Problem B
Brilliant Barbeque

Time limit: 10 seconds
Memory limit: 512 megabytes

Problem Description

Allen is hungry, and he has prepared 9 food items for the Barbeque. Due to limitations of the grill's size, he arranges his food into 3 rows and 3 items per row, i.e., a 3×3 grid. Noticing that the grill is not heated up uniformly, Allen decides to swap some food items' positions every minute so they can all be well-cooked faster. At the moment that all of them are well-cooked, they should also be placed at some specific positions on the grill.

Allen first puts his food items onto the grill in an arbitrary order. Then at the end of each minute, he can choose either two rows or two columns of food and swap them. If he is satisfied with the current food arrangement, he can also choose not to do anything.

Before a food item is put onto the grill, its temperature is 0°C, since Allen stores all his food in a fridge at 0°C. If something on the grill is placed somewhere where fire is more powerful, its temperature rises up faster. To describe how powerful the fire is, we define the "firepower" of a location as the increment of temperature (in Celsius degrees) of an item per minute if it is put there. For example, if a food item is put somewhere with a firepower of 5, its temperature increases by 5°C every minute, and if it's at somewhere with zero firepower, its temperature never rises and thus the item never gets cooked. We define the "cooked point" of a food item as the temperature at which it gets well-cooked.

Given the firepower of all 3×3 positions of the grill and the cooked points of 9 food items, help Allen to find out the minimum time required to well-cook all of them. Note that if an item has temperature higher than its cooked point, it will be overcooked and charred so Allen refuses to eat it. Furthermore, all of them should be well-cooked on the grill at the same time, at their required positions. The grill's fire is stable; in other words, the firepower of a position is constant. Lastly, the deadline of NA (Computer Network Administration, 計算機網路管理) is coming, so Allen is busy doing his homework. He will only glance at the barbeque every 60 seconds, so please make sure that the foods will be well-cooked at the end of some minute. Allen is too hungry to wait. If his meal cannot be prepared within 15 minutes, tell him that "NA IS HARD, SO IS LIFE.".

Input Format

The first line is an integer T indicating the number of test cases. Then T test cases follow. For each test case there are 2 sections, each of them contains 3 lines of 3 integers, representing a 3×3 grid.

The first section of each case describes the firepower map of the Barbeque: the jth value on the ith line corresponds to the ith row, j^{th} column on the grill.

The second section of each case indicates the food items' cooked points and their required locations: the jth value on the ith line means that there is an item having that value as its cooked point and should be placed at the ith row, j^{th} column.

Output Format

Output a single integer indicating the minimum time, in minutes, for all food items to be well-cooked. If it is impossible to meet the requirements or the required time is longer than 15 minutes, output "NA IS HARD, SO IS LIFE." (without quotes).

Technical Specification

- $1 \le T \le 10$

- All firepower values are integers between 0 and 100 (inclusive).

- The cooked points of all food items are integers between 1 and 100 (inclusive).

Sample Input 1

```
4
1 1 0
1 1 0
1 1 0
1 1 2
1 1 2
1 1 2
1 1 1
1 2 1
1 1 1
1 1 1
1 1 1
1 1 1
4 4 4
4 4 4
4 4 4
2 2 2
2 2 2
2 2 2
7 1 3
4 0 7
3 1 4
30 44 33
19 42 43
19 42 28
```

Sample Output 1

```
2
NA IS HARD, SO IS LIFE.
NA IS HARD, SO IS LIFE.
10
```

Hint

In the first sample, there are two kinds of food items whose cooked points are 1 and 2 respectively. Let the former be beef (B) and the latter be sausage (S). At the beginning, Allen can choose to put sausages in the first column and beef in other ones. Here is a diagram describing the temperatures and positions of each item on the Barbeque grill initially:

$$
\begin{array}{ccc}
S(0) & B(0) & B(0) \\
S(0) & B(0) & B(0) \\
S(0) & B(0) & B(0)
\end{array}
$$

At the end of the first minute, Allen can swap the right and center columns. The diagram becomes:

$$
\begin{array}{ccc}
S(1) & B(0) & B(1) \\
S(1) & B(0) & B(1) \\
S(1) & B(0) & B(1)
\end{array}
$$

At the end of the second minute, Allen can swap the left and right columns. The diagram should be:

$$
\begin{array}{ccc}
B(1) & B(1) & S(2) \\
B(1) & B(1) & S(2) \\
B(1) & B(1) & S(2)
\end{array}
$$

Thus all food items are well-cooked and at their required locations. Allen must therefore spend 2 minutes to prepare his meal.

In the second sample, the item put on the center of the grill will be overcooked.

In the third sample, all the food will be well-cooked after 30 seconds, while Allen is debugging for his NA homework and not noticing his dinner is ready. Not until the end of the first minute will he find that his dinner have been burnt, and in this case, he will realize his life is hard.