

4586 Maximum Value

Let $a_1, a_2, b_1, b_2 \in \mathbb{Z}$, the set of all integers, such that $a_1 \leq a_2$ and $b_1 \leq b_2$ and let \mathcal{R} be a set of points in the Cartesian plane such that

$$\mathcal{R} = \{(x, y) | a_1 \leq x \leq a_2, b_1 \leq y \leq b_2, x, y \in \mathbb{Z}\}$$

We define the *taxicab distance* between two points $P(x_P, y_P)$ and $Q(x_Q, y_Q)$ denoted by $d(P, Q)$ as follows:

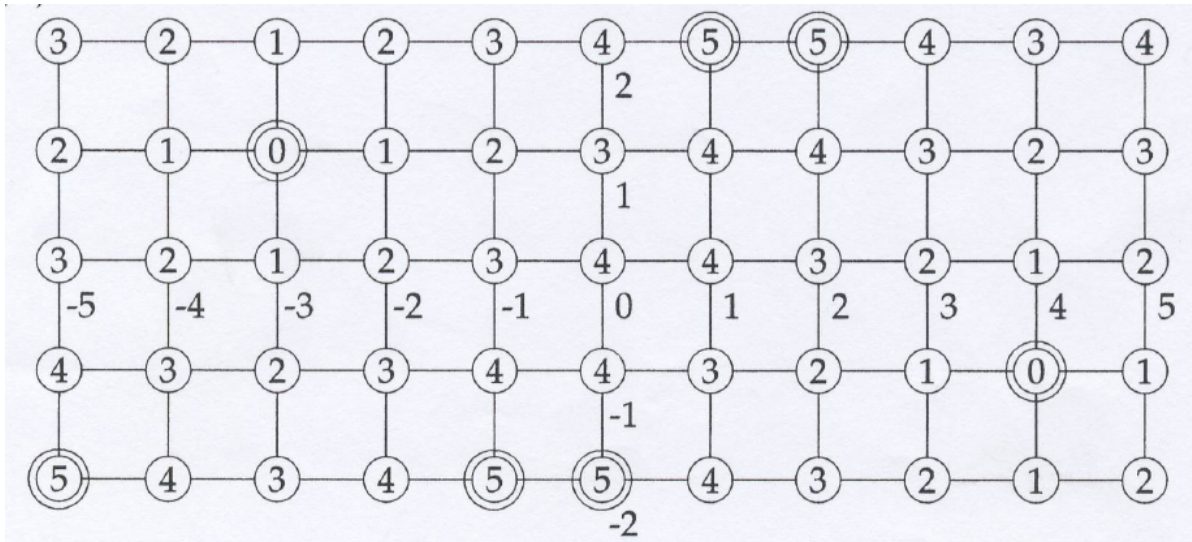
$$d(P, Q) = |x_P - x_Q| + |y_P - y_Q|$$

The points P and Q in \mathcal{R} are *neighbors* if and only if $d(P, Q) = 1$.

For each point P in \mathcal{R} , we assign a nonnegative integer denoted by $d(P)$ as follows:

1. $d(P) = 0$ if and only if P is a *source* in \mathcal{R}
2. If P is a source then $d(Q) = 1$ for every neighbors Q of P .
3. If P is not a source, then $d(P) = d(Q)$, or $d(P) = d(Q) - 1$, or $d(P) = d(Q) + 1$ where Q is a neighbor of P .
4. If P is not a source, then there exists a neighbor Q of P such that $d(P) = d(Q) + 1$.

In the example below, the value of the origin is $d(0, 0) = 4$ since the minimum value of its neighbors is 3. The sources have value 0 and are located at the points $(4, -1)$ and $(-3, 1)$. The maximum value is 5 and it is located at the points $(-5, -2)$, $(-1, -2)$, $(0, -2)$, $(1, 2)$, and $(2, 2)$.



Input

The input file contains one or more test cases. Each test case consists of one line in the form:

$$a_1, a_2, b_1, b_2, x_1, x_2, \dots, x_N, y_1, y_2, \dots, y_N$$

such that $a_1 \leq x \leq a_2$ and $b_1 \leq y \leq b_2$ for all points (x, y) in \mathcal{R} , and the sources in \mathcal{R} are the points (x_1, y_1) , (x_2, y_2) , \dots , and (x_N, y_N) . The absolute value of each number is an integer that does not exceed 1000.

Output

The output for each test case is one of two possibilities:

1. First possibility:

Max Value : M

Max Points: $(x_1, y_1), (x_2, y_2), \dots, (x_R, y_R)$

2. Second possibility:

Not a valid input

where M is the maximum of all the values in \mathcal{R} and $(x_1, y_1), (x_2, y_2), \dots, (x_R, y_R)$ are the points where the corresponding value is the maximum.

The output will be ‘Not a valid input’ if the terms in the sequence are not integers, or the number of terms is less than or equal to 4, or the number of terms is odd, or if the first term of the sequence is greater than the second term of the sequence, or if the third term is greater than the fourth term.

There should be a blank line between the outputs of test cases.

Sample Input

```
-5,5,-2,2,-3,4,1,-1
-2,1,1,2
-2,-5,-2,2,1,2
-5,5,-2,2,0,0
-5,5,-2,2,0,0.5
-5,5,-2,2,0,0,1
-1000,1000,-400,400,-600,800,200,-200
```

Sample Output

```
Max Value : 5
Max Points: (-5,-2),(-1,-2),(0,-2),(1,2),(2,2)
```

```
Not a valid input
```

```
Not a valid input
```

```
Max Value : 7
Max Points: (-5,-2),(-5,2),(5,-2),(5,2)
```

```
Not a valid input
```

```
Not a valid input
```

```
Max Value : 1100
Max Points: (-100,-400),(300,400)
```