Problem A. Altitude

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	512 megabytes

In a new computer game "Take Them All" the player controls a drone that flies forward and has to pass through all the checkpoints on its way. Each checkpoint is located at some altitude (possibly negative), and the player has to adjust the altitude of the drone in order to pass through this checkpoint.

You are given a sequence of n **distinct** integers $a_1, a_2, \ldots, a_n$. The i-th checkpoint is located at altitude a_i. The level is cyclic: the checkpoint with index n is followed by the checkpoint with index 1 again. The triple of indices (not necessarily distinct) i, j and k is *tricky* if $a_i < a_j > a_k$.

The *length* of the triple i, j and k is defined as the minimum number of segments between neighbouring checkpoints that the drone needs to fly through to get from i to j and then from j to k. Formally, we denote d_1 as $j - i$ if $j > i$ and $n - (i - j)$ if $j \le i$ and d_2 as $k - j$ if $k > j$ and $n - (j - k)$ if $k \le j$. Then, the length of the triple i, j and k is equal to $d_1 + d_2$.

The goal of this task is to find a tricky triple of the minimum possible length.

Input

The first line of input contains a single integer n ($2 \le n \le 100\,000$) — the number of checkpoints.

The second line contains the sequence of checkpoint altitudes $a_1, a_2, \ldots, a_n$ ($-10^9 \le a_i \le 10^9$). It is guaranteed that all values a_i are distinct.

Output

Output three integers i, j and k ($1 \le i, j, k \le n$) that define the tricky triple of the minimum possible length. If there are several optimal answers, print any of them.

Examples

standard input	standard output
2 20 16	2 1 2
4 2 0 1 6	3 4 1
5 16 10 20 1 6	2 3 4

Note

Please note that triple 1, 4, 3 is not a correct answer for the second sample. This triple is tricky, but its length is bigger than the length of the triple 3, 4, 1.

Problem B. Blocking Buffer

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	512 megabytes

New microarchitecture for parallel programming has a pipe buffer to organize the data exchange between two execution threads. The buffer is circular and can contain no more than l bytes. At the beginning of the program execution the buffer is empty. The first thread sometimes tries to write to the buffer, and it always uses blocks of size w bytes. The second thread sometimes reads from the buffer in blocks of size r bytes each. All write operations put the new data at the end of the pipe buffer and all read operations take the data from the beginning of the pipe buffer, so empty positions always form one continuous segment.

Both write and read operations are blocking. It means that, if the first thread tries to write the block of data to the buffer but there is not enough space there, the thread stops and waits until there will be at least w empty bytes in the buffer. Similarly, if the second thread tries to read the block of data from the buffer but there are less than r bytes of data left, the thread stops and waits until there will be enough new data in the buffer.

In this particular problem, a *deadlock* is a situation when the first thread is blocked because there is not enough space in the buffer to fit a new block of size w, and the second thread is blocked because there is not enough data in the buffer to read a new block of size r.

Your goal is to determine whether there exists such a sequence of reads and writes from two threads that will result in a deadlock. Note that write operations are only performed by the first thread and read operations are only performed by the second thread.

Input

The only line of input contains three integers l, r and w ($0 < l, r, w \le 10^{18}$, $r \le l$, $w \le l$).

Output

If there exists a sequence of reads and writes that result in a deadlock, print "`DEADLOCK`" (without quotes) in the only line of the output. Otherwise, print "`OK`" (without quotes).

Examples

standard input	standard output
5 3 4	DEADLOCK
5 2 3	OK

Note

One of the ways to obtain the deadlock in the first sample is:

1. The first thread writes a block of size 4 to the buffer.
2. The second thread reads a block of size 3. There is 1 byte of data left in the buffer.
3. The first thread writes a block of size 4. The buffer is full now.
4. The second thread reads a block of size 3. There are 2 bytes of data left in the buffer.
5. The second thread tries to read a block of size 3, but there is not enough data in the buffer, so the thread is blocked.
6. The first thread tries to write a block of size 4, but there it not enough free space in the buffer, so the thread is also blocked. The deadlock just happened.

