

## Fat King

Once upon a time there was a beautiful country. The most wonderful plants grew there, the most fantastic creature lived there, and the fattest man in the world ruled there.

The king, called Pudge, was so fat, that even the hugest pillars in his palace looked like bamboo comparing to his giant body. To make his movement more convenient, he removed all the walls in his palace. This made his palace looked funny - only a roof supported by several pillars.

No matter how big Pudge was, he was still gathering flesh. And you, his wizard, warned him one day: "If you keep on growing fat, you will be stuck in the palace and can never go outside."

If he got stuck, he could not walk around the country and show his giant body to his citizens, which is his only hobby.

Thus Pudge replied: "Then tell me how big I can grow! But if you cheat me, I will burn you!".

You only have one opportunity that time, luckily you got it right. Otherwise you would not have chance to tell this story today.

Can you share with us what was your answer that time?

Time limit: 2s.

## Input

The first line contains a single integer  $C$ , followed by  $C$  test cases.

The first line of each test case is a number  $N$ . Then  $N$  lines are given.

Each line contains two integer  $x_i$  and  $y_i$ , representing the coordinates of the pillar. Pillars' diameters are ignored.

Pudge's bed was at the origin, to be exact, centered at the origin. And he began his daily life there.

It is guaranteed that no two pillars will be collinear with the origin (i.e.  $x_i / x_j \neq y_i / y_j$ )

$1 \leq N \leq 2000$ .  $-5000 \leq x_i, y_i \leq 5000$

## Output

Assume that Pudge's body is a big circle. He can pass the space between two pillars, only if his diameter is not greater than the distance between the two pillars.

Your program should output one decimal indicating the largest diameter Pudge can grow to, ensuring that he can go outside. Please round to one thousandth.

Please be aware that if Pudge grow too fat, he would have no room to sleep, which is not desirable.

## Sample Input

```
2
3
1 2
1 -1
-1 0
3
1 1
1 -1
-2 0
```

## Sample Output

```
2.000
2.828
```

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