Shortest Job First(Preemptive) scheduling Algorithm:

Input-

```
#include <stdio.h>
 int main()
 {
  int arrival_time[10], burst_time[10], temp[10];
  int i, smallest, count = 0, time, limit;
  double wait_time = 0, turnaround_time = 0, end;
  float average_waiting_time, average_turnaround_time;
  printf("\nEnter the Total Number of Processes:\t");
  scanf("%d", &limit);
  printf("\nEnter Details of %d Processes", limit);
  for(i = 0; i < limit; i++)
  {
      printf("\nEnter Arrival Time:\t");
      scanf("%d", &arrival_time[i]);
      printf("Enter Burst Time:\t");
      scanf("%d", &burst_time[i]);
      temp[i] = burst_time[i];
  }
  burst_time[9] = 9999;
  for(time = 0; count != limit; time++)
  {
      smallest = 9;
      for(i = 0; i < limit; i++)
      {
          if(arrival_time[i] <= time && burst_time[i] < burst_time[smallest] && burst_time[i] > 0)
          {
              smallest = i;
          }
```

```
        }
        burst_time[smallest]--;
        if(burst_time[smallest] == 0)
        {
            count++;
            end = time + 1;
            wait_time = wait_time + end - arrival_time[smallest] - temp[smallest];
            turnaround_time = turnaround_time + end - arrival_time[smallest];
        }
    }
    average_waiting_time = wait_time / limit;
    average_turnaround_time = turnaround_time / limit;
    printf("\n\nAverage Waiting Time:\t%lf\n", average_waiting_time);
    printf("Average Turnaround Time:\t%lf\n", average_turnaround_time);
    return 0;
  }
```

Output-

```
Enter the Total Number of Processes:    4

Enter Details of 4 Processesn
Enter Arrival Time:     0
Enter Burst Time:       6

Enter Arrival Time:     1
Enter Burst Time:       4

Enter Arrival Time:     3
Enter Burst Time:       7

Enter Arrival Time:     5
Enter Burst Time:       2


Average Waiting Time:   3.750000
Average Turnaround Time:        8.500000

--------------------------------
Process exited after 32.68 seconds with return value 0
Press any key to continue . . .
```

Shortest Job First(Non-Preemptive) scheduling Algorithm:

Input –

```
#include<stdio.h>

int main() {
  int time, burst_time[10], at[10], sum_burst_time = 0, smallest, n, i;
  int sumt = 0, sumw = 0;
  printf("enter the no of processes : ");
  scanf("%d", & n);
  for (i = 0; i < n; i++) {
    printf("the arrival time for process P%d : ", i + 1);
    scanf("%d", & at[i]);
    printf("the burst time for process P%d : ", i + 1);
    scanf("%d", & burst_time[i]);
    sum_burst_time += burst_time[i];
  }
  burst_time[9] = 9999;
  for (time = 0; time < sum_burst_time;) {
    smallest = 9;
    for (i = 0; i < n; i++) {
      if (at[i] <= time && burst_time[i] > 0 && burst_time[i] < burst_time[smallest])
        smallest = i;
    }
    printf("P[%d]\t|\t%d\t|\t%d\n", smallest + 1, time + burst_time[smallest] - at[smallest], time -
at[smallest]);
    sumt += time + burst_time[smallest] - at[smallest];
    sumw += time - at[smallest];
```

```
    time += burst_time[smallest];
    burst_time[smallest] = 0;
  }
  printf("\n\n average waiting time = %f", sumw * 1.0 / n);
  printf("\n\n average turnaround time = %f", sumt * 1.0 / n);
  return 0;
}
```

Output-

```
enter the no of processes : 4
the arrival time for process P1 : 0
the burst time for process P1 : 6
the arrival time for process P2 : 1
the burst time for process P2 : 4
the arrival time for process P3 : 3
the burst time for process P3 : 7
the arrival time for process P4 : 5
the burst time for process P4 : 2
P[1]    |       6       |       0
P[4]    |       3       |       1
P[2]    |       11      |       7
P[3]    |       16      |       9


 average waiting time = 4.250000

 average turnaround time = 9.000000
--------------------------------
Process exited after 19.29 seconds with return value 0
Press any key to continue . . .
```

FCFS Scheduling Algorithm:

Input-

```
#include <stdio.h>
int main()
{
   int pid[15];
   int bt[15];
   int n;
   printf("Enter the number of processes: ");
   scanf("%d",&n);

   printf("Enter process id of all the processes: ");
   for(int i=0;i<n;i++)
   {
      scanf("%d",&pid[i]);
   }

   printf("Enter burst time of all the processes: ");
   for(int i=0;i<n;i++)
   {
      scanf("%d",&bt[i]);
   }

   int i, wt[n];
   wt[0]=0;

   //for calculating waiting time of each process
```

```
for(i=1; i<n; i++)
{
   wt[i]= bt[i-1]+ wt[i-1];
}

printf("Process ID     Burst Time     Waiting Time     TurnAround Time\n");
float twt=0.0;
float tat= 0.0;
for(i=0; i<n; i++)
{
   printf("%d\t\t", pid[i]);
   printf("%d\t\t", bt[i]);
   printf("%d\t\t", wt[i]);

   //calculating and printing turnaround time of each process
   printf("%d\t\t", bt[i]+wt[i]);
   printf("\n");

   //for calculating total waiting time
   twt += wt[i];

   //for calculating total turnaround time
   tat += (wt[i]+bt[i]);
}
float att,awt;

//for calculating average waiting time
awt = twt/n;

//for calculating average turnaround time
att = tat/n;
```

```
    printf("Avg. waiting time= %f\n",awt);
    printf("Avg. turnaround time= %f",att);
}
```

Output-

```
Enter the number of processes: 4
Enter process id of all the processes: 1 2 3 4
Enter burst time of all the processes: 5 2 6 4
Process ID     Burst Time     Waiting Time     TurnAround Time
1               5               0               5
2               2               5               7
3               6               7               13
4               4               13              17
Avg. waiting time= 6.250000
Avg. turnaround time= 10.500000
--------------------------------
Process exited after 11.59 seconds with return value 0
Press any key to continue . . .
```

Round Robin Scheduling Algorithm:

Input-

```
#include<stdio.h>

void main()
{
   // initlialize the variable name
   int i, NOP, sum=0,count=0, y, quant, wt=0, tat=0, at[10], bt[10], temp[10];
   float avg_wt, avg_tat;
   printf(" Total number of process in the system: ");
   scanf("%d", &NOP);
   y = NOP; // Assign the number of process to variable y

// Use for loop to enter the details of the process like Arrival time and the Burst Time
for(i=0; i<NOP; i++)
{
printf("\n Enter the Arrival and Burst time of the Process[%d]\n", i+1);
printf(" Arrival time is: \t");  // Accept arrival time
scanf("%d", &at[i]);
printf(" \nBurst time is: \t"); // Accept the Burst time
scanf("%d", &bt[i]);
temp[i] = bt[i]; // store the burst time in temp array
}
// Accept the Time qunat
printf("Enter the Time Quantum for the process: \t");
scanf("%d", &quant);
// Display the process No, burst time, Turn Around Time and the waiting time
printf("\n Process No \t\t Burst Time \t\t TAT \t\t Waiting Time ");
```

```
for(sum=0, i = 0; y!=0; )
{
if(temp[i] <= quant && temp[i] > 0) // define the conditions
{
   sum = sum + temp[i];
   temp[i] = 0;
   count=1;
   }
   else if(temp[i] > 0)
   {
      temp[i] = temp[i] - quant;
      sum = sum + quant;
   }
   if(temp[i]==0 && count==1)
   {
      y--; //decrement the process no.
      printf("\nProcess No[%d] \t\t %d\t\t\t\t %d\t\t\t %d", i+1, bt[i], sum-at[i], sum-at[i]-bt[i]);
      wt = wt+sum-at[i]-bt[i];
      tat = tat+sum-at[i];
      count =0;
   }
   if(i==NOP-1)
   {
      i=0;
   }
   else if(at[i+1]<=sum)
   {
      i++;
   }
   else
   {
```

```
      i=0;
   }
}
// represents the average waiting time and Turn Around time
avg_wt = wt * 1.0/NOP;
avg_tat = tat * 1.0/NOP;
printf("\n Average Turn Around Time: \t%f", avg_wt);
printf("\n Average Waiting Time: \t%f", avg_tat);

}
```

Output-

```
Total number of process in the system: 4
Enter the Arrival and Burst time of the Process[1]
 Arrival time is:   0
 Burst time is:     6
 Enter the Arrival and Burst time of the Process[2]
 Arrival time is:   1
 Burst time is:     4
 Enter the Arrival and Burst time of the Process[3]
 Arrival time is:   3
 Burst time is:     7
 Enter the Arrival and Burst time of the Process[4]
 Arrival time is:   5
 Burst time is:     2
 Enter the Time Quantum for the process:    2
 Process No          Burst Time          TAT         Waiting Time
Process No[4]        2              3           1
Process No[2]        4              11          7
Process No[1]        6              16          10
Process No[3]        7              16          9
 Average Turn Around Time:  6.750000
 Average Waiting Time:  11.500000
```

Bankers Algorithm :

