// Program to calculate number of page faults for reference string for optimal page replacement algorithms.

#include <stdio.h>

#define MAX\_FRAMES 10

int findOptimal(int frames[], int frameCount, int pages[], int pageCount, int currentIndex) {

int farthest = currentIndex, indexToReplace = -1;

for (int i = 0; i < frameCount; i++) {

int j;

for (j = currentIndex; j < pageCount; j++) {

if (frames[i] == pages[j]) {

if (j > farthest) {

farthest = j;

indexToReplace = i;

}

break;

}

}

// If the frame is never going to be used again

if (j == pageCount) {

return i; // Replace this frame

}

}

// If all pages are used in the future, replace the one that is used the farthest in the future

return (indexToReplace != -1) ? indexToReplace : 0;

}

int isPageInFrames(int frames[], int frameCount, int page) {

for (int i = 0; i < frameCount; i++) {

if (frames[i] == page) {

return 1; // Page found in frames

}

}

return 0; // Page not found

}

int main() {

int frameCount, pageCount;

int pageFaults = 0;

// Input: Number of frames and number of pages in the reference string

printf("Enter the number of frames: ");

scanf("%d", &frameCount);

printf("Enter the number of pages in the reference string: ");

scanf("%d", &pageCount);

int pages[pageCount];

printf("Enter the reference string (space-separated): ");

for (int i = 0; i < pageCount; i++) {

scanf("%d", &pages[i]);

}

int frames[MAX\_FRAMES];

for (int i = 0; i < frameCount; i++) {

frames[i] = -1; // Initialize frames as empty

}

// Processing each page in the reference string

for (int i = 0; i < pageCount; i++) {

int currentPage = pages[i];

// Check if the current page is already in the frames

if (!isPageInFrames(frames, frameCount, currentPage)) {

// Page fault occurs as the page is not in frames

int indexToReplace = findOptimal(frames, frameCount, pages, pageCount, i); // Find the optimal frame to replace

frames[indexToReplace] = currentPage; // Replace the optimal frame with the current page

pageFaults++; // Increment page faults

}

}

printf("\nTotal Page Faults: %d\n", pageFaults);

return 0;

}