

# Assignment 5

APRG TAs

April 21, 2023

## §1 Problem 1

You are given two positive integers, the length( $l$ ) and width( $w$ ) of a rectangular( $l \times w$ ) cake. You need to cut it into squares pieces. At each step, you need to select one rectangular piece and cut it into two rectangular pieces with integer side lengths. Output the minimum number of cuts you need to perform.

**Sample Input:**

3 5

**Sample Output:**

3

**Note:** We are expecting a solution with runtime  $O(\max(l, w)^3)$ .

## §2 Problem 2

You are playing a game where you are either on a black or white square. You may change your square colour after reading a lowercase english letter. Letters  $p$  and  $t$  will make you go into a black square whereas reading a  $k$  will make you go into a white square. Reading any of the letters  $\{a, b, c, d, e\}$  will make you go into a square of another colour. You start on a white square. Output the number of strings with  $m$  lowercase letters which will make you end up in a white square. As the number of such strings can be huge, print the answer modulo  $10^9 + 7$ .

**Sample Input:**

2

**Sample Output:**

403

**Note:** We are expecting a solution with runtime  $O(\log m)$ .