```c
//dll_impl.h
#include<stdio.h>
#include<stdlib.h>
#include<string.h>
#define max 10

struct dll* header(struct dll *head){
        head=(struct dll*)malloc(sizeof(struct dll));
        head->lptr=head->rptr=NULL;
        return head;
        };

person inputData(){
    person x;
    printf("Enter Name: ");
                scanf("%s",x.name);
                printf("Enter Address: ");
                scanf("%s",x.add);
                printf("Enter sex (Male/Female): ");
                scanf("%s",x.sex);
                printf("Enter age: ");
                scanf("%d",&x.age);
                printf("Enter PIN: ");
                scanf("%d",&x.pin);
                x.id=(rand()%99)+1;
    return x;
}

void insertFront(struct dll* head, person x){
        struct dll *p,*temp;
        p=head->rptr;
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        if(p==NULL){

                temp=(struct dll*)malloc(sizeof(struct dll));

                temp->p=x;

                temp->rptr=head->rptr;

                head->rptr=temp;

                temp->lptr=head;

                }

        else{

                temp=(struct dll*)malloc(sizeof(struct dll));

                temp->p=x;

                temp->rptr=head->rptr;

                head->rptr=temp;

                temp->lptr=head;

                p->lptr=temp;

                }

}


void insertEnd(struct dll* head, person x){

    struct dll* en=(struct dll*)malloc(sizeof(struct dll)),*temp=(struct dll*)malloc(sizeof(struct dll));

    temp=head;

    while(temp->rptr!=NULL)

        temp=temp->rptr ;

    en->p=x;

    en->rptr=NULL;

    en->lptr=temp;

    temp->rptr=en;

    }


void insertPIN(struct dll* head, person x, int pin){

    struct dll* en=(struct dll*)malloc(sizeof(struct dll)),*temp=(struct dll*)malloc(sizeof(struct dll));

    temp=head;
```

```c
      while(temp->p.pin!=pin)
         temp=temp->rptr ;
      en->p=x;
      en->rptr=temp->rptr;
      en->lptr=temp;
      temp->rptr=en;
   }


struct dll* locatePerson(struct dll* head){
   person A[10] ;
   int i=0;
   struct dll *temp=(struct dll*)malloc(sizeof(struct dll));
   temp=head->rptr;
   char loc[20];
   printf("\nEnter location(Address): ");
   scanf("%s",loc);
   while(temp!=NULL){
      if(strcmpi(loc,temp->p.add)==0){
         A[i]=temp->p;
         printf("Name: %s",temp->p.name);
         printf("\nAddress: %s",temp->p.add);
         printf("\nSex: %s",temp->p.sex);
         printf("\nID: %d",temp->p.id);
         printf("\nAge: %d",temp->p.age);
         printf("\nPIN: %d",temp->p.pin);
         printf("\n");
         i++ ;
      }
      temp=temp->rptr;
   }
   return A ;
```

```c
    }

struct dll* seniorPerson(struct dll* head){
    person A[10] ;
    int i=0;
    struct dll *temp=(struct dll*)malloc(sizeof(struct dll));
    temp=head->rptr;
    while(temp!=NULL){
      if(temp->p.age>=70){
        A[i]=temp->p;
        printf("Name: %s",temp->p.name);
        printf("\nAddress: %s",temp->p.add);
        printf("\nSex: %s",temp->p.sex);
        printf("\nID: %d",temp->p.id);
        printf("\nAge: %d",temp->p.age);
        printf("\nPIN: %d",temp->p.pin);
        printf("\n");
        i++ ;
      }
      temp=temp->rptr;
    }
    return A ;
}

void display(struct dll* head){
        struct dll *temp,*prev;
        temp=head->rptr;
        if(temp==NULL){
                printf("Empty list");
                return;
        }
```

