CHANDIGARH UNIVERSITY

UNIVERSITY INSTITUTE OF NGINEERING

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Submitted By: Vivek Kumar(21BCS8129)	**Submitted To:** Mamta Punia(E12337)
Subject Name	Competitive Coding - I
Subject Code	20CSP-314
Branch	Computer Science and Engineering
Semester	5th

Experiment No. - 9

Student Name: Vivek Kumar **UID: 21BCS8129**
Branch: BE-CSE(LEET) **Section/Group: WM-20BCS-616/A**
Semester: 5th **Date of Performance: 4/11/2022**
Subject Name: Competitive coding - I **Subject Code: 20CSP-314**

Construct the Array

1. **Aim/Overview of the practical:**

Backtracking

You have an $N * M$ chessboard on which some squares are blocked out. In how many ways can you place one or more queens on the board, such that, no two queens attack each other? Two queens attack each other, if one can reach the other by moving horizontally, vertically, or diagonally without passing over any blocked square. At most one queen can be placed on a square. A queen cannot be placed on a blocked square.

https://www.hackerrank.com/challenges/queens-on-board/problem

2. **Apparatus / Simulator Used:**
   - Windows 7 or above
   - Google Chrome

3. **Objective:**

   - To understand the concept of Backtracking.

4. **Code:**

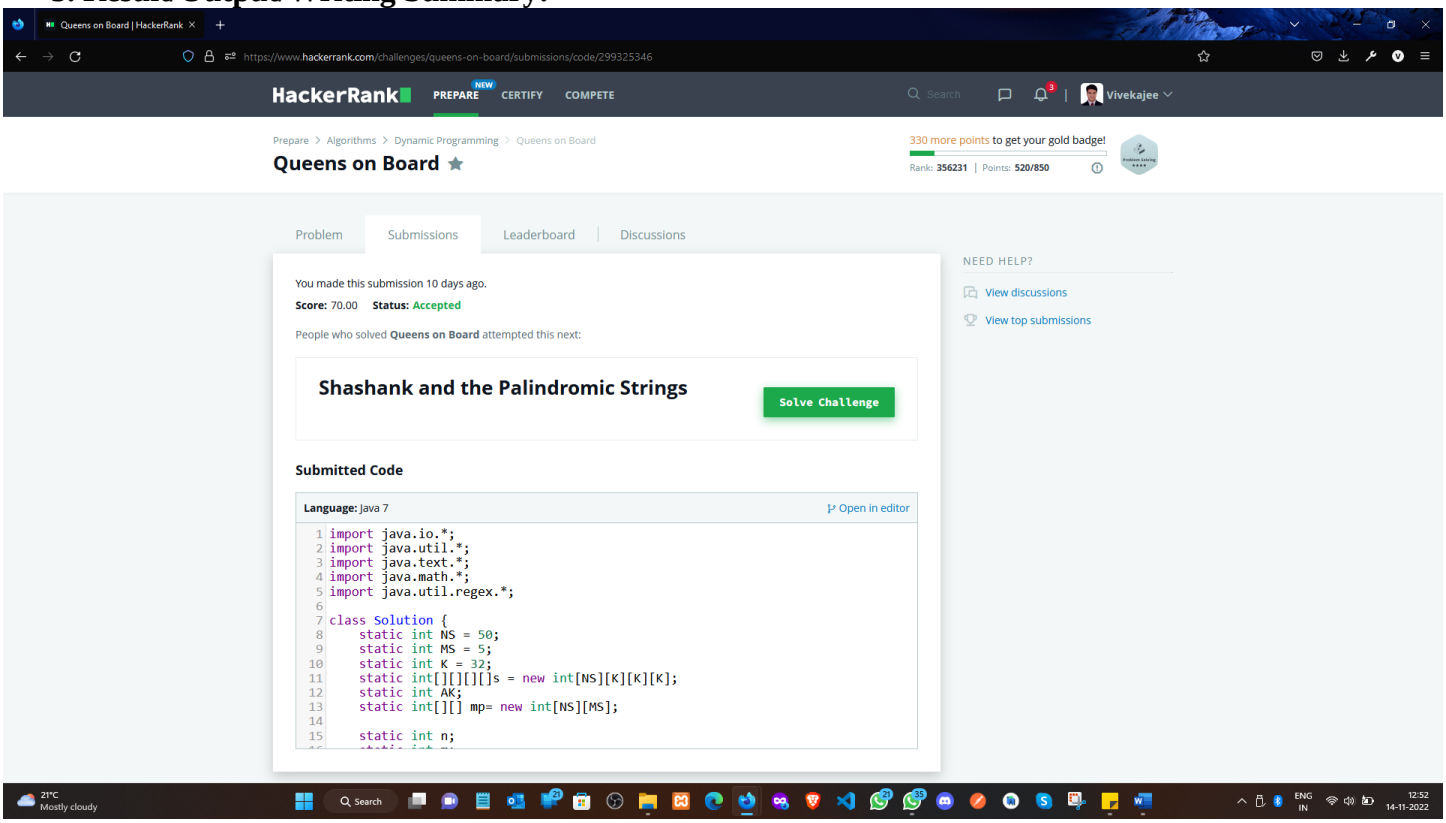
```
import java.io.*;
import java.util.*;
import java.text.*;
import java.math.*;
import java.util.regex.*;

class Solution {
    static int NS = 50;
    static int MS = 5;
    static int K = 32;
    static int[][][][]s = new int[NS][K][K][K];
    static int AK;
    static int[][] mp= new int[NS][MS];

    static int n;
```