Input-

```
#include<stdio.h>
void main()
{
char pro[10]={'A','B','C','D','E','F','G','H','I','J'},seq[10];
int avlbl[10],resrc[10],max[10][10],alloc[10][10],need[10][10],i,j,flag=0;
int proc,res,count=0,temp[10],temp1[10];
printf("ENTER THE NO. OF PROCESS=");
scanf("%d",&proc);
printf("ENTER THE NO. OF RESOURCE TYPES=");
scanf("%d",&res);
for(i=0;i<proc;i++)
{
temp[i]=0;
temp1[i]=0;
}
printf("ENTER THE CURRENTLY AVAILABLE RESOURCES OF EACH PROCESS(ALLOCATION MATRIX):\n");
for(i=0;i<proc;i++)
{
printf("FOR PROCESS %c",pro[i]);
for(j=0;j<res;j++)
scanf("%d",&alloc[i][j]);
}
printf("ENTER THE MAXIMUM REQUIRED RESOURCES OF EACH PROCESS(MAXIMUM MATRIX):\n");
for(i=0;i<proc;i++)
{
```

```
printf("FOR PROCESS %c",pro[i]);
for(j=0;j<res;j++)
scanf("%d",&max[i][j]);
}
printf("NEED OF RESOURCES OF EACH PROCESS(NEED MATRIX):");
for(i=0;i<proc;i++)
{
printf("\n FOR PROCESS %c",pro[i]);
for(j=0;j<res;j++)
{ need[i][j]=max[i][j]-alloc[i][j];
printf("\t%d",need[i][j]);}
}
printf("\n ENTER THE RESOURCE INSTANCES");
for(i=0;i<res;i++)
scanf("%d",&resrc[i]);
for(i=0;i<res;i++)
for(j=0;j<proc;j++)
temp1[i]=temp1[i]+alloc[j][i];
printf("AVAILABLE:");
for(i=0;i<res;i++)
{
avlbl[i]=resrc[i]-temp1[i];
printf("%d\t",avlbl[i]);
}
loop:for(i=0;i<proc;i++)
{
if(temp[i]!=1)
{
for(j=0;j<res;j++)
{
if(avlbl[j]<need[i][j])
```

```
{
flag=1;
}
}
if(flag==0)
{
printf("\n PROCESS %c EXECUTED",pro[i]);
printf("\n AVAILABLE=\t");
for(j=0;j<res;j++)
{
avlbl[j]=avlbl[j]+alloc[i][j];
printf("%d\t",avlbl[j]);
}
count++;
temp[i]=1;
seq[count-1]=pro[i];
}
else
flag=0;
}
}
if(count!=proc)
goto loop;
for(i=0;i<res;i++)
if(avlbl[i]==resrc[i])
{
printf("\n SAFE SEQUENCE:");
for(i=0;i<proc;i++)
printf("%c\t",seq[i]);
}
}
```

Output-

```
ENTER THE NO. OF PROCESS= 3
ENTER THE NO. OF RESOURCE TYPES= 3
ENTER THE CURRENTLY AVAILABLE RESOURCES OF EACH PROCESS(ALLOCATION MATRIX):
FOR PROCESS A  2 2 3
FOR PROCESS B  2 0 3
FOR PROCESS C  1 2 4
ENTER THE MAXIMUM REQUIRED RESOURCES OF EACH PROCESS(MAXIMUM MATRIX):
FOR PROCESS A  3 6 8
FOR PROCESS B  4 3 3
FOR PROCESS C  3 4 4
NEED OF RESOURCES OF EACH PROCESS(NEED MATRIX):
 FOR PROCESS A  1       4       5
 FOR PROCESS B  2       3       0
 FOR PROCESS C  2       2       0
 ENTER THE RESOURCE INSTANCES  7 7 10
AVAILABLE:2     3       0
 PROCESS B EXECUTED
 AVAILABLE=     4       3       3
 PROCESS C EXECUTED
 AVAILABLE=     5       5       7
 PROCESS A EXECUTED
 AVAILABLE=     7       7       10
 SAFE SEQUENCE:B        C       A
--------------------------------
Process exited after 67.01 seconds with return value 3
Press any key to continue . . .
```

```
ENTER THE NO. OF PROCESS= 5
ENTER THE NO. OF RESOURCE TYPES= 3
ENTER THE CURRENTLY AVAILABLE RESOURCES OF EACH PROCESS(ALLOCATION MATRIX):
FOR PROCESS A  0 1 0
FOR PROCESS B  2 0 0
FOR PROCESS C  3 0 2
FOR PROCESS D  2 1 1
FOR PROCESS E  0 0 2
ENTER THE MAXIMUM REQUIRED RESOURCES OF EACH PROCESS(MAXIMUM MATRIX):
FOR PROCESS A  7 5 3
FOR PROCESS B  3 2 2
FOR PROCESS C  9 0 2
FOR PROCESS D  2 2 2
FOR PROCESS E  4 3 3
NEED OF RESOURCES OF EACH PROCESS(NEED MATRIX):
 FOR PROCESS A  7       4       3
 FOR PROCESS B  1       2       2
 FOR PROCESS C  6       0       0
 FOR PROCESS D  0       1       1
 FOR PROCESS E  4       3       1
 ENTER THE RESOURCE INSTANCES  10 5 7
AVAILABLE:3     3       2
 PROCESS B EXECUTED
 AVAILABLE=     5       3       2
 PROCESS D EXECUTED
 AVAILABLE=     7       4       3
 PROCESS E EXECUTED
 AVAILABLE=     7       4       5
 PROCESS A EXECUTED
 AVAILABLE=     7       5       5
 PROCESS C EXECUTED
 AVAILABLE=     10      5       7
 SAFE SEQUENCE:B        D       E       A       C
--------------------------------
Process exited after 76.59 seconds with return value 3
Press any key to continue . . .
```

Exeeve program :

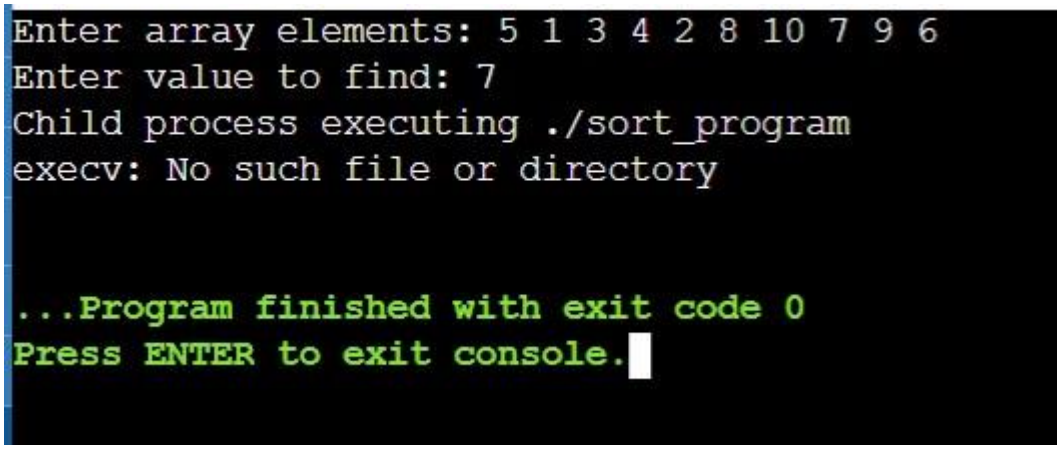
Input-

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

void sort(int a[11]);

int main(int argc, char *argv[])
{
   int pid;
   int i = 0, n = 10, search;
   int a[11];
   char *newarg[] = {"./sort_program", NULL}; // Replace with correct path to your sorting program
   FILE *f;

   printf("Enter array elements: ");
   for (i = 1; i <= 10; i++)
      scanf("%d", &a[i]);

   printf("Enter value to find: ");
   scanf("%d", &search);

   pid = fork();

   if (pid == 0)
   {
```

```
        printf("Child process executing %s\n", newarg[0]); // Debugging output
        sleep(1);
        execv(newarg[0], newarg);
        perror("execv"); // Print error if execv fails
        exit(1); // Terminate child process if execv fails
    }
    else
    {
        wait(NULL); // Wait for the child process to finish
        sort(a);
        f = fopen("sort.txt", "w");

        fprintf(f, "%d\n", search);

        for (i = 1; i <= n; i++)
        {
            fprintf(f, "%d ", a[i]);
        }

        fclose(f);
    }

    return 0;
}

void sort(int a[11])
{
    int n = 10, i, j, temp;

    for (i = 1; i <= n; i++)
    {
```

```
      for (j = i + 1; j <= n; j++)
      {
         if (a[i] > a[j])
         {
            temp = a[i];
            a[i] = a[j];
            a[j] = temp;
         }
      }
   }
}
```

Output-

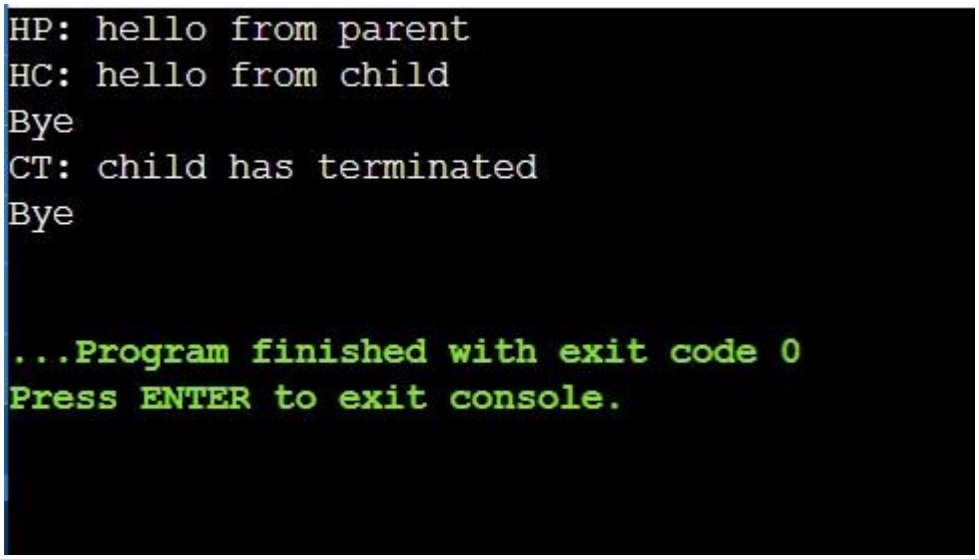


Wait program :

Input-

