THE CODERS CUP

SOPHOMORE ROUND

QUESTION SET

Competition Rules:

Participation Guidelines:

- The Freshmen Coders Cup round spans for 1 hour. If you have completed the problem set before the allocated time, you may leave the competition room quietly, but inform the coordinator must.
- If you leave the room, you cannot return.
- You can discuss only with your team mates. If you discuss with anyone else, both team will be disqualified from the competition.

Submission Guidelines:

- Find sample inputs from net-storage.
- The problem submission will be through PC^2
- Clarifications to any problem can be obtained using PC^2. No in room managers will be responsible for problems/confusions in problem set given.
- You are allowed to use language
    - C, C++, C#.NET, JAVA.
- IDEs allowed are:
    - Bloodshed Dev C++ for C and C++
    - Visual Studio 2008 or 2010 for C#.NET
    - NetBeans 6.8 for JAVA.
- Make console projects for all afore mentioned IDEs.
- Show output on console; don't write on a text file.
- Do not prompt for input from console in the program.
- Remove system ("pause")/getch()/package inclusion statements from your choice before submitting.

Additional Guidelines:

- The solution will be judged by multiple input files and execution time.
- The decision of judge will stand unchallenged.
- Books, manuals, and any sort of guide materials are not allowed.
- Your team can be dis-qualified, if found hard coding for solutions.
- Your team can be dis-qualified, if found using internet.
- Your team can be dis-qualified, if found unfair in anyway.

Note: Save your work continuously, ACM NUCES is not responsible for any loss of work due to power failure or any other reason.

Question 1:

THE W OF WINGARDIUM LEVIOSA

The year is 1991. Harry, Ron, and Hermione are all new to Hogwarts. They are careless little kids since the wrath and plans of lord voldy-the-baldy have not begun to unroll yet. The kids are spending their time bouncing up and down the corridors and pathways of Hogwarts and meeting other witches and wizards.

Professor Flitwick, the Charms teacher, has decided to teach kids the levitation charm a.k.a Wingardium Leviosa. It is the spell which is used to make things hover above the ground. Witty Miss Hermione Granger has learned the charm in her first lesson so Professor Flitwick has decided to give her an additional exercise for mastering this charm.

Apart from being a teacher of Charms, Mr. Flitwick is also interested in English linguistics and string manipulation algorithms. He has designed some strings he likes to call the W strings.

```
a     #     d
a   b c   d
 a b    c d
  #       #
```

A W string, as shown above, has the following characteristics,

- There is always a hash '#' character at each angular point
- There must be exactly three hashes '#' in each W string
- The substrings from the beginning of string to the first hash '#', in between the hashes '#', and after the last hash '#' must have the same characters i.e. ee#jj#pp#ss is a W string, re#vv#ab#dd is not a W string.

Hermione Granger is given the task of devising an algorithm for finding the W strings from a given set of strings. Since she has no knowledge of programming and algorithms, she has called you for help!

INPUT:

The first line of input file contains an integer N (1 =< N =< 100) denoting the number of test cases. Then N lines follow. Each line contains a string S.

OUTPUT:

For each test case, determine whether the string is a W string or not. Print 1 for yes and 0 for no.

Sample:

Input	Output
4	0
abc#hh#pp#q	1
wwww#vv#ooo#ffffff	0
aa#bbb#ccc#d#eee	0
#www#t#kk	

Question 2:

SCOOBY DOO AND PALINDROMIC NUMBERS

The crew of The Mystery Machine: Fred, Daphne, Velma, Shaggy, and Scooby are solving a case at a mansion of an old mathematician. Apart from being plagued by monsters and ghosts, the mansion is also riddled with numerous mathematical puzzles. Nearly every doorway, locker, and storeroom is protected by a devious mathematical problem.

Since the crew needs to search thoroughly in every part of the mansion, they are solving each puzzle. Like every time, Fred, Daphne, and mastermind Velma Dinkley have parted their way from Scooby and Shaggy to search for clues, and they are making good progress.

Scooby and Shaggy, as usual, are focusing less on solving the mystery and more on finding some snacks. Scooby has sniffed a large packet of the Scooby snacks locked in a cabinet. Like every other, this cabinet also has a puzzle. Scooby and Shaggy are unable to solve this puzzle (no surprises there!).

The puzzle is about finding the palindromic numbers. Palindromic numbers are the same when read from left to right and from right to left. For example, 5115 and 929 are such numbers, while 31 and 125 are not.