Problem C. Catch Me If You Can

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	512 megabytes

This is an interactive problem.

Carl Hanratty is a dour FBI agent usually pursuing criminals in the financial sector, but he also likes to play his Pokemon GO game in a park during his time off.

He still plays an old school version of the game with a working pokemon radar. This radar shows one, two or three paws telling him how far the pokemon is from the current player's location. Three paws means that the pokemon is not farther than $3 \cdot r$ meters from the player, two paws mean that it is not farther than $2 \cdot r$ meters, and one paw means not farther than r meters. It is known that the value of r is a real number between 1 and 100 meters, inclusive, but the exact value of r is unknown to Carl.

Since Carl is a very good FBI agent and always strives for excellence, he wants to improve his pokemon catching practice by utilizing a secret FBI analytical task force. You are a part of that analytical team. You will receive field information from Carl, and then direct his movements in order to find and catch the pokemon.

You may assume all the movements are happening on a two-dimensional plane. Carl is located at the point with coordinates $(0, 0)$, and he just saw the pokemon on the radar for the first time (with three paws). This means Carl is initially located $3 \cdot r$ meters away from the pokemon. To communicate with Carl, you are allowed to perform no more than 5 iterations of the following process:

1. You transmit to Carl an angle in degrees: the direction in which he should move. The angle might be any real value from 0 to 360 inclusive.
2. Carl goes straight in this direction until the radar indication changes. This happens if he catches the pokemon (then the game stops), reaches the radar zone that is closer to the pokemon (the number of paws on the radar decreases by 1) or reaches the radar zone that is farther from the pokemon (or pokemon disappears from the radar at all). In the last case, Carl immediately makes a step back to the previous three-paw zone, as he doesn't want to move in a direction which is definitely wrong.
3. Carl tells you the exact distance he traveled and the current number of paws p ($1 \le p \le 3$) of the radar zone. It means the current distance to the pokemon is $p \cdot r$. Note that the communication counts even if Carl returned a distance of 0 which means that walking any positive distance in the given direction will immediately result in radar indication change.

During your 5-th communication with Carl, his behavior is a bit different. As he knows he won't be able to get any instructions from you anymore, he ignores all the radar zones and moves straight in the direction you gave him until either he finds the pokemon or it totally disappears from the radar.

It is guaranteed that the pokemon location is fixed and does not change during each session of the game. It is also guaranteed that the unknown real value r lies between 1 and 100, inclusive.

Interaction Protocol

You have at most 5 communication attempts. To start the next attempt, your program must provide a direction to Carl by printing one real value a ($0 \le a \le 360$) on a separate line. After that, your program gets the result on the next line of the standard input.

If at any moment of time Carl is within $r/10$ from the actual pokemon location, he instantly catches it and returns you one final word "`Gotcha!`" (without quotes).

Otherwise, if you run out of communication sessions with Carl and he was unable to find the pokemon during the last move, he sends you one final line "`The pokemon ran away!`" (without quotes).

In all other cases, Carl transmits you the traveled distance d with at least ten digits after the decimal point and the integer number of paws p ($1 \le p \le 3$) of the new radar zone. These two numbers are separated by one space character.

Your communication with Carl must stop when the pokemon is caught or ran away.

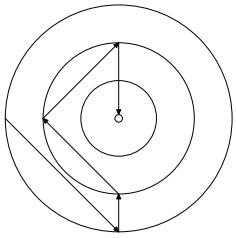
Examples

standard input	standard output
0.0000000000 3 3.0000000000 2 0.0000000000 2 0.0000000000 2 Gotcha!	90 0 270 90 0
14.1421356237 3 3.3333333333 2 9.4280904158 2 9.4280904158 2 Gotcha!	315 90 135 45 270

Note

In the first sample input, pokemon is sitting at point $(9, 0)$.

