

## EXPERIMENT-5

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**Semester:** 6<sup>th</sup>

**Subject Code:** 22ITP-351

### **PROBLEM-1**

#### **AIM:-**

Longest Increasing Subsequence

#### **CODE:-**

```
class Solution {
    public int lengthOfLIS(int[] nums) {
        List<Integer> res = new ArrayList<>();

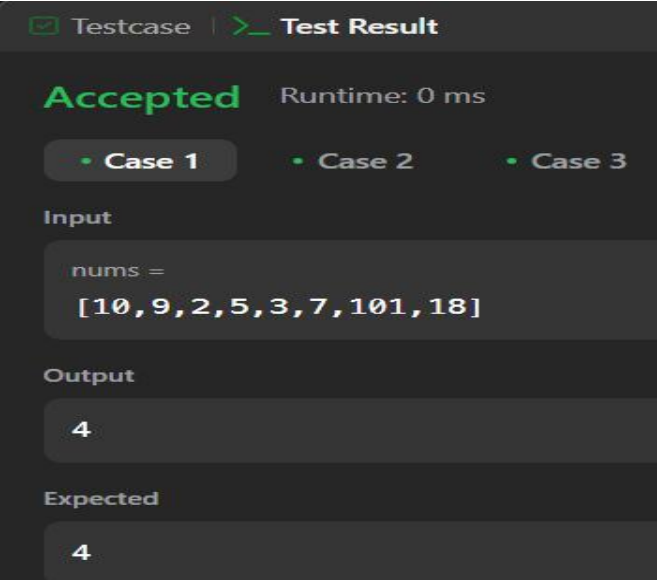
        for (int n : nums) {
            if (res.isEmpty() || res.get(res.size() - 1) < n) {
                res.add(n);
            } else {
                int idx = binarySearch(res, n);
                res.set(idx, n);
            }
        }

        return res.size();
    }

    private int binarySearch(List<Integer> arr, int target) {
        int left = 0;
        int right = arr.size() - 1;

        while (left <= right) {
            int mid = (left + right) / 2;
            if (arr.get(mid) == target) {
                return mid;
            } else if (arr.get(mid) > target) {
                right = mid - 1;
            } else {
                left = mid + 1;
            }
        }

        return left;
    }
}
```



**OUTPUT:-**



## PROBLEM-2

### AIM:-

Maximum Product Subarray

### CODE:-

```
class Solution {  
  
    public int maxProduct(int[] nums) {  
  
        int res = Integer.MIN_VALUE;  
  
        for (int n : nums) {  
  
            res = Math.max(res, n);  
  
        }  
  
        int curMax = 1, curMin = 1;  
  
        for (int n : nums) {  
  
            int temp = curMax * n;  
  
            curMax = Math.max(temp, Math.max(curMin * n, n));  
  

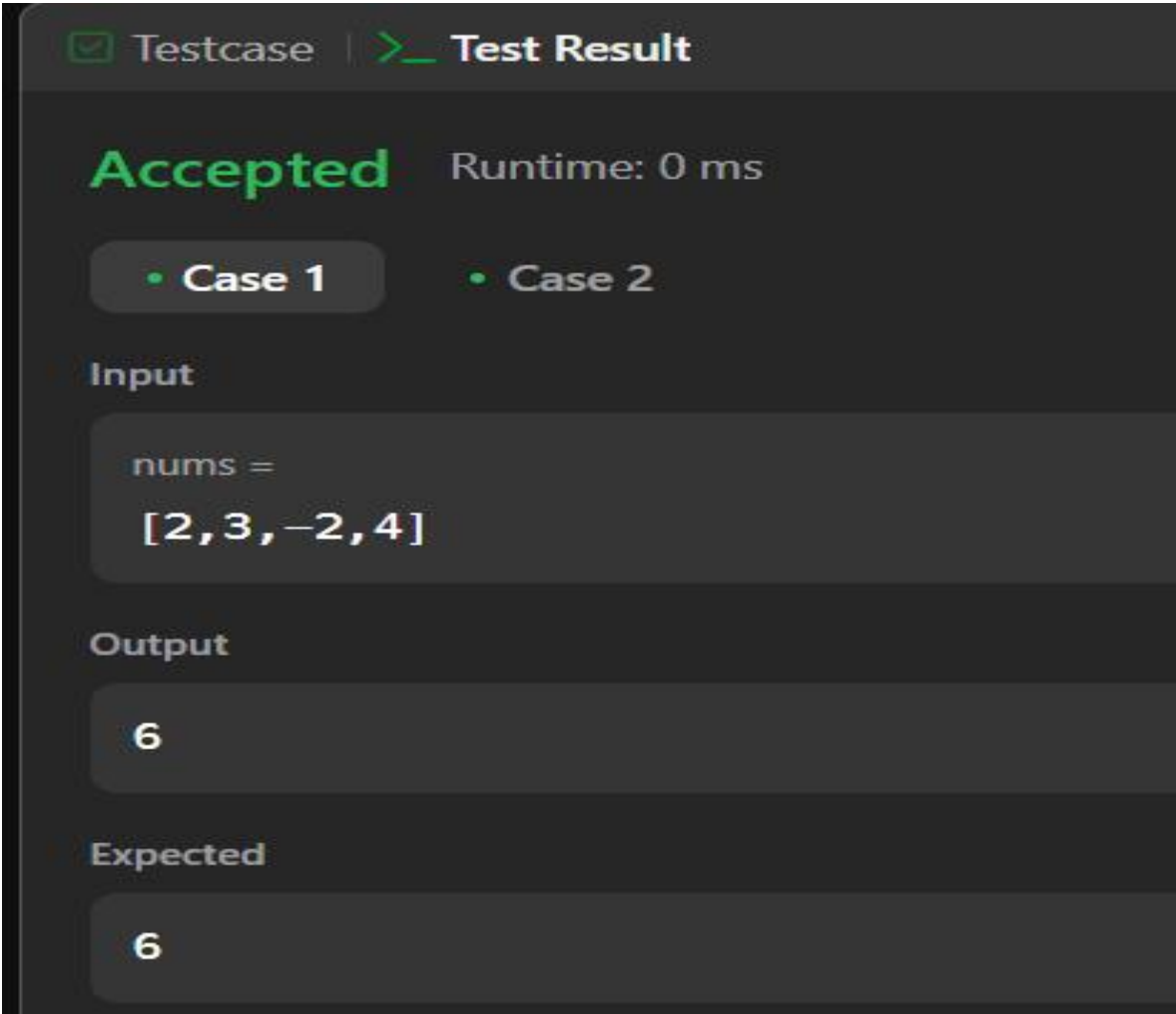
```

```
        curMin = Math.min(temp, Math.min(curMin * n, n));

        res = Math.max(res, curMax);
    }

    return res;
}
}
```

