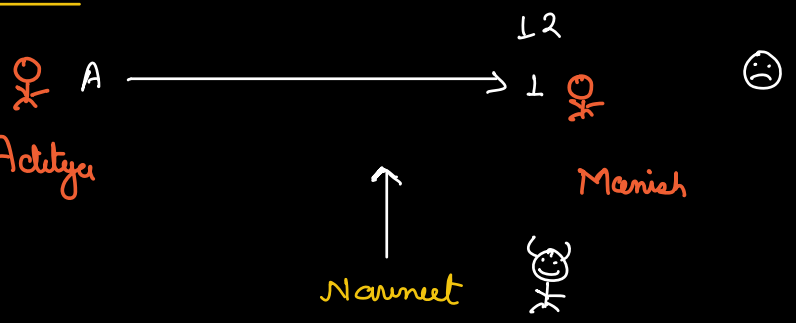
Q Ways to decode



A ⟶ 1
B ⟶ 2
C ⟶ 3
⋮
Z ⟶ 26

12 ⟶ AB, L
26 ⟶ BF, Z
121 ⟶ ABA, LA, AU

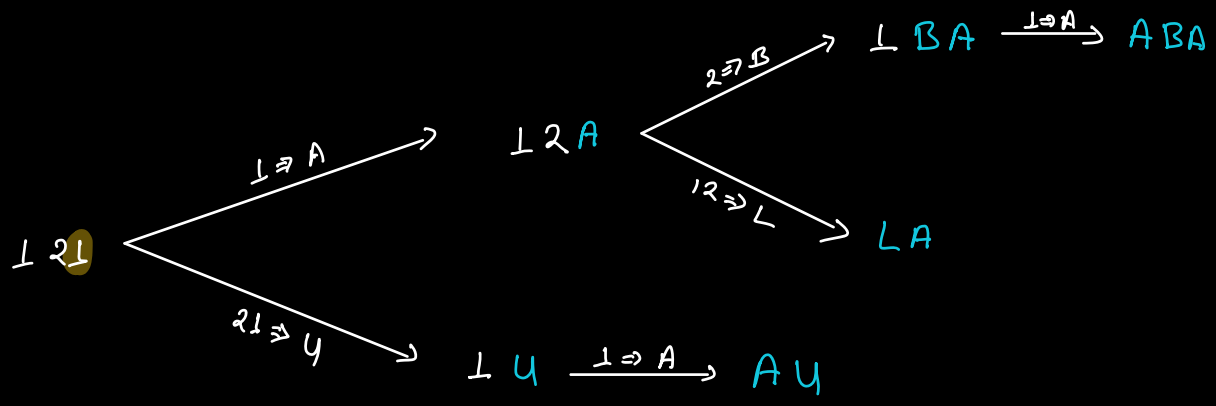
Given the string of digits (encoded)
Count the no. of ways of decoding it.

12 ⟶ 2
26 ⟶ 2
121 ⟶ 3
27 ⟶ 1

1 ⟶ A ⇒ 1

12 ⟶ AB, L ⇒ 2

121 ⟶ ABA, LA, AU ⇒ 3



Choice : Consider the i-th digit as a single digit

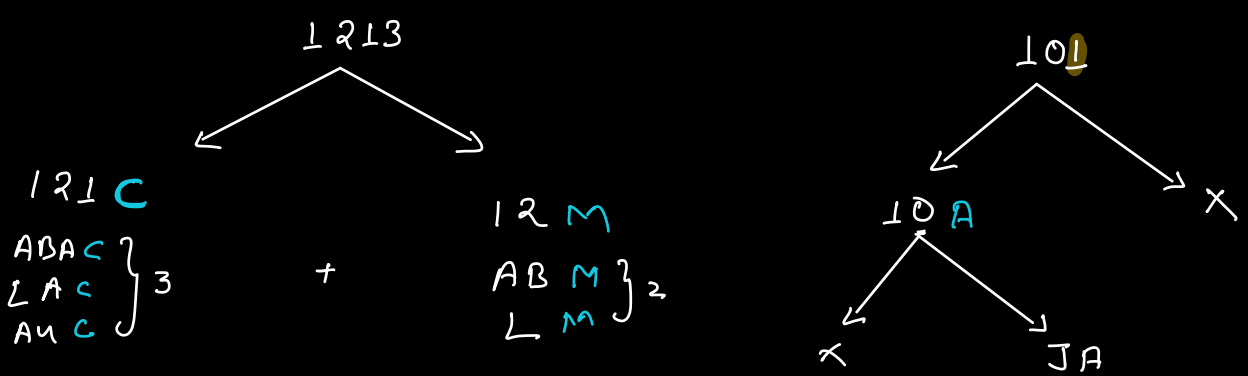
Or

If it is possible to couple with (i-1) digit then consider as a 2 digit no.

