Problem A: Magic Trick

Setter: Md. Samiul Alam

Solution:

Just print **"3".**

Problem B: Cunning Comedian

Setter: Md. Mushfiqur Rahman Sanim

Solution:

1. Standard 0-1 BFS
2. If Mr. X takes minimum n minutes to go to any adjacent cell of the robot then he needs 2*n time to leave the house. So, if 2*n is less than D then he can successfully take the robots otherwise Mr. Y will keep them.

Problem C: K- String

Setter: Simanta Deb Turja

Category: Greedy/Binary Search

Solution:

1. If k is greater than the number of distinct characters then answer = k – number of distinct characters.
2. If k is equal to the distinct number of characters then answer = 0
3. If k is smaller than the number of distinct of characters then answer = sum first (number of distinct characters – k) after sorting the characters according to their frequencies.

Problem D: Bad Cook

Setter: Mir Imtiaz Mostafiz Naved

Category: Math

Solution:

1. If N is odd, answer = ((N / 2)! * (N / 2 + 1)!) – 1
2. If N is even, answer = 2 * ((N / 2)!)^2 + (((N / 2)!)^2 * (N / 2 - 1)) - 1;

Problem E: Digit Printing

Setter: Sifat Siddiqi Shishir

Category: Implementation

Solution: Just print what the problem ask for.

Problem F: Convert String to Palindrome

Setter: Rajon Bardhan

Category: Dynamic Programming

Solution:

1. 1. If the last character of the string is same as the first character, no deletion is needed and we recur for the remaining substring X[i + 1, j – 1]
2. 2. If last character of string is different from the first character, then we return one plus maximum of the two values we get by
   - deleting the last character and recursively try for the remaining substring X[i, j – 1]
   - deleting the first character and recursively try for the remaining substring X[i + 1, j]

Problem G: Buildings!

Setter: Sifat Rabbi

Category: Binary Search/Greedy

Solution: Just binary search for the height of the building.

1. If you can build a building of height H, try with a height bigger the H else try with a height smaller than H.

Problem H: Tour

Setter: Shakil Ahmed

Category: Bitmask DP

Solution: Since the number of songs is not so big, try all the subset of songs and check whether all student can perform at least one song. Then take the minimum number of songs from the subset.

Problem I: Help

Setter: Fahim Ferdous Neerjhor

Category: Geometry

Solution:

1. If the tree cannot be trapped with a triangle, then it must be on the intersection point of two diagonals of a quadrilateral.
2. As, there can only be at most n/2 lines that contain the tree, we can check all pairs of lines that contain the tree and check the quadrilateral formed from those pair of lines and take the one with smallest perimeter.

Problem J: Interesting Pile Game

Setter: Ibnul Tahsin Bhuiyan

Category: Game Theory, DP

Solution:

Let, F(m) = 1 if current player can win with m stones and

F(m) = 0 if he can't win with m stones (If both of them play optimally).

To calculate F(m) we should check if any valid move after taking i stones makes the next move returning 0 , If so then current player can take i stones and put other player in that loosing state in next move.

Otherwise current player can't find such a move and loses.

Problem K: Phi Numbers in Range

Setter: G. M. Shahariar Shibli

Category: Number Theory, Data Structures(Mo's Algorithm, SQRT Decomposition)

Solution:

1. Pre-generate Phi numbers up to 10^5
2. Co-ordinate compression on the values to map array values in range: [1, N].
3. Divide the array into blocks using sqrt decomposition. For each block maintain a bit set. The bitset has N bits and marks whether the i-th value (after coordinate compression) is present or not.
4. For all pairs of block numbers (i, j) find the distinct elements. For any (L, R), it is simply the bitwise OR of all bit sets in [L, R].

Alternative Approach: Mo's Algorithm + Segment Tree