CS 186, Fall 2007
Discussion Section Worksheet
09/10 - 09/14

Disk Access Times

1) Disk access time is made up of **seek time**, **rotational delay**, and **transfer time**. Which of these three are affected by the data layout on disk (may be more than one)?

   Seek time and rotational delay

2) Assume that your disk spins at a rate of 250 revolutions per second, that it takes 2 milliseconds to move the read head to an adjacent track, and that it can transfer 100K per second from the disk into RAM. Assuming that the **1MB of data** you need is laid out sequentially on one track, how long will it take to transfer the data into RAM given the following situations:

   a. The read head is already over the same track, and it is already directly over the start of the requested data.

      0 + 0 + 1MB/(100k/s) = 10 s

   b. The read head is already over the same track, and the requested data will be under the read head in half of a disk rotation.

      0 + 1/500 + 10 = 10.002 s

   c. The read head is one track away from the one holding the data, and right when it reaches the correct track it will be over the needed data.

      0.002 + 0 + 10 = 10.002 ms

   d. The read head is three tracks away from the one holding the data, and when it reaches the correct track it will be over the needed data after a full disk rotation.

      0.002*3 + 1/250 + 10 = 10.01 ms

Buffer Pool Replacement Strategy

3) Assuming you start with an empty buffer pool with **four frames**, what will be the happen given the following sequence of page requests:

A, B, C, D, E, A, B, C, D, E, A, B, C, D, E

with the given page replacement policy? How many page faults will occur (meaning a page has to be brought from disk into the buffer pool)?

a) **LRU** **15 page faults**

Page being read →	**A**	**B**	**C**	**D**	**E**	**A**	**B**	**C**	**D**	**E**	**A**	**B**	**C**	**D**	**E**
Frame 1	**A**	**A**	**A**	**A**	**E**	**E**	**E**	**E**	**D**	**D**	**D**	**D**	**C**	**C**	**C**
Frame 2		**B**	**B**	**B**	**B**	**A**	**A**	**A**	**A**	**E**	**E**	**E**	**E**	**D**	**D**
Frame 3			**C**	**C**	**C**	**C**	**B**	**B**	**B**	**B**	**A**	**A**	**A**	**A**	**E**
Frame 4				**D**	**D**	**D**	**D**	**C**	**C**	**C**	**C**	**B**	**B**	**B**	**B**
Page fault?	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**

b) **MRU** **7 page faults**

Page being read →	**A**	**B**	**C**	**D**	**E**	**A**	**B**	**C**	**D**	**E**	**A**	**B**	**C**	**D**	**E**
Frame 1	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
Frame 2		**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**C**	**C**	**C**
Frame 3			**C**	**C**	**C**	**C**	**C**	**C**	**D**	**D**	**D**	**D**	**D**	**D**	**D**
Frame 4				**D**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**
Page fault?	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**N**	**N**	**Y**	**N**	**N**	**N**	**Y**	**N**	**N**