ways(i) ⟶ no. of ways of decoding the string from index 0 to i.

$$ways(i) = ways(i-1) + ways(i-2)$$

$ways(i-1)$: $A[i] > 0$; $ways(i-2)$: ≤ 26



⇒ 5

Base Case

$ways(i) = ways(i-1) + ways(i-2)$

ways when 0 to i

$i = 3 = ways(2) + ways(1)$ ✓

$i = 2 = ways(1) + ways(0)$ ✓

$i = 1 = ways(0) + ways(-1)$ ✗

```
if (i == 0) { // No of ways of decoding the substr from index 0 to 0 (length : 1)
    ret A[i] > 0 ? 1 : 0
}

if (i == 1) { // No of ways of decoding the substr from index 0 to 1 (length : 2)
    ans = 0;
    if( possible to consider both as single digits) {
        ans = 1;
    }
    if( possible to consider as a two digit no) {
        ans++;
    }
    ret ans;
}
```

1/2 ✓ 1/0 ✗

27 ✗

12 ✓

Q Ways to party

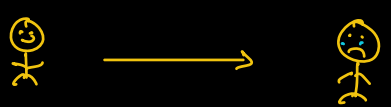
Given N people inside a party hall.

One person can enjoy the party in two ways:

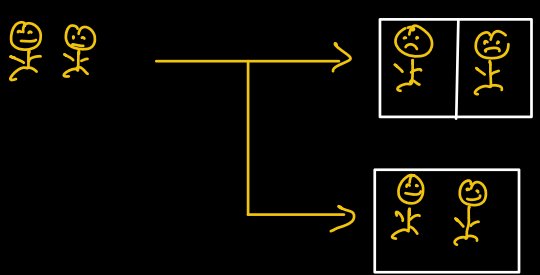
1. Being alone
2. Getting paired with someone.

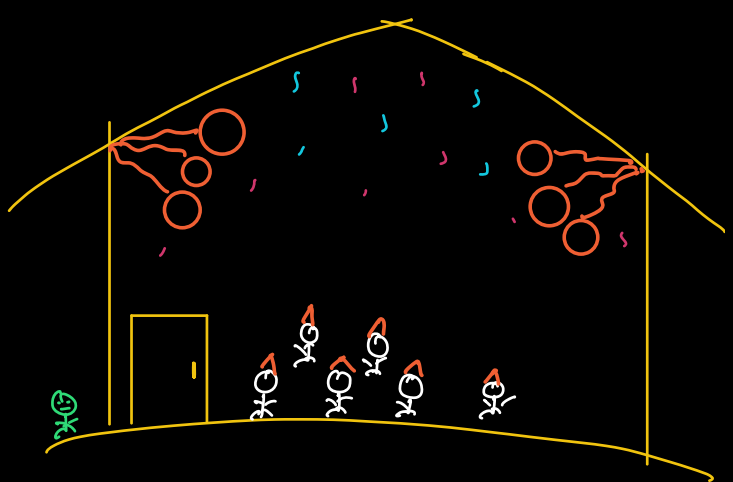
Return no of ways in which party can be enjoyed.

