TWGSS OI Team

2024/25 TEAM SELECTION TEST

SCHEDULE

Date 8 / 9 / 11 April 2025

Duration 2 hours 30 minutes

PROBLEMS

	Problem	*Limit*		*Score*	
		Time	*Memory*	*Subtasks*	*Total*
TS250	Top Scorer	1s	256MB	5 | 2 | 3	10
TS251	Treasure Passage	1s	256MB	5 | 7 | 10 | 8	30
TS252	Timing Challenge	1s	256MB	3 | 7 | 12 | 13	35
TS253	Test Case	1s	256MB	5 | 10 | 15 | 7 | 5 | 3	45
TS254	Tutor Assignment	1s	256MB	5 | 8 | 10 | 13 | 14	50
TS255	Typical PTCG	1.5s	256MB	6 | 8 | 12 | 13 | 11	50
TS256	Tick-tock Light	1s	256MB	12 | 13 | 14 | 15 | 11	65
TS257	Trivial Colour	1s	256MB	18 | 20 | 17 | 15 | 10	80
TS258	Travelling Wonder	1s	256MB	10 | 21 | 24 | 19 | 16 | 22 | 23	135
				Full Score	500

REMINDERS

- All problems are divided into subtasks. All test cases in a subtask must be passed to get points.
- You should answer in C++20. You may also attempt in other secondary languages provided on TWGSS Online Judge, including Python 3. It is not guaranteed that the problems are solvable using those secondary languages.
- Unless otherwise specified, your output will be automatically fixed as follows:
  - Trailing spaces in each line will be removed.
  - An end-of-line character will be added to the end of the output if not present.
- 64-bit integers may be required in some problems, use `long long` in C++ if needed.
- All stories are hypothetically written. In case of coincidences, they are coincidences.

TS250 Top Scorer

Score	Limit
10	1s | 256MB

You are Chris Wong, a student studying at Heung Shing Secondary School. The Uniform Test has finished. Upon receiving scores in all subjects, your classmates, and two long-time top scorers, Alice and Bob are going to compare their average test scores.

However, they don't want each other to know his/her score. Therefore they have given you their test scores separately and asked you, a bright programming star, to write a program to compare their scores.

INPUT

The first line consists of two floating-point numbers A and B, each with 2 decimal places, representing the test scores of Alice and Bob respectively.

OUTPUT

If Alice's test score is higher, output `Alice` on the first and only line.

If Bob's test score is higher, output `Bob` on the first and only line.

If Alice's and Bob's test scores are the same, output `Draw` on the first and only line.

SAMPLE TESTS

	Input	Output
1	22.22 22.22	Draw
2	37.21 9.70	Alice
3	19.61 20.21	Bob
4	0.00 0.00	Draw

CONSTRAINTS

$0.00 \leq A, B \leq 100.00$

SUBTASKS

	Points	Constraints
1	5	$B = 0.00$
2	2	$0.00 \leq A, B \leq 9.99$
3	3	No additional constraints

TS251 Treasure Passage

Score	Limit	
30	1s	256MB

"How come you get full marks in your Chinese writing?!?!?" You asked after seeing Alice's test score. She lent you her amazing passage *"Treasure Hidden in Soil (藏在泥土中的寶物)"*, and you found out that it is actually a treasure map!

Writing her *"passage"* on a grid paper, you quickly discovered that it is a coordinate plane. The centre cell of the paper is marked with the coordinate $(0, 0)$. She also marked N chests on the paper, where the i^{th} chest has the location (X_i, Y_i).

As the map is a grid, one can only move along the horizontal and vertical axes. Therefore the distance between two locations is the sum of difference between their x-coordinates and y-coordinates (also known as Manhattan distance). More specifically, for two locations (X_a, Y_a) and (X_b, Y_b), the distance between them is $|X_a - X_b| + |Y_a - Y_b|$, where $|z|$ represents the absolute value of z.

