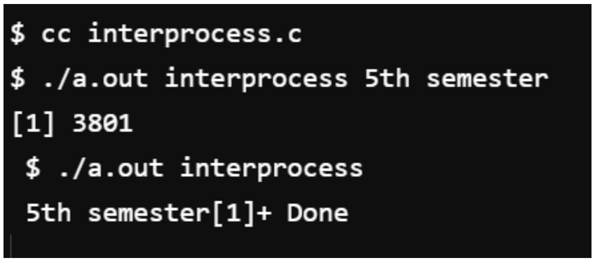
Aim of the program

Write a C/C++ program which demonstrates Interprocess Communication between a reader process and a writer process. Use mkfifo, open, read, write and close apis in your program.

Program

```
#include<sys/types.h>
#include<unistd.h>
#include<fcntl.h>
#include<sys/stat.h>
#include<string.h>
#include<errno.h>
#include<stdio.h>
int main(int argc, char* argv[])
{
int fd;
char buf[256];
if(argc != 2 && argc != 3)
{
printf(“USAGE %s <file> [<arg>]\n”,argv[0]);
return 0;
}
mkfifo(argv[1],S_IFIFO | S_IRWXU | S_IRWXG | S_IRWXO );
if(argc == 2)
{
fd = open(argv[1], O_RDONLY|O_NONBLOCK);
while(read(fd,buf, sizeof(buf)) &gt; 0)
printf(“%s”,buf);
}
else
{
fd = open(argv[1], O_WRONLY);
write(fd,argv[2],strlen(argv[2]));
}
close(fd);
}
```

Output



```
$ cc interprocess.c
$ ./a.out interprocess 5th semester
[1] 3801
 $ ./a.out interprocess
 5th semester[1]+ Done
```