```
#include <stdio.h>
#include <sys/wait.h>
#include <unistd.h>

int main()
{
   if (fork() == 0)

   {
      printf("HC: hello from child\n");
   }
   else
   {
      printf("HP: hello from parent\n");

      wait(NULL);

      printf("CT: child has terminated\n");
   }
   printf("Bye\n");

   return 0;
}
```

Output-


HP: hello from parent
HC: hello from child
Bye
CT: child has terminated
Bye
...Program finished with exit code 0
Press ENTER to exit console.

Producer Consumer :

Input-

```
#include<stdio.h>
#include<stdlib.h>

void producer();
void consumer();
int wait(int);
int signal(int);

int mutex = 1,full=0,empty=3,x=0;
int main(){
   printf("\n1.Producer\n2.Consumer\n3.Exit\n");
   int n;
   while(1){
      printf("Enter your choice\n");
      scanf("%d",&n);
      switch(n){
         case 1:{
            if(mutex==1 && empty!=0)
               producer();
            else
               printf("Buffer is full \n");
            break;
         }
         case 2:{
            if(mutex==1 && full!=0)
```

```
                consumer();
            else
                printf("Buffer is empty \n");
            break;
        }
        case 3:{
            exit(0);
            break;
        }
      }
   }
}

int wait(int s){
   return (--s);
}
int signal(int s){
   return (++s);
}
void producer(){
   mutex = wait(mutex);
   full= signal(full);
   empty = wait(empty);
   x++;
   printf("Producer produced an item %d\n",x);
   mutex=signal(mutex);
}
void consumer(){
   mutex = wait(mutex);
   full= wait(full);
   empty = signal(empty);
```

```
    printf("Consusmer consumed an item %d\n",x);
    x--;
    mutex=signal(mutex);
}
```

Output-

```
1.Producer
2.Consumer
3.Exit
Enter your choice
1
Producer produced an item 1
Enter your choice
2
Consusmer consumed an item 1
Enter your choice
2
Buffer is empty
Enter your choice
1
Producer produced an item 1
Enter your choice
1
Producer produced an item 2
Enter your choice
1
Producer produced an item 3
Enter your choice
1
Buffer is full
Enter your choice
3

--------------------------------
Process exited after 61.71 seconds with return value 0
Press any key to continue . . .
```

Student_Record :

Input-

```
#! /bin/bash

it=0
a=1
while [[ $op -lt 7 ]]
do
	echo enter the option
	echo "1 for create"
	echo "2 for add"
	echo "3 for display"
	echo "4 for search"
	echo "5 for delete"
	echo "6 for modify"
	echo "7 for exit"
	echo "enter u r choice"
	read op
word="$op"
case "$word" in

"1")
	if [ "$op" == "1" ]
		then
		echo "Enter the name for the database"
		read db
		touch "$db"
```

```
        fi
;;
"2")
        if [ "$op" == "2" ]
            then
            echo "in which database u want to add records"
            read db
            echo "enter the no. of records"
            read n
        while [ $it -lt $n ]
        do
            echo "enter id:"
            read id1
            echo "enter name:"
            read nm
            pa1="^[A-Za-z]"
        while [[ ! $add =~ $pa ]]
        do
            echo "enter valid address:"
            read add
        done
        echo "enter address:"
        read add
        pa="^[A-Za-z0-9]"
        while [[ ! $add =~ $pa ]]
        do
            echo "enter valid address:"
            read add
        done
        #echo $add
```

```
        echo "enter phone no.:"
        read ph
        pat="^[0-9]{10}$"
        while [[ ! $ph =~ $pat ]]
        do
            echo "please enter phone number as XXXXXXXXXX:"
            read ph
        done
        #echo $ph

        echo "enter email:"
        read em
        patem="^[a-z0-9._%-+]+@[a-z]+\.[a-z]{2,4}$"
        while [[ ! $em =~ $patem ]]
        do
            echo "please enter valid email address"
            read em
        done
        #echo $em

        echo "$id1,$nm,$add,$ph,$em" >> "$db"

        it=`expr $it + 1`
        echo "$it record entered"
        done
        fi
;;
"3")
        if [ "$op" == "3" ]
            then
            echo "enter name of database from where data to be display:"
```

```
            read db
            cat $db
        fi
;;
"4")
        if [ "$op" == "4" ]
            then
            echo "enter name of database from where to search:"
            read db
            echo "enter email to be search:"
            read em1
            grep $em1 $db
            echo "record found"
            else
            echo "not found"
        fi
;;

"5")
        if [ "$op" == "5" ]
            then
            echo "enter name of database:"
            read db
            echo "enter id:"
            read id1
            echo "enter line no. u want to delete:"
            read linenumber

            for line in `grep -n "$id1" $db`
            do
            number=`echo "$line" | cut -c1`
```

```
            #echo $number
            if [ $number == $linenumber ]
            then
            lineRemove="${linenumber}d"
            sed -i -e "$lineRemove" $db
            echo "record removed"
            fi
            #echo
            cat $db
            done
        fi
;;

"6")
        if [ "$op" == "6" ]
            then
            echo "enter name of database:"
            read db
            echo "enter id:"
            read id1
            echo "enter line u want to modify:"
            read linenumber

            for line in `grep -n "$id1" "$db"`
            do
            number=`echo "$line" | cut -c1`

            if [ "$number" == "$linenumber" ]
            then
            echo "what would u like to change"
            echo "\"id,name,address,mobile,email\""
```

```
            read edit
            linechange="${linenumber}s"
            sed -i -e "$linechange/.*/$edit/" $db
            echo record edited
            fi
            done
      fi
;;
"7")
      echo "bye"
;;
*) echo invalid input

esac
done

bash: line 1: chmod+x: command not found
```

Output-

```
m1u@m1u-VirtualBox:~$ chmod +x Student_Record.sh
m1u@m1u-VirtualBox:~$ ./Student_Record.sh
enter the option
1 for create
2 for add
3 for display
4 for search
5 for delete
6 for modify
7 for exit
enter u r choice
1
Enter the name for the database
TE-A
enter the option
1 for create
2 for add
3 for display
4 for search
5 for delete
6 for modify
7 for exit
enter u r choice
2
in which database u want to add records
TE-A
enter the no. of records
3
enter id:
01
enter name:
Jai
enter address:
jai1@gmail.com
enter phone no.:
1548729364
enter email:
jai1@gmail.com
1 record entered
enter id:
02
enter name:
Ajay
enter address:
pune
enter phone no.:
1948726356
enter email:
```

```
enter phone no.:
1948726356
enter email:
ajay2@gmail.com
2 record entered
enter id:
03
enter name:
Vijay
enter address:
Mumbai
enter phone no.:
74819623549
please enter phone number as XXXXXXXXXX:
1948726358
enter email:
vijay3@gmail.com
3 record entered
enter the option
1 for create
2 for add
3 for display
4 for search
5 for delete
6 for modify
7 for exit
enter u r choice
3
enter name of database from where data to be display:
TE-A
01,Jai,jai1@gmail.com,1548729364,jai1@gmail.com
02,Ajay,pune,1948726356,ajay2@gmail.com
03,Vijay,Mumbai,1948726358,vijay3@gmail.com
enter the option
1 for create
2 for add
3 for display
4 for search
5 for delete
6 for modify
7 for exit
enter u r choice
4
enter name of database from where to search:
TE-A
enter email to be search:
vijay3@gmail.com
03,Vijay,Mumbai,1948726358,vijay3@gmail.com
```

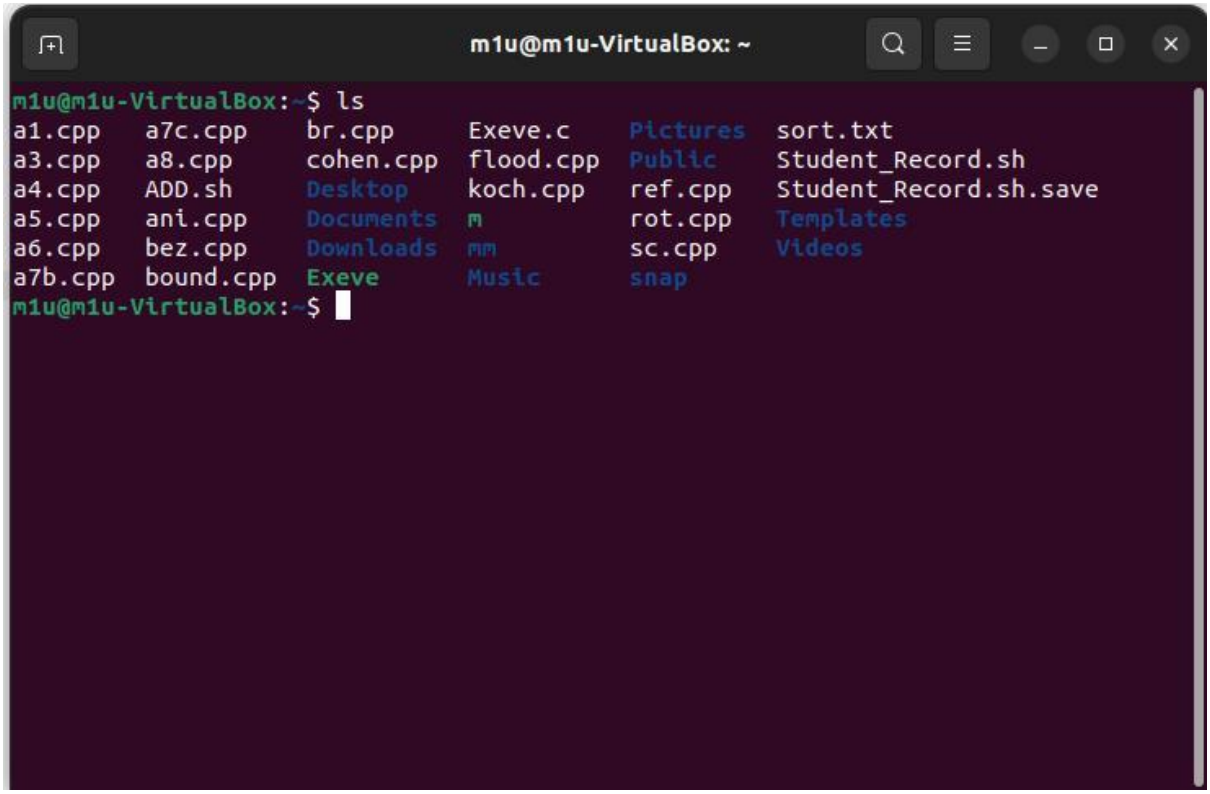
```
01,Jai,jai1@gmail.com,1548729364,jai1@gmail.com
02,Ajay,pune,1948726356,ajay2@gmail.com
03,Vijay,Mumbai,1948726358,vijay3@gmail.com
enter the option
1 for create
2 for add
3 for display
4 for search
5 for delete
6 for modify
7 for exit
enter u r choice
4
enter name of database from where to search:
TE-A
enter email to be search:
vijay3@gmail.com
03,Vijay,Mumbai,1948726358,vijay3@gmail.com
record found
enter the option
1 for create
2 for add
3 for display
4 for search
5 for delete
6 for modify
7 for exit
enter u r choice
5
enter name of database:
TE-A
enter id:
02
enter line no. u want to delete:
2
record removed
01,Jai,jai1@gmail.com,1548729364,jai1@gmail.com
03,Vijay,Mumbai,1948726358,vijay3@gmail.com
enter the option
1 for create
2 for add
3 for display
4 for search
5 for delete
6 for modify
7 for exit
enter u r choice
6
```