Struggling to find out the real meaning of the treasure map, you decided to do one thing first – write a program to find the chest closest to the map centre $(0, 0)$. It is guaranteed that there do not exist two treasures with the same distance to the map centre.

INPUT

The first line consists of an integer N, representing the number of chests.

The i^{th} line of the next N lines consists of two integers X_i and Y_i, describing the location of the i^{th} chest.

OUTPUT

On the first and only line, output two integers separated by a space, the index of the chest closest to the map centre and its corresponding distance.

SAMPLE TESTS

	Input	Output
1	3 -2 7 1 -5 0 10	2 6

Distances between map centre $(0, 0)$ and each of the chests:

- 1^{st} chest: $|0 - (-2)| + |0 - 7| = 2 + 7 = 9$
- 2^{nd} chest: $|0 - 1| + |0 - (-5)| = 1 + 5 = 6$
- 3^{rd} chest: $|0 - 0| + |0 - 10| = 0 + 10 = 10$

Therefore, the distance between the map centre and the 2^{nd} chest is the minimum.

2	1 7 9	1 16

3	2 8 6 4 9	2 13
4	6 2 0 1 0 6 0 3 0 10 0 5 0	2 1

CONSTRAINTS

$1 \leq N \leq 2 \times 10^5$

$-10^9 \leq X_i, Y_i \leq 10^9$

SUBTASKS

	Points	Constraints
1	5	$N = 1$ $0 \leq X_i, Y_i \leq 5000$
2	7	$N = 2$ $0 \leq X_i, Y_i \leq 5000$
3	10	$1 \leq N \leq 2000$ $0 \leq X_i \leq 5000$ $Y_i = 0$
4	8	No additional constraints

TS252 Timing Challenge

Score	Limit	
35	1s	256MB

"I still can't guess where the treasure is!" You complained. *"Maybe it's because our minds are created differently. That's why you're not as smart as me…"* Getting insulted by Alice, you decided to invite her for a Timing Challenge to see if her mind is really that different from yours.

There is a special stopwatch with only one clock hand, which can be moved in both anti-clockwise and clockwise directions. The clock hand moves at a uniform speed for both directions, while it takes K seconds for it to travel a full cycle.

The Timing Challenge consists of N rounds. For the i^{th} round, the stopwatch is first set to point exactly upwards. Then Alice will start the clock with the clock hand moving anti-clockwise, then stop it after A_i seconds. After that is your turn to start the clock, but with the clock hand moving clockwise, you will stop the clock after C_i seconds. You get a point if the clock hand ends up pointing exactly upwards for guessing Alice's mind correctly.

However, it would be extremely tedious to finish all N rounds in this Timing Challenge. Therefore, you decide to write a program to simulate the game and find out how many points you would get at the end.

INPUT

The first line consists of two integers N and K, representing the number of rounds in the Timing Challenge and the time taken for the clock hand to travel a cycle respectively.

The second line consists of N integers, the i^{th} integer A_i represents the duration of the clock hand moving anti-clockwise in the i^{th} round.

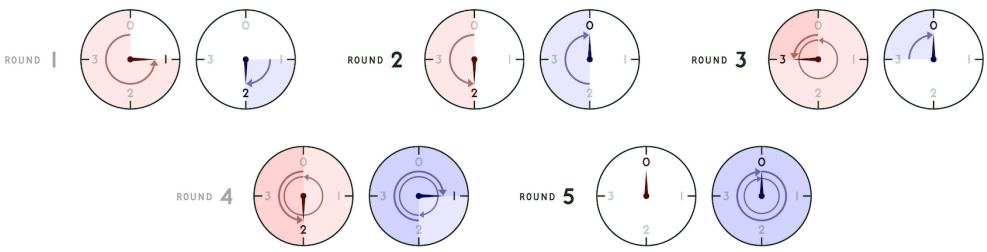
The third line consists of N integers, the i^{th} integer C_i represents the duration of the clock hand moving clockwise in the i^{th} round.

OUTPUT

Output an integer on the first and only line, the total points you would get at the end.

