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


int pageQIndex = 0;
int pageFaults = 0; // Variable to count page faults

void initializeFrames(int maxframes,int frames[],int pageQ[]) {
    for (int i = 0; i < maxframes; i++) {
        frames[i] = -1; // Initialize frames with -1 indicating empty
        pageQ[i] = -1; // Initialize page queue with -1
    }
}

void displayFrames(int maxframes,int frames[]) {
    for (int i = 0; i < maxframes; i++) {
        if (frames[i] == -1) {
            printf("- ");
        } else {
            printf("%d ", frames[i]);
        }
    }
    printf("\n");
}

int isPageInFrames(int page,int maxframes,int frames[]) {
    for (int i = 0; i < maxframes; i++) {
        if (frames[i] == page) {
            return 1; // Page found in frames
        }
    }
    return 0; // Page not found in frames
}

int findEmptyFrame(int maxframes,int frames[]) {
    for (int i = 0; i < maxframes; i++) {
        if (frames[i] == -1) {
            return i; // Return the index of an empty frame
        }
    }
    return -1; // No empty frame found
```

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}

int findLRUFrame(int pageQ[]) {
   return pageQ[0]; // LRU frame is the first page in the queue
}

int findOptimalFrame(int page, int Str[], int curridx,int maxframes,int maxpages,int
frames[]) {
   int farthestIndex = -1;
   int maxDistance = -1;

   for (int i = 0; i < maxframes; i++) {
      int j;
      for (j = curridx; j < maxpages; j++) {
         if (frames[i] == Str[j]) {
            if (j > maxDistance) {
               maxDistance = j;
               farthestIndex = i;
            }