```
1 for create
2 for add
3 for display
4 for search
5 for delete
6 for modify
7 for exit
enter u r choice
5
enter name of database:
TE-A
enter id:
02
enter line no. u want to delete:
2
record removed
01,Jai,jai1@gmail.com,1548729364,jai1@gmail.com
03,Vijay,Mumbai,1948726358,vijay3@gmail.com
enter the option
1 for create
2 for add
3 for display
4 for search
5 for delete
6 for modify
7 for exit
enter u r choice
6
enter name of database:
TE-A
enter id:
01
enter line u want to modify:
3
enter the option
1 for create
2 for add
3 for display
4 for search
5 for delete
6 for modify
7 for exit
enter u r choice
7
bye
./Student_Record.sh: line 166: bash:: command not found
m1u@m1u-VirtualBox:~$ ^C
m1u@m1u-VirtualBox:~$
```

Basic Linux Commands :

ls Command

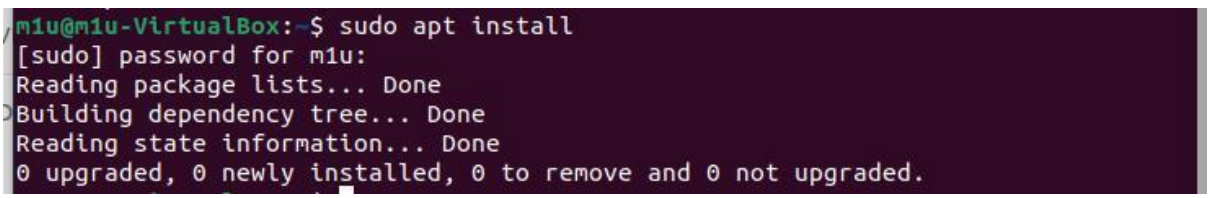
The ls command is used to display a list of content of a directory.



Echo Command

Sudo apt install

Used to install the libraries.



pwd Command

The pwd command is used to display the location of the current working directory.

```
m1u@m1u-VirtualBox:~$ pwd
/home/m1u
m1u@m1u-VirtualBox:~$
```

mkdir Command

The mkdir command is used to create a new directory under any directory.

```
m1u@m1u-VirtualBox:~$ mkdir aa
m1u@m1u-VirtualBox:~$
```

cd Command

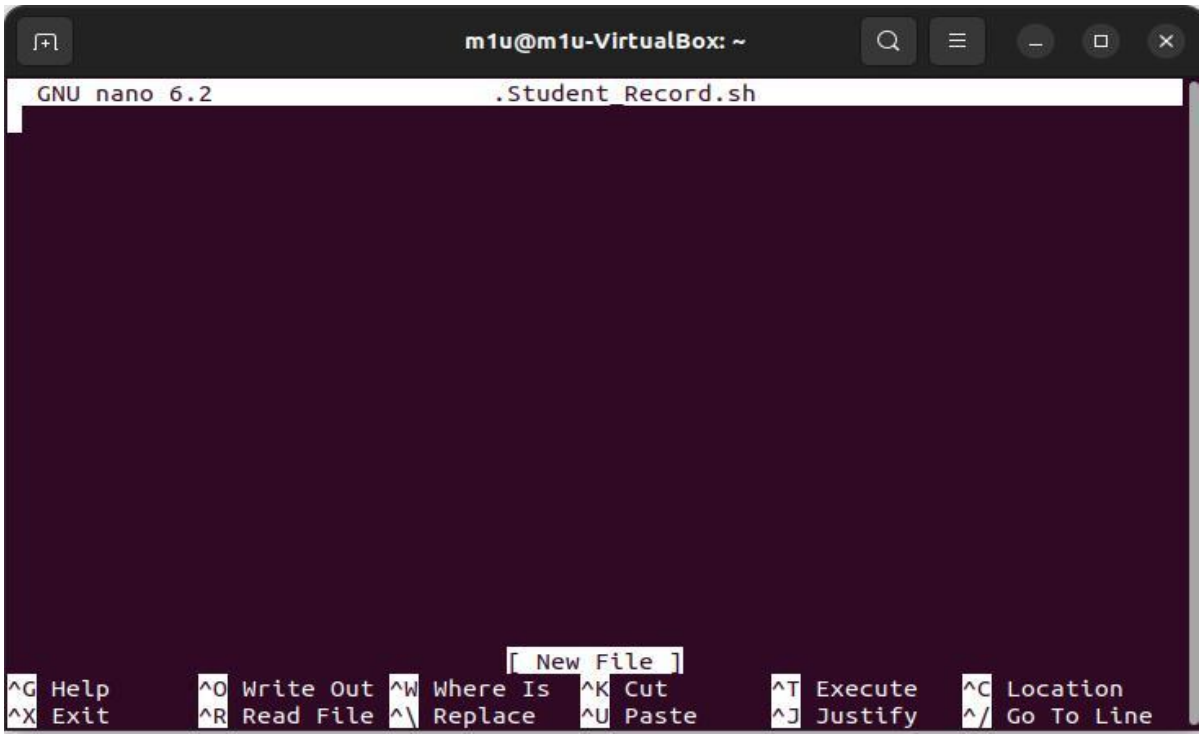
The cd command is used to change the current directory.

```
m1u@m1u-VirtualBox:~$ cd Desktop
m1u@m1u-VirtualBox:~/Desktop$ cd
m1u@m1u-VirtualBox:~$
```

nano Command

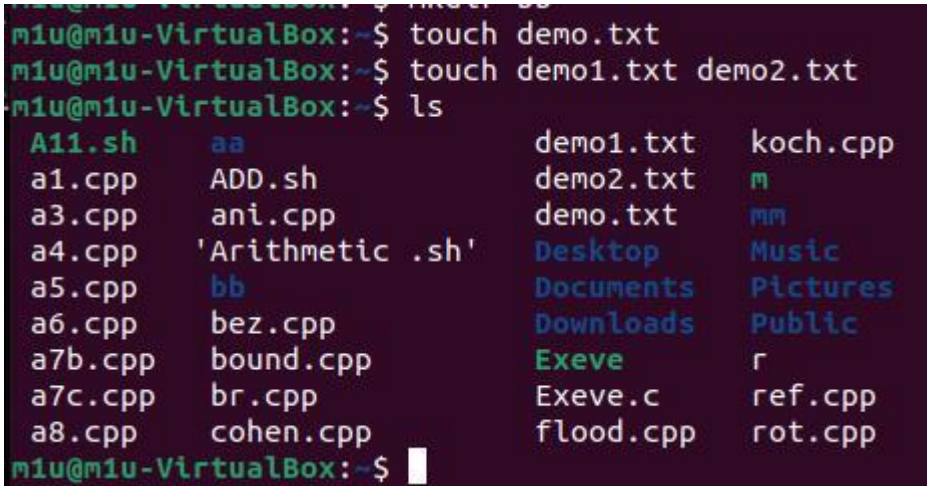
Opens the command line text editor.