SAMPLE TESTS

	Input	Output
1	5 4 3 2 5 6 0 1 2 1 7 8	3



2	4 3 2 2 2 2 2 0 2 1	2
3	4 5 1 2 3 1 4 3 2 1	1
4	2 1 5 7 6 20	2

CONSTRAINTS

$1 \leq N, K \leq 2 \times 10^5$

$0 \leq A_i, C_i \leq 10^9$

SUBTASKS

	Points	Constraints
1	3	$N = 1$ $0 \leq A_i, C_i < K$
2	7	$A_1 = A_2 = \cdots = A_N$ $0 \leq A_i, C_i < K$
3	12	$0 \leq A_i, C_i < K$
4	13	No additional constraints

TS253 Test Case

Score	Limit	
45	1s	256MB

"I think I am too weak compared with Alice…" After viewing Alice's passage, Bob felt pessimistic about his test results. *"Maybe I should learn something new instead… I know the OI Team is doing Member Recruitment. I know you are a senior member, do you think I can join the team?"* Bob asked. However, knowing Bob has almost never touched a computer before, you decided to ask him to do something instead – helping you to name the problem that you have just proposed for the upcoming Team Selection Test.

After viewing the problem statement, Bob has given you his proposed problem name S. However, the use of letter cases is messed up! As an honourable member of OI Team, you decided to write a program to modify the proposed problem name S, such that for each word, its first letter is in uppercase (`A-Z`) and the rest are in lowercase (`a-z`). Note that words in S consist of English letters (`A-Z`, `a-z`) only, and each of them is separated by one space ( ).

INPUT

The first line consists of a string S, representing the proposed problem name.

OUTPUT

Output a string on the first and only line, the modified problem name.

SAMPLE TESTS

	Input	Output
1	`aaAaAaa`	`Aaaaaaa`
2	`saf`	`Saf`
3	`TeST case`	`Test Case`
4	`NEver gonNA RaIn elDEr`	`Never Gonna Rain Elder`

CONSTRAINTS

$1 \leq \text{length of } S \leq 10^5$

S consists of English letters (`A`-`Z`, `a`-`z`) and spaces ( ) only

Each space in S is preceded and followed by an English letter

SUBTASKS

	Points	Constraints
1	5	S consists of letters `A` and `a` only
2	10	S consists of lowercase English letters (`a`-`z`) only
3	15	S consists of English letters (`A`-`Z`, `a`-`z`) only
4	7	S consists of letters `A`, `a` and spaces ( ) only
5	5	S consists of lowercase English letters (`a`-`z`) and spaces ( ) only
6	3	No additional constraints

TS254 Tutor Assignment

Score	Limit
50	1s | 256MB

The OI Team Member Recruitment has ended, and it's time for the C++ Foundation Course! This year, there are N participants and M tutors. The i^{th} participant has the name S_i and he/she is assigned to the T_i^{th} tutor.

"Hey Chris, please help inform the tutors about the arrangements!" Coach Wong asks you for help. *"Such an annoying coach! Why doesn't he do this himself?"* Despite getting annoyed, you still decide to write a program to find the list of participants assigned to each tutor.

INPUT

The first line consists of two integers N and M, representing the number of participants and tutors respectively.

The i^{th} line of the next N lines consists of a string S_i and an integer T_i, meaning the participant S_i is assigned to the T_i^{th} tutor.

OUTPUT

Output M lines.

On the i^{th} line, if no student is assigned to the i^{th} tutor, output `UNEMPLOYED`. Otherwise, output all participants' names assigned to the i^{th} tutor, separate each by a space. The names can be in any order, as long as they are on the correct line.

