

CS162, Spring 2004
Section 10 Quiz 1
Steve Martin

Directions: Complete the following questions as best you can. You're encouraged to discuss these questions with the people around you. This quiz IS NOT GRADED. Its only intended to help you understand the material.

1. Consider a demand paging system with four pages of physical memory that executes the following reference stream.

8; 8; 4; 6; 7; 5; 8; 7; 6; 5; 4; 8

- a) Assuming that memory starts empty and the system uses a FIFO page replacement strategy, how many page faults will occur and which pages are in memory at the end of the reference stream?

There were seven page faults. The table below shows the pages in memory at each point in the reference stream. The memory contents are shown in FIFO order with pages at the front of the queue at the left. The page to be replaced is, thus, the page shown on the left.

Reference Fault Memory

8 yes 8

8 no 8

4 yes 8 4

6 yes 8 4 6

7 yes 8 4 6 7

5 yes 4 6 7 5

8 yes 6 7 5 8

7 no 6 7 5 8

6 no 6 7 5 8

5 no 6 7 5 8

4 yes 7 5 8 4

8 no 7 5 8 4

- b) Determine the number of page faults and the final contents of memory assuming the system uses the LRU page replacement strategy.

There were eight page faults. The table below shows the pages in memory at each point in the reference stream. The memory contents are shown in LRU order with the most recently used page at the left. The page to be replaced is, thus, the page shown at the right.

Reference Fault Memory

8 yes 8

8 no 8
4 yes 4 8
6 yes 6 4 8
7 yes 7 6 4 8
5 yes 5 7 6 4
8 yes 8 5 7 6
7 no 7 8 5 6
6 no 6 7 8 5
5 no 5 6 7 8
4 yes 4 5 6 7
8 yes 8 4 5 6

- c) Compare the cost of using the FIFO and LRU page replacement strategies for the reference stream above. What is your intuition about how the schemes should perform? Do the results match your intuition? Why or why not?

Normally, one would expect the LRU scheme to perform better than the FIFO scheme. The LRU scheme performs worse, however, on the sample reference stream above, causing more page faults than the FIFO. One reason for this is that the working set of the reference stream does not fit in the four physical pages provided by the system. Consequently, the system thrashes, resulting in a high amount of paging.