In the second sample input, pokemon is sitting at point $(10, 0)$.



The pipe from your program to the interactor program and the pipe back have limited size. Your program must read from the standard input to avoid deadlock. Deadlock condition is reported as "`Time Limit Exceeded`".

To flush the standard output stream, use the following statements:

In C, use `fflush(stdout);`

In C++, use `cout.flush();`

In Java, use `System.out.flush();`

In Python, use `sys.stdout.flush()`.

If your program receives an `EOF` (end-of-file) condition on the standard input, it MUST exit immediately with exit code 0. Failure to comply with this requirement may result in "`Time Limit Exceeded`" error.

Problem D. Demolition Time

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	512 megabytes

Darkwing Duck is in trouble again! As soon as he returned to his town, it was announced that Negaduck has been attacking the place. As a proper villain, he is going to rob some set of **consecutively** placed buildings and escape with the loot.

The panorama of the town can be represented as a string s where each character represents the shape of the corresponding building. Different buildings may have the same shape, and hence are represented in the string by equal characters. Negaduck has picked some string p as his robbery plan. Fortunately, this string p has become known to the police. Now they want to find all the buildings which are in danger, but there is one complication on the way.

By the order of the new Mayor, some of the buildings in the town should be demolished. They are demolished one after another **in the order they appear** in the string s: from left to right. This demolition plan is well known in the city.

The robbery can take place anytime: before all planned demolitions, after them, or between the demolition of any two buildings which follow one another in the demolition plan. However, no demolitions can happen during the robbery.

Negaduck robs buildings strictly according to his robbery plan from left to right. He does not skip any buildings except for demolished ones. He can execute only the whole plan. Nevertheless, there can exist a lot of subsets of buildings which are in danger of being robbed.

Formally, consider string t we get from s by removing the characters corresponding to already demolished buildings. Note that string t is initially equal to s but changes after each demolition. Negaduck can rob a subset of buildings if there exists a moment of time when this subset forms a substring of t, and this substring is equal to string p.

Your task is to find the exact amount of subsets which are in danger of being robbed.

Input

The first line of input contains a non-empty string s consisting of lowercase and uppercase English letters, digits, characters '`,`', '`!`', '`_`', '`.`' and '`-`' representing the buildings in the town from left to right. The length of this string doesn't exceed 1 000 000.

The second line of input contains a string p consisting of lowercase and uppercase English letters, digits, characters '`,`', '`!`', '`_`', '`.`' and '`-`' representing the Negaduck's plan from left to right. The length of this string doesn't exceed 1 000 000.

Note that uppercase and lowercase English letters are considered different.

The third line of input contains one integer m ($0 \le m \le |s|$) — the length of the Mayor's demolition plan.

The next line contains an **increasing** sequence of integers $x_1, x_2, \ldots, x_m$ ($1 \le x_1 < \ldots < x_m \le |s|$) — the indices of buildings in order they should be demolished.

Output

Output one integer: the number of different subsets of buildings that can be robbed according to Negaduck's plan.

Example

standard input	standard output
aabbcc abc 3 2 4 5	2

Note

The answer for the given sample is 2 because the following possible sequences of buildings can be robbed: 1 3 5 (after two building demolitions) and 1 3 6 (after all three building demolitions).

Problem E. Economy Printing

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	512 megabytes

Helen has a large document consisting of 10^9 pages numbered from 1 to 10^9. She is given the list of indices of pages $p_1, p_2, \ldots, p_n$ she needs to print. Helen likes nature and cares a lot about the trees, so she wants to print exactly one copy of each of these pages and no copies of any other pages. In order to achieve this she composes the printing instruction using tokens of four types:

1. Single index "i". This token asks to print the page number i.
2. Range "i_1-i_2". This token asks to print all pages from i_1 to i_2 inclusive.
3. Even range "i_1%i_2". Here, both i_1 and i_2 should be even. This token asks to print the pages with even indices from i_1 to i_2 inclusive.
4. Odd range "i_1#i_2". Here, both i_1 and i_2 should be odd. This token asks to print the pages with odd indices from i_1 to i_2 inclusive.