```
m1u@m1u-VirtualBox:~$ nano .Student_Record.sh
```



touch Command

The touch command is used to create empty files. We can create multiple empty files by executing it once.

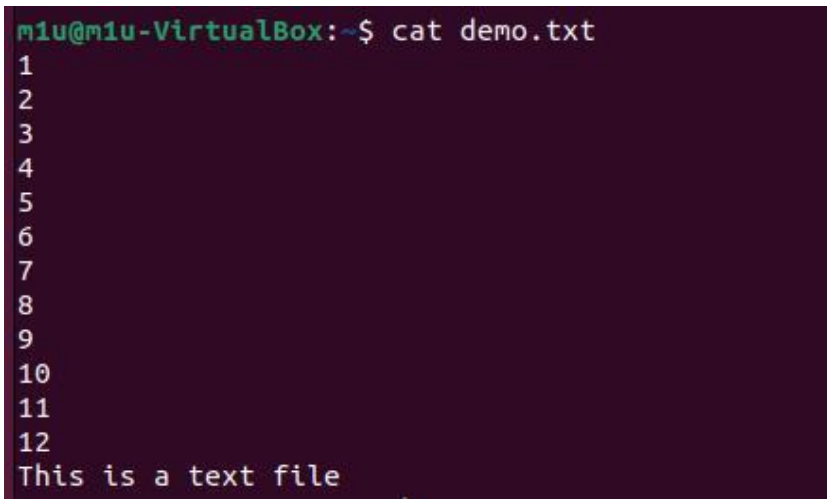


Uname

The command '*uname*' displays the information about the system.

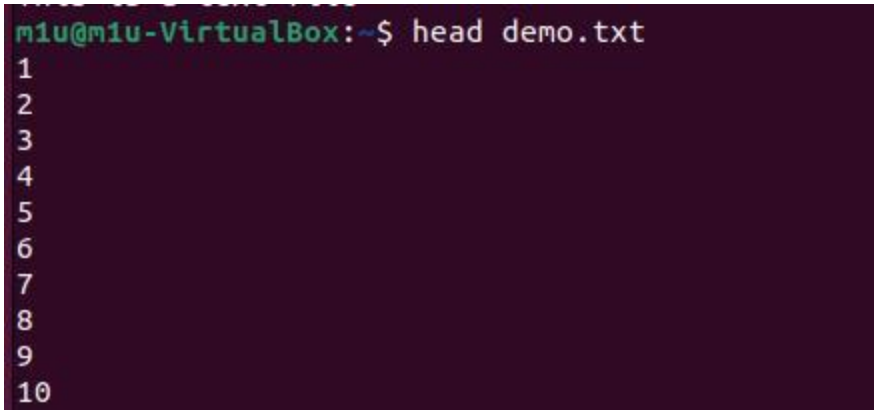
cat Command

The cat command is a multi-purpose utility in the Linux system. It can be used to create a file, display content of the file, copy the content of one file to another file, and more.



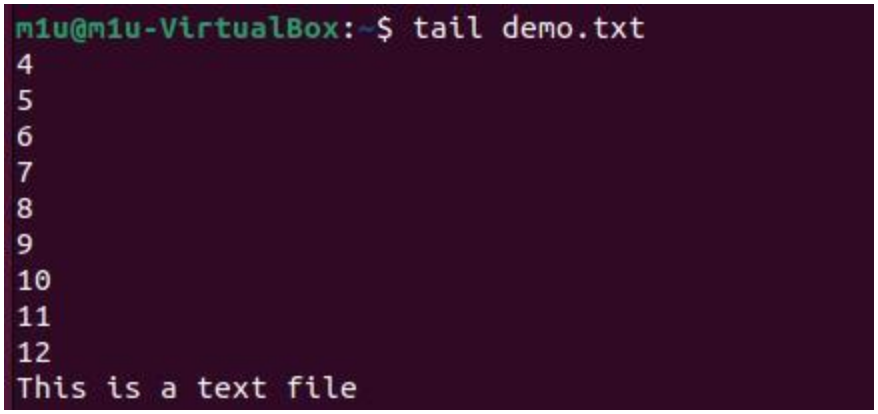
head Command

The head command is used to display the content of a file. It displays the first 10 lines of a file.



tail Command

The tail command is similar to the head command. The difference between both commands is that it displays the last ten lines of the file content. It is useful for reading the error message.

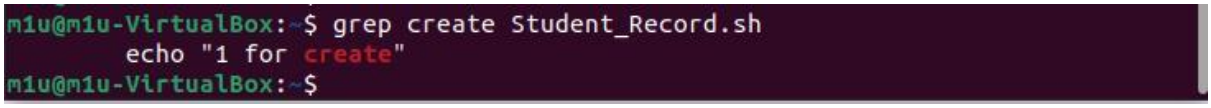


tac Command

The tac command is the reverse of cat command, as its name specified. It displays the file content in reverse order (from the last line).

grep command

grep or global regular expression print. It lets you find a word by searching through all the texts in a specific file.

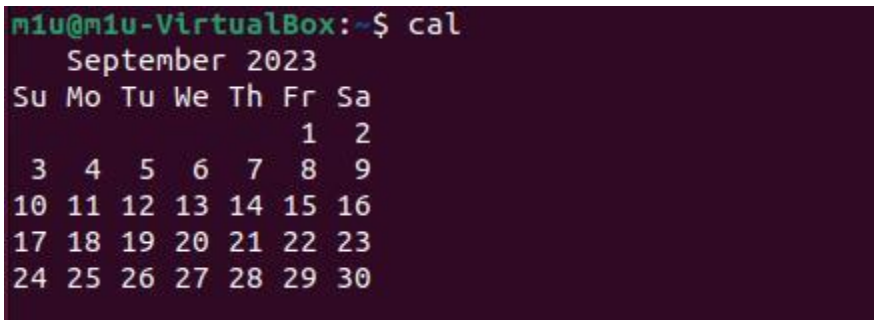


date Command

The date command is used to display date, time, time zone, and more.

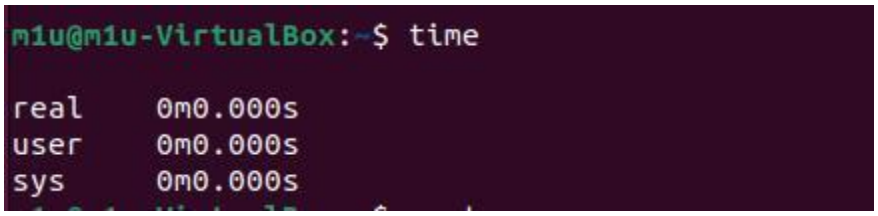
cal Command

The cal command is used to display the current month's calendar with the current date highlighted.



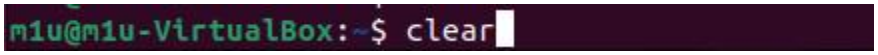
time Command

The time command is used to display the time to execute a command.



clear Command

Linux **clear** command is used to clear the terminal screen.



exit Command

Linux exit command is used to exit from the current shell. It takes a parameter as a number and exits the shell with a return of status number.

Reader Writer :

Input-

```
#include <semaphore.h>
#include <stdio.h>
#include <stdlib.h>
#include <pthread.h>

sem_t x, y;
pthread_t tid;
pthread_t writerthreads[100], readerthreads[100];
int readercount;

void *reader(void *param) {
   sem_wait(&x);
   readercount++;
   if (readercount == 1)
      sem_wait(&y);
   sem_post(&x);
   printf("\n%d reader is inside", readercount);
   sem_wait(&x);
   readercount--;
   if (readercount == 0) {
      sem_post(&y);
   }
   sem_post(&x);
   printf("\n%d Reader is leaving", readercount + 1);
```

```
}

void *writer(void *param) {
   printf("\nWriter is trying to enter");
   sem_wait(&y);
   printf("\nWriter has entered");
   sem_post(&y);
   printf("\nWriter is leaving");
}

int main() {
   int n2, i;
   printf("Enter the number of readers:");
   scanf("%d", &n2);
   int n1[n2];
   sem_init(&x, 0, 1);
   sem_init(&y, 0, 1);
   for (i = 0; i < n2; i++) {
      pthread_create(&writerthreads[i], NULL, reader, NULL);
      pthread_create(&readerthreads[i], NULL, writer, NULL);
   }
   for (i = 0; i < n2; i++) {
      pthread_join(writerthreads[i], NULL);
      pthread_join(readerthreads[i], NULL);
   }
}
```

Output-

```
Enter the number of readers:2

1 reader is inside
1 Reader is leaving
1 reader is inside
1 Reader is leaving
Writer is trying to enter
Writer has entered
Writer is leaving
Writer is trying to enter
Writer has entered
Writer is leaving
--------------------------------
Process exited after 2.017 seconds with return value 0
Press any key to continue . . .
```

```
Enter the number of readers:3

Writer is trying to enter
1 reader is inside
2 Reader is leaving
2 reader is inside
2 Reader is leaving
Writer is trying to enter
Writer is trying to enter
2 reader is inside
1 Reader is leaving
Writer has entered
Writer is leaving
Writer has entered
Writer is leaving
Writer has entered
Writer is leaving
--------------------------------
Process exited after 1.38 seconds with return value 0
Press any key to continue . . .
```

FCFS Paging Algorithm:

Input-

```
#include <stdio.h>

int main() {
   int pg[20], pgs, frm, frms[10], i, j, k = 0, hit = 0, flag = 0;
   float hitrt, missrt;

   printf("ENTER THE NO. OF PAGES: ");
   scanf("%d", &pgs);

   printf("ENTER THE PAGE VALUES:\n");
   for (i = 0; i < pgs; i++)
      scanf("%d", &pg[i]);

   printf("ENTER THE FRAME SIZE: ");
   scanf("%d", &frm);