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        else{
            while(temp!=NULL){
                printf("Name: %s",temp->p.name);
                printf("\nAddress: %s",temp->p.add);
                printf("\nSex: %s",temp->p.sex);
                printf("\nID: %d",temp->p.id);
                printf("\nAge: %d",temp->p.age);
                printf("\nPIN: %d",temp->p.pin);
                printf("\n");
                temp=temp->rptr;
            }
        }
}


void displayReverse(struct dll *head){
    struct dll *temp;
        temp=head;
        while(temp->rptr!=NULL) temp=temp->rptr;
        while(temp!=head){
                printf("Name: %s",temp->p.name);
                printf("\nAddress: %s",temp->p.add);
                printf("\nSex: %s",temp->p.sex);
                printf("\nID: %d",temp->p.id);
                printf("\nAge: %d",temp->p.age);
                printf("\nPIN: %d",temp->p.pin);
                printf("\n");
                temp=temp->lptr;
        }
}


struct Ratio sexRatio(struct dll *head){
```

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        struct Ratio sr;

    struct dll *temp;

    sr.m=sr.f=0;

            temp=head->rptr;

    while(temp!=NULL){

        if(strcmpi(temp->p.sex,"Female"))

            sr.f++;

        else

            sr.m++;

        temp=temp->rptr ;

        }

    return sr;

}


void sortID (struct dll *head){

        struct dll *t,*te;

        person temp;

        t=(struct dll*)malloc(sizeof(struct dll));

        te=(struct dll*)malloc(sizeof(struct dll));

        t=head->rptr;

        while(t!=NULL)

        {

                te=t->rptr;

                while(te!=NULL)

                {

                        if(t->p.id>te->p.id)

                        {

                                temp=t->p;

                                t->p=te->p;

                                te->p=temp;

                        }
```

```
                        te=te->rptr;
            }
            t=t->rptr;
    }

}


//dll_if.h
typedef struct {
        char name[10],add[100],sex[10];
        int id,age,pin;
        }person;


struct dll{
        person p;
        struct dll *lptr,*rptr;
        }*head;


struct Ratio{
    int m;
    int f;
    };


struct dll* header(struct dll *head);
person inputData();
void insertFront(struct dll* head, person x);
void insertEnd(struct dll* head, person x);
void insertPIN(struct dll* head, person x, int pin);
struct dll* seniorPerson(struct dll* head);
struct dll* locatePerson(struct dll* head);
void display(struct dll* head);
```

```c
void displayReverse(struct dll *head);

struct Ratio sexRatio(struct dll *head);

void sortID (struct dll *head);


//dll_appl.c

#include<stdio.h>

#include<stdlib.h>

#include "dll_if.h"

#include "dll_impl.h"


void main(){

        head=header(head);

        int ch;

        int i=0,pin;


        do{

    person x;

    printf("\tMENU:\n[1]Insert Start\n[2]Insert End\n[3]Insert After PIN\n[4]Sex Ratio\n[5]Search
Senior Citizens\n[6]Search per Location\n[7]Sort Based On ID\n[8]Display\n[9]Display
Reverse\n[10]EXIT");

                printf("\nEnter your choice: ");

                scanf("%d",&ch);


                if(ch==1){

    x=inputData();

    insertFront(head,x);

                }


                if(ch==2){

    x=inputData();

    insertEnd(head,x);

                }
```

```c
        if(ch==3){
x=inputData();
printf("Enter pin : ");
scanf("%d",&pin);
insertPIN(head, x, pin);
        }


        if(ch==4){
struct Ratio sr;
sr=sexRatio(head);
printf("\nSEX RATIO: %d:%d",sr.f,sr.m);
        }


        if(ch==5){
printf("List of senior citizens:\n");
person *E=seniorPerson(head);
        }


        if(ch==6){
printf("Citizens from the location:\n");
person *F=locatePerson(head);
        }


        if(ch==7){
printf("\tSORTED ORDER:\n");
sortID(head);
display(head);
        }


        if(ch==8){
```

```
        printf("\n\t\t\t\tPERSONAL DETAILS:\n");

        display(head);

                }


                if(ch==9){

        printf("\tPRINT REVERSE ORDER\n");

        displayReverse(head);

                }



        }while(ch!=10);

}
```

/*

OUTPUT:

    MENU:

[1]Insert Start

[2]Insert End

[3]Insert After PIN

[4]Sex Ratio

[5]Search Senior Citizens

[6]Search per Location

[7]Sort Based On ID

[8]Display

[9]Display Reverse

[10]EXIT

Enter your choice: 1

Enter Name: Swetha

Enter Address: Kodambakkam

Enter sex (Male/Female): Female

Enter age: 19

Enter PIN: 3456

   MENU:

[1]Insert Start

[2]Insert End

[3]Insert After PIN

[4]Sex Ratio

[5]Search Senior Citizens

[6]Search per Location

[7]Sort Based On ID

[8]Display

[9]Display Reverse

[10]EXIT

Enter your choice: 2

Enter Name: Tarun

Enter Address: K.K.Nagar

Enter sex (Male/Female): Male

Enter age: 18

Enter PIN: 7890

   MENU:

[1]Insert Start

[2]Insert End

[3]Insert After PIN

[4]Sex Ratio

[5]Search Senior Citizens

[6]Search per Location

[7]Sort Based On ID

[8]Display

[9]Display Reverse

[10]EXIT

Enter your choice: 3

Enter Name: Dheepika

Enter Address: T.Nagar

Enter sex (Male/Female): Female

Enter age: 15

Enter PIN: 34565

Enter pin : 3456

    MENU:

[1]Insert Start

[2]Insert End

[3]Insert After PIN

[4]Sex Ratio

[5]Search Senior Citizens

[6]Search per Location

[7]Sort Based On ID

[8]Display

[9]Display Reverse

[10]EXIT

Enter your choice: 8

    PERSONAL DETAILS:

Name: Swetha

Address: Kodambakkam

Sex: Female

ID: 42

Age: 19

PIN: 3456

Name: Dheepika

Address: T.Nagar

Sex: Female

ID: 98

Age: 15

PIN: 34565

Name: Tarun

Address: K.K.Nagar

Sex: Male

ID: 54

Age: 18

PIN: 7890

    MENU:

[1]Insert Start

[2]Insert End

[3]Insert After PIN

[4]Sex Ratio

[5]Search Senior Citizens

[6]Search per Location

[7]Sort Based On ID

[8]Display

[9]Display Reverse

[10]EXIT

Enter your choice: 4

SEX RATIO: 1:2

    MENU:

[1]Insert Start

[2]Insert End

[3]Insert After PIN

[4]Sex Ratio

[5]Search Senior Citizens

[6]Search per Location

[7]Sort Based On ID

[8]Display

[9]Display Reverse

[10]EXIT

Enter your choice: 1

Enter Name: rajendran

Enter Address: Kilpauk

Enter sex (Male/Female): Male

Enter age: 80

Enter PIN: 43626

     MENU:

[1]Insert Start

[2]Insert End

[3]Insert After PIN

[4]Sex Ratio

[5]Search Senior Citizens

[6]Search per Location

[7]Sort Based On ID

[8]Display

[9]Display Reverse

[10]EXIT

Enter your choice: 5

List of senior citizens:

Name: rajendran

Address: Kilpauk

Sex: Male

ID: 68

Age: 80

PIN: 43626

     MENU:

[1]Insert Start

[2]Insert End

[3]Insert After PIN

[4]Sex Ratio

[5]Search Senior Citizens

[6]Search per Location

[7]Sort Based On ID

[8]Display

[9]Display Reverse

[10]EXIT

Enter your choice: 6

Citizens from the location:

Enter location(Address): Kodambakkam

Name: Swetha

Address: Kodambakkam

Sex: Female

ID: 42

Age: 19

PIN: 3456

    MENU:

[1]Insert Start

[2]Insert End

[3]Insert After PIN

[4]Sex Ratio

[5]Search Senior Citizens

[6]Search per Location

[7]Sort Based On ID

[8]Display

[9]Display Reverse

[10]EXIT

Enter your choice: 9

      PRINT REVERSE ORDER

Name: Tarun

Address: K.K.Nagar

Sex: Male

ID: 54

Age: 18

PIN: 7890

Name: Swetha

Address: Kodambakkam

Sex: Female

ID: 42

Age: 19

PIN: 3456

Name: rajendran

Address: Kilpauk

Sex: Male

ID: 68

Age: 80

PIN: 43626

    MENU:

[1]Insert Start

[2]Insert End

[3]Insert After PIN

[4]Sex Ratio

[5]Search Senior Citizens

[6]Search per Location

[7]Sort Based On ID

[8]Display

[9]Display Reverse

[10]EXIT

Enter your choice: 10

*/