Printing instruction is composed using any number of tokens of any types, separated by commas. Note that each page is printed any time it matches a token, but Helen wants each page from her list to be printed only once, and she doesn't want to print any page not from her list. As Helen also wants to save some space on her screen, she asks you to find the correct printing instruction of minimum possible length. The length of the instruction is equal to the **total number of characters** that are used to write it down.

Input

The first line of the input contains a single integer n ($1 \le n \le 200\,000$) — the number of pages Helen wants to print.

The second line contains a list of n distinct indices of pages p_i ($1 \le p_i \le 10^9$).

Output

Print one line containing the shortest possible instruction which will print all the pages from the list exactly once and won't print any other pages. If there are several optimal answers, print any one of them.

Example

standard input	standard output
15 1 18 20 5 14 11 3 16 17 8 4 10 6 15 21	11,21,20,14-18,4%10,1#5

Note

The length of the answer to the given example is 23.

Problem F. Format

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	512 megabytes

In C/C++, format "`%[..]`" is used by `scanf` to read a string consisting of characters defined by this format string.

The left bracket is followed by a sequence of characters and a right bracket. The sequence f of characters between the brackets defines a set of accepted characters. Only characters with ASCII codes from 32 (space) to 126 ('`~`') inclusive are acceptable there. In this problem, the characters '`^`', '`]`' and '`-`' are used in format only as control characters.

If the first character of sequence f is not a circumflex ('`^`'), then the sequence f defines the set of available characters s, and the function reads all characters up to the first character that is not in the set s or the end of the input. If the first character of sequence f is '`^`', then it must be followed by a **non-empty** sequence of characters defining the set of forbidden characters s, and the function reads all characters up to the first character in the set s or the end of the input.

A group of characters with sequential ASCII codes may be abbreviated as an *interval*: first character in the group, '`-`' (minus sign, ASCII code 45), last character in the group. For example, interval "`B-Q`" defines a set of uppercase English letters from '`B`' to '`Q`' inclusive.

A string is called *alphanumeric* if it consists only of upper- and lowercase English letters, digits and spaces. Given an alphanumeric string t, build the "`%[..]`" format which:

1. Accepts string t: when this string is given as input, scanf reads it fully.
2. Accepts the least possible number of other alphanumeric strings of length $|t|$.
3. Has the minimum possible length (as a string) among all format strings that conform to all the points above.
4. Is lexicographically smallest among all format strings that conform to all the points above.

Input

The first line of input contains one non-empty string t consisting only of upper- and lowercase English letters, digits and spaces. It is guaranteed that this string is no longer than 100 000 characters, does not have leading or trailing spaces, and does not have two or more consecutive spaces.

Output

Print the answer as a format string "`%[..]`" (without quotes).

Examples

standard input	standard output
bc0123456789ABCDEFxxyyzz	%[!-Fbcx-z]
012345678 abcdefABCDEF	%[^9G-Zg-z]
01234567 abcdefABCDEF	%[-7:-F[-f]

Note

Note that the format string may contain non-alphanumeric characters. For example, in sample 1, '`!`' (character with ASCII code 33) is used instead of '`0`' because the number of alphanumeric characters between '`!`' and '`F`' and between '`0`' and '`F`' is the same, but format string with '`!`' is lexicographically smaller.

String a is lexicographically smaller than string b if b is not a prefix of a and one of two conditions hold:

1. a is a prefix of b.
2. Let k be the first positions where a and b differ. The ASCII code of the character at position k in the string a is smaller than ASCII code of the character at position k in the string b.