   // Initialize frames to -1
   for (i = 0; i < frm; i++)
      frms[i] = -1;

   printf("INITIAL PAGE VALUES:\n");
   for (i = 0; i < frm; i++)
      printf("%d\t", frms[i]);

   printf("\n");

   for (i = 0; i < pgs; i++) {
```

```
        flag = 0;

        for (j = 0; j < frm; j++) {
            if (pg[i] == frms[j]) {
                printf("HIT:\t");
                hit++;
                flag = 1;
                break;
            }
        }

        if (flag == 0) {
            printf("MISS:\t");
            frms[k] = pg[i];
            k = (k + 1) % frm; // Move to the next frame using circular queue
        }

        for (j = 0; j < frm; j++)
            printf("%d\t", frms[j]);

        printf("\n");
    }

    printf("NO. OF HITS = %d\n", hit);
    hitrt = (float)hit / (float)pgs;
    missrt = 1 - hitrt;

    printf("HIT RATIO = %f\n", hitrt);
    printf("MISS RATIO = %f\n", missrt);

    return 0;
}
```

Output-

```
ENTER THE NO. OF PAGES: 14
ENTER THE PAGE VALUES:
1 2 3 4 2 1 5 6 2 1 2 3 3 6
ENTER THE FRAME SIZE: 3
INITIAL PAGE VALUES:
-1      -1      -1
MISS:   1       -1      -1
MISS:   1       2       -1
MISS:   1       2       3
MISS:   4       2       3
HIT:    4       2       3
MISS:   4       1       3
MISS:   4       1       5
MISS:   6       1       5
MISS:   6       2       5
MISS:   6       2       1
HIT:    6       2       1
MISS:   3       2       1
HIT:    3       2       1
MISS:   3       6       1
NO. OF HITS = 3
HIT RATIO = 0.214286
MISS RATIO = 0.785714

--------------------------------
Process exited after 24.61 seconds with return value 0
Press any key to continue . . .
```

```
ENTER THE NO. OF PAGES: 14
ENTER THE PAGE VALUES:
1 2 3 4 2 1 5 6 2 1 2 3 3 6
ENTER THE FRAME SIZE: 4
INITIAL PAGE VALUES:
-1      -1      -1      -1
MISS:   1       -1      -1      -1
MISS:   1       2       -1      -1
MISS:   1       2       3       -1
MISS:   1       2       3       4
HIT:    1       2       3       4
HIT:    1       2       3       4
MISS:   5       2       3       4
MISS:   5       6       3       4
MISS:   5       6       2       4
MISS:   5       6       2       1
HIT:    5       6       2       1
MISS:   3       6       2       1
HIT:    3       6       2       1
HIT:    3       6       2       1
NO. OF HITS = 5
HIT RATIO = 0.357143
MISS RATIO = 0.642857

--------------------------------
Process exited after 27.38 seconds with return value 0
Press any key to continue . . .
```

```
ENTER THE NO. OF PAGES: 15
ENTER THE PAGE VALUES:
6 5 1 2 5 3 5 4 2 3 6 3 2 1 2
ENTER THE FRAME SIZE: 3
INITIAL PAGE VALUES:
-1      -1      -1
MISS:   6       -1      -1
MISS:   6       5       -1
MISS:   6       5       1
MISS:   2       5       1
HIT:    2       5       1
MISS:   2       3       1
MISS:   2       3       5
MISS:   4       3       5
MISS:   4       2       5
MISS:   4       2       3
MISS:   6       2       3
HIT:    6       2       3
HIT:    6       2       3
MISS:   6       1       3
MISS:   6       1       2
NO. OF HITS = 3
HIT RATIO = 0.200000
MISS RATIO = 0.800000

--------------------------------
Process exited after 20.77 seconds with return value 0
Press any key to continue . . .
```

```
ENTER THE NO. OF PAGES: 17
ENTER THE PAGE VALUES:
5 6 7 8 5 6 9 5 6 7 8 9 6 7 4 9 8
ENTER THE FRAME SIZE: 3
INITIAL PAGE VALUES:
-1      -1      -1
MISS:   5       -1      -1
MISS:   5       6       -1
MISS:   5       6       7
MISS:   8       6       7
MISS:   8       5       7
MISS:   8       5       6
MISS:   9       5       6
HIT:    9       5       6
HIT:    9       5       6
MISS:   9       7       6
MISS:   9       7       8
HIT:    9       7       8
MISS:   6       7       8
HIT:    6       7       8
MISS:   6       4       8
MISS:   6       4       9
MISS:   8       4       9
NO. OF HITS = 4
HIT RATIO = 0.235294
MISS RATIO = 0.764706

--------------------------------
Process exited after 52.98 seconds with return value 0
Press any key to continue . . .
```

Least Recently Used (LRU) Paging Algorithm :

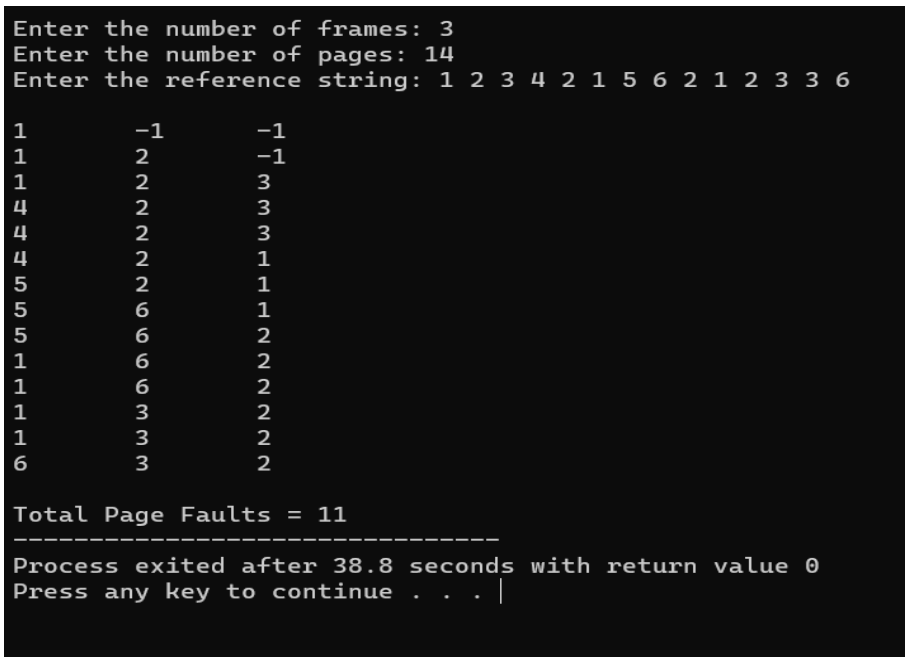
Input-

```
#include <stdio.h>

int findLRU(int time[], int n) {
   int i, minimum = time[0], pos = 0;
   for (i = 1; i < n; ++i) {
      if (time[i] < minimum) {
         minimum = time[i];
         pos = i;
      }
   }
   return pos;
}

int main() {
   int no_of_frames, no_of_pages, frames[10], pages[30], counter = 0, time[10], flag1, flag2, i, j, pos,
faults = 0;

   printf("Enter the number of frames: ");
   scanf("%d", &no_of_frames);

   printf("Enter the number of pages: ");
   scanf("%d", &no_of_pages);

   printf("Enter the reference string: ");
   for (i = 0; i < no_of_pages; ++i) {
      scanf("%d", &pages[i]);
```

```
}

for (i = 0; i < no_of_frames; ++i) {
   frames[i] = -1;
}

for (i = 0; i < no_of_pages; ++i) {
   flag1 = flag2 = 0;

   for (j = 0; j < no_of_frames; ++j) {
      if (frames[j] == pages[i]) {
         counter++;
         time[j] = counter;
         flag1 = flag2 = 1;
         break;
      }
   }

   if (flag1 == 0) {
      for (j = 0; j < no_of_frames; ++j) {
         if (frames[j] == -1) {
            frames[j] = pages[i];
            time[j] = counter;
            counter++;
            faults++;
            flag2 = 1;
            break;
         }
      }
   }
```

```
      if (flag2 == 0) {
         pos = findLRU(time, no_of_frames);
         counter++;
         faults++;
         frames[pos] = pages[i];
         time[pos] = counter;
      }

      printf("\n");
      for (j = 0; j < no_of_frames; ++j) {
         printf("%d\t", frames[j]);
      }
   }

   printf("\n\nTotal Page Faults = %d", faults);
   return 0;
}
```

Output-



```
Enter the number of frames: 4
Enter the number of pages: 14
Enter the reference string: 1 2 3 4 2 1 5 6 2 1 2 3 3 6

1       -1      -1      -1
1       2       -1      -1
1       2       3       -1
1       2       3       4
1       2       3       4
1       2       3       4
1       2       5       4
1       2       5       6
1       2       5       6
1       2       5       6
1       2       5       6
1       2       3       6
1       2       3       6
1       2       3       6

Total Page Faults = 7
--------------------------------
Process exited after 33.37 seconds with return value 0
Press any key to continue . . .
```

```
Enter the number of frames: 3
Enter the number of pages: 17
Enter the reference string: 5 6 7 8 5 6 9 5 6 7 8 9 6 7 4 9 8

5       -1      -1
5       6       -1
5       6       7
8       6       7
8       5       7
8       5       6
9       5       6
9       5       6
9       5       6
7       5       6
7       8       6
7       8       9
6       8       9
6       7       9
6       7       4
9       7       4
9       8       4

Total Page Faults = 15
--------------------------------
Process exited after 33.93 seconds with return value 0
Press any key to continue . . .
```

Optimal Paging Algorithm :

Input-