            break;
         }
      }
      if (j == maxpages) {
         return i; // Page not referenced again, so it's the best choice
      }
   }

   return farthestIndex;
}

void FCFS(int Str[],int maxframes,int maxpages,int frames[],int pageQ[]) {
   initializeFrames(maxframes,frames,pageQ);
   pageFaults = 0;

   printf("FCFS Page Replacement Algorithm:\n");
   for (int i = 0; i < maxpages; i++) {
      if (!isPageInFrames(Str[i],maxframes,frames)) {
         int emptyFrameIndex = findEmptyFrame(maxframes,frames);
         if (emptyFrameIndex != -1) {
            frames[emptyFrameIndex] = Str[i];
         } else {
                frames[0] = Str[i];
            }
            pageFaults++;
        }

        displayFrames(maxframes,frames);
    }
    printf("Total Page Faults: %d\n", pageFaults);
}

void LRU(int Str[],int maxframes,int maxpages,int frames[],int pageQ[]) {
    initializeFrames(maxframes,frames,pageQ);
    pageFaults = 0;

    printf("\nLRU Page Replacement Algorithm:\n");
    for (int i = 0; i < maxpages; i++) {
        if (!isPageInFrames(Str[i],maxframes,frames)) {
            int emptyFrameIndex = findEmptyFrame(maxframes,frames);
            if (emptyFrameIndex != -1) {
                frames[emptyFrameIndex] = Str[i];
            } else {
                int lruFrame = findLRUFrame(pageQ);
                for (int j = 0; j < maxframes; j++) {
                    if (pageQ[j] == lruFrame) {
                        frames[j] = Str[i];
                        break;
                    }
                }
            }
            pageFaults++;
        }

        // Update the page queue