Hint:

32		48	0	64	@	80	P	96	‘	112	p
33	!	49	1	65	A	81	Q	97	a	113	q
34	"	50	2	66	B	82	R	98	b	114	r
35	#	51	3	67	C	83	S	99	c	115	s
36	$	52	4	68	D	84	T	100	d	116	t
37	%	53	5	69	E	85	U	101	e	117	u
38	&	54	6	70	F	86	V	102	f	118	v
39	’	55	7	71	G	87	W	103	g	119	w
40	(	56	8	72	H	88	X	104	h	120	x
41	)	57	9	73	I	89	Y	105	i	121	y
42	*	58	:	74	J	90	Z	106	j	122	z
43	+	59	;	75	K	91	[	107	k	123	{
44	,	60	<	76	L	92	\	108	l	124	|
45	-	61	=	77	M	93	]	109	m	125	}
46	.	62	>	78	N	94	^	110	n	126	~
47	/	63	?	79	O	95	_	111	o		

Problem G. Great Guest Gathering

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	512 megabytes

Pizza Factory has decided to host a great guest gathering for promotional purposes and has invited n their most valuable guests. The chef has prepared n plates, each having exactly one pizza on it. All pizzas are of different types. The chef doesn't know the preferences of guests, so he wants everyone to be able to taste pizza of each type.

In order achieve that, he divided each pizza into n equal slices, and now he wants to shuffle them into n "festival" pizzas, each containing one slice of each type. He has one additional small plate that can hold only one slice of any pizza.

One chef's move can be either:

- Taking a slice of pizza from some plate and placing it on the free space on another plate. Note that each plate can contain no more than n slices simultaneously.
- Taking a slice of pizza from some plate and placing it on the additional small plate, if this plate is free.
- Taking a slice of pizza from the additional small plate and placing it on the free space on another plate.

Your task is to help chef come up with the shortest possible list of moves he has to make in order to prepare n "festival" pizzas.

Input

The first line of the input contains a single integer n ($2 \le n \le 100$).

Output

Print the shortest list of moves that is required to make n "festival" pizzas.

Print each move on a separate line of output as three integers a, b and c ($0 \le a, c \le n$, $1 \le b \le n$). A line containing "$a\ \ b\ \ c$" means that the chef moves a slice belonging to pizza b from plate a to plate c, where plate 0 denotes the additional small plate.

Example

standard input	standard output
3	1 1 0 3 3 1 2 2 3 1 1 2 2 2 1 3 3 2 0 1 3

Problem H. Hockey Cup

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	512 megabytes

Recently the World Hockey Cup was held once again, 12 years after the previous one! During the group stage, all teams were divided into groups, four teams in each of them. The group stage is played using a round robin system: each team plays with each other team exactly once. Thus, each group will feature six games in total. After all games are played, two best teams from each group advance to the knockout stage. We are only interested in the group that contains the Russian team.

Currently five out of six games were already played and their results are known. We want to check whether the Russian team is guaranteed to advance to the next stage, or at least has a chance to advance.

The rules for the group stage of the competition are the following. Each team is playing exactly one game against each of its opponents. If the game's prime time finishes with a tie (teams' scores are equal), then teams play overtime **until one of them scores**, and that team is declared the winner of the game. Each team gets 2 points for each victory, 1 point for each loss in overtime and no points for losses in the prime time.

At the end of the round robin, teams are ordered by the total number of points earned. If two or more teams have the same number of points, the tie-breaking procedure is applied.

If only two teams are tied, the tie is always broken by the result of their head-to-head game. If there are three or four teams tied, the following values are calculated (the bigger the better) based on the results **of all games played by the team**, not only games between the tied teams.

1. The total number of wins.
2. The total number of wins in prime time.
3. The goal differential: the number of goals scored by the team minus the total number of goals conceded by the team.
4. The total number of goals scored.

The rules are applied **one by one** until all four-way and three-way ties are broken. At this point, if any two-way ties remain, each of them will automatically be broken by the head-to-head game between the two tied teams (see two-way tie criteria outlined above) and not by continuing on with any additional steps.

If there is still a tie among some teams after all the above steps, those teams will be ranked in **random order**.

Note that in the last game, each team can score **any** number of goals.

