LEBANESE AMERICAN UNIVERSITY
School of Arts and Science
Department of Computer Science and Mathematics

CSC 310: Algorithms and Data Structures

Lab IV

29. Sep. 2015

Important Note: Input should be read from a file named after the problem name. For example, problem 1 has the input file "problem1.in".

Problem 1

Given an array of ints, is it possible to choose a group of some of the ints, such that the group sums to the given target *T*?

Input

The first line of input is an integer *T* representing the number of test cases.
Each test case is made up of an integer *N* as the array length. *N* elements follow then followed by *T*

Output

For each test case, output Yes if it is possible to achieve *T* otherwise output *No*.

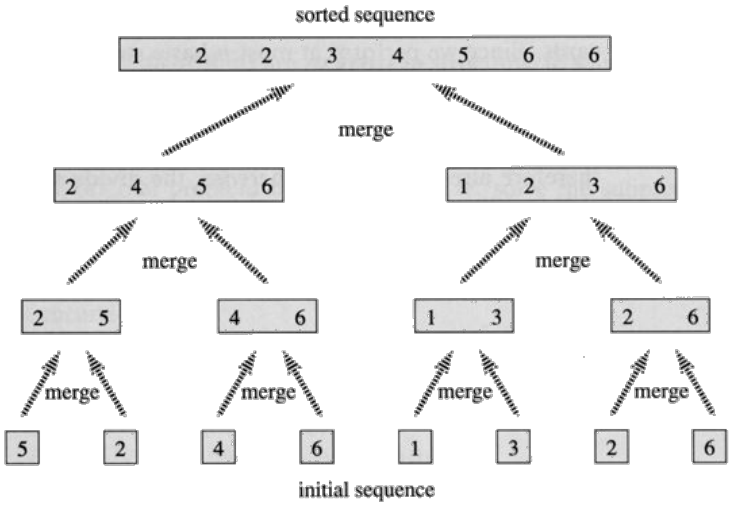
Sample Input	**Sample Output**
3 3 2 4 8 10 3 2 4 8 14 3 2 4 8 9	Yes Yes No

Problem 2

Given an array of integers, write a program that sorts the array using Merge Sort.

Recursively keep on dividing the array into subarrays until you reach a single element(a single element is considered sorted). After that keep on merging subarrays to produce a new subarray until 1 subarray remain which will be the sorted array. Given a sequence:

5, 2, 4, 6, 1, 3, 2, 6



Input

The first line of input is an integer T representing the number of test cases.
Each test case is made up of two lines. The first line has an integer N representing the number of elements in the array. The second line contains N integers representing the values in the array.

Output

For each test case, output the sorted array.

Sample Input	**Sample Output**
3 7 25 13 10 30 15 27 37 4 6 7 8 9 6 10 7 15 13 4 6	1 5 8

Problem 3

Given an integer array, write a program that checks if it is possible to divide the integers into two groups, so that the sum of the two groups is the same, with these constraints: all the values that are multiple of 5 must be in one group, and all the values that are a multiple of 3 (and not a multiple of 5) must be in the other.

Input

The first line of input is an integer *T* representing the number of test cases.

Each test case is made up of two lines. The first line has an integer *N* representing the number of integers in the array. The second line contains *N* integers representing the values in the array.

Output

For each test case, output "Yes" if the grouping is possible, else output "No".

Sample Input	**Sample Output**
3 2 1 1 3 1 1 1 4 3 3 5 1	Yes No Yes

Problem 4

Given a sequence of numbers, write a program that finds the length of the longest increasing subsequence. The subsequence is not necessarily contiguous nor unique. For example, given the following subsequence,

10, 22, 9, 33, 21, 50, 41, 60

The longest increasing subsequence in the previous example is 10, 22, 33, 50, and 60. The length of the subsequence is 5.

Input

The first line of input is an integer *T* representing the number of test cases.

Each test case is made up of two lines. The first line has an integer *N* representing the number of integers in the sequence. The second line contains *N* integers representing the values in the sequence.

Output

For each test case, output the length of the longest increasing subsequence.

Sample Input	**Sample Output**
2 8 10 22 9 33 21 50 41 60 5 5 8 12 6 9	5 3