Here is what makes this puzzle interesting. The number being palindromic or not depends on the base in which the number is written. For example, 21 is not palindromic in base 10 but it is palindromic in base 2 (because 21 = 10101). It is very interesting that any number becomes palindromic when it is written in an appropriate base.

Given a number N, write a program to help Shaggy and Scooby in computing the smallest base B such that N is palindromic when written in base B.

So are you going to help Scoobs to get his scooby snacks?

INPUT:

The first line contains t, the number of test cases (1 =< t =< 100). Then t test cases follow. Each test case consists of a number N written in one line (1 <= N <= 1010).

OUTPUT:

For each given number N, print a line containing the smallest base B such that N is palindromic in base B.

Sample:

Input	Output
3 1 4 21	2 3 2

Question 3:

A GAME OF CARDS

Chaos in The Gotham city has reached its limit. Hundreds of people are losing their lives every day. The Batman has had enough and he has called The nefarious Joker for a final showdown. The Joker has accepted the invitation but with conditions. He does not want a contest of muscle and strength; instead, he wants a fight of wit and cunning, played on the ground of intelligence and logicality.

The game is played on the deck of 24 cards, four of each: 1, 2, 3, 4, 5, 6. The deck is visible to both the contestants. Both the contestants alternately withdraw one card from deck and place it on a pile. The winner of the game is that player who places the last card such that the sum of all the placed cards does not exceed 31.

Your task is to determine the winner of the game.

The problem is that you will not be given a complete set of the placed cards in all the cases. Sometimes, you will be provided with a set of partially played game, you have to assume that the rest of the game is played by both the sides to the best of their ability, and this is where your logic skills are put to test. In these incomplete games, your task will be to speculate the winner of the game.

For example, in the following game Batman wins:

The Joker will always take the first turn.

3 5 6 6 5
Joker plays 3
Batman plays 5
Joker plays 6
Batman plays 6
Joker plays 5

3 + 5 + 6 + 6 + 5 = 25

This is a partially played game. Batman won this one. How? Here is how:

- The sum up to this point is 25, since the sum does not equal or exceed 31, the game is not over.
- The next turn is of Batman, since the deck is visible to both the players, Batman will pick the card of number 6 and place it. This will equal the sum of the pile to 31 and Batman will win the game.

Make sure that you design the algorithm correctly. Gotham City depends upon your code.

INPUT:

The first line of the input file contains an integer N(1 <= N <= 100) denoting the number of test cases. The N sequence of numbers follows.

OUTPUT:

The output file will contain the test case and the name of the winner in front of it. ‘A’ for Joker and ‘B’ for the Batman.

Input	Output
5 356656 35665 3566 111126666 552525	356656 B 35665 B 3566 A 111126666 A 552525 A

Question 4:

THE FLIGHT OF FRODO BAGGINS

Poor Frodo and Samwise have a monumental task to do. The fellowship of the ring has deserted them and it all now comes to them to take the ring to Mount Doom. Sauron is getting powerful every passing day and the enemy is marching towards Minas Tirith. They must take the ring to Mordor before the massive hosts of Orcs destroy every race on the face of the earth.

Frodo and Samwise have a set of pathways which will lead them to Mount Doom. Some of them are short and some of them are deviously long. They want to get there as quickly as possible so they need your assistance in determining the shortest possible route which will take them to Mount Doom.

It is not a simple task. One checkpoint cannot lead to all the other checkpoints. There is a specific pathway Frodo and Sam must take. The details of the pathways are described in the input file.

The clock is ticking.

INPUT:

Each test case starts with a line with three non-negative integers, 1 =< n =< 150,1 =< m =< 5000 and 1 =< q =< 1000, separated by single space, where n is the numbers of nodes in the graph, m the number of edges and q the number of queries. Nodes are numbered from 0 to n−1. Then follow m lines, each line consisting of three (space-separated) integers u, v and w indicating that there is an edge from u to v in the graph with weight 1 =< w =< 1000. Then follow q lines of queries, each consisting of two node numbers u and v (separated by a space), asking for the minimum distance from node u to node v.

Input will be terminated by a line containing 0 0 0, this line should not be processed.

OUTPUT:

For each query, output a single line containing the minimum distance from node u to v, or the word ‘Impossible’ if there is no path from u to v, or ‘-Infinity’ if there are arbitrarily short paths from u to v

Input	Output
4 3 4 0 1 2 1 2 2 3 3 1 0 2 1 2 3 0 3 3 0 0 0	4 2 Impossible 0