Input

The first five lines of input contain the results of the first five games, each on its own line. Each of these lines contains four or five tokens separated by single spaces: $team_A$ $team_B$ $goals_A$ $goals_B$ ($team_A \neq team_B$; $goals_A \neq goals_B$; $0 \leq goals_A, goals_B \leq 10$; $team_A, team_B \in$ {"`Russia`", "`Sweden`", "`Finland`", "`NA`"}). If the teams were playing overtime in this game, the corresponding line ends with the fifth token "`OT`" separated by a single space character.

It is guaranteed that each two teams were playing against each other at most once, and the number of goals in each overtime game differs exactly by 1.

The last line contains the names of two teams that are about to play the last game in that group separated by a single space character. It is guaranteed that they haven't played their game yet.

Output

If the team with name "Russia" is advancing to knockout stage irrelevant of the results of the group's last game, output a single line with text "`Already in playoff!`" (without quotes).

Otherwise, if the team with name "Russia" is not advancing to knockout stage no matter what the result of the group's last game is or what the result of random ranking is, output a single line with text "`No chance`" (without quotes).

Otherwise, output a line with text "`Believe in playoff!`" (without quotes).

Examples

standard input	standard output
Russia Sweden 1 2 Finland NA 1 4 NA Russia 3 4 Finland Sweden 0 2 NA Sweden 4 3 OT Finland Russia	Believe in playoff!
Russia Sweden 1 0 OT Finland NA 0 5 NA Sweden 5 0 Finland Russia 0 1 OT Russia NA 0 5 Sweden Finland	Already in playoff!
Russia Sweden 0 1 Finland NA 0 1 NA Russia 0 5 Sweden Finland 0 1 Russia Finland 0 1 NA Sweden	No chance
Russia Sweden 0 4 Finland NA 0 1 NA Sweden 0 1 Finland Russia 4 0 Sweden Finland 1 0 Russia NA	Believe in playoff!
Russia Sweden 0 1 Finland NA 10 0 Sweden Finland 0 10 Russia NA 1 0 Finland Russia 10 0 NA Sweden	Believe in playoff!

Note

In the first sample, any win should be sufficient for the team "Russia".

Consider the fourth sample.

Team	Points	Total Wins	Prime Time Wins	Goal Differential	Goals Scored
Sweden	6	3	3	6	6
NA	2	1	1	0	1
Finland	2	1	1	2	4
Russia	0	0	0	-8	0

If the Russian team wins 11 to 0 it qualifies to the knockout stage. If the team "Russia" team wins 10 to 0, then three teams use tiebreaking rules for places 2–4. The total number of wins and the total number of wins in prime time are equal for all these teams. By goal differential, the team "NA" takes the fourth place. After that, tiebreaking rules are applied again to determine the second place. Team "Finland" is better as it won the game between the two teams (the fact that team "Russia" scored more is ignored).

Consider the fifth sample.

Team	Points	Total Wins	Prime Time Wins	Goal Differential	Goals Scored
Finland	6	3	3	30	30
Sweden	2	1	1	-9	1
Russia	2	1	1	-10	1
NA	0	0	0	-11	0

The only outcome that gives team "Russia" a chance to advance to the knockout stage is win of team "NA" over team "Sweden" in regular time with score 1 to 0. In this case, all three teams will have identical results, and team "Russia" has a chance to get to the knockout stage by random.

Problem I. Interesting Interactive Idea

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	512 megabytes

This is an interactive problem.

The jury has chosen two integers x_0 and m ($0 \le x_0 < m \le n$). You are given a number n: the upper limit for m.

Your task is to guess both integers x_0 and m.

In order to do that, your program will ask questions in the form "a_i" ($1 \le a_i \le n$) where $i = 1, 2, \ldots$ is the index of the question.

After each question, the jury calculates $x_i = (x_{i-1} + a_i) \mod m$ and tells you the result of comparison between x_i and x_{i-1} ('`>`', '`<`' or '`=`').