N = 1

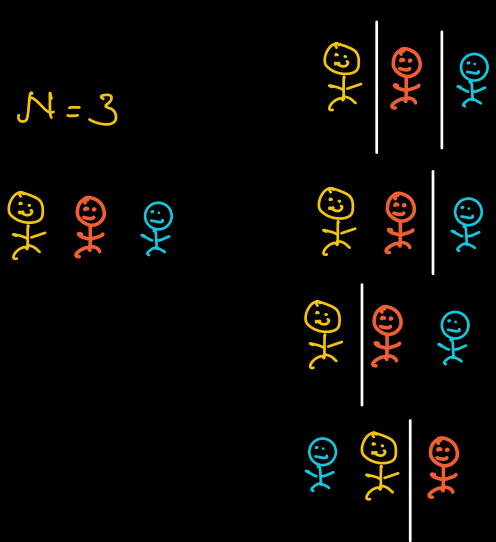


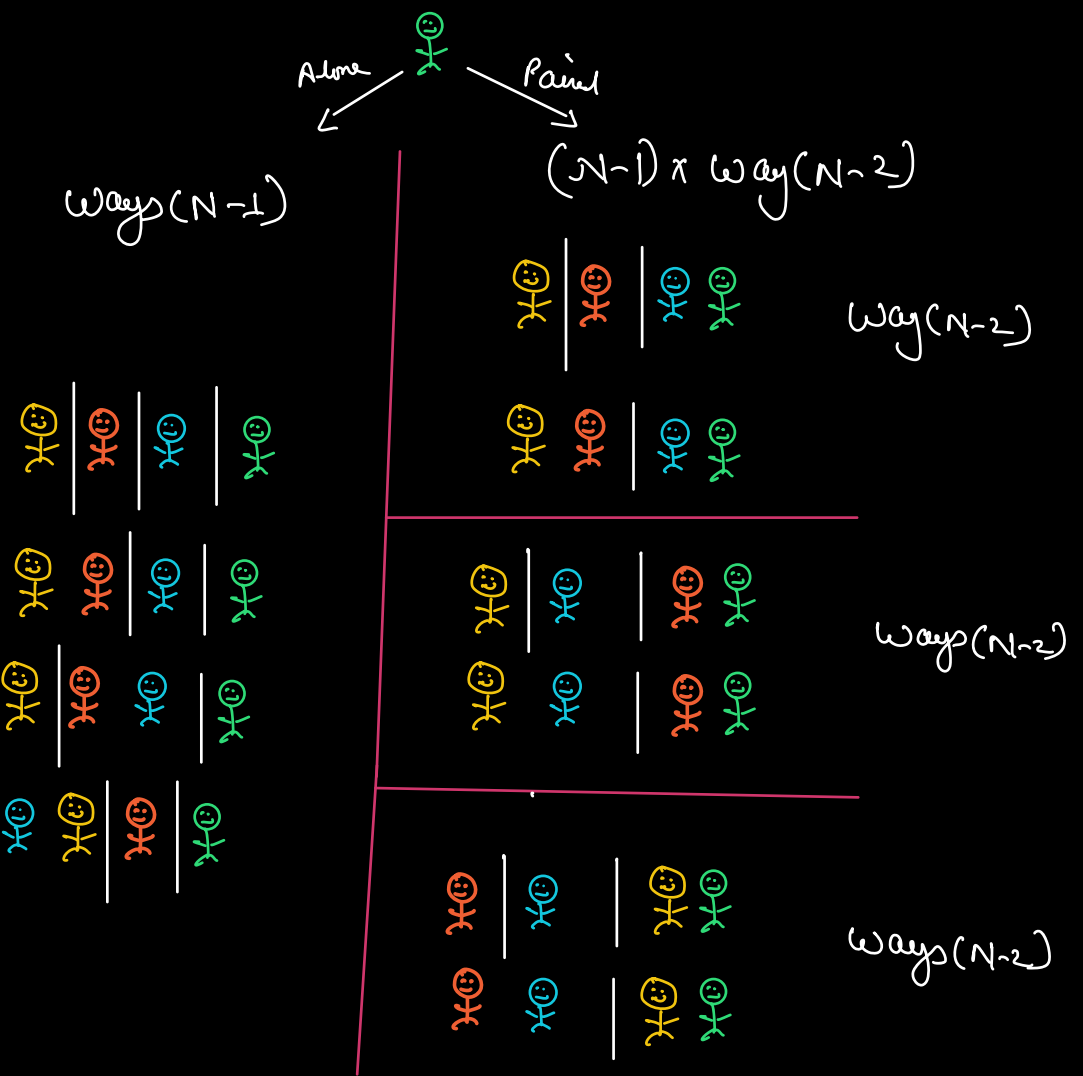
N = 2





N = 3





$$ways(i) = ways(i-1) + (i-1)\ ways(i-2)$$

Base cases

```
if(i==1) // only one person is partying
    ret 1;

if(i==2) // 2 people
    ret 2;
```

Q Given a 6-phase dice. Count the no of ways to get a required sum: N if you can throw the dice as many times as you want.

