Competitive Programming Contest: Introduction to Competitive Programming

A. Who Let the Dogs Out?

1 second, 256 megabytes

Oh dear! While walking home, Ahmad had discovered that his neighbor recently adopted two dogs who are quite aggressive, always barking and on the lookout to bite those who walk by.

Day by day, he notices something about these two particular dogs: they have specific periods of hostility and calmness, which constantly cycle all day long, leaving him a specific timeframe where he can get home safe without being bitten.

Specifically, he noticed that:

- One dog appears to be hostile for about a_1 minutes, then transitions to stay calm for b_1 minutes, before starting over again.
- The other dog is also hostile for a_2 minutes, then becomes calm for b_2 minutes, before starting over again as previously mentioned.
- Both the dogs start being hostile at the first minute.

Tired of the possibility of being attacked, Ahmad wants to test and determine whether he is going to be attacked by either none, one, or both of the dogs when he passes by his neighbor's house at the times of t_1, t_2, and t_3 minutes.

Can you lend him a hand?

Input

The first line of input contains a single integer, k ($1 \leq k \leq 10^5$) — the number of test cases.

The first line of each test case contains four integers a_1, b_1, a_2, and b_2 ($1 \leq a_i, b_i \leq 2 \cdot 10^9$).

The second line of each test case contains three integers t_1, t_2, and t_3 ($1 \leq t_i \leq 10^{14}$) — the minute in the day where Ahmad was to hypothetically walk by his neighbor's house. For example, if t_2 has the value of 15, it can be interpreted as "Ahmad walked by his neighbor's house at the 15th minute".

Output

For each test case, output one of the following words for each t:

- "none", if none of the dogs were to attack at a given time t.
- "one", if only one of the dogs were to attack at a given time t.
- "both", if both of the dogs were to attack at a given time t.

Scoring

Group	Points	Constraints
1	5	$k \leq 10^3$, $a_i, b_i \leq 10^3$, $t_i \leq 10^3$
2	12	$k \leq 10^4$, $a_i, b_i \leq 10^9$, $t_i \leq 10^9$
3	3	No additional constraints

input

```
2
2 2 3 3
1 3 4
2 3 4 5
4 9 5
```

output

```
both
one
none
one
none
none
```

In the first test case of the example:

Minute	1 both	2	3 one	4 none	5	6	7
Dog 1	H	H	C	C	H	H	C
Dog 2	H	H	H	C	C	C	H

The output for the first, third and fourth minute.

Hints

- How can we determine the number of minutes each dog is into each individual cycle?
- Are there other efficient strategies than looping through each minute?

B. Eisen's Dungeon Gold Hunt

2 seconds, 256 megabytes

Eisen, a tough dwarf warrior, has stumbled upon an ancient dungeon rumoured to be filled with fortune and danger. This dungeon has n portals numbered from 1 to n, each leading to a distinct room with the same number as its corresponding portal. Adjacent rooms are interconnected, which allows Eisen to traverse from one room to the next. Every room i within the dungeon is assigned a risk/reward value r_i; positive values denote gold gains, while negative values represent gold losses due to monster encounters.

The portals for entering and exiting the ancient dungeon.

Eisen's approach is straightforward and bold: enter once, traverse swiftly, and exit with pockets heavier than when he entered. Specifically, he aims to navigate the dungeon from one portal to another in a straight path that maximizes his gold acquisition. Your task is to determine the two portals that Eisen should enter and exit to achieve the highest possible gold gain during his one-way journey.

Input

The first line of input contains an integer n, ($1 \leq n \leq 2 \cdot 10^5$) — the number of portals.

The second line of input contains n integers, $r_1, r_2, \ldots, r_n$ ($-10^9 \leq r_i \leq 10^9$) — the risk/reward value of room i.

Output

Output the maximum gold Eisen can gain, followed by two portal numbers he should enter and exit to achieve that amount. If multiple sets of portals have the maximum gold, output the set with a shorter distance between the portals. If there are still ties, choose the set with the smaller portal number to enter. If Eisen can never gain any gold, output "better leave".

Scoring

Group	Points	Constraints
1	3	$n \leq 100$, and each risk/reward value is either positive or zero, $r_i \geq 0$
2	5	$n \leq 100$
3	8	$n \leq 2 \cdot 10^4$
4	14	No additional constraints

input

```
4
1 2 3 0
```

output

```
6 1 3
```

input

```
5
-10 5 -2 4 -7
```

output

```
7 2 4
```

input

```
5
-1 -2 -3 -4 -5
```

output

```
better leave
```

input

```
8
0 8 -4 7 -100 7 1 3
```

output

```
11 2 4
```

In the last example, there are multiple paths where Eisen can gain a maximum gold of 11, such as:

- $1 \to 4$
- $2 \to 4$
- $4 \to 2$
- $6 \to 8$

Eisen should use enter portal 2 and exit from portal 4, as it has the shortest distance and a smaller portal number to enter.