5.32 (you can use the Java wait-notify constructs to solve this problem) A file is to be shared among different processes, each of which has a unique number. The file can be accessed simultaneously by several processes, subject to the following constraint: the sum of all unique numbers associated with all the processes currently accessing the file must be less than n. Write a monitor to coordinate access to the file.

See monitor.java

8.11 Given six memory partitions of 300 KB, 600 KB, 350 KB, 200 KB, 750 KB, and 125 KB (in order), how would the first-fit, best-fit, and worst-fit algorithms place processes of size 115 KB, 500 KB, 358 KB, 200 KB, and 375 KB (in order)? Rank the algorithms in terms of how efficiently they use memory.

Table 1-1: First Fit

	300 KB	**600 KB**	**350 KB**	**200 KB**	**750 KB**	**125KB**
115 KB	185 KB	600 KB	350 KB	200 KB	750 KB	125 KB
500 KB	185 KB	100 KB	350 KB	200 KB	750 KB	125 KB
358 KB	185 KB	100 KB	350 KB	200 KB	392 KB	125 KB
200 KB	185 KB	100 KB	150 KB	200 KB	392 KB	125 KB
375 KB	185 KB	100 KB	150 KB	200 KB	17 KB	125 KB

Table 1-2: Best Fit

	300 KB	**600 KB**	**350 KB**	**200 KB**	**750 KB**	**125 KB**
115 KB	300 KB	600 KB	350 KB	200 KB	750 KB	10 KB
500 KB	300 KB	100 KB	350 KB	200 KB	750 KB	10 KB
358 KB	300 KB	100 KB	350 KB	200 KB	392 KB	10 KB
200 KB	300 KB	100 KB	350 KB	0 KB	392 KB	10 KB
375 KB	300 KB	100 KB	350 KB	0 KB	17 KB	10 KB

Table 1-2: Worst Fit						
	300 KB	**600 KB**	**350 KB**	**200 KB**	**750 KB**	**125 KB**
115 KB	300 KB	600 KB	350 KB	200 KB	635 KB	125 KB
500 KB	300 KB	600 KB	350 KB	200 KB	113 KB	125 KB
358 KB	300 KB	242 KB	350 KB	200 KB	113 KB	125 KB
200 KB	300 KB	242 KB	150 KB	200 KB	113 KB	125 KB
375 KB	300 KB	242 KB	150 KB	200 KB	113 KB	125 KB

My ranking of the algorithms in terms of how efficiently they use memory is Best Fit, First Fit, then Worst Fit (most efficient to lease efficient).

Worst fit is ranked the lowest because it has the largest total unused memory at 1130 KB and also could not place 1 processes because of the fragmentation. First Fit was ranked second because while the total unused memory was equal to Best Fit, the fragmentation is worse in this case. Worst fragmentation means the remaining partitions are much smaller and numerous. That leaves Best fit as the most efficient placement algorithm because it had the lowest total unused memory and least fragmentation.

8.21 The BTV operating system has a 21-bit virtual address, yet on certain embedded devices, it has only a 16-bit physical address. It also has a 2-KB page size. How many entries are there in each of the following?

a. **A conventional, single-level page table**

   The single level page table will contain 1024 entries (2^10).

b. **An inverted page table**

   The inverted page table can only contain 32 entries (2^5).

8.23 Consider a logical address space of 256 pages with a 4-KB page size, mapped onto a physical memory of 64 frames.

a. How many bits are required in the logical address?

$$4\,KB = 2^{12}$$
$$256\,Bytes = 2^{8}$$

$$12 + 8 = 20\,bits$$

b. How many bits are required in the physical address?

$$4\,KB = 2^{12}$$
$$64\,Bytes = 2^{6}$$

$$12 + 6 = 18\,bits$$