CS 161 Fall 2017: Section 7

Encoding

Suppose we encode lowercase letters into a numeric string as follows: we encode a as 1, b as 2 ... and z as 26. Given a numeric string S of length n, develop an $O(n)$ algorithm to find how many letter strings this can correspond to.

Dice Probabilities

We wish to find the probability that rolling k 6-sided fair dice will result in a sum S. Devise an algorithm to find this probability.

Knight Moves

Given an 8×8 chessboard and a knight that starts at position $a1$, devise an algorithm that returns how many ways the knight can end up at position xy after k moves. Knights move ± 1 squares in one direction and ± 2 squares in the other direction.

Egg Dropping

We have E eggs and n floors. Assume that all of the eggs are the same strength; if one egg breaks after dropping from floor i, all eggs will break after dropping from floor i. We want to find the minimum number of drops needed to find the highest floor in which an egg will not break after dropping. Devise an algorithm that returns the number of drops needed to accomplish this task.

Box Stacking

We have a series of boxes, where box i has dimensions $h_i \times w_i \times d_i$. We want to create the tallest structure possible, where a box a can only be stacked on top of another box b if 2D surface of a fits strictly within the surface in contact with b. You are allowed to rotate boxes as you please. You may use each box as many times as you wish.