Nowfloats Screening round, CET BBSR, 19/08/2016

Revenge of the Pokemons

General Instructions

Total time: 75 mins

Total Questions: 4

Maximum points: 120

Prologue

Qualifying points: 60

Examples have been graphically illustrated by me for better understanding of a wider audience, they weren't originally

When it comes to catching Pokemons, no-one has beat the students at NowFloats University. Since launch, catching these monsters has gone viral at

NowFloats. The students have mastered the knack of throwing PokeBalls and haven't spared even one. Pokemons around the world travelling through Hyderabad have never been seen again. They say that the life of a Pokemon around here is hardly a few seconds. This created a serious scare among Pokemons around the world and thus, they called a meeting. In this meeting, it was decided that all the pokemons attack NowFloats University and raze it to the ground. This attack would more affect Hyderabad so to erase every possibility of comeback. The revenge has started. Chapter 1

Points: 50 Day of the attack 10:00 AM Here's a conversation between two gym leaders, Pranav and Rachit. They are roommates and have shared every secret to

catch'em all. Pranav: Dude, wake up. Check your whatsapp Rachit: What happened? It's 5 in the morning. Pranav: Look at these pictures! Sajal got attacked around midnight and is badly injured. Everyone is scared and staying in. They have burnt our library,

completely destroyed our labs and spreading fast outside the campus. could be destroyed.

Rachit: *completely woken up now* Oh yes, i have more pictures. They are everywhere, we have to do something. If we don't stop them, our beautiful city Pranav: I have an idea. Lets first stop the Pokemons from spreading across the campus. First we need to build a fence around them. But the question is

how do we do thet :O Rachit: Great idea. I can make the fence real fast but we also need to plan as to where we would put up the pillars for the fence. Any idea? Pranav: Let me attack the pokemons on the outer ring of the attack zone. As soon as i catch a pokemon, i will also build the fence pillar. You follow me

secretly and build the fence around those pillars. So they start. Consider there are N pokemons that attacked the campus. And the location of the ith pokemon can be represented as (xi, yi). Help Pranav find the pokemons that he needs to catch (and build a fence pillar at that location) so that Rachit can quickly fence all the pokemons. Remember they have only

limited material to build the fence. Write a code which Pranav can run to get the M locations $(x_1, y_1), (x_2, y_2) \dots (x_m, y_m)$

of pokemons where he can catch pokemons and also build the pillars.

Input

Example 1:

35 41 17 62

35 7 55 65

Output 17 62

35 7

55 65

Explanation Number of pokemons (N): 4 Locations of the pokemons (Loc_array): (35,7), (55,65), (35,41), (17,62) Minimum number of location where pillar needs to be built (M): 3 Location of the pillars: (17,62), (35,7), (55, 65)

![Locations of pokemons and the fence](./Q1.png) This will ensure that all the pokemons are caged. The pokemon at the location (35,41) will automatically get surrounded by fence.

Output:

150,150 377,106 588,361 274,381

Example2: Input:

377 106 588 361 450 261

377 261 274 381 404 342

150 150

Pokemon must be caught in only one cage.

Example 1

6 (Number of pokemons) 6 (Max capacity of each cage) 1 2 4 3 5 3 (weights of pokemons)

Input

Find C and respective placement of pokemons in these cages.

