



# Backtracking

Leetcode  
-1718

Medium

Video - 18



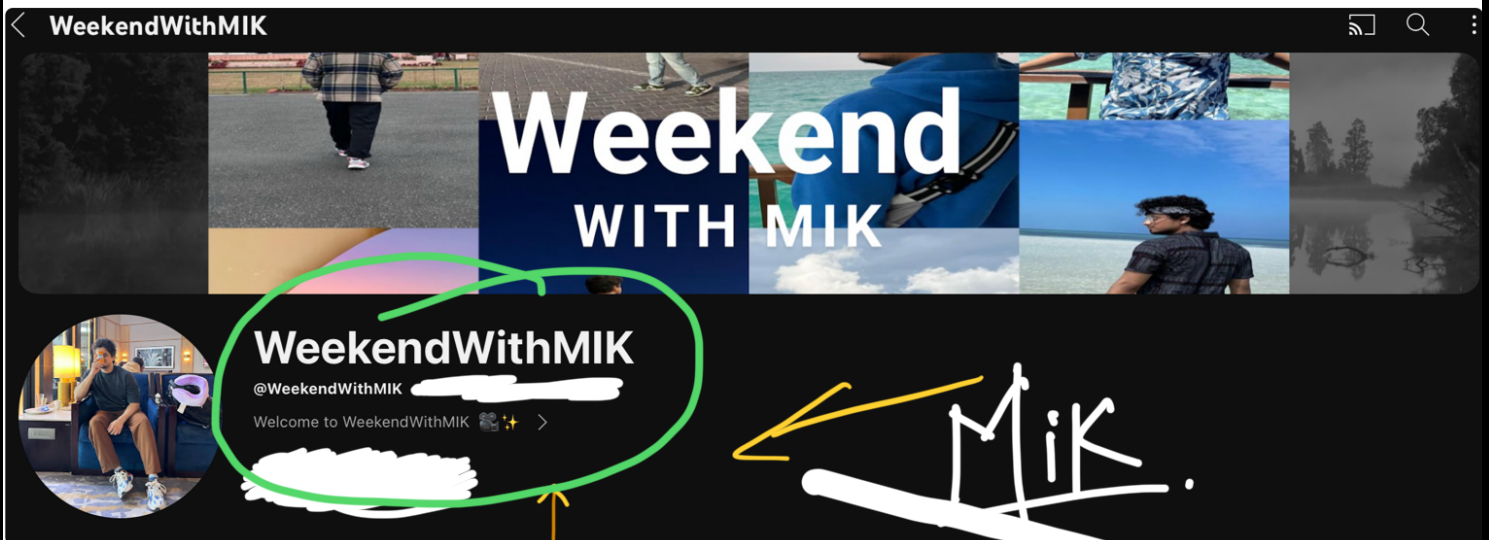
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**Motivation :-** To all my Youtube family members -

I wish I could put into words how much I truly trust & believe in you all. Every single day, I see your dedication, your consistency & your effort & it genuinely inspires me. If someone else can do it, so can you. And no matter how hard it gets, please remember - **MIK believes in you all** ❤️"

### 1718. Construct the Lexicographically Largest Valid Sequence

Medium Topics Companies Hint

Given an integer  $n$ , find a sequence that satisfies all of the following:

- ✓ The integer 1 occurs once in the sequence.
- ✓ Each integer between 2 and  $n$  occurs twice in the sequence.
- ✓ For every integer  $i$  between 2 and  $n$ , the **distance** between the two occurrences of  $i$  is exactly  $i$ .

The **distance** between two numbers on the sequence,  $a[i]$  and  $a[j]$ , is the absolute difference of their indices,  $|j - i|$ .

Return the **lexicographically largest** sequence. It is guaranteed that under the given constraints, there is always a solution.

A sequence  $a$  is lexicographically larger than a sequence  $b$  (of the same length) if in the first position where  $a$  and  $b$  differ, sequence  $a$  has a number greater than the corresponding number in  $b$ . For example,  $[0, 1, 9, 0]$  is lexicographically larger than  $[0, 1, 5, 6]$  because the first position they differ is at the third number, and 9 is greater than 5.

Example:-  $n = 3$

output:-  $[3, 1, 2, 3, 2]$

$\uparrow \quad \uparrow \quad \uparrow \quad \uparrow \quad \uparrow$   
 $\{2, 3, 2, 1, 2, 4\}$

$$|3 - 0| = 3 \checkmark$$

$$|4 - 2| = 2 \checkmark$$



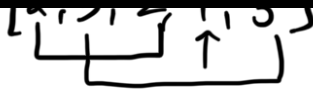
$$n = 3$$

$\Rightarrow \{9, 1, 2, 3, 2\}$

$\{2, 3, 2, 1, 3\}$



$$\text{size} = 2 * n - 1;$$



$$n = 4 \rightarrow \{1, 2, 3, 4\}$$

$$\text{size} = 2 * 4 - 1 = 7$$

# Thought Process

$$n = 3$$

$$\{1\}$$

$$\{2, 1, 2\}$$

$$\{3, 1, 2, 3, 2\}$$

$$\{4, 2, 3, 2, 4, 3, 1\}$$

lexicographically largest

~~Pattern~~

$$n = 3, \text{ size} = (2 * n - 1);$$

// 5

$$\left\{ \frac{3}{0}, \frac{1}{1}, \frac{2}{2}, \frac{3}{3}, \frac{2}{4} \right\}$$

