1. A computer has four page frames. The time of loading, time of last access, and the R and M bits for each page are as shown below (the times are in clock ticks):

Page	Loaded	Last Reference	R	M
0	126	279	0	0
1	230	260	1	0
2	120	272	1	1
3	160	280	1	1

(a) Which page will NRU replace?
(b) Which page will FIFO replace?
(c) Which page will LRU replace?
(d) Which page will second chance replace?

Ans.
(a) Page 0. Because (R, M) = (0, 0)
(b) Page 2. Because it's loaded at 120. (First In)
(c) Page 1. Because it's referenced at 260. (Least recently)
(d) Page 0. Because the reference bit is 0.

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2. A small computer has 8 page frames, each containing a page. The page frames contain virtual pages A, C, G, H, B, L, N , and D in that order. Their respective load times were 18, 23, 5, 7, 32, 19, 3, and 8. Their reference bits are 1, 0, 1, 1, 0, 1, 1, and 0 and their modified bits are 1, 1, 1, 0, 0, 0, 1, and 1, respectively.Which page will the second chance page replacement algorithm replace?

Ans. Page N.

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3. What is the difference between a physical address and a virtual address?
Physical addressing means that your program actually knows the real layout of RAM. When you access a variable at address 0x8746b3, that's where it's really stored in the physical RAM chips.

Ans.
In contrast, virtual addressing means that your program don't actually know the real layout of RAM. With virtual addressing, all application memory accesses go to a page table, which then maps from the virtual to the physical address. So every application has its own "private" address space, and no program can read or write to another program's memory. This is called segmentation.

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4. Are there any circumstances in which clock and second chance choose different pages to replace? If so, what are they?

Ans.
Traditional clock and standard second chance are literally the same. There's no circumstances in which clock and second chance choose different pages to replace.

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5. A small computer has four page frames. At the first clock tick, the R bits are 0111 (page 0 is 0, the rest are 1). At subsequent clock ticks, the values are 1011, 1010, 1101, 0010, 1010, 1100, and 0001. If the aging algorithm is used with an 8-bit counter, give the values of the four counters after the last ticks.

Ans.

Page 0 = 01101110

Page 1 = 01001001

Page 2 = 00110111

Page 3 = 10001011