

For use Dynamic Programming DP

Array: [2, 7, 1, 8, 4]

expected: $15 = 7 + 8$ at [1, 3]

Time Comp $O(n)$

Space Comp $O(n)$

1) PP array: $dp = []$

$$dp[0] = 2$$

$$dp[1] = \max(2, 7) = 7$$

$$dp = [2, 7, 0, 0, 0]$$

2) iterate the array from index 2 to end.

$\underbrace{[2, 7, 1, 8, 4]}_{\text{then update } dp}$

$$dp[i] = \max(dp[i-1], dp[i-2] + \text{array}[i])$$

So, at index 2

$$dp[2] = \max(dp[1], dp[0] + \text{array}[2])$$

$$= \max(7, 2+1)$$

$$= 7$$

$$dp = [2, 7, 7, 0, 0]$$

At index 3

$$dp[3] = \max(dp[2], dp[1] + \text{array}[3])$$

$$= \max(7, 7+8)$$

$$= 15$$

$$dp = [2, 7, 7, 15, 0]$$

At index 4:

$$\begin{aligned} dp[4] &= \max(dp[3], dp[2] + array[4]) \\ &= \max(15, 7+4) \\ &= 15 \end{aligned}$$

④ $dp = [2, 7, 7, 15, 15]$

- 3) use dp Array to find which elements were chose to obtain the max sum.

At index 4 of dp, $dp[4] = dp[3] = 15$, $dp[4]$ didn't contribute max so, choose index 3 $dp[3]$,

At index 3, $dp[3] = 15$, $dp[2] = 7$, $15 > 7$
so, $dp[3]$ is max. and ans is their 8 and 7
which index of array 3 and 1

Also, to index 1, the base case to end,

$dp[1]$ and $dp[0]$, $dp[1] = 7 > dp[0] = 2$.
and element at index 1 = 7 in array

no more elements to the left of index 1, just stop here.

- 4) So far array $[2, 7, 1, 8, 4]$ max = 15 at [1, 3]
when it can not adjacent each other.

Time Comp : $O(n)$ Space Comp : $O(n)$

For Brute Force.

Array $[2, 7, 1, 8, 4]$, since not adjacent

1) List all possible subsets of array.

$$[1], [2], [7], [1], [8], [4]$$

$$[2, 1], [2, 8], [2, 4]$$

$$[7, 8], [7, 4]$$

$$[1, 4]$$

2) calculate them all for each subset

$$[1] = 0$$

$$[2, 1] = 2 + 1 = 3$$

$$[7, 8] = 7 + 8 = 15$$

$$[2] = 2$$

$$[2, 8] = 2 + 8 = 10$$

$$[7, 4] = 7 + 4 = 11$$

$$[7] = 7$$

$$[2, 4] = 2 + 4 = 6$$

$$[1] = 1$$

$$[8] = 8$$

$$[4] = 4$$

$$[1, 4] = 1 + 4 = 5$$

3) find the max result of each subset:

$$[7, 8] = 7 + 8 = 15$$

So, is $7 + 8 = 15$ at index $[1, 3]$

4) Time Comp. = $O(2^n)$

Space Comp. : $O(2^n)$

n : is length of input array. for all subset, 2^n in worst time
And store the subset of Array it took space.