

## 2024 THE THING

The research department of *Widget, Whatsit & Doodah* (est. 1862) is constantly experimenting with interesting pieces of technology. Behind locked doors and, often, several inches of safety glass.

This year's promising line of inquiry, currently codenamed *The Thing*, involves a grid of squares, each of which is either *vacant* or *occupied*. (The exact content is protected by loyalty to the firm, a non-disclosure agreement and smelling slightly of lemon.) There are currently two ways the team have been able to manipulate squares and those directly adjacent (horizontally or vertically); for safety the team only perform a single manipulation at a time.

Firstly, when there are two adjacent occupied squares the team are able to *empty* those two squares. Secondly, when all four adjacent squares to an occupied square are vacant, the occupied square can be *expanded*, making that square vacant and causing the adjacent squares to become occupied. Note that a square touching the perimeter of the grid does *not* have four adjacent squares, so cannot be expanded.

For example, if the only occupied squares in the grid were at co-ordinates (3,5), (5,5), (7,5), (5,7) and (5,3):

- No squares can be emptied as there are no adjacent occupied squares;
- If the square at (5,5) is expanded, the occupied squares in the grid become (3,5), (4,5), (6,5), (5,6), (5,4), (7,5), (5,7) and (5,3);
- There are now no squares that can be expanded but there are four pairs, such as (3,5), (4,5) and (5,7), (5,6) which can be emptied.

The team would like to manipulate *The Thing* so that the smallest possible number of squares are occupied.

### SAMPLE INPUT

```
4
3 5
5 5
7 5
5 7
```

### SAMPLE OUTPUT

```
1
E 5 5
H 3 5
H 6 5
V 5 7
```

The first line of the input will contain a single integer,  $c$  ( $1 \leq c \leq 2^8$ ) indicating the number of occupied squares. This will be followed by  $c$  lines each giving the co-ordinates,  $x$  then  $y$  ( $2 \leq x, y \leq 1021$ ), of a different occupied square.

The grid is 1024x1024 squares; including the squares (0,0) and (1023, 1023).

The first line of your output should be the minimum number of occupied squares that can be reached after manipulating *The Thing*. This should be followed by a sequence of manipulations to achieve this minimum, one per line. There should be no additional manipulations after reaching the minimum. You are not required to minimise the number of manipulations but you may not use more than 1,000,000 manipulations.

Valid manipulations are:

- $E \ x \ y$  to expand (x, y)
- $H \ x \ y$  to empty (x, y) and (x+1, y)
- $V \ x \ y$  to empty (x, y) and (x, y-1)