Question 1

a. Define a page-replacement algorithm using this basic idea. Specifically address these problems:

I. What the initial value of the counters is.

The initial value of the counter is 0. (ZERO)

II. When counters are increased.

When a new page is associated with the frame, the counter is incremented.

III. When counters are decreased.

When an associated page with the frame is no longer required, the counter is decremented.

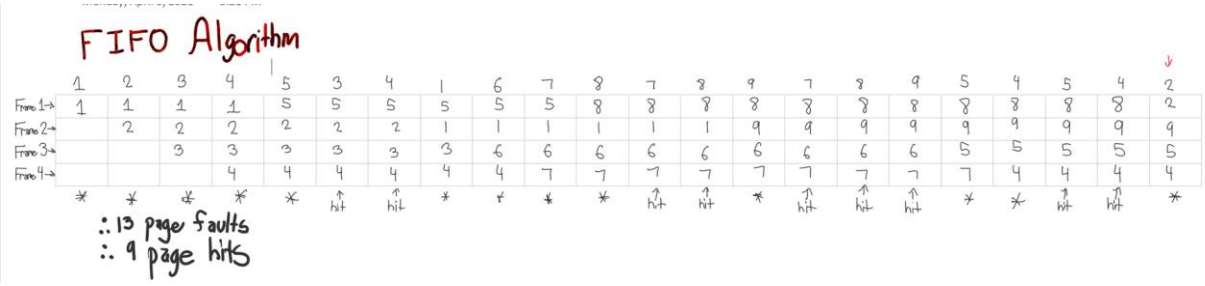
iv. How the page to be replaced is selected.

The page frame with the smallest counter is selected then replaced.

b. How many page faults occur for your algorithm for the following reference string, for four-page frames? 1, 2, 3, 4, 5, 3, 4, 1, 6, 7, 8, 7, 8, 9, 7, 8, 9, 5, 4, 5, 4, 2.

FIFO Replacement Algorithm: 13 Page Faults

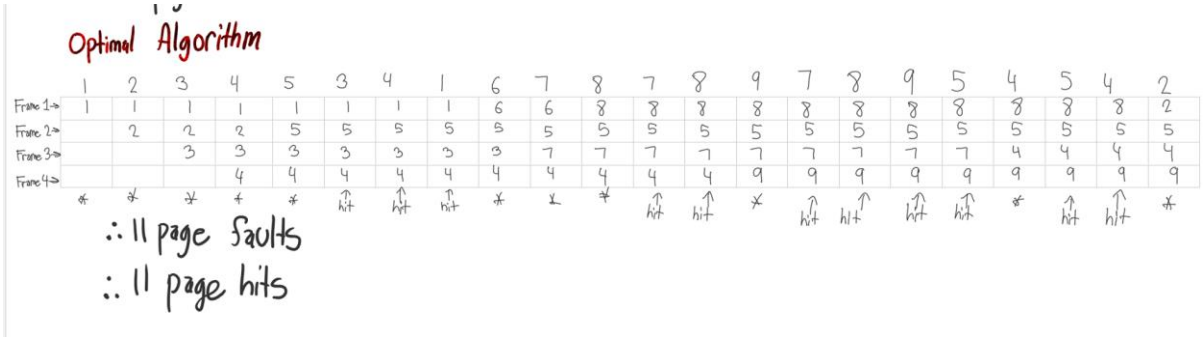
LRU Replacement Algorithm: 13 Page Faults

