You operate a maintenance shop that repairs aircraft engine compressors for a large airline. The number of compressors you receive to be repaired each day is Poisson with a mean value of 8.2. The crucial step in each repair operation is realigning the compressor's blades. The machine used to align these blades has a part that wears out rapidly, as follows:

Day of Use	Chance of Part Failure
1	2%
2	5%
3	10%
4	12%
5	15%
6	20%
7 or higher	25%

On days when the part does not fail, you can process 10 compressors. On days when it does fail, you are equally likely to be able to process 0, 1, 2, 3, 4, 5, 6, 7, 8, or 9 compressors. After a failure, you must replace the part and wait until the next day to resume work.

On any given day, if you have more compressors to repair than you are able to fix, you set the leftover compressors aside in a queue, and try to fix them the next day. You estimate that each day each compressor waits in this queue costs you $80.

Your policy is to replace the alignment machine part after n days of use or when it fails, whichever comes first. Replacement costs $500, whether done intentionally, or because of failure.

What value of n gives you the lowest total cost? Try n = 2, 3, 4, 5, 6, and 7. Simulate a 100-day period with a sample size of 1000 and turn in the standard sheets. For the best choice of n, estimate the expected value of the following over the 100-day period: (a) the average number of compressors in the queue at the end of each day, (b) the number of scheduled part replacements (that is, the number of times you replace a part that has not failed) over the 100-day period, and (c) the number of times the part fails over the 100-day period.

Finally, you are also interested in the probability of the event that, at any time during the 100 day period, the number of compressors in queue at the end of the day is 15 or larger. (d) For the best choice of n, estimate the probability of this event.