

First In First Out [FIFO]

Program

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

```
void prfr(int frames[], int frame) {  
    int i;  
    printf("\tCurrent status of Frames: ");  
    for (i = 0; i < frame; i++) {  
        printf("%d ", frames[i]);  
    }  
    printf("\n");  
}
```

```
void fifo(int frame, int page[], int n) {  
    int i, j;  
    int frames[frame];  
    for (i = 0; i < frame; i++) {  
        frames[i] = -1;  
    }  
  
    float pagefaults = 0, hits = 0;  
    int found;
```

```
    for (i = 0; i < n; i++) {  
        found = 0;  
        for (j = 0; j < frame; j++) {  
            if (page[i] == frames[j]) {  
                found = 1;  
                hits++;  
                printf("Page %d is already in the frames: ", page[i]);  
                prfr(frames, frame);  
                break;  
            }  
        }  
    }
```

```
    if (!found) {  
        pagefaults++;  
        frames[i % frame] = page[i];  
        printf("Page %d loaded into frames:\t ", page[i]);  
        prfr(frames, frame);  
    }  
}
```

```
printf("Total Page Faults: %.0f\n", pagefaults);
printf("Total Hits: %.0f\n", hits);
printf("Miss Ratio: %.2f\n", pagefaults / n);
printf("Hit Ratio: %.2f\n", hits / n);
}

int main() {
    int i, n, frame, page[100];
    printf("Enter the Number of Frames: ");
    scanf("%d", &frame);

    printf("Enter the length of reference string: ");
    scanf("%d", &n);

    printf("Enter the reference string (space-separated): ");
    for (i = 0; i < n; i++) {
        scanf("%d", &page[i]);
    }

    fifo(frame, page, n);
    return 0;
}
```

output

```
gokul@gokul-ThinkPad-T460s: ~/S4/OS/EXP11_PageReplacement
gokul@gokul-ThinkPad-T460s:~/S4/OS/EXP11_PageReplacement$ open FIFO.c
gokul@gokul-ThinkPad-T460s:~/S4/OS/EXP11_PageReplacement$ gcc FIFO.c -o fifo.out
gokul@gokul-ThinkPad-T460s:~/S4/OS/EXP11_PageReplacement$ ./fifo.out
Enter the Number of Frames: 3
Enter the length of reference string: 20
Enter the reference string (space-separated): 1 2 3 2 3 1 8 3 1 3 1 3 9 8 7 6 1
2 3 4
Page 1 loaded into frames:          Current status of Frames: 1 -1 -1
Page 2 loaded into frames:          Current status of Frames: 1 2 -1
Page 3 loaded into frames:          Current status of Frames: 1 2 3
Page 2 is already in the frames:    Current status of Frames: 1 2 3
Page 3 is already in the frames:    Current status of Frames: 1 2 3
Page 1 is already in the frames:    Current status of Frames: 1 2 3
Page 8 loaded into frames:          Current status of Frames: 8 2 3
Page 3 is already in the frames:    Current status of Frames: 8 2 3
Page 1 loaded into frames:          Current status of Frames: 8 2 1
Page 3 loaded into frames:          Current status of Frames: 3 2 1
Page 1 is already in the frames:    Current status of Frames: 3 2 1
Page 3 is already in the frames:    Current status of Frames: 3 2 1
Page 9 loaded into frames:          Current status of Frames: 9 2 1
Page 8 loaded into frames:          Current status of Frames: 9 8 1
Page 7 loaded into frames:          Current status of Frames: 9 8 7
Page 6 loaded into frames:          Current status of Frames: 6 8 7
Page 1 loaded into frames:          Current status of Frames: 6 1 7
Page 2 loaded into frames:          Current status of Frames: 6 1 2
Page 3 loaded into frames:          Current status of Frames: 3 1 2
Page 4 loaded into frames:          Current status of Frames: 3 4 2
Total Page Faults: 14
Total Hits: 6
Miss Ratio: 0.70
Hit Ratio: 0.30
gokul@gokul-ThinkPad-T460s:~/S4/OS/EXP11_PageReplacement$
```