SAMPLE TESTS

1

Input	Output
6 4 daniel 4 jack 3 duncan 1 charles 1 ryan 4 felix 4	duncan charles UNEMPLOYED jack daniel ryan felix

2

Input	Output
3 4 alice 3 bob 3 chris 3	UNEMPLOYED UNEMPLOYED chris alice bob UNEMPLOYED

3

5 5 clice 3 alice 1 dlice 4 blice 2 elice 5	alice blice clice dlice elice

CONSTRAINTS

$1 \leq N, M \leq 10^5$

$1 \leq T_i \leq M$

$1 \leq \text{length of } S_i \leq 10$

S_i consists of lowercase English letters (a - z) only

$S_i \neq S_j$ for $i \neq j$

SUBTASKS

	Points	Constraints
1	5	$M = 1$
2	8	$T_1 = T_2 = \cdots = T_N$
3	10	$N = M$ $T_1 \neq T_2 \neq \cdots \neq T_N$
4	13	$1 \leq N, M \leq 1000$
5	14	No additional constraints

TS255 Typical PTCG

Score	Limit	
50	1.5s	256MB

After finishing the tedious job assigned by Coach Wong, you decided to go to the *"Thrive with Smiling Hearts" Room (荃心軒)* to relax. Stepping into the room, you saw Alice and Bob playing the card game *"Pick The Coding Great (PTCG)"* together. You asked Bob, *"Aren't you feeling depressed as you lost to Alice in the Uniform Test–"* He cut off your question, *"Shhhhh… I'll explain to you later."*

Feeling bored waiting for Bob for his explanation, you start to take a look at how the game PTCG works. You discover that there are $2N$ cards on the desk, with the i^{th} card having the codeforce F_i printed on it. There are N rounds in a game of PTCG. In each round, Alice will pick a card on the desk, followed by Bob picking a card on the desk. Cards picked will not be placed back on the desk.

The score of each player is the sum of codeforces of the cards picked by him/her. As Alice and Bob are so smart, they will always perform their moves optimally, such that each of them can get the highest score possible within the rules. However, as a smart senior OI Team member, you quickly realise PTCG is a typical game that the result can already be determined at the start. Therefore, you decide to write a program to calculate their final score difference before the game even starts to impress the two top scorers!

INPUT

The first line consists of an integer N, representing the number of rounds in a game of PTCG.

The second line consists of $2N$ integers, the i^{th} integer F_i represents the codeforce of the of the i^{th} card.

OUTPUT

Output an integer on the first and only line, the final score difference of Alice and Bob.

SAMPLE TESTS

	Input	Output
1	3 4 6 9 8 9 10	4

Best strategy for Alice and Bob in each round:

- Round 1: Alice picks 10, Bob picks 9.
- Round 2: Alice picks 9, Bob picks 8.
- Round 3: Alice picks 6, Bob picks 4.

Score difference $= (10 + 9 + 6) - (9 + 8 + 4) = 4$

2	1 1 10	9
3	3 2 3 5 7 11 13	5
4	5 1 1 2 2 3 3 4 4 5 5	0
5	3 1 5 10 4 3 8	5

CONSTRAINTS

$1 \leq N \leq 10^5$

$1 \leq F_i \leq 10^9$

SUBTASKS

	Points	Constraints
1	6	$N = 1$
2	8	$1 \leq N \leq 4$
3	12	$F_1 \leq F_2 \leq F_3 \leq \cdots \leq F_{2N}$
4	13	$1 \leq N, F_i \leq 2000$
5	11	No additional constraints

TS256 Tick-tock Light

Score	Limit	
65	1s	256MB

"So what's the reason that you suddenly get along with Alice that well?" You asked Bob after the game of PTCG ends. *"That's because–"*

Suddenly, the light in the room starts flickering. *Tick-tock…* *Tick-tock…* Along with each tick-tock sound, the state of the light will change (i.e. being switched on if originally off, being switched off if originally on). After some observations, you discover the pattern of the sequence of tick-tock sounds.

