## The National Geological Survey   P89193_en
Vuitè Concurs de Programació de la UPC - Final (2010-09-22)

Masao's life is very interesting. At one moment, he was the only employee of the National Geological Survey (NGS) of an undisclosed nation, well known for his attachment to *long long* traditions. Following this noble traditionalism, Masao elaborated maps by carrying his good ol' theodolite (which he secretly—and lovingly—called Mady) across the country, taking angle measures, and deducing from them the position of the features of interest.
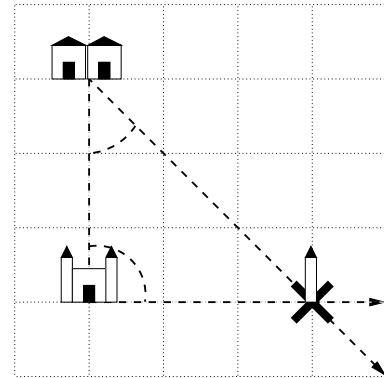
Masao started with two reference features, whose positions were known. Then, he deduced from two angle measures the position of another feature, etc. The terrain was flat, so Masao considered it a plane with Cartesian coordinates, and happily used good ol' trigonometry formulae to locate the position of the features.

Can you write a program that, given all the measurements, prints the coordinates of all the features of the country?

Input

Input begins with the name and the position (two real numbers x and y) of the two reference features. Next come, in any order, the measurements, each with the names of three features A, B and C and a real number α, which indicate that the angle from vector $\vec{BA}$ to vector $\vec{BC}$ measures α degrees, with positive values corresponding to counterclockwise angles. Except for the two reference features, every feature appears as C in exactly two measurements. The locations of A and B are always already known at the time of the measurement. The names of the features are all different.

The picture above corresponds to the second and last measurements given in the sample input.

Output

Print, in lexicographical order, the name and the x and y coordinates of every feature, with three digits after the decimal point. The input cases have no precision issues.

Sample input

```
Castle  1.0 1.0
Town    1.0 4.0
Town    Tower    Lighthouse  -45.0
Castle  Town     Tower        45.0
Town    Tower    Gardens     -90.0
Town    Gardens  Lighthouse  -30.0
Castle  Town     Gardens      90.0
Town    Castle   Tower       -90.0
```

Sample output

```
Castle 1.000 1.000
Gardens 7.000 4.000
Lighthouse 4.000 5.732
Tower 4.000 1.000
Town 1.000 4.000
```

Problem information

Author : Edgar Gonzàlez
Generation : 2013-09-02 15:43:19