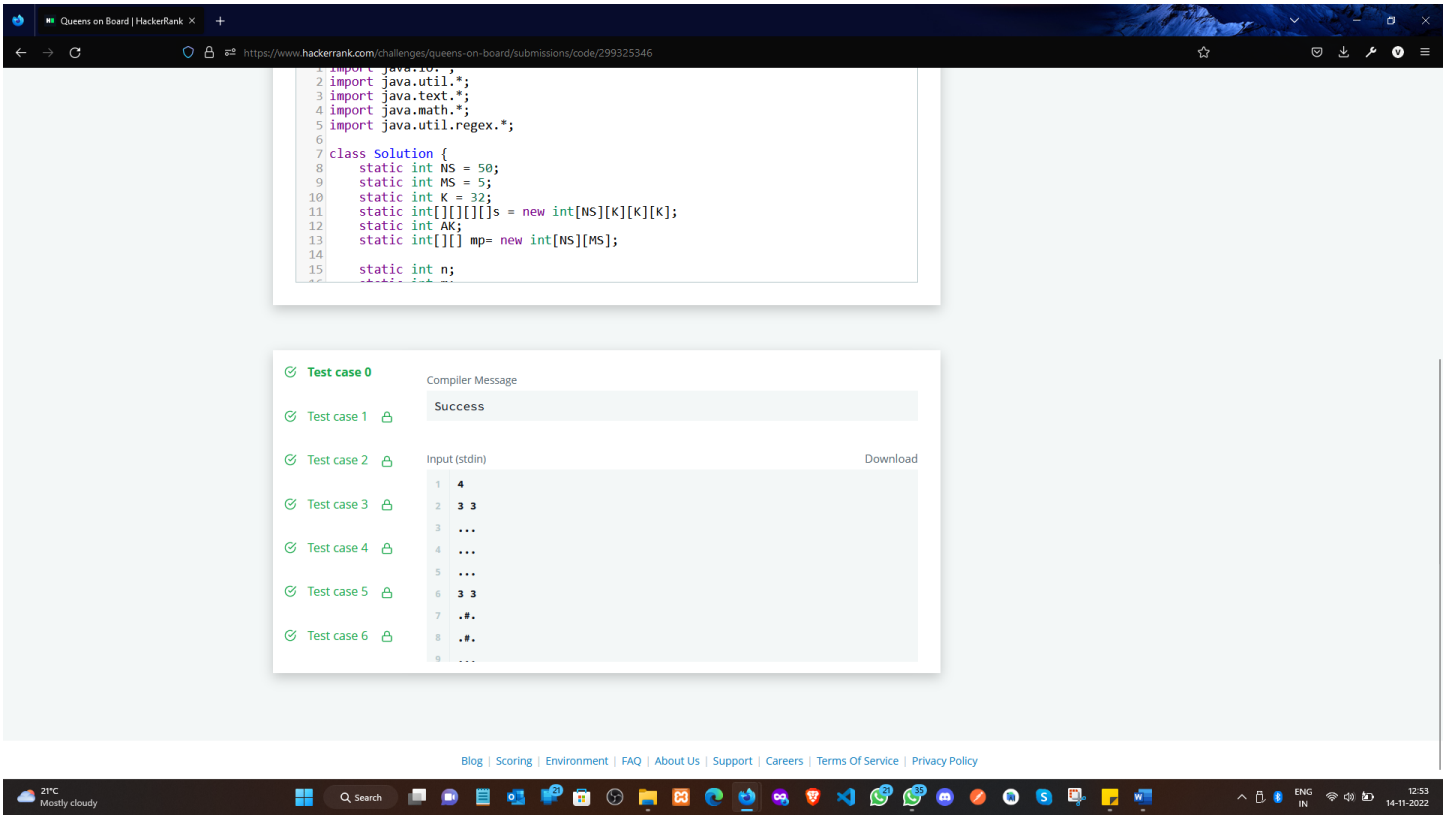
```
    static int m;

    static int dp(int c, int b1, int b2, int b3) {
          if (c == n) return 1;
          if (s[c][b1][b2][b3] >= 0) return s[c][b1][b2][b3];
          /*
          System.out.print(c);System.out.print(' ');
          System.out.print(b1);System.out.print(' ');
          System.out.print(b2);System.out.print(' ');
          System.out.print(b3);System.out.print(' ');
          System.out.println();
          */
          int sum = 0;
          for (int i = 0; i < AK; i++) {
                if (check(c,i,b1,b2,b3)){
                    int[] mask = mask(c,i,b1,b2,b3);
                    /*
                    System.out.print(c);
                    System.out.println(i);
                    */
                    sum = (sum+dp(c+1, mask[0],mask[1],mask[2]))%1000000007;
                }
          }
          s[c][b1][b2][b3] = sum;
          return sum;
    }

    static boolean check(int c, int i, int b1, int b2, int b3) {
        int[] loc = {1,2,4,8,16};
        boolean selfblock = false;

        //check other block
        for (int li = 0; li < m; li++) {
            if ((i&loc[li]) != 0) {
                if (mp[c][li] == 0) return false;
                if (selfblock == true) return false;

                if ((b1&loc[li]) !=0 || (b2&loc[li]) !=0|| (b3&loc[li]) !=0) return
false;

                selfblock = true;
            }
```

```