        pageQ[pageQIndex] = Str[i];
        pageQIndex++;

        displayFrames(maxframes,frames);
    }
    printf("Total Page Faults: %d\n", pageFaults);
}
```

```
void Optimal(int Str[],int maxframes,int maxpages,int frames[],int pageQ[]) {
   initializeFrames(maxframes,frames,pageQ);
   pageFaults = 0;

   printf("\nOptimal Page Replacement Algorithm:\n");
   for (int i = 0; i < maxpages; i++) {
      if (!isPageInFrames(Str[i],maxframes,frames)) {
         int emptyFrameIndex = findEmptyFrame(maxframes,frames);
         if (emptyFrameIndex != -1) {
            frames[emptyFrameIndex] = Str[i];
         } else {
            int optimalFrame = findOptimalFrame(Str[i], Str, i +
1,maxframes,maxpages,frames);
            frames[optimalFrame] = Str[i];
         }
         pageFaults++;
      }

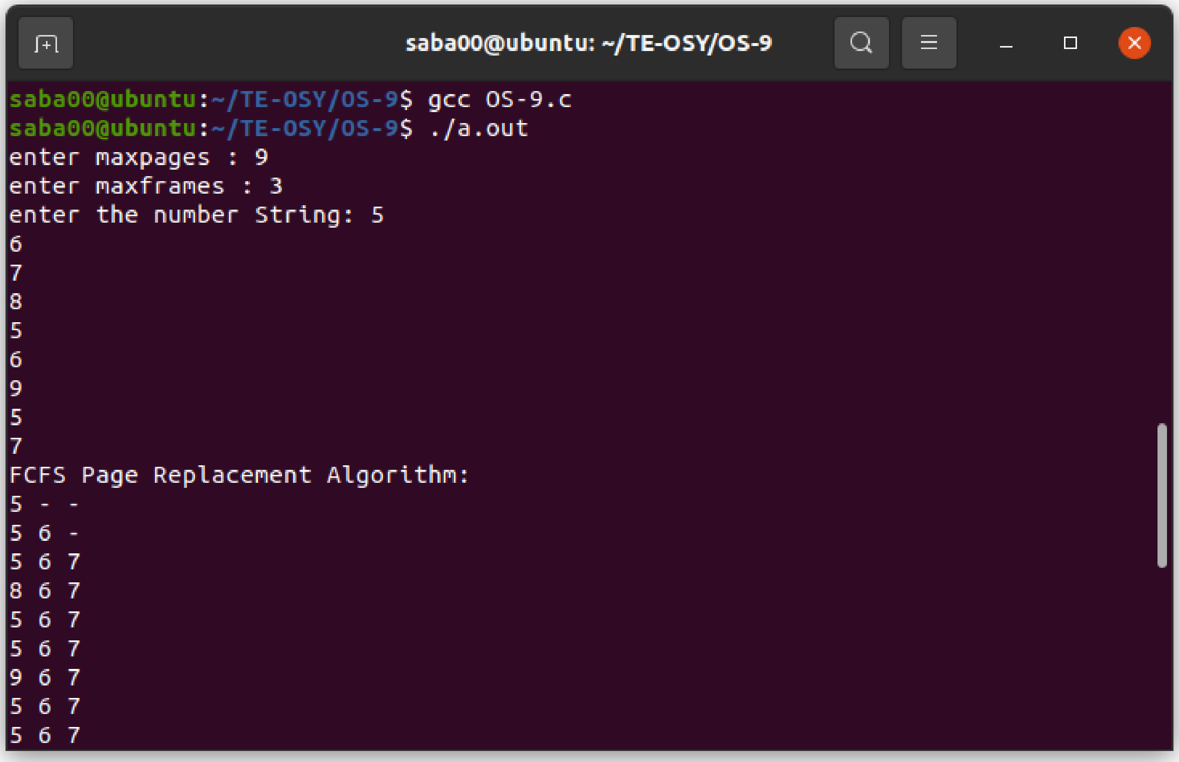
      displayFrames(maxframes,frames);
   }
   printf("Total Page Faults: %d\n", pageFaults);
}

int main() {

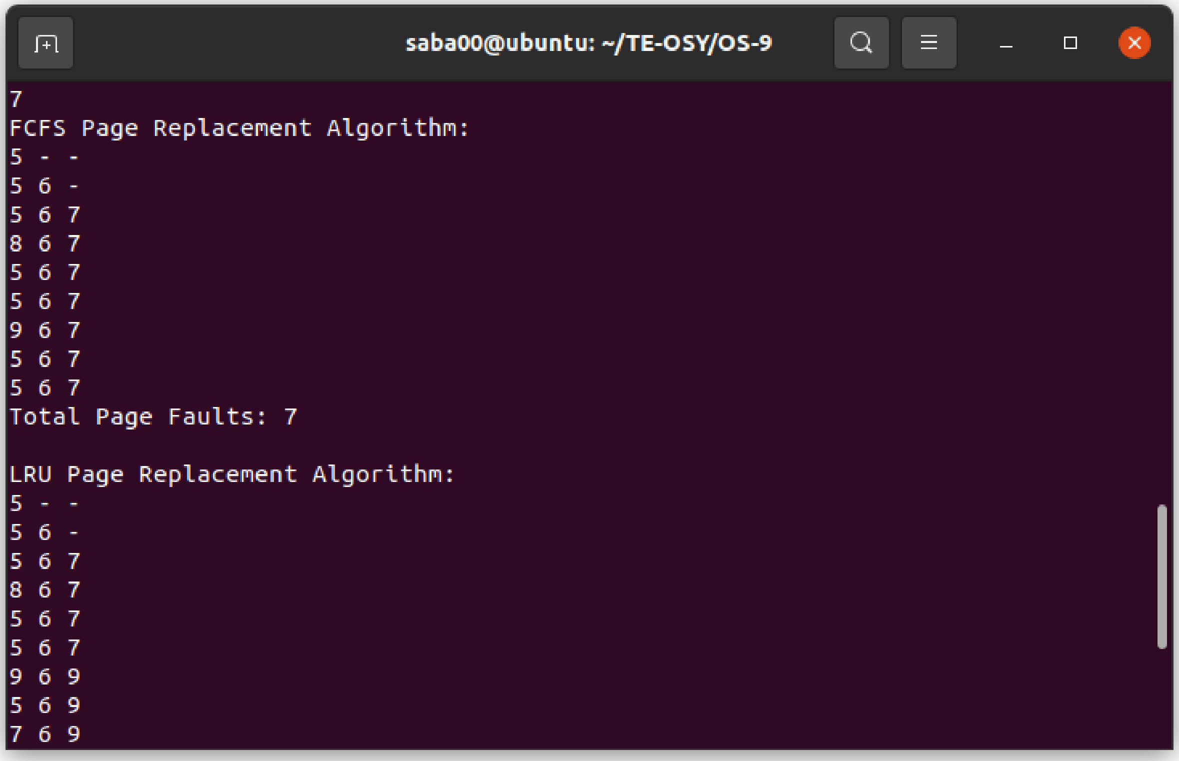
   int maxframes;
   int maxpages;
   printf("enter maxpages : ");
   scanf("%d",&maxpages);
   printf("enter maxframes : ");
   scanf("%d",&maxframes);
   int frames[maxframes];
   int pageQ[maxframes];
   int Str[maxpages];
   printf("enter the number String: ");
   for(int i=0;i<maxpages;i++){
      scanf("%d",&Str[i]);
   }
   //int Str[maxpages] = {7, 0, 1, 2, 0, 3, 0, 4, 2, 3};
   FCFS(Str,maxframes,maxpages,frames,pageQ);
   LRU(Str,maxframes,maxpages,frames,pageQ);
```

```
    Optimal(Str,maxframes,maxpages,frames,pageQ);

    return 0;
}
//**************************************************OUTPUT*************************************************
```