```
#include<stdio.h>
int main()
{
   int no_of_frames, no_of_pages, frames[10], pages[30], temp[10], flag1, flag2, flag3, i, j, k, pos, max, faults =
0;
   printf("Enter number of frames: ");
   scanf("%d", &no_of_frames);

   printf("Enter number of pages: ");
   scanf("%d", &no_of_pages);

   printf("Enter page reference string: ");

   for(i = 0; i < no_of_pages; ++i){
      scanf("%d", &pages[i]);
   }

   for(i = 0; i < no_of_frames; ++i){
      frames[i] = -1;
   }

   for(i = 0; i < no_of_pages; ++i){
      flag1 = flag2 = 0;

      for(j = 0; j < no_of_frames; ++j){
         if(frames[j] == pages[i]){
               flag1 = flag2 = 1;
```

```
            break;
        }
    }

    if(flag1 == 0){
       for(j = 0; j < no_of_frames; ++j){
          if(frames[j] == -1){
              faults++;
              frames[j] = pages[i];
              flag2 = 1;
              break;
          }
       }
    }

    if(flag2 == 0){
     flag3 =0;

       for(j = 0; j < no_of_frames; ++j){
        temp[j] = -1;

        for(k = i + 1; k < no_of_pages; ++k){
        if(frames[j] == pages[k]){
        temp[j] = k;
        break;
        }
        }
       }

       for(j = 0; j < no_of_frames; ++j){
        if(temp[j] == -1){
        pos = j;
        flag3 = 1;
```

```
            break;
            }
           }

           if(flag3 ==0){
            max = temp[0];
            pos = 0;

            for(j = 1; j < no_of_frames; ++j){
            if(temp[j] > max){
            max = temp[j];
            pos = j;
            }
            }
           }
frames[pos] = pages[i];
faults++;
      }

      printf("\n");

      for(j = 0; j < no_of_frames; ++j){
         printf("%d\t", frames[j]);
      }
   }

   printf("\n\nTotal Page Faults = %d", faults);

   return 0;
}
```

Output-

```
Enter number of frames: 3
Enter number of pages: 10
Enter page reference string: 2 3 4 2 1 3 7 5 4 3

2       -1      -1
2       3       -1
2       3       4
2       3       4
1       3       4
1       3       4
7       3       4
5       3       4
5       3       4
5       3       4

Total Page Faults = 6
--------------------------------
Process exited after 30.6 seconds with return value 0
Press any key to continue . . .
```

```
Enter number of frames: 3
Enter number of pages: 14
Enter page reference string: 1 2 3 4 2 1 5 6 2 1 2 3 3 6

1       -1      -1
1       2       -1
1       2       3
1       2       4
1       2       4
1       2       4
1       2       5
1       2       6
1       2       6
1       2       6
1       2       6
3       2       6
3       2       6
3       2       6

Total Page Faults = 7
--------------------------------
Process exited after 29.17 seconds with return value 0
Press any key to continue . . .
```

```
Enter number of frames: 3
Enter number of pages: 17
Enter page reference string: 5 6 7 8 5 6 9 5 6 7 8 9 6 7 4 9 8

5       -1      -1
5       6       -1
5       6       7
5       6       8
5       6       8
5       6       8
5       6       9
5       6       9
5       6       9
7       6       9
8       6       9
8       6       9
8       6       9
8       7       9
8       4       9
8       4       9
8       4       9

Total Page Faults = 9
--------------------------------
Process exited after 33.37 seconds with return value 0
Press any key to continue . . .
```

```
Enter number of frames: 3
Enter number of pages: 15
Enter page reference string: 6 5 1 2 5 3 5 4 2 3 6 3 2 1 2

6       -1      -1
6       5       -1
6       5       1
6       5       2
6       5       2
3       5       2
3       5       2
3       4       2
3       4       2
3       4       2
3       6       2
3       6       2
3       6       2
1       6       2
1       6       2

Total Page Faults = 8
--------------------------------
Process exited after 30.89 seconds with return value 0
Press any key to continue . . .
```

```
Enter number of frames: 3
Enter number of pages: 17
Enter page reference string: 0 1 3 6 2 4 5 2 5 0 3 1 2 5 4 1 0

0       -1      -1
0       1       -1
0       1       3
0       6       3
0       2       3
0       2       4
0       2       5
0       2       5
0       2       5
0       2       5
3       2       5
1       2       5
1       2       5
1       2       5
1       4       5
1       4       5
0       4       5

Total Page Faults = 11
--------------------------------
Process exited after 28.71 seconds with return value 0
Press any key to continue . . .
```

Shortest Job First(Preemptive) scheduling Algorithm:

Input-

```
#include <stdio.h>

int main() {
   int arrival_time[10], burst_time[10], temp[10];
   int i, smallest, count = 0, time, limit;
   double wait_time = 0, turnaround_time = 0, end;
   float average_waiting_time, average_turnaround_time;

   printf("\nEnter the Total Number of Processes:\t");
   scanf("%d", &limit);

   printf("\nEnter Details of %d Processes\n", limit);
   for (i = 0; i < limit; i++) {
      printf("\nEnter Arrival Time for Process %d:\t", i + 1);
      scanf("%d", &arrival_time[i]);
      printf("Enter Burst Time for Process %d:\t", i + 1);
      scanf("%d", &burst_time[i]);
      temp[i] = burst_time[i];
   }

   burst_time[9] = 9999;

   printf("\nProcess No\tArrival Time\tBurst Time\tWaiting Time\tTurnaround Time\n");
```

```
    for (time = 0; count != limit; time++) {
        smallest = 9;
        for (i = 0; i < limit; i++) {
            if (arrival_time[i] <= time && burst_time[i] < burst_time[smallest] && burst_time[i] > 0) {
                smallest = i;
            }
        }

        burst_time[smallest]--;

        if (burst_time[smallest] == 0) {
            count++;
            end = time + 1;
            wait_time = wait_time + end - arrival_time[smallest] - temp[smallest];
            turnaround_time = turnaround_time + end - arrival_time[smallest];
            printf("%d\t\t%d\t\t%d\t\t%lf\t\t%lf\n", smallest + 1, arrival_time[smallest], temp[smallest],
                end - arrival_time[smallest] - temp[smallest], end - arrival_time[smallest]);
        }
    }

    average_waiting_time = wait_time / limit;
    average_turnaround_time = turnaround_time / limit;

    printf("\nAverage Waiting Time:\t%lf\n", average_waiting_time);
    printf("Average Turnaround Time:\t%lf\n", average_turnaround_time);

    return 0;
}
```

Output-

```
Enter the Total Number of Processes:    4

Enter Details of 4 Processes

Enter Arrival Time for Process 1:       0
Enter Burst Time for Process 1: 6

Enter Arrival Time for Process 2:       1
Enter Burst Time for Process 2: 4

Enter Arrival Time for Process 3:       3
Enter Burst Time for Process 3: 7

Enter Arrival Time for Process 4:       5
Enter Burst Time for Process 4: 2

Process No      Arrival Time    Burst Time      Waiting Time    Turnaround Time
2               1               4               0.000000                4.000000
4               5               2               0.000000                2.000000
1               0               6               6.000000                12.000000
3               3               7               9.000000                16.000000

Average Waiting Time:   3.750000
Average Turnaround Time:        8.500000

--------------------------------
Process exited after 43.73 seconds with return value 0
Press any key to continue . . .
```

Fork :

Input-

```
# include <stdio.h>
# include <sys/wait.h>
int main()
{
int p1,p2;
p1= fork();
if(p1==-1)
{
printf("error");
return 0;
}
else
{
printf("parent id is %d\n" , getppid());
printf(" child id is %d\n" , getpid());
}
}
```

Output-

```
/tmp/6sYsRYJ6Ci.o
parent id is 23
 child id is 30
parent id is 30
 child id is 31
```

Inter Process Communication (IPC) :

Input-

```
#include <stdio.h>
#include <unistd.h>
#include <stdlib.h>
#include <string.h>
#include <sys/wait.h>

int main(void) {
    int fd1[2], nbytes, fd2[2], a = 0;
    pid_t tpid;
    char string[80];
    char readbuffer[80];
    char ch = 'a', ch1 = '\n';
    FILE *fp;

    pipe(fd1); // PIPE CREATED
    pipe(fd2); // PIPE CREATED

    /* Error in fork */
    if ((tpid = fork()) == -1) {
        perror("fork");
        exit(1);
    }

    // Child Process
    if (tpid == 0) {
        close(fd1[1]); /* closing write end of Pipe 1 */
        read(fd1[0], readbuffer, sizeof(readbuffer)); /* reading filename through Pipe 1 */
        printf("\nFilename '%s' is being read by Child Process through Pipe 1...\n", readbuffer);
        fp = fopen(readbuffer, "r");
        close(fd1[0]); /* closing read end of Pipe 1 */
        close(fd2[0]); /* closing read end of Pipe 2 */
        printf("\nContents of %s are being sent to Parent Process through Pipe 2\n",
readbuffer);

        while (a != -1) {
            a = fscanf(fp, "%c", &ch);
            write(fd2[1], &ch, sizeof(ch)); /* writing contents of the file on Pipe 2 */
        }

        close(fd2[1]); /* closing write end of Pipe 2 */
        exit(0);
    }

    // Parent process
```

```
    else {
        close(fd1[0]); /* closing read end of Pipe 1 */
        printf("IN PARENT PROCESS\n");
        printf("\nEnter the name of the file: ");
        scanf("%s", string);
        printf("Filename is being sent by Parent Process to Child Process through Pipe 1.\n");
        write(fd1[1], string, (strlen(string) + 1)); /* writing filename on Pipe 1 */
        wait(0);
        close(fd1[1]); /* closing write end of Pipe 1 */
        close(fd2[1]); /* closing write end of Pipe 2 */
        printf("\nContents of %s are being received by Parent Process through Pipe 2...\n\n",
string);
        printf("IN PARENT PROCESS\n");
        printf("\nReceived Message:\n");

        while (nbytes != 0) {
            printf("%c", ch1);
            nbytes = read(fd2[0], &ch1, sizeof(ch1)); /* reading contents of the file from Pipe 2 */
        }

        close(fd2[0]); /* closing read end of Pipe 2 */
    }

    return 0;
}
```

Output-

```
IN PARENT PROCESS

Enter the name of the file: "C:\Users\asus\Documents\Reader.txt"
Filename is being sent by Parent Process to Child Process through P
ipe 1.