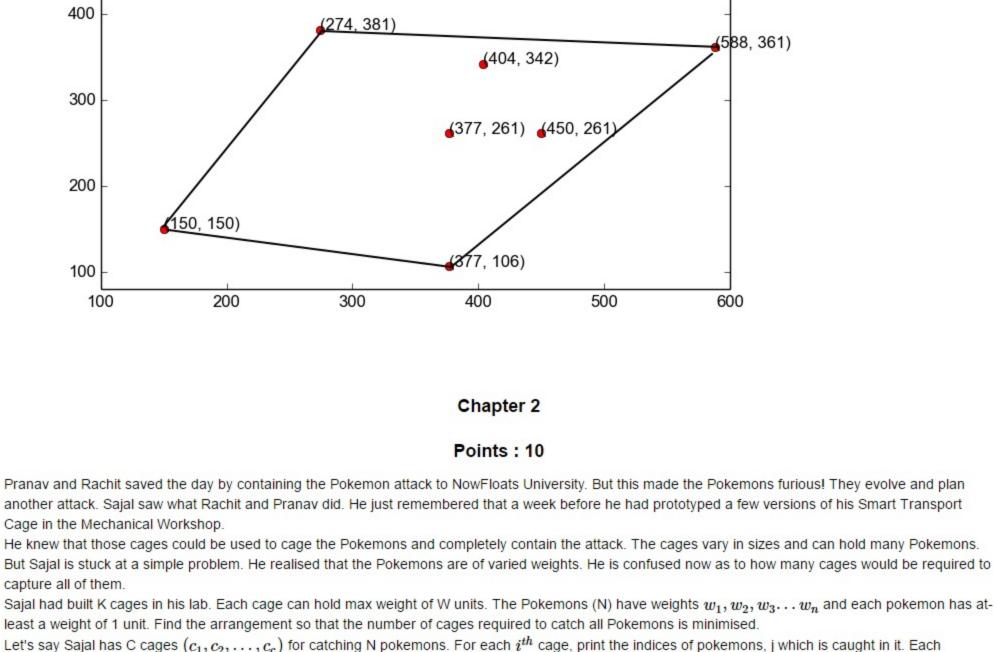
First cage: [1, 2, 3] [Contains Pokemons of weights 1, 2 and 3]

Second cage: [3] [Contains Pokemon of weight 3] Third cage: [4] [Contains Pokemon of weight 4] Fourth cage: [5] [Contains Pokemon of weight 5]

600

500

Graphical Explanation



Output 123

Explanation Number of Cages required (C): 4

Chapter 3

Points: 50

Each pokemon has a unique fighting style which can be represented using a number, say 12. It means this pokemon when attacked, would throw 12 fireballs

at the same time. Based on this unique feature the pokemon war-groups are being created. Each group plans to attack a particular zone in the college. Students get a bit surprised to see this move from the pokemons. Suddenly there is a pokemon group formations across the college. But the NowFloats university students do not give up. They get together and gather the best pokemon catchers. The engineering students create a unique device called "Fire-Ball Reverse Shield (FBRS)". A war-group is created even by the students, and each student owns FBRS device which has a unique property say 4. This

The students send a spy to find some hidden details of the pokemon strategy. And it does work. The spy is able to figure out number of pokemons in each war-group. This information is vital for the students and they start making equal sized groups to attack the pokemons. So a group of 5 pokemons would be attacked by a group of 5 students. We need your help so that we can predict the overall damage that would happen in the university campus assuming the

Assume that there are N pokemon war groups. Each war-group has a size of P pokemons. The i^{th} war-group has P pokemons with fighting style index as f_1, f_2, \dots, f_p . Here j^{th} pokemon in this group, when attacked would throw f_j fireballs at a time. Also say there are M student groups and each group has P students. The ith student-group has P students with FBRS index as $s_1, s_2 \dots s_p$. Here for the j^{th} student in this group, when one fireball is thrown at the

64

Example 2

Input

10 564

Note: First line is the value of C. So 2 cages required. The second two lines shows the pokemons in each of the cage. Cage 1 has two pokemons with weights 6 and 4 units. Cage 2 has one pokemon with weight 5 units You could also have placed the pokemons as [5,4] and [6]

Output

Pokemons are very frustrated looking at the smart fight back from the students of the NowFloats University. They come up with a group attack strategy.

means the FBRS device would fireback 4 fireballs if you throw one fire-ball at it.

worst case - every student group would fight with every pokemon war-group.

fireballs to fight back. Hence total damage at that location is 5+12 = 17.

Pokemons divide themselves into groups, and the groups started spreading around the university campus.

FBRS would throwback s_i new fireballs as response. When one group of pokemons and one student-group start fighting in a building, one pokemon throws the fireballs at the closest student and the closest student uses the FBRS to fight back only with that pokemon. Since all groups have the same size, so during every group fight one student fights with only Example student group (1,2) attacks pokemon group (5,6). Then the fight happens between 1 and 5, 2 and 6. Pokemon "5" would throw 5 fireballs at

student "1". Student "1" would throw back 5 fireballs as fight back. Pokemon "6" would throw 6 fireballs at student "2". Student "2" would throw back 12

34 12 45 Output 14 32

Note: The first fight is between student group (4,5) and pokemon group (3,4). So the damage is 32. The second fight is between student group (4,5) and

Chapter 4

Points: 10

Solutions

Chapter 1

Points: 50

Type: Geomerty/Math

Basically, the problem asks us to enclose the given set of points using the minimum number of lines. Applying some basic common sense and math, we can

Now let us pick the leftmost point p_0 since it's a certainty that this point is a boundary point. (You can pick the topmost, bottom most or rightmost points.)

