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

CSC 310: Algorithms and Data Structures

Lab IX

Problem 1: [problem1.in]

Given a sequence of integers $S = a_1 a_2 \dots a_n$, you are required to find a subsequence of S such that the integers in the subsequence are in increasing order, and the length of the subsequence is maximized.

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

Each test case begins with an integer N which represents the length of the sequence.

The output of the program is the length of the longest increasing subsequence found in S .

Sample Input:

```
3
5 1 2 4 0 3
7 9 10 3 8 6 12 13
16 0 8 4 12 2 10 6 14 1 9 5 13 3 11 7 15
```

Sample Output:

```
3
4
6
```

Problem 2: [problem2.in]

Given two sequences of characters, find the length of the longest common subsequence present in both of them.

A subsequence is a sequence that appears in the same relative order, but not necessarily contiguous. For example, in the string "abcdefg", "abc", "abg", "bdf", "aeg" are all subsequences.

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

Each test case consists of two strings $str1$ and $str2$.

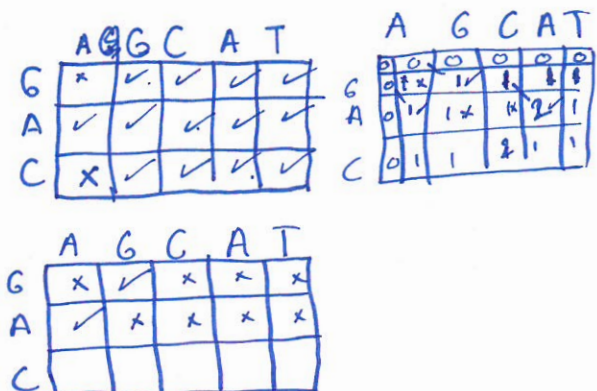
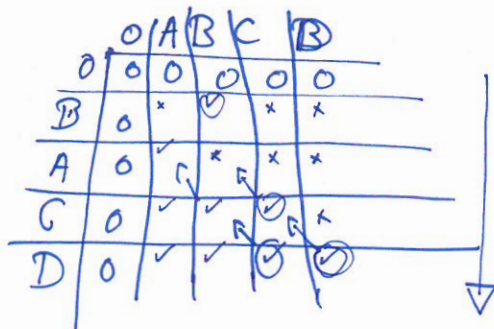
The output of the program is the length of the longest common subsequence found in $str1$ and $str2$.

Sample Input:

```
3
ABCD
BACD
AGCAT
GAC
XMJYAUZ
MZJAWXU
```

Sample Output:

```
3
2
4
```



Problem 3: [problem3.in]

Given a binary matrix (consisting of 0's or 1's), find the maximum square sub-matrix consisting of only ones.

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

Each test begins with two integers M and N representing the number of rows and the number of columns of the binary matrix.

For each test case, print the maximum size of the sub-matrix.

Sample Input:

```
2
6 5
0 1 1 0 1
1 1 0 1 0
0 1 1 1 0
1 1 1 1 0
1 1 1 1 1
0 0 0 0 0
4 3
0 1 1 0
1 1 1 1
0 1 1 0
```

Sample Output:

```
3
2
```

Problem 4: [problem4.in]

Given an array of integers where each element represents the max number of steps that can be made forward from that element. Write a function to return the minimum number of jumps to reach the end of the array (starting from the first element). If an element is 0, then cannot move through that element.

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

Each test begins with an integers N representing the number of elements in the array.

For each test case, print the minimum number of jumps needed to reach the end of the array.

Sample Input:

```
2
11 1 3 5 8 9 2 6 7 6 8 9
6 1 3 6 1 0 9
```

Sample Output:

```
3
3
```

Problem 5: [problem5.in]

Given a set of non-negative integers, and a value sum , determine if there is a subset of the given set with sum equal to given sum .

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

Each test begins with two integers N and S , representing the number of elements in the set and the given

sum.

For each test case, print "YES" if the set contains a subset equal to the given sum, else print "NO".

Sample Input:

2
6 9
3 34 4 12 5 2
5 6
8 12 4 9 1

Sample Output:

YES
NO