The intervals between the tick-tock sounds form a periodic sequence of length N. As the time begins, the 1^{st} tick-tock sound is made after T_1 seconds, the 2^{nd} tick-tock sound is made T_2 seconds after the 1^{st} one, so on and so forth. Up till N, the i^{th} tick-tock sound is made T_i seconds after $i-1^{\text{th}}$ sound. The loop then continues, where the $N+1^{\text{th}}$ tick-tock sound is made T_1 seconds after the N^{th} one, the $N+2^{\text{th}}$ tick-tock sound is made T_2 seconds after the $N+1^{\text{th}}$ one…

The light is originally on when the time begins. There are still K seconds remaining until the infamous *"505" announcement* where you are forced to leave. You decide to write a program to calculate how long the light is on until you leave the room, such that you can communicate with Bob without disturbance.

INPUT

The first line consists of two integers N and K, representing the length of the intervals' periodic sequence and your time remaining in the room respectively.

The second line consists of N integers, describing the time intervals between the tick-tock sounds, with the i^{th} integer being T_i.

OUTPUT

Output an integer on the first and only line, the sum of time (in seconds) that the light is on during the T seconds before you leave.

SAMPLE TESTS

	Input	Output
1	3 7 1 2 3	4

From time 0 to time 1, the light is on.
From time 1 to time 3, the light is off.
From time 3 to time 6, the light is on.
From time 6 to time 7, the light is off.

	Input	Output
2	3 11 1 2 3	6

The light is on from time 0 to time 1, from time 3 to time 6 and from time 7 to time 9.

CONSTRAINTS

$1 \leq N \leq 2 \times 10^5$

$1 \leq K, T_i \leq 10^9$

SUBTASKS

	Points	Constraints
1	12	$N = 1$
2	13	$T_1 + T_2 + \cdots + T_N \geq K$
3	14	$1 \leq K \leq 10^5$
4	15	N is even
5	11	No additional constraints

TS257 Trivial Colour

Score	Limit
80	1s | 256MB

"As the light in the room is flickering, maybe I go back home first, see yoou guys tomorrow!" Alice left the room. *"Hey Chris, I think I have some ideas on what Alice was writing in her 'passage'."* said Bob. *"So that's why you approached Alice? To get some clues from Alice?"* you asked. *"Yes. However, I think I may need some programming help to identify the colours on the grid paper."*

There are N colours on the paper. The i^{th} colour is named C_i and can be represented by three numbers R_i, G_i and B_i, the intensity of red, green and blue light respectively.

Two colours can be mixed together, the intensities of red, green and blue light in the resultant colour will be the average of the two original colours, rounded down to the nearest integer. In other words, if one colour has intensities R_x, G_x and B_x, and the other colour has intensities R_y, G_y and B_y, the resultant colour will have intensities $\lfloor \frac{R_x+R_y}{2} \rfloor$, $\lfloor \frac{G_x+G_y}{2} \rfloor$ and $\lfloor \frac{B_x+B_y}{2} \rfloor$.

By some magical decoding, Bob discovered that there are Q colour mixing operations specified in the passage. For each mix, if the resultant colour does not already exist on the paper, it would be considered trivial (i.e. not important), otherwise the resultant colour name should be found. You are going to help Bob by writing a program to compute the result of the colour mixing operations.

INPUT

The first line consists of two integers N and Q, representing the number of colours on the paper and the number of colour mixing operations respectively.

The i^{th} line of the next N lines consists of a string C_i, three integers R_i, G_i and B_i, representing the name of the i^{th} colour and its intensity of red, green and blue light respectively.

The j^{th} line of the next Q lines consists of two strings X_j and Y_j, representing the names of the two colours to be mixed in the j^{th} colour mixing operation.

OUTPUT

Output Q lines.

On the j^{th} line, output the result of the j^{th} colour mixing operation. If the resultant colour does not already exist on the paper, output `TRIVIAL`. Otherwise, output the name of the resultant colour.

