Task: TAS
Town Assembly Square

AACPP SuSe 2024 Round 4 Memory: 7MiB (Java: 104MiB) 2024.06.11 – 2024.06.25

With the continuous success of experimental programmes, Byteland's next big idea is a city of the future, built from the ground up. After the successful implementation of the Aerial Payload Delivery programme, Byteman was awarded the Medal of Freedom. Thrilled with the award, of his own volition he decided to join the new project as the urban planning consultant in the IT Task Force.

The planning team, looking for a perfect spot to build the city at, divided the region into a 2D grid of n axis-aligned rectangular zones with the goal of assigning districts to them later. These zones are described by a bottom-left corner at (x, y) and dimentions (w, h). They can be tangential, but do not overlap (their area of intersection is 0).

It is agreed that the largest tangential group of zones will become the *majestic* Town Assembly Square (TAS[1]), where people will gather to celebrate and host events. The planning team expects roads to connect zones, so zones *"touching"* each other with only corners also count as tangential! To estimate the budget for the construction work, Byteman is tasked with finding the TAS zones as well as the total area they occupy.

Input

In the first line of standard input there is a single integer n, number of zones on the grid. There is at least one zone and they are listed in an arbitrary order.

The next n lines contain the descriptions of the zones. In the i-th line there are four integers x_i, y_i, w_i, h_i, describing the bottom-left corner of a zone, its width (length along the x-axis), and its height (length along the y-axis).

Output

Your program should write two lines to standard output. The first line should contain one integer, the total area of the TAS *aka* the biggest group of tangential rectangles.

The next line should contain a list of unique integers between 0 and $n - 1$ inclusive, denoting which rectangles belong to the TAS, in ascending order. If more than one set of rectangles suits to be assigned as TAS, your program may output any one of the sets.

[1] Not to be confused with Tool-Assisted Speedruns

Example

For the input:

```
8
14 1 2 2
16 9 1 5
11 3 5 2
3 4 2 5
5 9 3 2
21 3 2 8
13 2 1 1
13 8 3 5
```

the correct output is:

```
20
1 7
```

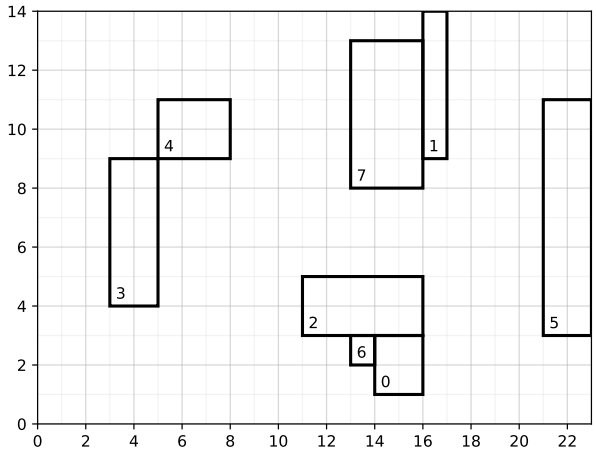

Figure 1: Visual representation of the region. Zone numbering starts at 0.

Additional examples

The following initial tests are also available:

- `0b` – sample for Subtask 1, $n = 16$, similar to example above, $0 \leq (x, y) \leq 15$, one or more answers, $1 \leq (w, h) \leq 3$;
- `0c` – sample for Subtask 2, $n = 25$ variable-size rectangles, $0 \leq (x, y) \leq 25$, one answer, $1 \leq (w, h) \leq 4$;
- `0d` – sample for Subtask 3, $n = 100$ unit-size rectangles, $0 \leq (x, y) \leq 20$, one or more answers, $(w, h) = (1, 1)$;
- `0e` – sample for Subtask 4, $n = 10000$, coordinate limits, $-10^9 \leq (x, y) \leq 10^9$, one or more answers, $(w, h) = (400, 400)$;
- `0f` – sample for Subtask 5, $n = 50000$, max number of rectangles, $-10^9 \leq x \leq 10^9$ and $-10^9 \leq y \leq 10^9$, one or more answers, $1 \leq (w, h) \leq 10^6$.

Limits

Your solution will be evaluated on a number of hidden test cases divided into groups. Points for a group are awarded if and only if the submission returns the correct answer for each of the tests in the group within the allotted time limit. These groups are organised into subtasks with the following limits and points awarded.

In all tests the area of each zone is limited by 10^6.

Subtask	Limits	Points
1.	$1 \leq n \leq 50$, $0 \leq x \leq 50$, $0 \leq y \leq 50$, $1 \leq w \leq 20$, $1 \leq h \leq 20$	2
2.	$1 \leq n \leq 10^4$, $0 \leq x \leq 1000$, $0 \leq y \leq 1000$, $1 \leq w \leq 20$, $1 \leq h \leq 20$	1
3.	$1 \leq n \leq 2 * 10^4$, $0 \leq x \leq 1000$, $0 \leq y \leq 1000$, $w = 1$, $h = 1$	2
4.	$1 \leq n \leq 10^4$, $-10^9 \leq x \leq 10^9$, $-10^9 \leq y \leq 10^9$, $1 \leq w \leq 400$, $1 \leq h \leq 400$	2
5.	$1 \leq n \leq 5 * 10^4$, $-10^9 \leq x \leq 10^9$, $-10^9 \leq y \leq 10^9$, $1 \leq w \leq 10^6$, $1 \leq h \leq 10^6$	3