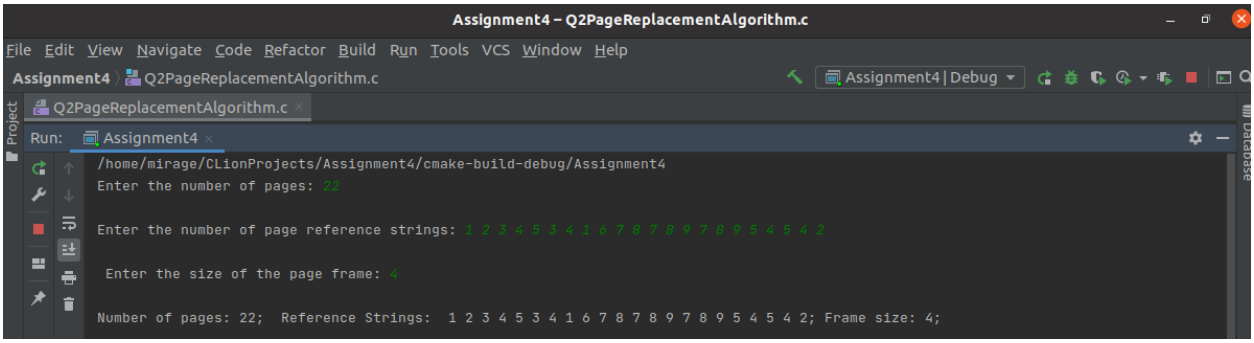


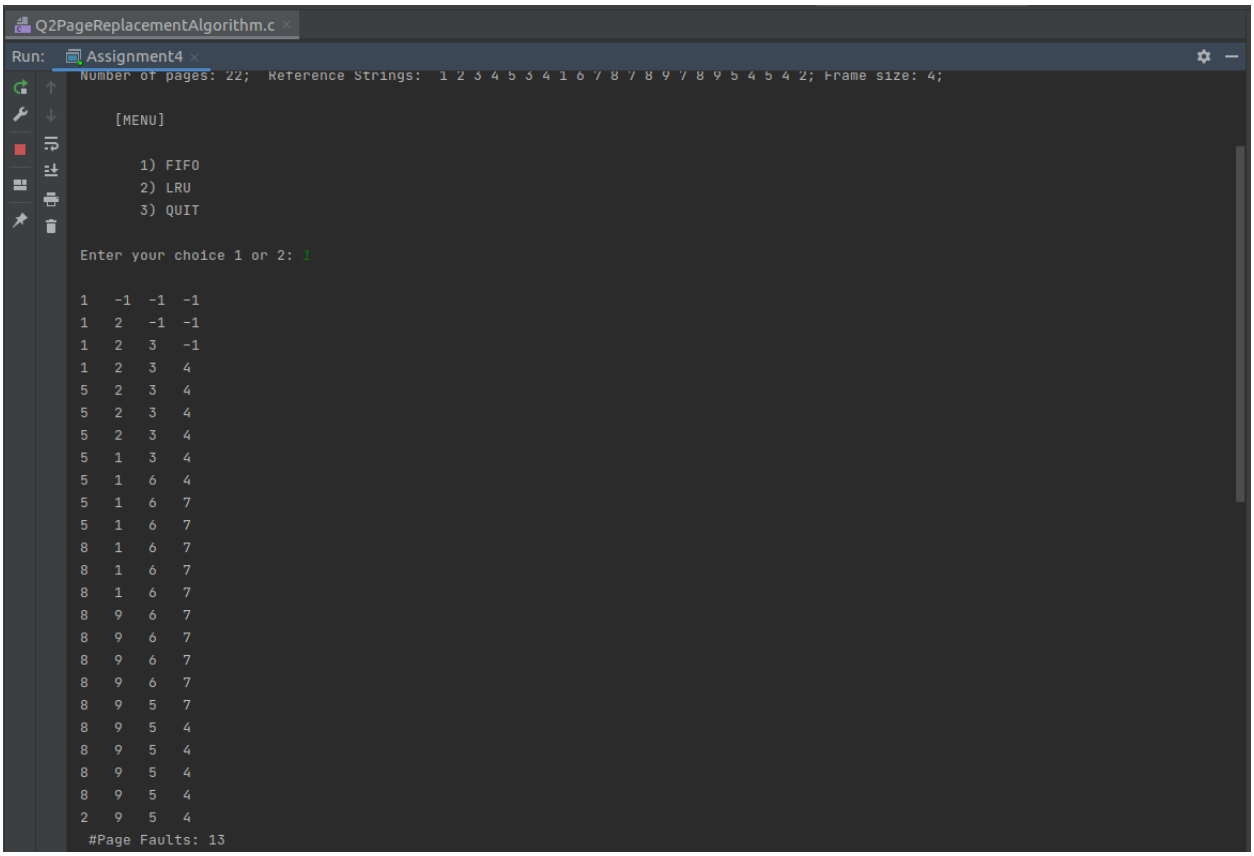
c. What is the minimum number of page faults for an optimal page replacement strategy for the reference string in part b with four-page frames?

OPTIMAL Replacement Algorithm: 11 Page Faults

Question 2 Page Replacement Algorithm


Optimal Algorithm
1 2 3 4 5 3 4 1 6 7 8 7 8 9 7 8 9 5 4 5 4 2
Frame 1
Frame 2
Frame 3
Frame 4
∴ 11 page faults
∴ 11 page hits


Assignment4 – Q2PageReplacementAlgorithm.c
File Edit View Navigate Code Refactor Build Run Tools VCS Window Help
Assignment4 Q2PageReplacementAlgorithm.c
Assignment4 | Debug
Q2PageReplacementAlgorithm.c
Run: Assignment4
/home/mirage/CLionProjects/Assignment4/cmake-build-debug/Assignment4
Enter the number of pages: 22
Enter the number of page reference strings: 1 2 3 4 5 3 4 1 6 7 8 7 8 9 7 8 9 5 4 5 4 2
Enter the size of the page frame: 4
Number of pages: 22; Reference Strings: 1 2 3 4 5 3 4 1 6 7 8 7 8 9 7 8 9 5 4 5 4 2; Frame size: 4;


Q2PageReplacementAlgorithm.c
Run: Assignment4
Number of pages: 22; Reference Strings: 1 2 3 4 5 3 4 1 6 7 8 7 8 9 7 8 9 5 4 5 4 2; Frame size: 4;
[MENU]
1) FIFO
2) LRU
3) QUIT
Enter your choice 1 or 2: 1
1 -1 -1 -1
1 2 -1 -1
1 2 3 -1
1 2 3 4
5 2 3 4
5 2 3 4
5 2 3 4
5 1 3 4
5 1 6 4
5 1 6 7
5 1 6 7
8 1 6 7
8 1 6 7
8 1 6 7
8 9 6 7
8 9 6 7
8 9 6 7
8 9 6 7
8 9 5 7
8 9 5 4
8 9 5 4
8 9 5 4
8 9 5 4
2 9 5 4
#Page Faults: 13

```
 #Page Faults: 13
    [MENU]

       1) FIFO
       2) LRU
       3) QUIT

Enter your choice 1 or 2: 2

1   -1  -1  -1
1   2   -1  -1
1   2   3   -1
1   2   3   4
5   2   3   4
5   2   3   4
5   2   3   4
5   1   3   4
6   1   3   4
6   1   7   4
6   1   7   8
6   1   7   8
6   1   7   8
6   9   7   8
6   9   7   8
6   9   7   8
6   9   7   8
5   9   7   8
5   9   4   8
5   9   4   8
5   9   4   8
5   9   4   2
 #Page Faults: 13
```

```
#Page Faults: 13
   [MENU]

       1) FIFO
       2) LRU
       3) QUIT

Enter your choice 1 or 2: 3

Process finished with exit code 0
```

Question 3 – Catalan Number