

WC '01 Suicidal P5 - The Mole

Time limit: 1.0s **Memory limit:** 16M

Woburn Challenge 2001 - Suicidal

So that was enough craziness. Three whole days of no studying was just too much and so orientation week was cut back to only 3 days (or was it?). Today is the first day of class – discrete math. The students are divided into groups of about 10 and are each given a 2-CNF formula (i.e. a formula in conjunctive normal form with 2 variables per clause – e.g., $(a \text{ OR } b) \text{ AND } (c \text{ OR } a) \text{ AND } (x \text{ OR NOT } y)$) for which they have to find a solution. Being engineers not in the math stream, they set out to solve the formula using the only method they know: brute force (i.e. trying all possible combinations for all the variables). There are however 2 twists on this sinister day.

1. Word has leaked out that this so-called "class" is really another test of their orientation week and that there is a mole within their group who is sabotaging their efforts to find a solution to the formula.
2. They have discovered that not all CNF formulas are satisfiable.

Therefore the following question arises: are they unable to find a solution because a) they are stupid, b) the mole is sabotaging their efforts or c) the formula is unsatisfiable.

Furthermore, being Waterloo keepers, they want to solve this problem in time $\mathcal{O}(n \log n)$ or less, where n is the number of clauses in the formula and \log is the base 2 logarithm.

Input Specification

The input consists of several 2-CNF formulas. Variables will be strings consisting of lowercase English characters (a - z) and digits (0 - 9). $\&$ is **AND**, $|$ is **OR** and $!$ is **NOT**. There will be spaces between $|$ and $\&$ and brackets around each clause.

There will be at most 10 000 variables per formula and at most 60 000 clauses per input file.

Output Specification

If a formula is satisfiable, print out `satisfiable`.

Otherwise, output `unsatisfiable`.

Sample Input

```
(a | b) & (a | c)
(a | a) & (!a | !a)
```

Sample Output

satisfiable
unsatisfiable