Round 1A 2018

Ended Apr 14 2018 9:00 am

Practice is available

Last updated: Jan 15 2019 3:59 pm

Waffle Choppers
(9pt 16pt)

Bit Party
(11pt 21pt)

Edgy Baking
(14pt 29pt)

Edgy Baking

Problem

The baker Mr. Maillard has rolled out some cookie dough and cut it up to create **N** cookies, each of which is a rectangle. He was just about to put them in the oven when he remembered that the crispy, caramelized edges of cookies taste particularly delicious. Specifically, he thinks he would be happiest if the sum of the perimeters of all the cookies were as close as possible to **P** millimeters (mm), without going over. (If the batch of cookies is *too* edgy, it might burn!)

For each cookie, Mr. Maillard can decide whether to leave it as is, or make a single straight cut to separate it into two (not necessarily rectangular) halves with equal area. (Note that such a cut must necessarily go through the center of the cookie.) The two new cookies created in this way cannot themselves be cut again.

If Mr. Maillard makes optimal decisions, what is the closest he can come to **P** without exceeding it?

Input

The first line of the input gives the number of test cases, **T**. **T** test cases follow. Each begins with one line with two integers **N** and **P**: the number of cookies, and the desired perimeter sum (in mm), respectively. Then, **N** lines follow. The i-th of these has two integers W_i and H_i: the width and height (both in mm) of the i-th cookie.

Output

For each test case, output one line containing `Case #x: y`, where x is the test case number (starting from 1) and y is a real number: the largest possible sum (in mm) of the perimeters of all cookies (after Mr. Maillard is done cutting) that does not exceed **P**. y will be considered correct if it is within an absolute or relative error of 10^{-6} of the correct answer. See the FAQ for an explanation of what that means, and what formats of real numbers we accept.

Limits

$1 \le T \le 100$.
$1 \le N \le 100$.
$1 \le W_i \le 250$, for all i.
$1 \le H_i \le 250$, for all i.
P ≥ 2 × the sum of ($W_i + H_i$) over all i. (**P** is at least as large as the sum of the perimeters of all cookies before any cuts are made.)
$P \le 10^8$.
Time limit: 15 seconds per test set.
Memory limit: 1GB.

Test set 1 (Visible)

$W_i = W_j$, for all i and j.
$H_i = H_j$, for all i and j.
(All of the provided cookies have the same dimensions.)

Test set 2 (Hidden)

No additional limits beyond the general ones. (In particular, the provided cookies do not all necessarily have the same dimensions.)

Sample

Input	Output

```
4                        Case #1:  6.828427
1 7                      Case #2:  920.000000
1 1                      Case #3:  32.000000
2 920                    Case #4:  240.000000
50 120
50 120
1 32
7 4
3 240
10 20
20 30
30 10
```

Note that the last sample case would not appear in test set 1.

In Sample Case #1, there is only one cookie, and it is a square with side length 1. Mr. Maillard can cut from one corner to a diagonally opposite corner, which creates two right triangles, each of which has side lengths 1, 1, and sqrt(2). Then the perimeter sum is 4 + 2 × sqrt(2); this is smaller than **P** = 7, but it is not possible to get any closer.

In Sample Case #2, Mr. Maillard can cut the first cookie along its longer axis to create two new 25 x 120 rectangles, and leave the second cookie alone. The total perimeter is then 580 + 340 = 920, which is exactly **P**.

In Sample Case #3, Mr. Maillard can cut the cookie to make two trapezoids, each of which has side lengths of 2, 4, 5, and 5. Then the new perimeter sum is 32, which is exactly **P**.

In Sample Case #4, the initial perimeter sum is exactly **P**, so Mr. Maillard should not make any cuts.

Solution for Edgy Baking ↗

```
1  |
```

This is a practice submission.

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