Problem 18: Dog and Gopher[1]

Source filename:	`gopher.(cpp|java)`
Input filename:	`gopher.in`
Output filename:	`gopher.out`

A large field has a dog and a gopher. The dog wants to eat the gopher, while the gopher wants to run to safety through one of several gopher holes dug in the surface of the field.

Neither the dog nor the gopher is a math major; however, neither is entirely stupid. The gopher decides on a particular gopher hole and heads for that hole in a straight line at a fixed speed. The dog, which is very good at reading body language, anticipates which hole the gopher has chosen. The dog heads at double the speed of the gopher to the same hole. If the dog reaches the hole first, the gopher gets gobbled up; otherwise, the gopher escapes.

You have been retained by the gopher to select a hole through with it can escape, if such a hole exists.

Input File (`gopher.in`)

The input file contains several sets of input. The first line of each set contains one integer and four floating point numbers. The integer *n* denotes how many holes are in the set. The four floating point numbers denote the (*x*,*y*) coordinates of the gopher followed by the (*x*,*y*) coordinates of the dog. The subsequent *n* lines of input each contain two floating point numbers: the (*x*,*y*) coordinates of a gopher hole. All distances are in meters to the nearest millimeter. There is a blank line between two consecutive sets of input. The input file is terminated by a line that contains the integer 0.

Output File (`gopher.out`)

Output a single line for each set of input. If the gopher can escape, the output line should read, "`The gopher can escape through the hole at (x,y).`" while identifying the appropriate hole to the nearest millimeter. Otherwise, the output line should read, "`The gopher cannot escape.`" If the gopher can escape through more than one hole, report the one that appears first in the input set. There are at most 1,000 gopher holes in a set of input and all coordinates range between -10,000 and +10,000.

Sample Input

```
1 1.000 1.000 2.000 2.000
1.500 1.500

2 2.000 2.000 1.000 1.000
1.500 1.500
2.500 2.500
```

Sample Output

```
The gopher cannot escape.
The gopher can escape through the hole at (2.500,2.500).
```

[1] This problem appears in *Programming Challenges* on page 304.