LAB REPORT

CSE 114 : Data Structure and Algorithms Sessional

PREPARED BY

Mehrin Farzana
ID: 2101013
Session: 2021-2022
Date: 4/10/2023

SUPERVISED BY

Suman Saha
Lecturer
Department of IRE, BDU

BANGABANDHU SHEIKH MUJIBUR RAHMAN DIGITAL UNIVERSITY

(BDU)

List of Problems

1. Implement circular queue.

2. Implement a program to solve the Tower of Hanoi problem for n disks, and print the sequence of moves required to transfer all the disks from one peg to another while adhering to the rules.

3. Write down a program to Check Whether a Number is Palindrome or Not.

Problem No.: 01

Problem Statement:

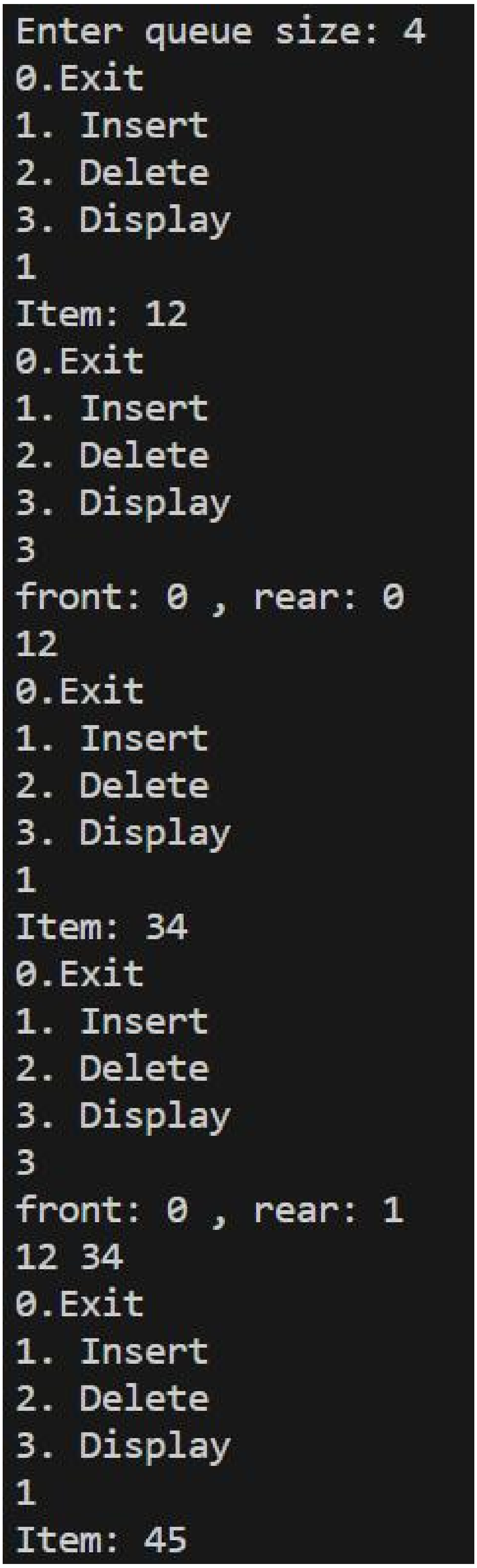
Implement circular queue.

Code:

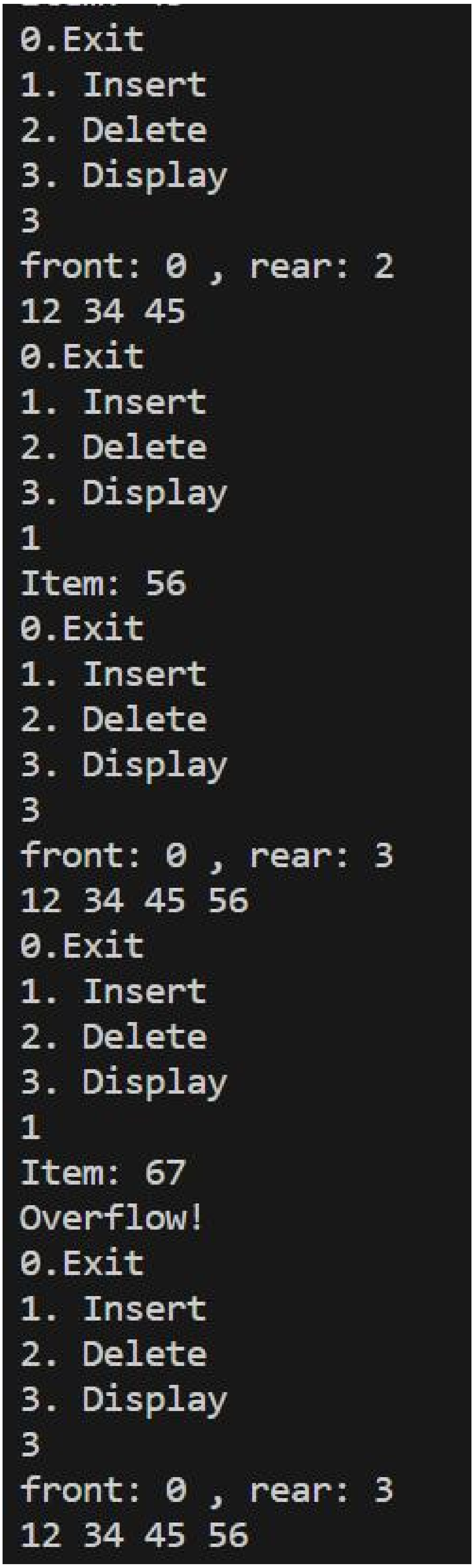
```
#include <stdio.h>
int rear = -1 , front = -1;

int is_full(int *a, int n){
   if(front==0 && rear==n-1){
      return 1;
   }
   if(rear==front-1){
      return 1;
   }
   return 0;
}

int is_empty(int *a, int n){
   if(front==-1){
      return 1;
   }
   return 0;
}

void insert(int *a, int n, int item){
   if(is_full(a,n)){
      printf("Overflow!\n");
      return;
   }
   else if(front==-1){
      front++;
      rear++;
   }
   else if(rear<n-1){
      rear++;
   }
   else if(rear==n-1){
      rear=0;
   }
   a[rear]=item;
}
```

```
void delete(int *a, int n){
    if(front==-1){
        printf("Underflow!\n");
        return;
    }
    if(front==rear){
        front=-1;
        rear=-1;


   // printf("%d %d\n", front, rear);
    }
    else if(front==n-1){
        front=0;
    }
    else{
        front++;
    }

}

void display(int *a, int n){
    printf("front: %d , rear: %d\n", front, rear);
    if(front==-1 && rear==-1){
        printf("Empty queue\n");
    }
    else if(front<=rear){
        for(int i=front; i<=rear; i++){
            printf("%d ", a[i]);
        }
   }
   else if(front>rear){
        for(int i=0; i<=rear; i++){
            printf("%d ", a[i]);
        }
        for(int i=front; i<n; i++){
            printf("%d ", a[i]);
        }


   }
   printf("\n");
}


int main() {
    int b=1;
    int n,item;
    printf("Enter queue size: ");
    scanf("%d", &n);
    int a[n];
    while(b){
        printf("0.Exit\n1. Insert\n2. Delete\n3. Display\n");
        scanf("%d", &b);
        switch(b){
            case 0:
                break;
            case 1:
                printf("Item: ");
                scanf("%d", &item);
                insert(a, n, item);
                break;
            case 2:
                delete(a, n);
                break;
            case 3:
                display(a, n);
                break;
            default:
                break;
        }
    }

    return 0;
}
```

