Name: _____   USC ID: _____

Quiz 2: SSD and File Systems (10 points. 15 minutes)

Please show your work (i.e., the derivation and immediate steps leading to your final answer).

1. [5 points] Suppose the latencies for reading a page, writing a page, and erasing a block are 20µs, 200µs, and 1000µs respectively. Compute the total latency for the entire workload shown in the diagram below (the same as you saw in class): updating a red page, and adding two green pages. Note that **ALL** pages are read before erasing and the processing cost in **RAM** can be ignored.

1.5 points **# of reads: 6,** for loading all pages, including the stale page and the free page, to buffer RAM before erasing block and rearranging pages in RAM.
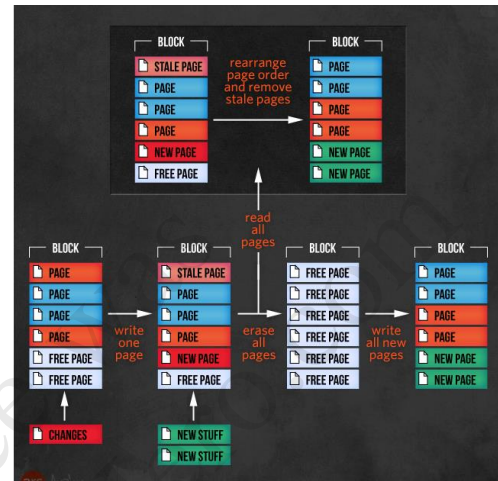
1.5 points **# of writes: 7, 1** for updating the first red page and **6** for writing all pages back to block from buffer RAM.
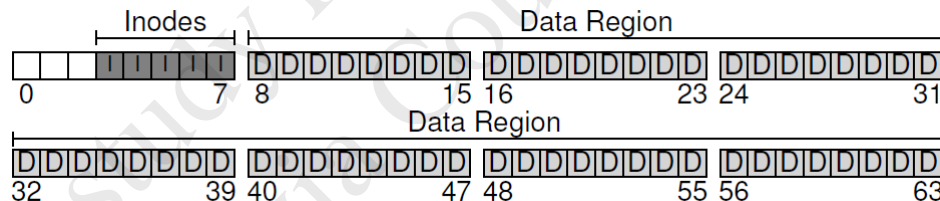
1 point **# of erasing: 1**

1 point **Total cost:** 6 * 20 + 7 * 200 + 1000 us = 2.52 ms

2. [5 points] Consider a file system with the same layout as you saw in class. But here we assume that each inode occupies 512B. The block size remains to be 4KB.

a. [2 points] What is the maximum number of files this file system can store?

1 point **# of inodes per block** = block size/inode size = 4KB/512B = 8
1 point **# of inodes in total** = # of blocks storing indodes * # of inodes per block = 5 * 8 = 40

The maximum number of files this system can store is equal to the number of inodes, namely **40**

b. [3 points] What is the offset (in **Kilobytes**) of the inode for the file with inumber = 20?

1 point **Offset for the first inode** = 3 * 4 KB = 12 KB
1 point **Space occupied by previous inodes** = 20 * 512B = 10 KB
1 point **Offest for this inode** = 12 + 10 KB = 22 KB