        if (mp[c][li] == 0) selfblock = false;
    }

    return true;
}

static int[] mask(int c, int i, int b1, int b2, int b3){
    int[] loc = {1,2,4,8,16};
    int[] mask = new int[3];
    mask[0] = b1|i;
    mask[1] = ((b2 << 1) % K) | ((i << 1) % K);
    mask[2] = (b3 >> 1) | (i >> 1);
    for (int li = 0; li < m; li++){
        if(mp[c][li] == 0) {
            mask[0] = mask[0] & (~loc[li]);
            mask[1] = mask[1] & (~(loc[li] << 1)%K);
            mask[2] = mask[2] & (~(loc[li] >> 1));
        }
    }

    return mask;
}

public static void main(String[] args) {
    Scanner in = new Scanner(System.in);
    int TN = in.nextInt();

    for (int ti = 0; ti < TN; ti++) {
        n = in.nextInt();
        m = in.nextInt();
        String str[] = new String[n];
        for(int i=0; i<n; i++)
            str[i] = in.next();
        for (int i = 0; i < n; i++)
        for (int j = 0; j < m; j++) {
            mp[i][j] = 1;
            if (str[i].charAt(j) == '#')
                mp[i][j] = 0;
        }

        for (int i1 = 0; i1 < n; i1++)
```

```
            for (int i2 = 0; i2 < K; i2++)
            for (int i3 = 0; i3 < K; i3++)
            for (int i4 = 0; i4 < K; i4++)
                s[i1][i2][i3][i4] = -1;

            AK = 1;
            for (int i =0; i< m; i++)
                AK = AK *2;

            int r = dp(0,0,0,0);
            System.out.println((r+1000000007-1) % 1000000007);
        }
    }
}
```

