

CISC-365
2009
Lab # 2
Week of September 21

At the Cut-throat Investment Management Company, each stock analyst will lose their job if they cannot show a net profit over at least a specified number of **consecutive** days. It is your job to write the software that will be used to examine the analysts' records and make the decision to fire or keep each one (I will leave it up to you to decide if this is ethical or not).

Each analyst's record consists of a sequence of integers showing their daily earnings. The value of the integer gives the number of millions of dollars that the analyst earned or lost that day. For example, if an analyst's record is

2 -3 1 0 -1 2

then the analyst earned \$2 million the first day, lost \$3 million the next day, earned \$1 million the next day, and so on. Note that this analyst had a net profit of \$1 million at the end of the six days, but there is no period of five **consecutive** days on which she had a net profit.

The input consists of a single text file, with the following format:

The first line contains a single integer, indicating the number of analysts to be evaluated.

The second line contains a single integer, indicating the number of days of data available for each analyst.

The third line contains a single integer, indicating the minimum number of consecutive days over which the analysts must beat the market.

Each subsequent line gives the data for one of the analysts, with tabs between the integers.

The output should consist of one line for each analyst, containing either the word YES or the word NO

For example, the input file might look like this

```
2
5
3
4      -6      1      -4      3
8      -5      -5      4      -3
```

The output for this input file would be

```
NO
YES
```

The first analyst loses his job because there is no set of **3 or more consecutive days** over which he showed a net profit. The second analyst keeps her job because she showed a net profit over the first 4 consecutive days, and 4 is ≥ 3

An input file that you can use to test your program is available as a link from the course webpage.

As usual, you can use any of the languages supported in the lab. Also as usual, you are not required to

submit your solution. The TAs will be present during the lab to assist you and answer questions.

Make sure that you can determine the computational complexity of your solution.

Something to think about: As presented, this is clearly a decision problem, and your algorithm should certainly run in polynomial time ... so we can see that this problem belongs to the class **P**. In reality we would probably be more interested in the **optimization** version of the problem: for each analyst, determine the **longest** sequence of consecutive days over which she showed a net profit. Our efforts on the decision form of the problem are not wasted however. You should try to figure out how we can solve the optimization version with no more than n applications of the decision version, where n is the number of values in the data for the analyst.