i

$$j = i + \text{nums}[i]$$

Used {3, 1}

~~3 2 1~~  
3 2

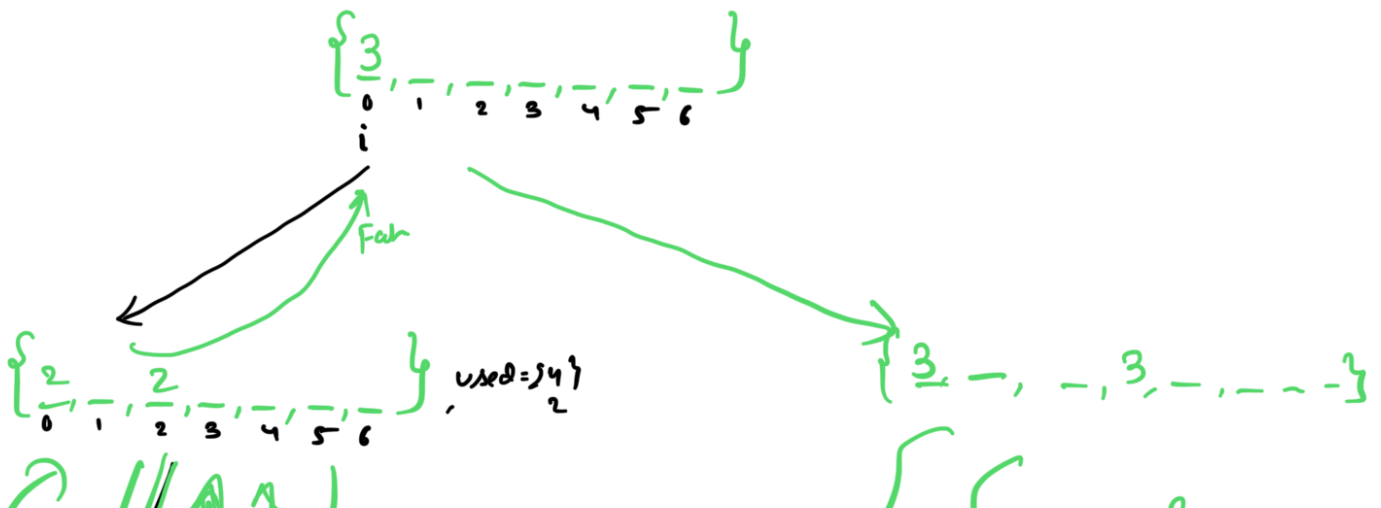
$$j = i + \text{nums}[i] \\ = 2 + 2 \\ = 4$$

10, 2, 5  
2

Few observations :-

- ①  $2 * n - 1$  ;
- ② Used  $\rightarrow$  set, `vector<bool> Used (n+1, false);`
- ③ Apart from 1,  $(2 \text{ to } n)$   $i \equiv j = i + \text{nums}[i]$ ;
- ④ For any index  $i$  will try to put largest no.  
if not possible, move to 2nd largest & so...on.  
 $\hookrightarrow$  we have to explore different options.
- ⑤ if `result[i]` already populated, move ahead.

$$n = 4, \text{ size} = 2 * 4 - 1 = 7$$



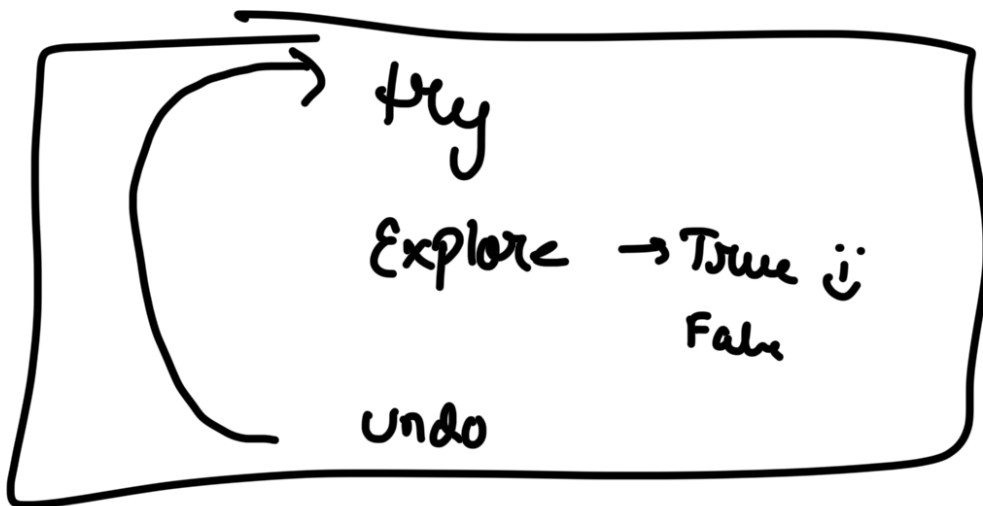
$\{4, 2, \frac{-}{i}, 2, 4, -, -, -\}$

True.

Options  $\rightarrow$  Recursion.

(Backtracking).

All Sequences  $\rightarrow$  Back



$n = 3$

solve(  
 $i=0, n=3, \{ \frac{-}{i}, \frac{-}{i}, \frac{-}{i}, \frac{-}{i}, \frac{-}{i} \}, \text{used}$ )

```
for ( num = 3 ; num >= 1 ; num-- ) {  
    if ( used [ num ] == true ) continue ;
```

```
    // Try
```

```
    used [ num ] = True ;
```

```
    result [ i ] = num ;
```

```
    if ( num == 1 ) { // only once
```

```
        if ( Solve ( i+1 , n , result , used ) == True ) {
```

```
            return True ;
```

```
        } else {
```

```
            = num + i
```

```
}
```