The last question must be in the form "`0` x_0 m".

Your program must guess the numbers x_0 and m by asking no more than 2016 questions.

Input

The first line of the input contains a single integer n ($1 \le n \le 10^{18}$). After that, for each new question in the form "a_i", the input will contain a line with a single character: the result of comparison between x_i and x_{i-1}. If $x_i > x_{i-1}$ then the result is '`>`', if $x_i < x_{i-1}$ then the result is '`<`', otherwise the result is '`=`'.

Output

Your program must output each question on a separate line. Each question except the last one must consist of a single integer a_i ($1 \le a_i \le n$). The last question must be in the form "`0` x_0 m" ($0 \le x_0 < m \le n$).

Example

standard input	standard output

2
 	
`<`
 	
`>`
 	
`<`
	1
	
	1
	
	1
	
	0 1 2

Note

The pipe from your program to the interactor program and the pipe back have limited size. Your program must read from the standard input to avoid deadlock. Deadlock condition is reported as "`Time Limit Exceeded`".

To flush the standard output stream, use the following statements:

In C, use `fflush(stdout)`; in C++, use `cout.flush()`; in Java, use `System.out.flush()`; in Python, use `sys.stdout.flush()`.

If your program receives an `EOF` (end-of-file) condition on the standard input, it MUST exit immediately with exit code 0. Failure to comply with this requirement may result in "`Time Limit Exceeded`" error.

Problem J. Juice Degustation

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	512 megabytes

Vasya plans a juice degustation party at his house. There are n different kinds of juice from Vasya's favorite parts of the world, such as Loire Valley in France, Napa Valley in California and Valle Central in Chili. He has bought c_i liters of juice of kind i.

To store the juice till the beginning of the party, Vasya needs to buy some special barrels. Each barrel is large enough to fit any amount of juice. Then, he distributes the different kinds of juice between the barrels following the special rules below:

1. All the juice of all kinds should be distributed into barrels.
2. Each barrel may contain juice of no more than two different kinds.
3. Any two barrels should have the same total amount of juice.

Note that the amount of juice in the barrels might be non-integer. Some barrels are allowed to contain only one kind of juice. Each kind of juice can be used in any number of barrels. Two different kinds of juice can be mixed in a barrel in any proportion.

The barrels are expensive, therefore Vasya wants to buy the minimum number of them in order to be able to store the juice following the above rules. Help him find this number.

Input

The first line of the input contains an integer n ($1 \le n \le 20$) — the number of different kinds of juice Vasya likes.

The second line contains n integers $c_1, c_2, \ldots, c_n$ ($1 \le c_i \le 10^9$), the i-th of them shows how many liters of i-th kind of juice Vasya has.

Output

Print one integer: the minimum number of barrels Vasya has to buy in order to be able to store all his juice following the above rules.

Examples

standard input	standard output
3 1 1 1	2
5 1 2 1 1 1	3
1 100	1

Note

In the first sample, Vasya has 3 kinds of juice, 1 liter of each kind. He can put all the juice of the first kind in the first barrel, all the juice of the second kind in the second barrel, and add 0.5 liters of juice of the third kind in each of the barrels.

Problem K. Knights of the Old Republic

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	512 megabytes

A long time ago in a galaxy far, far away a group of Jedi from the Resistance forces had to destroy the Death Star. The Death Star consists of n guarded command centers and m bidirectional pathways connecting them. Each pathway connects two (not necessarily distinct) command centers. A pair of command centers may be connected by two or more pathways. The goal of the Resistance is to capture all command centers. Note that it is **not** necessary to capture all pathways.

For any command center i, you are given the number of resources b_i required to transfer one Jedi there (thus, for sending k Jedi you need to spend $b_i \cdot k$ resources). To capture the command center i, the Resistance forces need to gather at least a_i Jedi there. To capture the pathway j, they need to simultaneously gather at least c_j Jedi cumulatively at the endpoints of this pathway. All captures happen without any casualties: none of the Jedi die and they all can fight for other command centers and pathways.