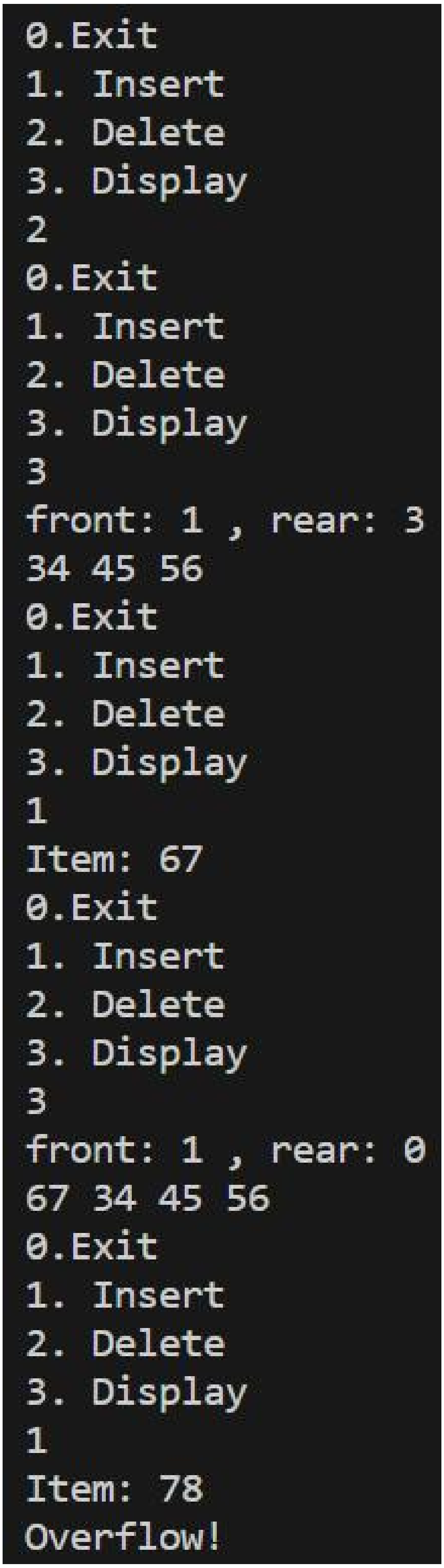
Output:



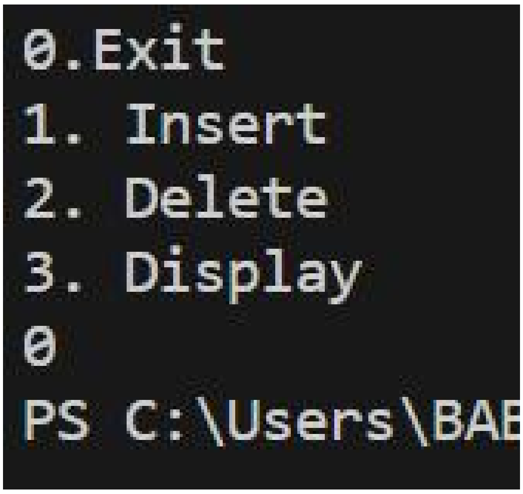
```
Enter queue size: 4
0.Exit
1. Insert
2. Delete
3. Display
1
Item: 12
0.Exit
1. Insert
2. Delete
3. Display
3
front: 0 , rear: 0
12
0.Exit
1. Insert
2. Delete
3. Display
1
Item: 34
0.Exit
1. Insert
2. Delete
3. Display
3
front: 0 , rear: 1
12 34
0.Exit
1. Insert
2. Delete
3. Display
1
Item: 45
```



```
0.Exit
1. Insert
2. Delete
3. Display
3
front: 0 , rear: 2
12 34 45
0.Exit
1. Insert
2. Delete
3. Display
1
Item: 56
0.Exit
1. Insert
2. Delete
3. Display
3
front: 0 , rear: 3
12 34 45 56
0.Exit
1. Insert
2. Delete
3. Display
1
Item: 67
Overflow!
0.Exit
1. Insert
2. Delete
3. Display
3
front: 0 , rear: 3
12 34 45 56
```



```
0.Exit
1. Insert
2. Delete
3. Display
2
0.Exit
1. Insert
2. Delete
3. Display
3
front: 1 , rear: 3
34 45 56
0.Exit
1. Insert
2. Delete
3. Display
1
Item: 67
0.Exit
1. Insert
2. Delete
3. Display
3
front: 1 , rear: 0
67 34 45 56
0.Exit
1. Insert
2. Delete
3. Display
1
Item: 78
Overflow!
```



```
0.Exit
1. Insert
2. Delete
3. Display
0
PS C:\Users\BAB
```

Fig 1.1: Output on console for case 1.

