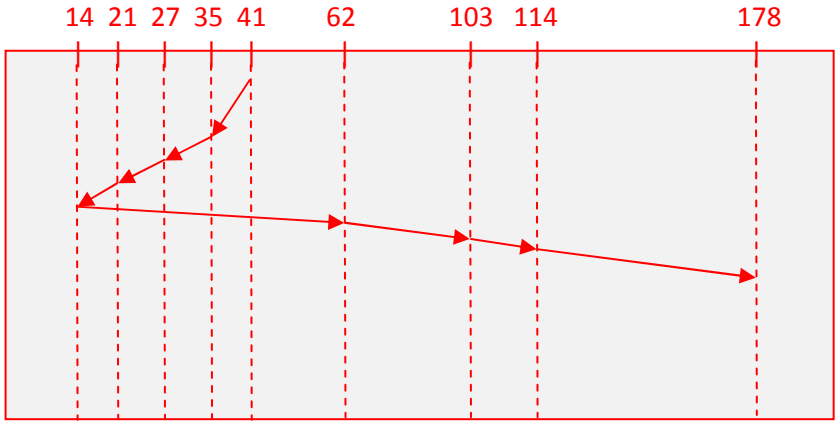
Operating Systems Final Exam (Spring 2014)

(Answers which are too long may not be read.)

No :

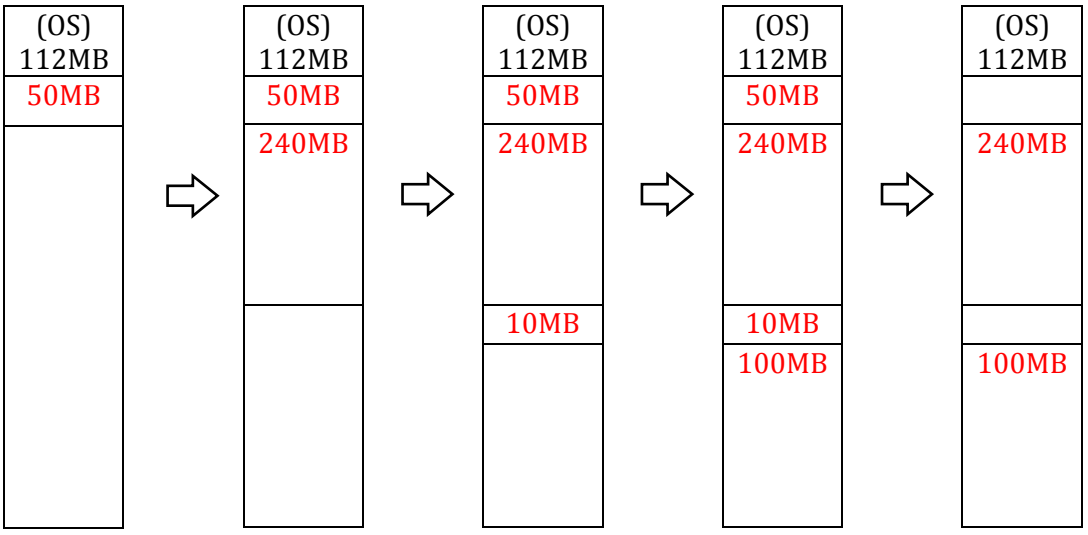
Name: period: 60 min.

1. *(20P)* Let's the queue be "178, 103, 27, 21, 114, 14, 35, 62", and the head pointer starts at 41. The head can move interval of [0 200]. Find total head movement in cylinders by using SSTF (Shortest Seek Time First) disk scheduling algorithm graphically.



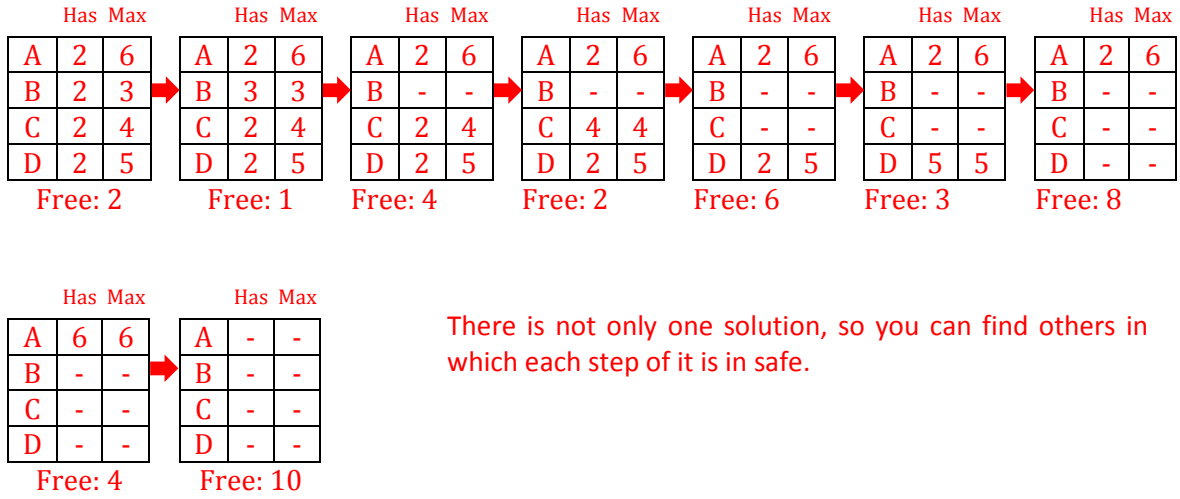
SSTF method finds total head movement of **191 cylinders**

2. *(25P)* Assume we have the space of 512 MB in main memory. The OS's files occupy 112 MB space. After opening the system, the user wants to execute five processes (from A to E in order) in which they are 50, 240, 10, 100, 60 MB respectively. Before process E start, processes of A and C exits voluntarily. By using first fit partitioning method, show all allocations in main memory. What is the problem occurred when process E tries to run? How can we solve it?



- When process E tries to run, an **external fragmentation** problem occurs (although there are enough free space in total, the system cannot find any free one-piece partition).
- Therefore the system should do a **compaction** to collect all free partitions together.

3. *(20P)* Consider we have four processes and 10 free blocks in main memory. Processes (A though D) need 6, 3, 4, and 5 blocks, respectively. How can we serve to processes by the Banker's algorithm? (NOTE: when a fifth process comes to OS, the system has to give it at least 1 free block so that it can start to run.)



There is not only one solution, so you can find others in which each step of it is in safe.

4. *(35P)* Answer the questions below as short as possible.

a. What is the difference between preemptive and non-preemptive scheduling?

Non-preemptive scheduling algorithms let the active process run until it blocks or voluntarily releases the CPU, but preemptive scheduling algorithms let the active process run for a fixed time interval.

b. Write two differences between process and thread?

Threads in the same process can share variables easily, but processes not. Threads are easier to create and destroy than processes.

c. What is I/O-bound process?

I/O bound process is the process which spends more time on I/O requests than computing.

d. Write two differences between user-level and kernel-level treads.

A user-level threads package can be implemented on an operating system that does not support threads. Because the kernel knows nothing about user-space treads, letting a thread make the system call leads to stop all the threads in the same process.

e. Write the most important difference between semaphore and mutex.

A semaphore variable can be used as a counter, but a mutex cannot.

f. What does a page replacement algorithm do?

Page replacement algorithms determine how the page to be replaced is selected when a page fault occurs.

g. What does it mean when a dirty bit is set to 1?

If dirty bit of a page is set, it means that page has been modified since it was swapped in.