**OUTPUT:-**



**PROBLEM-3**

**AIM:-**

Decode Ways

**CODE:-**

```
class Solution {
    public int numDecodings(String s) {
        if (s.charAt(0) == '0') {
            return 0;
        }
    }
}
```

```

int n = s.length();
int[] dp = new int[n + 1];
dp[0] = dp[1] = 1;

for (int i = 2; i <= n; i++) {
    int one = Character.getNumericValue(s.charAt(i - 1));
    int two = Integer.parseInt(s.substring(i - 2, i));

    if (1 <= one && one <= 9) {
        dp[i] += dp[i - 1];
    }
    if (10 <= two && two <= 26) {
        dp[i] += dp[i - 2];
    }
}

return dp[n];
}
}

```

**OUTPUT:-**

☒ Testcase
 | 
 [>\\_ Test Result](#)

**Accepted**
Runtime: 0 ms

• Case 1
• Case 2
• Case 3

**Input**

s =  
 "12"

**Output**

2

**Expected**

2

## PROBLEM-4

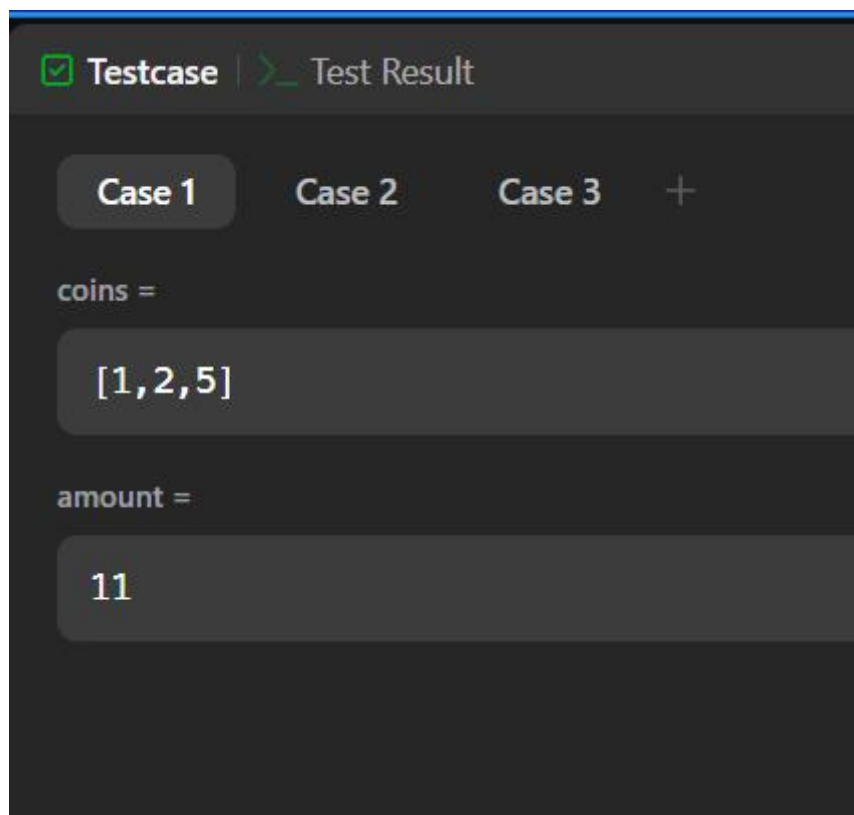
### AIM:-

Coin Change

### CODE:-

```
class Solution {  
    public int coinChange(int[] coins, int amount) {  
        int[] minCoins = new int[amount + 1];  
        Arrays.fill(minCoins, amount + 1);  
        minCoins[0] = 0;  
  
        for (int i = 1; i <= amount; i++) {  
            for (int j = 0; j < coins.length; j++) {  
                if (i - coins[j] >= 0) {  
                    minCoins[i] = Math.min(minCoins[i], 1 + minCoins[i - coins[j]]);  
                }  
            }  
        }  
  
        return minCoins[amount] != amount + 1 ? minCoins[amount] : -1;  
    }  
}
```

### OUTPUT:-



## PROBLEM-5

### AIM:-

Perfect Squares

### CODE:-

```
public class Solution {
    public boolean searchMatrix(int[][] matrix, int target) {
        if(matrix == null || matrix.length < 1 || matrix[0].length < 1) {
            return false;
        }
        int col = matrix[0].length-1;
        int row = 0;
        while(col >= 0 && row <= matrix.length-1) {
            if(target == matrix[row][col]) {
                return true;
            } else if(target < matrix[row][col]) {
                col--;
            } else if(target > matrix[row][col]) {
                row++;
            }
        }
        return false;
    }
}
```

Testcase   >_ Test Result	Testcase   >_ Test Result
<b>Accepted</b> Runtime: 0 ms	<b>Accepted</b> Runtime: 0 ms
• Case 1 • Case 2	• Case 1 • Case 2
<b>Input</b>	<b>Input</b>
n = 13	n = 12
<b>Output</b>	<b>Output</b>
2	3

## PROBLEM-6

### AIM:-

Word Break

### CODE:-

### OUTPUT:-

```
class Solution {
    public boolean wordBreak(String s, List<String> wordDict) {
        return recWay1(s, wordDict);
    }

    boolean recWay2(String s, List<String> wordDict) {
        Boolean[] memo = new Boolean[s.length() + 1];