Least Recently Used [LRU]

program

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

```
void prfr(int frames[], int frame) {
    int i;
    printf("\tCurrent status of Frames: ");
    for (i = 0; i < frame; i++) {
        printf("%d ", frames[i]);
    }
    printf("\n");
}
```

```
void lru(int frame, int page[], int n) {
    int i, j;
    int frames[frame];
    int last_used[frame];
    for (i = 0; i < frame; i++) {
        frames[i] = -1;
        last_used[i] = -1;
    }
```

```
float pagefaults = 0, hits = 0;
int found, lru_index;
```

```
for (i = 0; i < n; i++) {
    found = 0;
    for (j = 0; j < frame; j++) {
        if (page[i] == frames[j]) {
            found = 1;
            hits++;
            last_used[j] = i;
            printf("Page %d is already in the frames: ", page[i]);
            prfr(frames, frame);
            break;
        }
    }
}
```

```
if (!found) {
    pagefaults++;
    lru_index = 0;
    for (j = 1; j < frame; j++) {
        if (last_used[j] < last_used[lru_index]) {
            lru_index = j;
        }
    }
}
```

```

        frames[lru_index] = page[i];
        last_used[lru_index] = i;
        printf("Page %d loaded into frames: ", page[i]);
        prfr(frames, frame);
    }
}

printf("Total Page Faults: %.0f\n", pagefaults);
printf("Total Hits: %.0f\n", hits);
printf("Miss Ratio: %.2f\n", pagefaults / n);
printf("Hit Ratio: %.2f\n", hits / n);
}

int main() {
    int i, n, frame, page[100];
    printf("Enter the Number of Frames: ");
    scanf("%d", &frame);

    printf("Enter the length of reference string: ");
    scanf("%d", &n);

    printf("Enter the reference string (space-separated): ");
    for (i = 0; i < n; i++) {
        scanf("%d", &page[i]);
    }

    lru(frame, page, n);
    return 0;
}

```

Output

```
gokul@gokul-ThinkPad-T460s: ~/S4/OS/EXP11_PageReplacement
gokul@gokul-ThinkPad-T460s:~/S4/OS/EXP11_PageReplacement$ open LRU.c
gokul@gokul-ThinkPad-T460s:~/S4/OS/EXP11_PageReplacement$ gcc LRU.c -o lru.out
gokul@gokul-ThinkPad-T460s:~/S4/OS/EXP11_PageReplacement$ ./lru.out
Enter the Number of Frames: 3
Enter the length of reference string: 20
Enter the reference string (space-separated): 1 2 3 2 3 1 8 3 1 3 1 3 9 8 7 6 1
2 3 4
Page 1 loaded into frames:      Current status of Frames: 1 -1 -1
Page 2 loaded into frames:      Current status of Frames: 1 2 -1
Page 3 loaded into frames:      Current status of Frames: 1 2 3
Page 2 is already in the frames: Current status of Frames: 1 2 3
Page 3 is already in the frames: Current status of Frames: 1 2 3
Page 1 is already in the frames: Current status of Frames: 1 2 3
Page 8 loaded into frames:      Current status of Frames: 1 8 3
Page 3 is already in the frames: Current status of Frames: 1 8 3
Page 1 is already in the frames: Current status of Frames: 1 8 3
Page 3 is already in the frames: Current status of Frames: 1 8 3
Page 1 is already in the frames: Current status of Frames: 1 8 3
Page 3 is already in the frames: Current status of Frames: 1 8 3
Page 9 loaded into frames:      Current status of Frames: 1 9 3
Page 8 loaded into frames:      Current status of Frames: 8 9 3
Page 7 loaded into frames:      Current status of Frames: 8 9 7
Page 6 loaded into frames:      Current status of Frames: 8 6 7
Page 1 loaded into frames:      Current status of Frames: 1 6 7
Page 2 loaded into frames:      Current status of Frames: 1 6 2
Page 3 loaded into frames:      Current status of Frames: 1 3 2
Page 4 loaded into frames:      Current status of Frames: 4 3 2
Total Page Faults: 12
Total Hits: 8
Miss Ratio: 0.60
Hit Ratio: 0.40
gokul@gokul-ThinkPad-T460s:~/S4/OS/EXP11_PageReplacement$
```

Least Frequently Used[LFU]