SAMPLE TESTS

	Input	Output
1	6 4 red 255 0 0 green 0 255 0 blue 0 0 255 yellow 127 127 0 magenta 127 0 127 cyan 0 127 127 red red green blue blue green yellow cyan	red cyan cyan TRIVIAL
2	3 3 black 0 0 0 grey 127 127 127 white 255 255 255 white white white grey black white	white TRIVIAL grey

CONSTRAINTS

$1 \leq N, Q \leq 10^5$

$0 \leq R_i, G_i, B_i \leq 255$

$1 \leq$ length of $C_i, X_j, Y_j \leq 10$

C_i, X_j, Y_j consist of lowercase English letters (`a` - `z`) only

$C_a \neq C_b$ for $a \neq b$

X_j, Y_j can be found in one of C_i

SUBTASKS

	Points	Constraints
1	18	$N = 3$ $R_i = G_i = B_i$
2	20	$R_i = G_i = B_i$
3	17	$1 \leq N, Q \leq 1000$ $0 \leq R_i, G_i, B_i \leq 63$
4	15	$0 \leq R_i, G_i, B_i \leq 63$
5	10	No additional constraints

TS258 Travelling Wonder

Score	Limit	
135	1s	256MB

"The treasure is in… Wonderland?!?! No doubt it's Alice who drew the map!" After analysing the colours in the "passage", you and Bob finally reached the last step of the challenge! Before going to the Wonderland to find the treasure, you and Bob decided to do comprehensive research on this exciting yet dangerous land.

There are N landmarks in the Wonderland, which are numbered from 1 to N. There are also M roads, the i^{th} road connects the landmarks U_i and V_i. The roads are bidirectional (i.e. can be travelled in both directions) and no two roads connect the same pair of landmarks. The roads are full of dangerous species. Therefore, one must have at least W_i wonder seeds to have enough strength to pass the i^{th} road. Note that wonder seeds will not be consumed after passing the roads.

To get fully prepared, Bob has listed out Q possible journeys in Wonderland. For the j^{th} journey, you are going to travel from landmark u_j to v_j with w_i wonder seeds. *"We are so close to getting the treasure!"* To finish the preparation work before going to Wonderland, you are going to write a program to find out whether each of the journeys is possible.

INPUT

The first line consists of three integers N, M and Q, representing the number of landmarks, roads and journeys respectively.

The i^{th} line of the next M lines consists of three integers U_i, V_i and W_i, representing a road connecting landmarks U_i and V_i, which requires at least W_i wonder seeds to pass.

The j^{th} line of the next Q lines consists of three integers u_j, v_j and w_j, representing the starting landmark, ending landmark and the number of wonder seeds you have in the j^{th} journey.

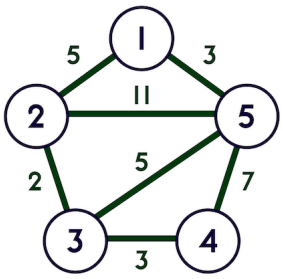
OUTPUT

Output Q lines.

On the j^{th}, output `Yes` if the j^{th} journey is possible, and `No` otherwise.

SAMPLE TESTS

	Input	Output
1	5 7 3 1 2 5 2 3 2 3 4 3 4 5 7 5 1 3 2 5 11 3 5 5 1 4 3 1 4 6 2 4 3	No Yes Yes



2	5 4 5 1 2 5 2 3 3 3 4 11 4 5 8 1 3 5 2 4 5 4 1 15 4 5 8 2 1 4	Yes No Yes Yes No
3	3 3 3 1 2 5 2 3 3 3 1 2 1 2 3 2 1 2 2 1 5	Yes No Yes

CONSTRAINTS

$1 \leq N, M, Q \leq 2 \times 10^5$

$1 \leq U_i, V_i, u_j, v_j \leq N$

$U_i \neq V_i$

$u_j \neq v_j$

$1 \leq W_i, w_j \leq 10^9$

SUBTASKS

	Points	Constraints
1	10	$N = 2$
2	21	$Q = 1$
3	24	$1 \leq N, M, Q \leq 100$
4	19	$M = N - 1$ $U_i = i$ $V_i = i + 1$ $u_i = 1$
5	16	$M = N - 1$ $U_i = 1$ $V_i = i + 1$
6	22	$1 \leq W_i \leq 2$
7	23	No additional constraints