Problem No.: 02

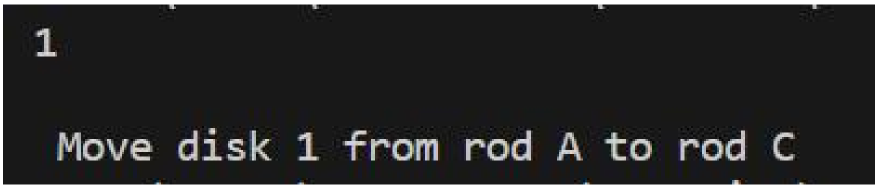
Problem Statement:

Implement a program to solve the Tower of Hanoi problem for n disks, and print the sequence of moves required to transfer all the disks from one peg to another while adhering to the rules.

Code:

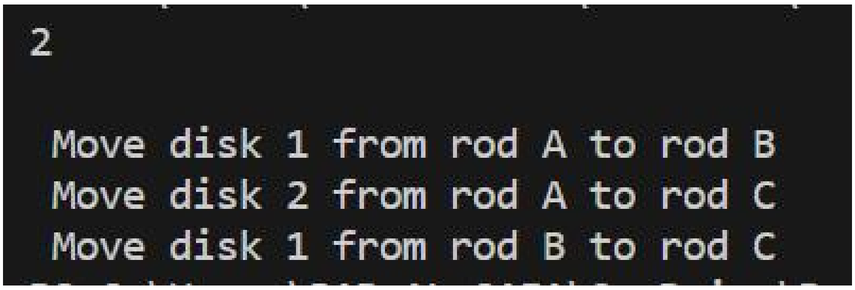
```
#include <stdio.h>

void towerOfHanoi(int n, char from_rod, char to_rod, char aux_rod)
{
        if (n == 1)
        {
                printf("\n Move disk 1 from rod %c to rod %c", from_rod, to_rod);
                return;
        }
        towerOfHanoi(n-1, from_rod, aux_rod, to_rod);
        printf("\n Move disk %d from rod %c to rod %c", n, from_rod, to_rod);
        towerOfHanoi(n-1, aux_rod, to_rod, from_rod);
}

int main()
{
        int n;
   scanf("%d", &n);
        towerOfHanoi(n, 'A', 'C', 'B');
        return 0;
}
```

Output:



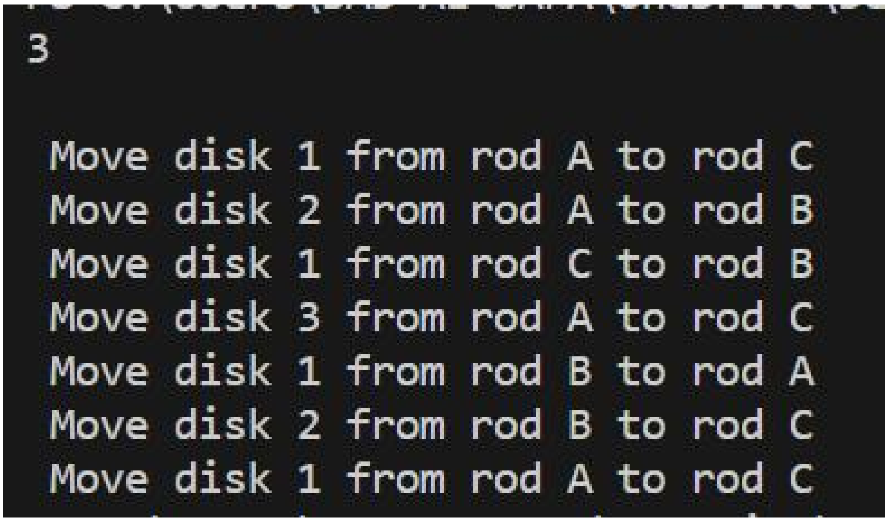
```
1

 Move disk 1 from rod A to rod C
```

Fig 1.1: Output on console for case 1.