Program

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

```
void prfr(int frames[], int frame) {
    int i;
    printf("\tCurrent status of Frames: ");
    for (i = 0; i < frame; i++) {
        printf("%d ", frames[i]);
    }
    printf("\n");
}
```

```
void lfu(int frame, int page[], int n) {
    int i, j;
    int frames[frame];
    int frequency[frame];
    int last_used[frame];
```

```
    for (i = 0; i < frame; i++) {
        frames[i] = -1;
        frequency[i] = 0;
        last_used[i] = -1;
    }
```

```
    float pagefaults = 0, hits = 0;
    int found, lfu_index;
```

```
    for (i = 0; i < n; i++) {
        found = 0;
        for (j = 0; j < frame; j++) {
            if (page[i] == frames[j]) {
                found = 1;
                hits++;
                frequency[j]++;
                last_used[j] = i;
                printf("Page %d is already in the frames: ", page[i]);
                prfr(frames, frame);
                break;
            }
        }
    }
```

```

        if (!found) {
            pagefaults++;
            lfu_index = 0;
            for (j = 1; j < frame; j++) {
                if (frequency[j] < frequency[lfu_index] || (frequency[j] == frequency[lfu_index] &&
last_used[j] < last_used[lfu_index])) {
                    lfu_index = j;
                }
            }
            frames[lfu_index] = page[i];
            frequency[lfu_index] = 1;
            last_used[lfu_index] = i;
            printf("Page %d loaded into frames: ", page[i]);
            prfr(frames, frame);
        }
    }

    printf("Total Page Faults: %.0f\n", pagefaults);
    printf("Total Hits: %.0f\n", hits);
    printf("Miss Ratio: %.2f\n", pagefaults / n);
    printf("Hit Ratio: %.2f\n", hits / n);
}

int main() {
    int i, n, frame, page[100];
    printf("Enter the Number of Frames: ");
    scanf("%d", &frame);

    printf("Enter the length of reference string: ");
    scanf("%d", &n);

    printf("Enter the reference string (space-separated): ");
    for (i = 0; i < n; i++) {
        scanf("%d", &page[i]);
    }

    lfu(frame, page, n);
    return 0;
}

```


Output

```
gokul@gokul-ThinkPad-T460s: ~/S4/OS/EXP11_PageReplacement
gokul@gokul-ThinkPad-T460s:~/S4/OS/EXP11_PageReplacement$ open LFU.c
gokul@gokul-ThinkPad-T460s:~/S4/OS/EXP11_PageReplacement$ gcc LFU.c -o LFU.out
gokul@gokul-ThinkPad-T460s:~/S4/OS/EXP11_PageReplacement$ ./LFU.out
Enter the Number of Frames: 3
Enter the length of reference string: 20
Enter the reference string (space-separated): 1 2 3 2 3 1 8 3 1 3 1 3 9 8 7 6 1
2 3 4
Page 1 loaded into frames:      Current status of Frames: 1 -1 -1
Page 2 loaded into frames:      Current status of Frames: 1 2 -1
Page 3 loaded into frames:      Current status of Frames: 1 2 3
Page 2 is already in the frames: Current status of Frames: 1 2 3
Page 3 is already in the frames: Current status of Frames: 1 2 3
Page 1 is already in the frames: Current status of Frames: 1 2 3
Page 8 loaded into frames:      Current status of Frames: 1 8 3
Page 3 is already in the frames: Current status of Frames: 1 8 3
Page 1 is already in the frames: Current status of Frames: 1 8 3
Page 3 is already in the frames: Current status of Frames: 1 8 3
Page 1 is already in the frames: Current status of Frames: 1 8 3
Page 3 is already in the frames: Current status of Frames: 1 8 3
Page 9 loaded into frames:      Current status of Frames: 1 9 3
Page 8 loaded into frames:      Current status of Frames: 1 8 3
Page 7 loaded into frames:      Current status of Frames: 1 7 3
Page 6 loaded into frames:      Current status of Frames: 1 6 3
Page 1 is already in the frames: Current status of Frames: 1 6 3
Page 2 loaded into frames:      Current status of Frames: 1 2 3
Page 3 is already in the frames: Current status of Frames: 1 2 3
Page 4 loaded into frames:      Current status of Frames: 1 4 3
Total Page Faults: 10
Total Hits: 10
Miss Ratio: 0.50
Hit Ratio: 0.50
gokul@gokul-ThinkPad-T460s:~/S4/OS/EXP11_PageReplacement$
```