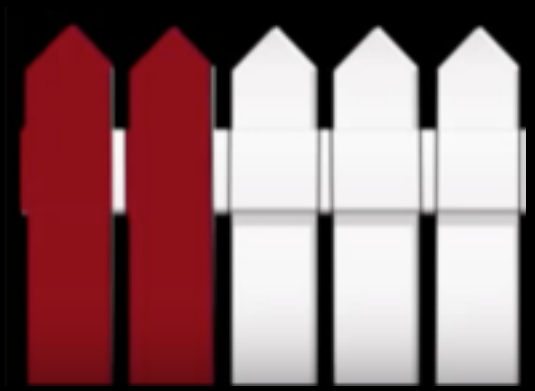
PAINTING FENCE ALGORITHM

https://www.geeksforgeeks.org/painting-fence-algorithm/

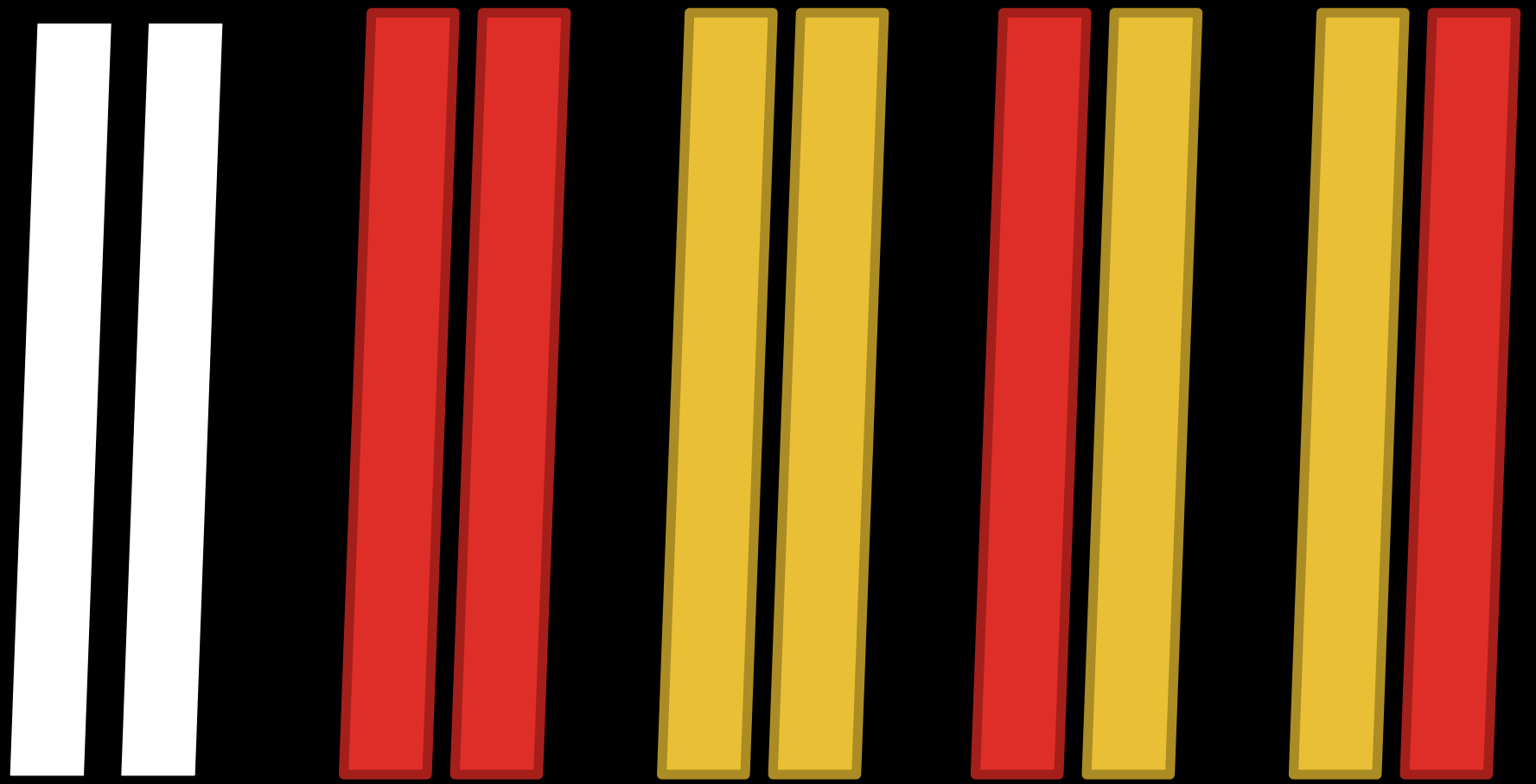
2018.07.08 원은지

어떤 문제인가?

- n개의 개수의 울타리를 k개의 색깔을 가지고 칠하려고 한다.
- 2개 이상 같은 색으로 칠할 수 없다.
- 울타리를 칠할 수 있는 모든 경우의 수를 구해라.



n = 2 / k = 2



same

same

diff

diff

총 4가지 경우

어떻게 풀 것인가?

- 동적 프로그래밍 이용

Consider these two terms

Same

No of ways when color of last two posts is same

Diff

No of ways when color of last two posts is different

n=1

diff = k , same = 0

total = k

For one post we just have k choices

n = 2

diff = k * (k-1)

same = k

Total = k + k * (k-1)

k choices for common color of two posts

n = 3

diff = [k + k * (k-1)] * (k-1)

2- different = k * (k-1) choices

1 - same = k choices

3 -different = k-1 choices

n = 3

diff = [k + k * (k-1)] * (k-1)

same = k * (k-1)

K -1 choices for these two

K choices for this

Summary for these cases

for n = 1
diff = k, same = 0
total = k

for n = 2
diff = k * (k-1)
same = k
total = k + k * (k-1)

for n = 3
diff = [k + k * (k-1)] * (k-1)
same = k * (k-1)

total = [k + k * (k-1)] * (k-1) + k * (k-1)

Hence we deduce that

total[i] = same[i] + diff[i]

same[i] = diff[i-1]

diff[i] = (diff[i-1] + diff[i-2]) * (k-1)

= total[i-1] * (k-1)

복잡도

- 시간 복잡도 : O(n)
- 공간 복잡도 : O(n)