Filename '"C:\Users\asus\Documents\Reader.txt"' is being read by Ch
ild Process through Pipe 1...

Contents of "C:\Users\asus\Documents\Reader.txt" are being sent to
Parent Process through Pipe 2

Contents of "C:\Users\asus\Documents\Reader.txt" are being received
 by Parent Process through Pipe 2...

IN PARENT PROCESS

Received Message:



...Program finished with exit code 0
Press ENTER to exit console.
```

```
/tmp/iGcYQwIS7X.o
IN PARENT PROCESS

Enter the name of the file: "C:\Users\asus\Documents\Reader.txt"
Filename is being sent by Parent Process to Child Process through Pipe 1.
Filename '"C:\Users\asus\Documents\Reader.txt"' is being read by Child Process through Pipe 1...

Contents of "C:\Users\asus\Documents\Reader.txt" are being sent to Parent Process through Pipe 2
Contents of "C:\Users\asus\Documents\Reader.txt" are being received by Parent Process through
    Pipe 2...

IN PARENT PROCESS

Received Message:


Hello
OS Practical-7
```

Disk Scheduling Algorithm :

Input-

```
#include <stdio.h>
#include <stdlib.h>
#include <math.h>

int choice, track, no_req, head, head1, distance;
int disc_reql[100], finish[100];

void menu() {
   printf("\n\n********MENU*********");
   printf("\n1. FCFS\n2. SSTF\n3. SCAN\n4. C-LOOK\n5. Exit");
   printf("\n\nEnter your choice: ");
   scanf("%d", &choice);
}

void input() {
   int i;
   printf("Enter the total number of tracks: ");
   scanf("%d", &track);
   printf("Enter the total number of disc requests: ");
   scanf("%d", &no_req);
   printf("\nEnter disc requests in FCFS order:\n");
   for (i = 0; i < no_req; i++) {
      scanf("%d", &disc_reql[i]);
   }
   printf("\nEnter current head position: ");
   scanf("%d", &head1);
```

```
}

void sstf() {
    int min, diff;
    int pending = no_req;
    int i, distance = 0, index;
    head = head1;

    for (i = 0; i < no_req; i++) {
        finish[i] = 0;
    }

    printf("\n%d -> ", head);

    while (pending > 0) {
        min = 9999;
        for (i = 0; i < no_req; i++) {
            diff = abs(head - disc_reql[i]);
            if (finish[i] == 0 && diff < min) {
                min = diff;
                index = i;
            }
        }

        finish[index] = 1;
        distance += min;
        head = disc_reql[index];
        pending--;

        printf("%d -> ", head);
    }
```

```
    printf("End");
    printf("\n\nTotal Distance Traversed: %d", distance);
}

void sort() {
    int temp, i, j;
    for (i = 0; i < no_req; i++) {
        for (j = 0; j < no_req; j++) {
            if (disc_reql[i] < disc_reql[j]) {
                temp = disc_reql[i];
                disc_reql[i] = disc_reql[j];
                disc_reql[j] = temp;
            }
        }
    }
}

void scan() {
    int index, dir, i, distance = 0;
    head = head1;
    printf("\nEnter the direction of head (1 - Towards higher disc / 0 - Towards lower disc): ");
    scanf("%d", &dir);
    sort();
    printf("\nSorted Disc requests are: ");
    for (i = 0; i < no_req; i++) {
        printf("%d ", disc_reql[i]);
    }

    for (i = 0; i < no_req; i++) {
        if (head < disc_reql[i]) {
            index = i;
            break;
```

```
    }
}

printf("\nIndex: %d", index);
printf("%d -> ", head);

if (dir == 1) {
    sort();
    for (i = index; i < no_req; i++) {
        distance += abs(head - disc_reql[i]);
        head = disc_reql[i];
        printf("%d -> ", head);
    }

    distance += abs(head - (track - 1));
    head = track - 1;

    for (i = index - 1; i >= 0; i--) {
        distance += abs(head - disc_reql[i]);
        head = disc_reql[i];
        printf("%d -> ", head);
    }
} else {
    sort();
    for (i = index - 1; i >= 0; i--) {
        distance += abs(head - disc_reql[i]);
        head = disc_reql[i];
        printf("%d -> ", head);
    }

    distance += abs(head - 0);
    head = 0;
```

```
        for (i = index; i < no_req; i++) {
            distance += abs(head - disc_reql[i]);
            head = disc_reql[i];
            printf("%d -> ", head);
        }
    }

    printf("End");
    printf("\nTotal Distance Traversed: %d", distance);
}

void clook() {
    int index, dir, i, distance = 0;
    head = head1;
    printf("\nEnter the direction of head (1 - Towards higher disc / 0 - Towards lower disc): ");
    scanf("%d", &dir);
    sort();
    printf("\nSorted Disc requests are: ");
    for (i = 0; i < no_req; i++) {
        printf("%d ", disc_reql[i]);
    }

    for (i = 0; i < no_req; i++) {
        if (head < disc_reql[i]) {
            index = i;
            break;
        }
    }

    printf("\nIndex: %d");
    printf("%d -> ", head);
```

```
    if (dir == 1) {
        sort();
        for (i = index; i < no_req; i++) {
            distance += abs(head - disc_reql[i]);
            head = disc_reql[i];
            printf("%d -> ", head);
        }

        for (i = 0; i < index; i++) {
            distance += abs(head - disc_reql[i]);
            head = disc_reql[i];
            printf("%d -> ", head);
        }
    } else {
        sort();
        for (i = 0; i < index; i++) {
            distance += abs(head - disc_reql[i]);
            head = disc_reql[i];
            printf("%d -> ", head);
        }

        for (i = index; i < no_req; i++) {
            distance += abs(head - disc_reql[i]);
            head = disc_reql[i];
            printf("%d -> ", head);
        }
    }

    printf("End");
    printf("\nTotal Distance Traversed: %d", distance);
}
```

```
int main() {
    while (1) {
        menu();
        switch (choice) {
            case 1:
                input();
                break;
            case 2:
                sstf();
                break;
            case 3:
                scan();
                break;
            case 4:
                clook();
                break;
            case 5:
                exit(0);
                break;
            default:
                printf("Enter a valid choice.\n");
                break;
        }
    }

    return 0;
}
```

Output-

```
********MENU*********
1. FCFS
2. SSTF
3. SCAN
4. C-LOOK
5. Exit

Enter your choice: 1
Enter the total number of tracks: 100
Enter the total number of disc requests: 11

Enter disc requests in FCFS order:
45 21 67 90 4 50 89 52 61 87 25

Enter current head position: 50


********MENU*********
1. FCFS
2. SSTF
3. SCAN
4. C-LOOK
5. Exit

Enter your choice: 2

50 -> 50 -> 52 -> 45 -> 61 -> 67 -> 87 -> 89 -> 90 -> 25 -> 21 -> 4 -> End

Total Distance Traversed: 140
```

```
********MENU*********
1. FCFS
2. SSTF
3. SCAN
4. C-LOOK
5. Exit

Enter your choice: 3

Enter the direction of head (1 - Towards higher disc / 0 - Towards lower disc): 1

Sorted Disc requests are: 4 21 25 45 50 52 61 67 87 89 90
Index: 550 -> 52 -> 61 -> 67 -> 87 -> 89 -> 90 -> 50 -> 45 -> 25 -> 21 -> 4 -> End
Total Distance Traversed: 144

********MENU*********
1. FCFS
2. SSTF
3. SCAN
4. C-LOOK
5. Exit

Enter your choice: 3

Enter the direction of head (1 - Towards higher disc / 0 - Towards lower disc): 0

Sorted Disc requests are: 4 21 25 45 50 52 61 67 87 89 90
Index: 550 -> 50 -> 45 -> 25 -> 21 -> 4 -> 52 -> 61 -> 67 -> 87 -> 89 -> 90 -> End
Total Distance Traversed: 140
```

```
********MENU*********
1. FCFS
2. SSTF
3. SCAN
4. C-LOOK
5. Exit

Enter your choice: 4

Enter the direction of head (1 - Towards higher disc / 0 - Towards lower disc): 1

Sorted Disc requests are: 4 21 25 45 50 52 61 67 87 89 90
Index: 5250 -> 52 -> 61 -> 67 -> 87 -> 89 -> 90 -> 4 -> 21 -> 25 -> 45 -> 50 -> End
Total Distance Traversed: 172

********MENU*********
1. FCFS
2. SSTF
3. SCAN
4. C-LOOK
5. Exit

Enter your choice: 4

Enter the direction of head (1 - Towards higher disc / 0 - Towards lower disc): 0

Sorted Disc requests are: 4 21 25 45 50 52 61 67 87 89 90
Index: 5250 -> 4 -> 21 -> 25 -> 45 -> 50 -> 52 -> 61 -> 67 -> 87 -> 89 -> 90 -> End
Total Distance Traversed: 132
```

```
********MENU*********
1. FCFS
2. SSTF
3. SCAN
4. C-LOOK
5. Exit

Enter your choice: 5

--------------------------------
Process exited after 49.86 seconds with return value 0
Press any key to continue . . .
```