Problem A. Drying

Input file:	drying.in
Output file:	drying.out
Time limit:	2 seconds
Memory limit:	64 megabytes

It is very hard to wash and especially to dry clothes in winter. But Jane is a very smart girl. She is not afraid of this boring process. Jane has decided to use a radiator to make drying faster. But the radiator is small, so it can hold only one thing at a time.

Jane wants to perform drying in the minimal possible time. She asked you to write a program that will calculate the minimal time for a given set of clothes.

There are n clothes Jane has just washed. Each of them took a_i water during washing. Every minute the amount of water contained in each thing decreases by one (of course, only if the thing is not completely dry yet). When amount of water contained becomes zero the cloth becomes dry and is ready to be packed.

Every minute Jane can select one thing to dry on the radiator. The radiator is very hot, so the amount of water in this thing decreases by k this minute (but not less than zero — if the thing contains less than k water, the resulting amount of water will be zero).

The task is to minimize the total time of drying by means of using the radiator effectively. The drying process ends when all the clothes are dry.

Input

The first line contains a single integer n ($1 \le n \le 100\,000$). The second line contains a_i separated by spaces ($1 \le a_i \le 10^9$). The third line contains k ($1 \le k \le 10^9$).

Output

Output a single integer — the minimal possible number of minutes required to dry all clothes.

Example

drying.in	drying.out
3 2 3 9 5	3
3 2 3 6 5	2

Problem B. Godfather

Input file:	godfather.in
Output file:	godfather.out
Time limit:	2 seconds
Memory limit:	64 megabytes

Last years Chicago was full of gangster fights and strange murders. The chief of the police got really tired of all these crimes, and decided to arrest the mafia leaders.

Unfortunately, the structure of Chicago mafia is rather complicated. There are n persons known to be related to mafia. The police have traced their activity for some time, and know that some of them are communicating with each other. Based on the data collected, the chief of the police suggests that the mafia hierarchy can be represented as a tree. The head of the mafia, Godfather, is the root of the tree, and if some person is represented by a node in the tree, its direct subordinates are represented by the children of that node. For the purpose of conspiracy the gangsters only communicate with their direct subordinates and their direct master.

Unfortunately, though the police know gangsters' communications, they do not know who is a master in any pair of communicating persons. Thus they only have an undirected tree of communications, and do not know who Godfather is.

Based on the idea that Godfather wants to have the most possible control over mafia, the chief of the police has made a suggestion that Godfather is such a person that after deleting it from the communications tree the size of the largest remaining connected component is as small as possible. Help the police to find all potential Godfathers and they will arrest them.

Input

The first line of the input file contains n — the number of persons suspected to belong to mafia ($2 \le n \le 50\,000$). Let them be numbered from 1 to n.

The following $n-1$ lines contain two integer numbers each. The pair a_i, b_i means that the gangster a_i has communicated with the gangster b_i. It is guaranteed that the gangsters' communications form a tree.

Output

Print the numbers of all persons that are suspected to be Godfather. The numbers must be printed in the increasing order, separated by spaces.

Example

godfather.in	godfather.out
6 1 2 2 3 2 5 3 4 3 6	2 3

Problem C. Jenny's First Exams

Input file:	jenny.in
Output file:	jenny.out
Time limit:	2 seconds
Memory limit:	64 megabytes

First exams cause many problems to Jenny. One problem is that Jenny needs the whole day to prepare for any exam (good news is she needs only one day for any preparation). Another problem: in a day of the exam Jenny is not able to study anything. And the main problem: Jenny must prepare for i-th exam not earlier then t_i days before it, in the other case she forgets absolutely everything by the time of the exam.

Jenny wants to start preparations as later as possible but she has to pass all exams. Help Jenny to choose a day when she must start.

Input

The first line of the input file contains n ($1 \le n \le 50\,000$) — the number of exams. The following lines describes exams.

Each description consists of three lines. The first line is the name of the subject (a string containing only Latin letters, maximal length is 10). The second line is the date of the exam in format

`dd.mm.yyyy`. The third line contains t_i for this exam ($1 \le t_i \le 100\,000$).

All exams take place in interval from 01.01.1900 to 31.12.2100.

Recall that if the year is divisible by 4 and is not divisible by 100, or is divisible by 400 — it is the leap one. Such year has 366 days, the additional day is on February 29.

Output

Output the latest date when Jenny may start preparation and pass all exams. Write date in format `dd.mm.yyyy`. If it is impossible to pass all the exams, output the word "`Impossible`".

Example

jenny.in	jenny.out
3 Philosophy 01.01.1900 1 Algebra 02.01.1900 3 Physics 04.01.1900 10	30.12.1899
2 Philosophy 29.06.2005 1 Algebra 30.06.2005 2	Impossible

Problem D. K Best

Input file:	`k.in`
Output file:	`k.out`
Time limit:	2 seconds
Memory limit:	64 megabytes

Demy has n jewels. Each of her jewels has some value v_i and weight w_i.

Since her husband John got broke after recent financial crises, Demy has decided to sell some jewels. She has decided that she would keep k best jewels for herself.

She decided to keep such jewels that their specific value is as large as possible. That is, denote the specific value of some set of jewels $S = \{i_1, i_2, \ldots, i_k\}$ as

$$s(S) = \frac{\sum_{j=1}^{k} v_{i_j}}{\sum_{j=1}^{k} w_{i_j}}.$$

Demy would like to select such k jewels that their specific value is maximal possible. Help her to do so.

Input

The first line of the input file contains n — the number of jewels Demy got, and k — the number of jewels she would like to keep ($1 \le k \le n \le 100\,000$).

The following n lines contain two integer numbers each — v_i and w_i ($0 \le v_i \le 10^6$, $1 \le w_i \le 10^6$, both the sum of all v_i and the sum of all w_i do not exceed 10^7).

Output

Output k numbers — the numbers of jewels Demy must keep. If there are several solutions, output any one.

Example

k.in	k.out
3 2 1 1 1 2 1 3	1 2