

Problem 8 – Packaging Figures

You are given N figures (rectangles, squares and circles) in a two-dimensional Cartesian coordinate system. A figure F_A is **nested** inside another figure F_B if **all points of F_A are contained within F_B** . We denote this as $F_A < F_B$. Find the **longest sequence of figures $F_1 < F_2 < \dots < F_K$** . If several longest sequences exist, find the **first in the alphabetical order**.

A **rectangle** is defined by two corners: top-left $A(A_x; A_y)$ and bottom-right $B(B_x; B_y)$. A **square** is defined by its top-left point $A(A_x; A_y)$ and side S . All square and rectangle sides are parallel to the coordinate axes. A **circle** is defined by its center $O(O_x; O_y)$ and radius R .

The coordinates increase from left to right by horizontal and from bottom to top by vertical.

Input

- The input is read from the console.
- Each line contains a single figure in one of the following formats:
 - rectangle name A_x A_y B_x B_y**
 - square name A_x A_y S**
 - circle name O_x , O_y , R**
- The last line contains the single word **End**.

Output

- Print at the console the longest sequence of nested figures in the following format:
 - name1 < name2 < ... < nameK**
- If several longest sequences exist, print the **first in the alphabetical order**.

Constraints

- The numbers N and K are integers in the interval $[1; 2500]$.
- $A_x, A_y, B_x, B_y, O_x, O_y, S$ and R are integer numbers in the range $[-10000; 10000]$. S and R are positive.
- Figure names** consist of Latin letters and digits and are case-sensitive. Duplicate names are not allowed.
- No two figures have the same coordinates.
- Time limit: **300 ms**. Allowed memory: **32 MB**.

Sample Input and Output

Input	Visualization
<pre>rectangle Theta -30 40 55 -10 square Delta -40 30 20 rectangle Alpha -60 50 40 -20 square Zeta -50 30 30 circle Beta 5 15 15 circle Lambda 50 30 20 rectangle Gamma -40 40 60 -35 End</pre>	
Output	
Alpha < Zeta < Delta	
Comments	

Two longest sequences of the same length 3 exist:

- Gamma < Theta < Beta
- Alpha < Zeta < Delta

The first in the alphabetical order is Alpha < Zeta < Delta.

Input	Visualization
<pre>rectangle Europe 0 60 70 0 rectangle Italy 5 30 30 20 rectangle Austria 35 20 60 10 rectangle France 35 40 60 30 circle Alps 30 30 20 End</pre>	
Output	
<pre>Europe < Alps</pre>	