Let us assume we are forming the polygon *counter-clockwise*. The next point is picked by picking a point to the right of the current point p_i which subtends

Finally, the fight is over! With your help, all Pokemons have been caught. This great victory, calls for a celebration. So, NowFloats University announces a huge party tonight. M boys and N girl would attend this party. Each boy wants a girl who is strictly shorter than him. A girl can dance with only one boy and

vice-versa. Given the heights of all the boys and girls tell whether it is possible for all boys to get a girl.

The first line contains T denoting the number of test cases.

The third contains N integers each denoting the height of girl.

Print YES if it is possible for each boy to get a girl else print NO.

The second line contains M integers each denoting the height of boy.

Each test case contains three lines. The first line contains M and N.

Example 2 Input

Total Number of fights: 2

Example 1

Explanation

Number of pokemon groups (N): 2 Number of student groups (M): 1 Size of pokemon group (P): 2 Size of student group (P): 2

Fighting Index of all pokemons (pokemon_array): [(3,4),(1,2)]

FBRS index of all student groups (fbrs_array): [(4,5)]

Damage Spread across the campus: [14, 32]

pokemon group (1,2). So the damage is 14.

Input:

Output:

Input

2

Input:

Output:

Input:

532946 3536379

67

33 876

Sample input 1:

567 output: NO YES

Sample input 2:

Input:

Output: YES

45 2568 38517

> There can be multiple solutions, the one's I have listed are the most common ones By Anwesh Mohanty

deduce that the polygon so formed will be _convex_ in nature.

the minimum angle heta wrt the vertical drawn through the current point

From this point p_0 , we can form the polygon either clockwise or counter-clockwise.

. We contiune like this till we arrive at our starting location p_0 and hence, enclose all the points inside

An illustrated diagram is shown below

For more info, please read the following link on [Convex Hulls](https://en.wikipedia.org/wiki/Convex_hull) Chapter 2 Points: 10 Type: Dynamic Programming In this question we can use a modified version of the classic **knapsack problem** of dynamic programming. For this case, the **priority/value** of each of the pokemon should be the same, and we have to maximise the value while staying under the capacity of the cage (denoted by the weights of the Get a cage (represented by empty dynamic array or linked list), and fill it with the most optimal way using the knapsack algorithm. Stop when all the pokemons are in the cages. In this way, you can be sure of using the minimum number of cages since you have filled all the cages optimally. Now all that's left to do is to print the number of cages and the content of each cage for full marks.

pokemons)

Chapter 3 Points: 50

Type: Math

Often real life problems seem very complicated and hard to decipher. But if you have the paitence to analyze them properly and don't freak out, they will break down to very trivial and simpler problems. Such is the case with this question. This problem reduces to a basic matrix multiplication problem, where you have to find the values of each $row \times column$ operation and sort those values in

 $\begin{bmatrix} 1 & 4 \\ 2 & 4 \\ 3 & 5 \end{bmatrix} \times \begin{bmatrix} 1 & 1 & 1 \\ 2 & 2 & 2 \\ 3 & 4 & 5 \end{bmatrix}$

[6, 12, 13, 26, 26, 53]

Chapter 4 Points: 10

girlfriend and the condition is satisfied. If we dont, the condition isn't satisfied. Similar thing can be achived by using a queue or heap

The reason for taking $heta_{min}$ is to ensure that all points remain inside the boundary we have defined. You can try and see for yourself

Note: A greedy solution may work, haven't thought about it. For those suggesting it, a mathematical proof would be appreciated

Let us consider the second example. Representing the data as follows, we get the value of $row \times column$ operations, store it, sort it and then display it

when the values are sorted

Type: Sorting/Queue's

ascending order.

This is a very easy question. There are a number of ways to solve it. The first method is to sort the two arrays. Then we can iterate through both the arrays. We move forward in the girl's array till we find a boy who is just taller

than him and then, move on to the next boy and repeat the process. If we reach the end of the boy's array, it means that all the boys have been assigned a