Problem D: Rent your airplane and make money

``ABEAS Corp.'' is a very small company that owns a single airplane. The customers of ABEAS Corp are large airline companies which rent the airplane to accommodate occasional overcapacity.

Custommers send renting orders that consist of a time interval and a price that the custommer is ready to pay for renting the airplane during the given time period.

Orders of all the custommers are known in advance. Of course, not all orders can be acomodated and some orders have to be declined. Eugene LAWLER, the Chief Scientific Officer of ABEAS Corp would like to maximize the profit of the company.

You are requested to compute an optimal solution.

1 Small Example

Consider for instance the case where the company has 4 orders AF514 (start time 0, duration 5, price 10), CO5 (start time 3, duration 7, price 14), AF515 (start time 5, duration 9, price 7) and BA01 (start time 6, duration 9, price 8). The optimal solution consists in declining CO5 and AF515 and the gain is 10 + 8 = 18. Note that the solution made of AF514 and AF515 is feasible (the airplane is rented with no interruption from time 0 to time 14) but non-optimal.

2 Input Data

Each test case is described by one `input` file that contains all the relevant data: The first line contains the number n of orders ($n \leq 3000$). This line is followed by n lines. Each of which describes an order and contains the name identifier of the order (less than 80 characters, with no white space) followed by three integer values: the start time of the order, the duration of the order and the price the custommer is ready to pay for this order (white spaces are used as separators). We assume that orders have a strictly positive duration.

3 Sample Input

```
4
AF514 0 5 10
CO5 3 7 14
AF515 5 9 7
BA01 6 9 8
```

4 Output

You are required to compute an optimal solution for each input file. Your program has to write the total price paid by airlines.

5 Sample Output

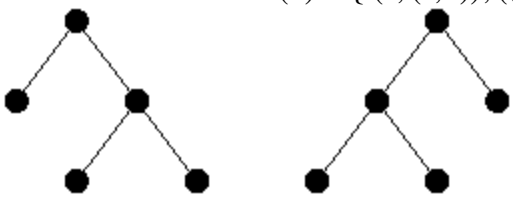
The output corresponding to the input file is:

```
18
```

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Problem: E Who's next?

Every computer science student knows binary trees. Here is one of many possible definitions of binary trees. Binary trees are defined inductively. A binary tree t is either an external node (leaf) • or a single ordered pair (t_1,t_2) of two binary trees, left subtree t_1 and right subtree t_2 respectively, called an internal node. Given an integer n, $B(n)$ is the set of trees with n leaves. For instance, the picture below shows the two trees of $B(3) = \{ (\bullet, (\bullet, \bullet)), ((\bullet, \bullet), \bullet) \}$.



Observe that those trees both have two internal nodes and a total of five nodes.

Given a tree t we define its unique integer identifier $N(t)$:

1. $N(\bullet) = 0$
2. $N(t_1, t_2) = 2^{n_1 + n_2} + 2^{n_2} N(t_1) + N(t_2)$, where n_1 and n_2 are the number of nodes in t_1 and t_2 respectively.

For instance, we have $N(\bullet, \bullet) = 2^2 + 2^1 \times 0 + 0 = 4$, $N(\bullet, (\bullet, \bullet)) = 2^4 + 2^3 \times 0 + 4 = 20$ and $N((\bullet, \bullet), \bullet) = 2^4 + 2^1 \times 4 + 0 = 24$.

The ordering $\succcurlyeq$ is defined on binary trees as follows:

$$\bullet \succcurlyeq t$$

$$(t_1, t_2) \succcurlyeq (u_1, u_2), \text{when } t_1 \prec u_1, \text{ or } t_1 = u_1 \text{ and } t_2 \succcurlyeq u_2$$

Hence for instance, $(\bullet, (\bullet, \bullet)) \succcurlyeq ((\bullet, \bullet), \bullet)$ holds, since we have $\bullet \prec (\bullet, \bullet)$.

Using the ordering $\succcurlyeq$, $B(n)$ can be sorted. Then, given a tree t in $B(n)$, we define $S(t)$ as the tree that immediately follows t in the sorted presentation of $B(n)$, or as the smallest tree in $B(n)$, if t is maximal in $B(n)$. For instance, we have $S(\bullet, \bullet) = (\bullet, \bullet)$ and $S(\bullet, (\bullet, \bullet)) = ((\bullet, \bullet), \bullet)$.

By composing the inverse of N, S and N we finally define a partial map on integers.

$$s(n) = N(S(N^{-1}(n)))$$

1 Task

Write a program that computes $s(n)$.

2 Input

The first input line contains an integer K, with $K > 0$. It is followed by K lines, each specifying an integer n_i with $1 \le i \le K$ and $0 \le n_i < 2^{31}$.

3 Output

The output should consist of K lines, the i^{th} output line being $s(n_i)$, or NO if $s(n_i)$ does not exist.

4 Example

For the input:

```
5
4
0
20
5
432
```

The correct answer is:

```
4
0
24
NO
452
```

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