5. Result/Output/Writing Summary:





Experiment 9.2

1. **Aim/Overview of the practical:**

Backtracking

You are given a list of *N* positive integers, *A = {a[1], a[2], ..., a[N]}* and another integer *S*. You have to find whether there exists a non-empty subset of *A* whose sum is greater than or equal to *S*.
You have to print the size of minimal subset whose sum is greater than or equal to S. If there exists no such subset then print `-1` instead.

https://www.hackerrank.com/challenges/subset-sum/problem

2. **Apparatus / Simulator Used:**
   - Windows 7 or above
   - Google Chrome

3. **Objective:**
   - To understand the concept of Backtracking.

4. **Code:**

```
import java.util.Scanner
import scala.collection.Searching._
object Solution {
  def main(args: Array[String]): Unit = {
    val sc = new Scanner(System.in)
    sc.nextLine
    val a = sc.nextLine.split(' ').map(_.toLong).sortBy(-_)
    var sum = 0L
    val sums = a.map(v => {
      sum += v
      sum
    })
    val t = sc.nextInt
    (0 until t).foreach(_ => {
      val s = sc.nextLong
      val count = (sums.search(s) match {
        case InsertionPoint(i) => i
        case Found(i) => i
      }) + 1
      println(if (count <= a.length) count else -1)
    })
  }
}
```

5. **Result/Output/Writing Summary:**

Subset Sum | HackerRank

https://www.hackerrank.com/challenges/subset-sum/submissions/code/300461479

HackerRank PREPARE NEW CERTIFY COMPETE Search Vivekajee

Prepare > Functional Programming > Ad Hoc > Subset Sum

Subset Sum

Points: 20 Rank: 36088

Problem | Submissions | Leaderboard | Discussions

You made this submission 3 days ago.

Score: 20.00 **Status:** Accepted

People who solved **Subset Sum** attempted this next:

Elementary Watson Solve Challenge

NEED HELP?

View discussions

View top submissions

Submitted Code

Language: Scala Open in editor

```scala
import java.util.Scanner
import scala.collection.Searching._
object Solution {
  def main(args: Array[String]): Unit = {
    val sc = new Scanner(System.in)
    sc.nextLine
    val a = sc.nextLine.split(' ').map(_.toLong).sortBy(-_)
    var sum = 0L
    val sums = a.map(v => {
      sum += v
      sum
    })
    val t = sc.nextInt
    (0 until t).foreach(_ => {
      val s = sc.nextLong
```

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Subset Sum | HackerRank

https://www.hackerrank.com/challenges/subset-sum/submissions/code/300461479


```scala
import java.util.Scanner
import scala.collection.Searching._
object Solution {
  def main(args: Array[String]): Unit = {
    val sc = new Scanner(System.in)
    sc.nextLine
    val a = sc.nextLine.split(' ').map(_.toLong).sortBy(-_)
    var sum = 0L
    val sums = a.map(v => {
      sum += v
      sum
    })
    val t = sc.nextInt
    (0 until t).foreach(_ => {
      val s = sc.nextLong
```


- Test case 0
- Test case 1
- Test case 2
- Test case 3
- Test case 4
- Test case 5
- Test case 6

Compiler Message

Success

Input (stdin) Download

```
4
4 8 10 12
4
4
13
30
100
```

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Learning outcomes (What I have learnt):

- Learned the concept of Backtracking.

Evaluation Grid (To be created per the faculty's SOP and Assessment guidelines):

Sr. No.	Parameters	Marks Obtained	Maximum Marks
1.	Worksheet completion including writing learning objectives/Outcomes. (To be submitted at the end of the day).		
2.	Post-Lab Quiz Result.		
3.	Student Engagement in Simulation/Demonstration/Performance and Controls/Pre-Lab Questions.		
	Signature of Faculty (with Date):	Total Marks Obtained:	