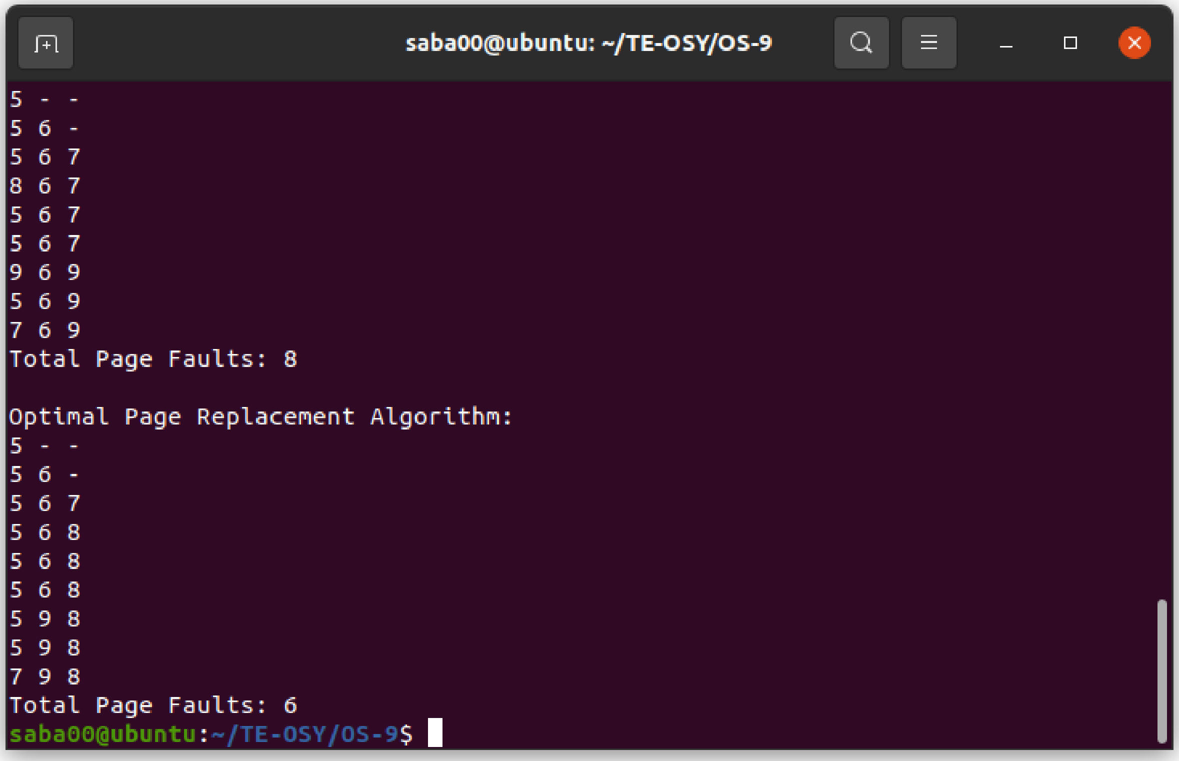


```
saba00@ubuntu:~/TE-OSY/OS-9$ gcc OS-9.c
saba00@ubuntu:~/TE-OSY/OS-9$ ./a.out
enter maxpages : 9
enter maxframes : 3
enter the number String: 5
6
7
8
5
6
9
5
7
FCFS Page Replacement Algorithm:
5 - -
5 6 -
5 6 7
8 6 7
5 6 7
5 6 7
9 6 7
5 6 7
5 6 7
```


saba00@ubuntu: ~/TE-OSY/OS-9

```
7
FCFS Page Replacement Algorithm:
5 - -
5 6 -
5 6 7
8 6 7
5 6 7
5 6 7
9 6 7
5 6 7
5 6 7
Total Page Faults: 7

LRU Page Replacement Algorithm:
5 - -
5 6 -
5 6 7
8 6 7
5 6 7
5 6 7
9 6 9
5 6 9
7 6 9
```


saba00@ubuntu: ~/TE-OSY/OS-9

```
5 - -
5 6 -
5 6 7
8 6 7
5 6 7
5 6 7
9 6 9
5 6 9
7 6 9
Total Page Faults: 8

Optimal Page Replacement Algorithm:
5 - -
5 6 -
5 6 7
5 6 8
5 6 8
5 6 8
5 9 8
5 9 8
7 9 8
Total Page Faults: 6
saba00@ubuntu:~/TE-OSY/OS-9$
```