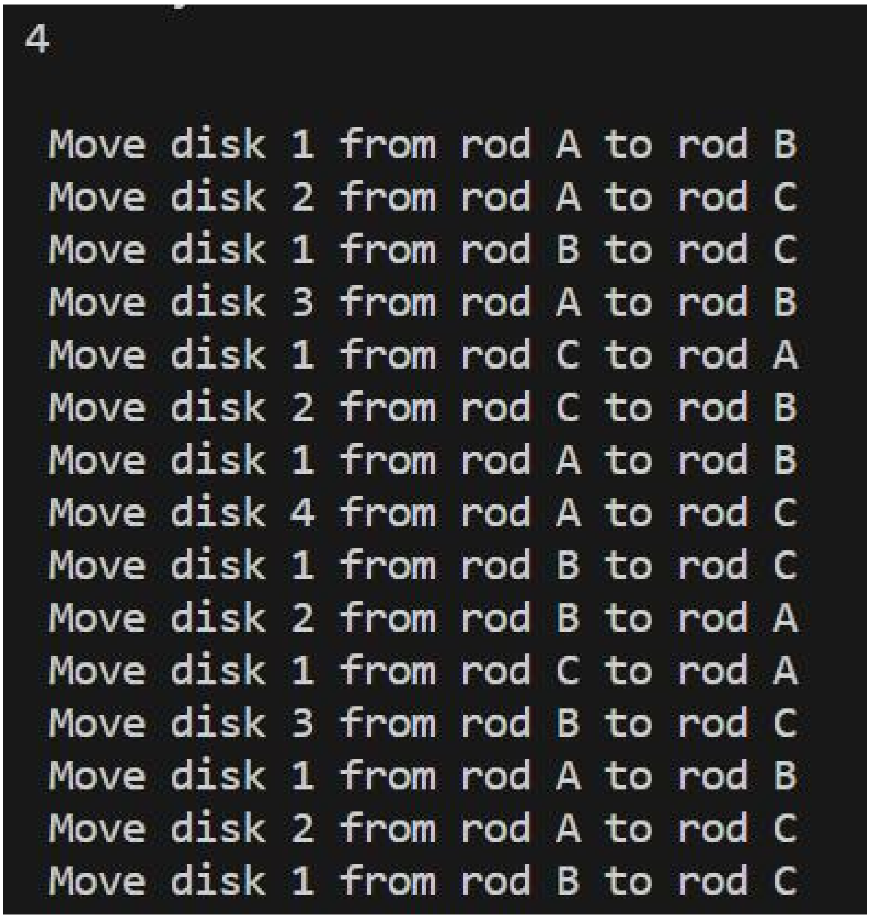
```
2

 Move disk 1 from rod A to rod B
 Move disk 2 from rod A to rod C
 Move disk 1 from rod B to rod C
```

Fig 1.2: Output on console for case 2.



```
3

 Move disk 1 from rod A to rod C
 Move disk 2 from rod A to rod B
 Move disk 1 from rod C to rod B
 Move disk 3 from rod A to rod C
 Move disk 1 from rod B to rod A
 Move disk 2 from rod B to rod C
 Move disk 1 from rod A to rod C
```

Fig 1.3: Output on console for case 3.



```
4

 Move disk 1 from rod A to rod B
 Move disk 2 from rod A to rod C
 Move disk 1 from rod B to rod C
 Move disk 3 from rod A to rod B
 Move disk 1 from rod C to rod A
 Move disk 2 from rod C to rod B
 Move disk 1 from rod A to rod B
 Move disk 4 from rod A to rod C
 Move disk 1 from rod B to rod C
 Move disk 2 from rod B to rod A
 Move disk 1 from rod C to rod A
 Move disk 3 from rod B to rod C
 Move disk 1 from rod A to rod B
 Move disk 2 from rod A to rod C
 Move disk 1 from rod B to rod C
```

Fig 1.4: Output on console for case 4.