        return wordBreak2(s, new HashSet<>(wordDict), 0, memo);
    }

    boolean wordBreak2(String s, Set<String> wordDict, int k, Boolean[] memo) {
        int n = s.length();
        if (k == n) return true;

        if (memo[k] != null) return memo[k];

        for (int i=k + 1; i<=n; i++) {
            String word = s.substring(k, i);
            if (wordDict.contains(word) && wordBreak2(s, wordDict, i, memo)) {
                return memo[k] = true;
            }
        }

        return memo[k] = false;
    }

    boolean recWay1(String s, List<String> wordDict) {
        Boolean[] memo = new Boolean[s.length() + 1];
        return wordBreak(s, wordDict, 0, memo);
    }

    boolean wordBreak(String s, List<String> wordDict, int k, Boolean[] memo) {
        if (k == s.length()) {
            return true;
        }
    }
```

```

    if (memo[k] != null) {
        return memo[k];
    }

    for (int i=0; i<wordDict.size(); i++) {
        String word = wordDict.get(i);
        if (s.startsWith(word, k)) {
            if(wordBreak(s, wordDict, k + word.length(), memo)) return memo[k] = true;
        }
    }

    return memo[k] = false;
}
}

```

☒ Testcase
 ☒ Test Result

**Accepted**
 Runtime: 0 ms

• Case 1
 • Case 2
 • Case 3

**Input**

s =  
 "leetcode"

wordDict =  
 ["leet", "code"]

**Output**

true

**Expected**

true



## PROBLEM-7

### AIM:-

Word Break 2

### CODE:-

```
import java.util.*;

class Solution {
    public List<String> wordBreak(String s, List<String> wordDict) {
        Set<String> wordSet = new HashSet<>(wordDict);
        Map<Integer, List<String>> memo = new HashMap<>();

        return backtrack(s, 0, wordSet, memo);
    }

    private List<String> backtrack(String s, int start, Set<String> wordSet, Map<Integer,
List<String>> memo) {
        if (memo.containsKey(start)) {
            return memo.get(start);
        }

        List<String> result = new ArrayList<>();

        if (start == s.length()) {
            result.add("");
            return result;
        }

        for (int end = start + 1; end <= s.length(); end++) {
            String word = s.substring(start, end);

            if (wordSet.contains(word)) {
                List<String> sublist = backtrack(s, end, wordSet, memo);
                for (String sub : sublist) {
                    if (sub.isEmpty()) {
                        result.add(word);
                    } else {
                        result.add(word + " " + sub);
                    }
                }
            }
        }
    }
}
```

```
}
    memo.put(start, result);
return result;
}
}
```