After capturing a pathway or a command center, Jedi can move through it for free. To capture a command center Jedi need to be either sent there or walk there from other command centers through already captured pathways. To capture a pathway, Jedi do not have to unite in one command center: they can attack the pathway from both endpoints (but only if the total number of Jedi at both endpoints is at least c_i).

Find the minimum number of resources required to capture all the command centers.

Input

The first line of the input contains two integers n and m ($1 \le n, m \le 300\,000$) — the number of command centers and pathways respectively.

Each of the next n lines contains two integers a_i and b_i ($0 \le a_i, b_i \le 1\,000\,000$) providing the minimum number of Jedi that can capture the i-th command center and the amount of resources required to send one Jedi directly to the i-th command center.

Next m lines describe the pathways. Each of them contains three integers s_i, f_i and c_i ($1 \le s_i, f_i \le n$, $0 \le c_i \le 1\,000\,000$) — the numbers of command centers connected by the i-th pathway and the minimum number of Jedi required to capture the i-th pathway.

Output

Print one integer: the minimum number of resources required to capture all the command centers of the Death Star.

Example

standard input	standard output
3 2 10 5 20 10 10 3 1 2 22 2 3 200	140

Problem L. Lazy Coordinator

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	512 megabytes

Boris is a contest coordinator on WWWforces, an online platform that conducts regular "What? Where? When?" competitions. There are two types of events in his life:

1. Someone submits a contest proposal (a set of questions) to Boris. He puts this new proposal in the waiting pool.
2. The time comes to organize a new contest. As Boris doesn't remember the initial order of proposals in his pool, he just picks a random proposal, removes it from the pool and uses it for the upcoming contest. Each proposal in the pool is picked with the same probability, regardless on how long it already waits.

There will be exactly n events of the first type and exactly n events of the second type. Moreover, for the k-th event of the second type, there will be at least k events of the first type preceding it. In other words, there will be at least one proposal in the pool any time the coordinator needs it. Finally, it is guaranteed that no two events happen simultaneously.

For each proposal, you should determine the expected time it will stay in the waiting pool.

Input

The first line of the input contains a single integer n ($1 \le n \le 100\,000$) — the number of events of each type.

Then $2n$ lines follow that describe the events. Each line is either "+ t_i" or "- t_i" meaning that an event of the first or the second type (respectively) occurs at the moment t_i.

It is guaranteed that all t_i are positive integers not exceeding 10^9, and the events will be given in the order of strictly increasing t_i. Moreover, for the k-th event of the second type, there will be at least k events of the first type preceding it. Finally, it is guaranteed that there will be exactly n events of the first type and exactly n events of the second type.

Output

For each proposal (event of the first type), print the expected time it will stay in the waiting pool. Your answer will be considered correct if its absolute or relative error does not exceed 10^{-6}.

Formally, assume that your answer is a, and the answer of the jury is b. The checker program will consider your answer correct if $\frac{|a-b|}{\max(1,b)} \le 10^{-6}$.

Examples

standard input	standard output
2 + 1 + 3 - 8 - 12	9.0000000000 7.0000000000
4 + 1 - 2 + 3 - 4 + 5 - 6 + 7 - 8	1.0000000000 1.0000000000 1.0000000000 1.0000000000
3 + 4 + 10 - 11 + 16 - 20 - 100	31.5000000000 25.5000000000 44.0000000000

Note

In the first sample, Boris receives all two proposals first and then uses them in two contests. Each proposal has the probability $\frac{1}{2}$ to be used in each of the contests. Thus, the expected waiting times are $(8-1)\cdot 0.5+(12-1)\cdot 0.5 = 3.5+5.5 = 9$ for the first proposal and $(8-3)\cdot 0.5+(12-3)\cdot 0.5 = 2.5+4.5 = 7$ for the second one.

In the second sample, each proposal is almost immediately used to conduct a contest.