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HS 2012
Exercise Sheet BGL Week III

Algorithms Lab

Exercise 1 – *Buddy Selection*

At the beginning Mathilda was very enthusiastic about her school's new buddy program. Students were to be grouped into pairs of buddies that were supposed to help each other out in their studies. As one of the first, Mathilda composed a short profile of herself describing her hobbies etc. The school director Dr. Fuzzman intended to use these profiles to find a suitable partner for every student. Alas, when Mathilda got the profile of her assigned partner she was very disappointed: Her partner was to be male, like soccer and be crazy about military gear. In short, her partner was the direct opposite of herself.

Mathilda went straight to Dr. Fuzzman to complain about the assignment. However he could not understand her discontent as Mathilda's partner liked math and chemistry just like Mathilda and enjoyed watching tv, just like her. Nodding to a huge stack student profiles he said with a mean smile: "I can give you the profiles of everybody and you will see that no better pairing is possible – it is a chance that everybody can be paired at all!". You have to help Mathilda.

Problem Given a list of students and several characteristics per student, check whether there is a buddy assignment in which partners share more common characteristics than in the solution of Dr. Fuzzman.

Input The first line of input contains the number of testcases. Every testcase starts with a single line containing three integers n, c, f separated by single spaces: $2 \leq n \leq 400, n \equiv 0 \bmod 2$ is the number of students, $c \leq 10$ is the number of characteristics per student and $f \geq 1$ is the minimum number of common characteristics over all pairs of buddies in Dr. Fuzzbrain's solution. The description of the n students follows. Each student is described by a single line containing c space separated keywords. Every keyword describes a characteristic. Keywords consist of less than 20 lowercase letters and no two keywords for one student are the same.

Output For every testcase, if there is a buddy assignment in which all pairs of buddies share more than f characteristics, output "`not optimal`" otherwise output "`optimal`". Two characteristics are considered equal only if they have identical keywords.

Sample Input

```
2
6 2 1
neat tv
tv soccer
neat soccer
soccer tv
neat soccer
```

```
neat tv
4 3 1
sports cooking cellphone
cooking cellphone cricket
cricket cellphone math
cooking piano cricket
```

Sample Output

```
not optimal
optimal
```