$N = 2$ $\{1, 1\}, \{2\} \longrightarrow 2$

$N = 3$ $\{1, 1, 1\}, \{1, 2\}, \{2, 1\}, \{3\} \longrightarrow 4$

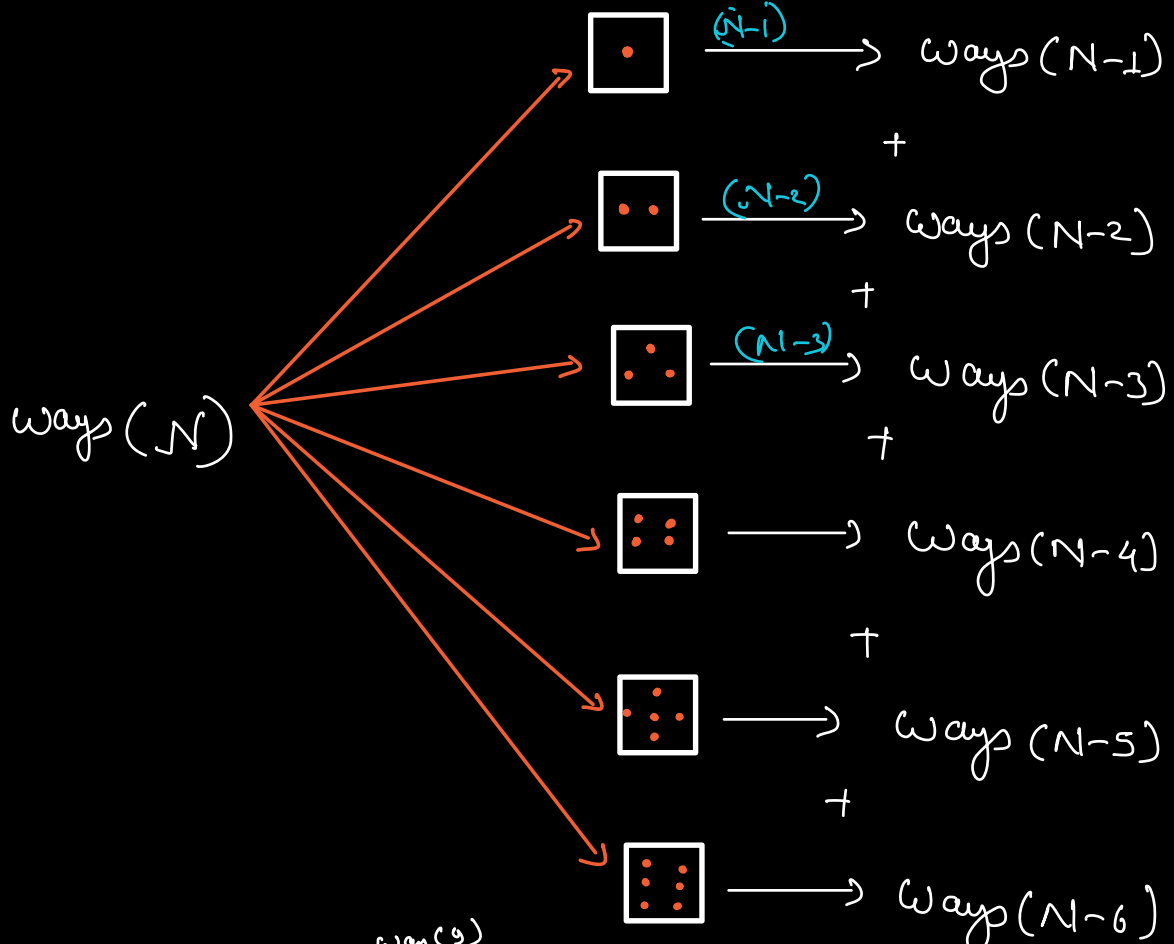
$N = 4$ 1,1,1,1 / 1,2,1 / 2,1,1 / 3,1 / 1,1,2 / 2,2 / 1,3 / 4 $\Rightarrow 8$

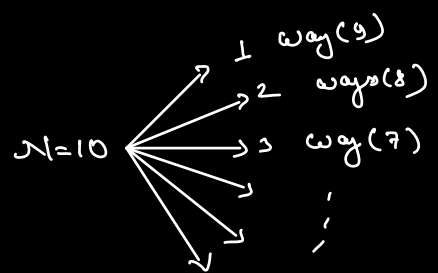
$N = 5$

$$1\left(\{1,1,1\},\{1,2\},\{2,1\},\{3\}\right) + 2\left(\{1,1\},\{2\}\right) + 3(1) + 4$$

$N = 4$ $\quad$ $N = 3$

1





1 ( )

$$ways(10) = ways(9) + ways(8) + ways(7) + ways(6) \ldots + ways(4)$$

way(9) way(8) way(7) way(6)