

There are 1 questions for a total of 25 points.

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- (25) 1. The egg drop problem: There is a building with  $n$  floors. You have identical eggs with the property that any egg will break iff thrown from floor  $B$  and above. If an egg breaks, you cannot fix and reuse it. You want to determine the value of  $B$ . Consider the case where you only have one egg. In this case, the worst-case number of trials needed is  $n - 1$  since the value of  $B$  may be equal to  $n$  and the only strategy is to start dropping the egg from floor  $1, 2, 3, \dots, n - 1$ . Now, suppose you have two eggs. Consider the strategy that minimizes the number of trials in the worst-case. Let this worst-case number of trials be denoted by  $T(n, 2)$ . Similarly, we can define  $T(n, 3), T(n, 4), \dots$  (for 3 eggs, 4 eggs etc.). Design an algorithm to compute the value of  $T(n, k)$  for any given  $k (1 \leq k \leq 100)$  and  $n (1 \leq n \leq 10000)$ . You may assume that  $1 \leq B \leq n$ .

Your programs should take input from a file named `input.txt` and should write the output in a file named `output.txt`. Your programs should produce an output within 2 minutes for this assignment. The format for input and output files are as follows.

INPUT: The first line of the input file gives  $n, k$ . Below is an example of an input file.

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5,1

OUTPUT: The output should be  $T(n, k)$ . For example, consider the output file corresponding to the input file above:

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SUBMISSION INSTRUCTIONS: All your program files should be in a directory named (Your entry no.). You will be asked to create a zip of this directory and submit this zip file. In this directory, there should be a makefile that will compile your code (read about makefile on the net in case you do not know what it is). After running `make`, the directory should have executable called `eggdrops`. This when executed, should read the input file (`input.txt`) and write the answer in the output file (`output.txt`).