EXERCISE REPORT

TEAM 15

DYNAMIC PROGRAMMING 1

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Excercise: Team 9's Excercise

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EXERCISE: ZORO

In the i-th day, number of possible choices is $\binom{3i}{k}$. So the problem is converted into calculating $\sum_{i=1}^{n}\binom{3i}{k}$ for each k in query.

We have $\binom{n}{k} = \binom{n-1}{k} + \binom{n-1}{k-1}$ equivalent to $\binom{n-1}{k-1} = \binom{n}{k} - \binom{n-1}{k}$

We define f(k,m) in which:

- k is number of demons that Zoro can kill
- m is the value of n modulo by 3

f(k,m) is $\sum_{i=1}^{n}\binom{3i}{k}$ if m = 0 and $\sum_{i=0}^{n-1}\binom{3i+m}{k}$ if m != 0

Recursion formula is:

f(k,0) = f(k+1,1) – f(k+1,0) + $\binom{3n+1}{k+1}$

f(k,1) = f(k+1,2) – f(k+1,1)

f(k,2) = f(k+1,0) – f(k+1,2)

The initial state:

f(3n,0) = 1

f(3n,1) = f(3n,2) = 0

Using tabulation the time complexity for initiation is O(n) and time complexity for each query is O(1).