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CSC 341-01 Han
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Project 4

Antonio Mendoza used source code from Data Structures (CSC 311) to provide a modified SingleLinkedList-Queue and Stack data structure.

Both members worked on the project, and both understand how to implement the algorithms.

The program ran the FIFO, LRU, and OPT algorithms on a reference string created during class (4/26/2017).

1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6

The program first performs user input to generate a string based on inputted *reference string length* (=a) and *page range* (=b) to generate a reference string. For demonstration purposes, we used a reference string we were familiar with.

Then the user inputs a *frame amount* (=c) that can be in memory. For demonstration purposes, we used 4, as it we calculated the algorithms' expected result in class.

We determined that the code ultimately

QUESTION

On page 413 of the textbook, it shows a graph that the number of page faults decreases with increase of number of frames, and finally stabilizes, at which moment, what is the value of the number of the page faults?

According to our data below, it appears that for (b=10) and (a=20), stabilization occurs when (c=7). At that point, each algorithm shares the same amount of page faults, **8**.

OUTPUT

```
run:
=> Welcome to Project 4. Page fault stuff.

=> How many page references?
20
=> How many pages?
10
=> How many (physical) frames?
4
=> Reference string: 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6

=> FIFO: 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6
       => Page Fault: [ 01 |    |    |    ]
       => Page Fault: [ 01 | 02 |    |    ]
       => Page Fault: [ 01 | 02 | 03 |    ]
       => Page Fault: [ 01 | 02 | 03 | 04 ]
       => Page Fault: [ 01 | 02 | 03 | 04 ]
       => Page Fault: [ 01 | 02 | 03 | 04 ]
       => Page Fault: [ 02 | 03 | 04 | 05 ]
       => Page Fault: [ 03 | 04 | 05 | 06 ]
       => Page Fault: [ 04 | 05 | 06 | 02 ]
       => Page Fault: [ 05 | 06 | 02 | 01 ]
       => Page Fault: [ 05 | 06 | 02 | 01 ]
       => Page Fault: [ 06 | 02 | 01 | 03 ]
       => Page Fault: [ 02 | 01 | 03 | 07 ]
       => Page Fault: [ 01 | 03 | 07 | 06 ]
       => Page Fault: [ 01 | 03 | 07 | 06 ]
       => Page Fault: [ 03 | 07 | 06 | 02 ]
       => Page Fault: [ 07 | 06 | 02 | 01 ]
       => Page Fault: [ 07 | 06 | 02 | 01 ]
       => Page Fault: [ 06 | 02 | 01 | 03 ]
       => Page Fault: [ 06 | 02 | 01 | 03 ]
=> Total Page Faults (FIFO): 14

=> LRU: 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6
       => Page Fault: [ 01 |    |    |    ]
       => Page Fault: [ 01 | 02 |    |    ]
       => Page Fault: [ 01 | 02 | 03 |    ]
       => Page Fault: [ 01 | 02 | 03 | 04 ]
       => Page Fault: [ 01 | 02 | 05 | 04 ]
       => Page Fault: [ 01 | 02 | 05 | 06 ]
       => Page Fault: [ 01 | 02 | 03 | 06 ]
       => Page Fault: [ 01 | 02 | 03 | 07 ]
       => Page Fault: [ 06 | 02 | 03 | 07 ]
       => Page Fault: [ 06 | 02 | 03 | 01 ]
=> Total Page Faults (LRU): 10

=> OPT: 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6
       => Page Fault: [ 01 |    |    |    ]
       => Page Fault: [ 01 | 02 |    |    ]
       => Page Fault: [ 01 | 02 | 03 |    ]
       => Page Fault: [ 01 | 02 | 03 | 04 ]
       => Page Fault: [ 01 | 02 | 03 | 05 ]
       => Page Fault: [ 01 | 02 | 03 | 06 ]
       => Page Fault: [ 07 | 02 | 03 | 06 ]
       => Page Fault: [ 01 | 02 | 03 | 06 ]
=> Total Page Faults (OPT): 8
```

```
=> Comparing algorithms for frames decremnting from total amount of pages. Reference
string: 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6
      => Frames: 10
            => Total Page Faults (FIFO): 8
            => Total Page Faults (LRU): 8
            => Total Page Faults (OPT): 10
      => Frames: 9
            => Total Page Faults (FIFO): 8
            => Total Page Faults (LRU): 8
            => Total Page Faults (OPT): 10
      => Frames: 8
            => Total Page Faults (FIFO): 8
            => Total Page Faults (LRU): 8
            => Total Page Faults (OPT): 9
      => Frames: 7
            => Total Page Faults (FIFO): 8
            => Total Page Faults (LRU): 8
            => Total Page Faults (OPT): 8
      => Frames: 6
            => Total Page Faults (FIFO): 10
            => Total Page Faults (LRU): 9
            => Total Page Faults (OPT): 8
      => Frames: 5
            => Total Page Faults (FIFO): 11
            => Total Page Faults (LRU): 10
            => Total Page Faults (OPT): 8
      => Frames: 4
            => Total Page Faults (FIFO): 14
            => Total Page Faults (LRU): 10
            => Total Page Faults (OPT): 8
      => Frames: 3
            => Total Page Faults (FIFO): 16
            => Total Page Faults (LRU): 15
            => Total Page Faults (OPT): 11
      => Frames: 2
            => Total Page Faults (FIFO): 18
            => Total Page Faults (LRU): 18
            => Total Page Faults (OPT): 15
      => Frames: 1
            => Total Page Faults (FIFO): 20
            => Total Page Faults (LRU): 20
            => Total Page Faults (OPT): 20
BUILD SUCCESSFUL (total time: 12 seconds)
```

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PAGE FAULT TABLE

# of Frames	**FIFO**	**LRU**	**OPT**
1	20	20	20
2	18	18	15
3	16	15	11
4	14	10	8
5	11	10	8
6	10	9	8
7	8	8	8
8	8	8	9
9	8	8	10
10	8	8	10

PAGE-FAULT CURVE LINE CHART