Problem No.: 03

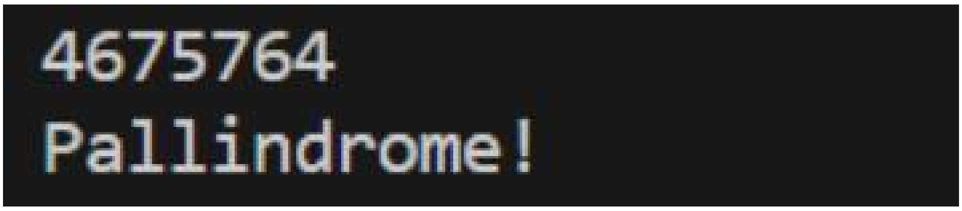
Problem Statement:

Write down a program to Check Whether a Number is Palindrome or Not.

Code:

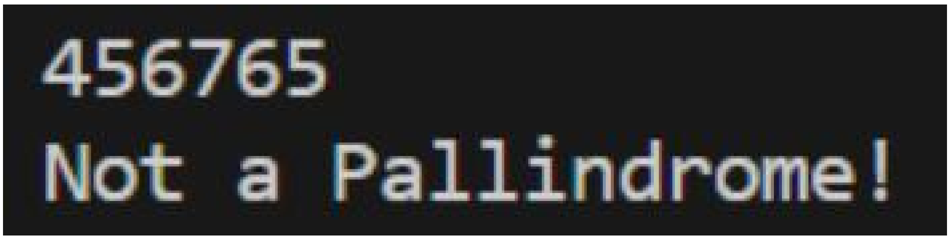
```
#include <stdio.h>
#include <string.h>


int main() {
   char s[101];
   scanf("%s", s);
   int n = strlen(s), flag=0;
   for(int i=0; i<=n/2; i++){
      if(s[i]!=s[n-1-i])
         flag=1;
   }
   if(!flag)
      printf("Pallindrome!");
   else if(flag)
      printf("Not a Pallindrome!");
   return 0;
}
```

Output:



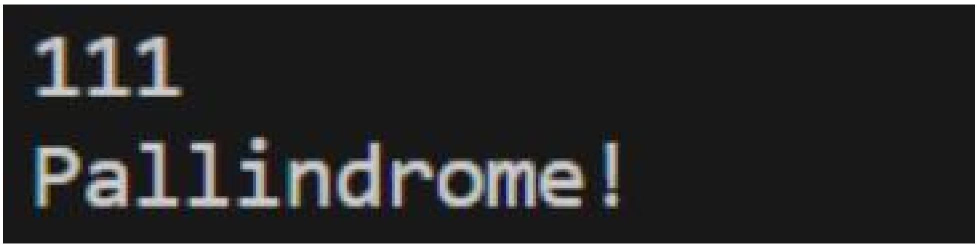
```
4675764
Pallindrome!
```

Fig 1.1: Output on console for case 1.



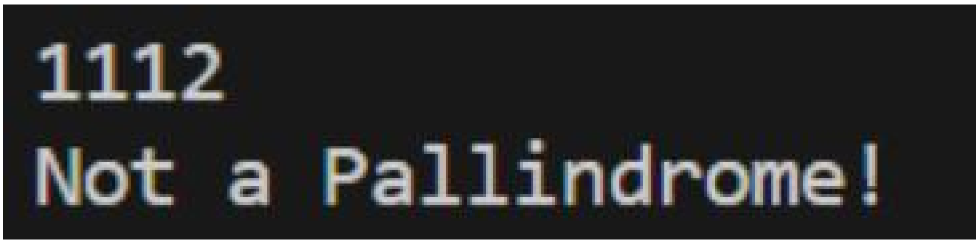
```
456765
Not a Pallindrome!
```

Fig 1.2: Output on console for case 2.



```
111
Pallindrome!
```

Fig 1.3: Output on console for case 3.



```
1112
Not a Pallindrome!
```

Fig 1.4: Output on console for case 4.