

Qualification Round 2008

[A. Saving the Universe](#)[B. Train Timetable](#)**C. Fly Swatter**[Contest Analysis](#)[Questions asked](#) 7

Submissions

Saving the Universe

5pt Not attempted
6760/10473 users
correct (65%)20pt Not attempted
6258/7836 users
correct (80%)

Train Timetable

5pt Not attempted
5076/6516 users
correct (78%)20pt Not attempted
4408/5491 users
correct (80%)

Fly Swatter

5pt Not attempted
1007/1536 users
correct (66%)20pt Not attempted
652/1274 users correct
(51%)

Top Scores

rem	75
ymatsux	75
Reid	75
Jacek	75
krijgertje	75
inazz	75
gawry	75
t3hg0suazn	75
RomanLipovsky	75
jasonw	75

Problem C. Fly Swatter

This contest is open for practice. You can try every problem as many times as you like, though we won't keep track of which problems you solve. Read the [Quick-Start Guide](#) to get started.

Small input
5 points

Solve C-small

Large input
20 points

Solve C-large

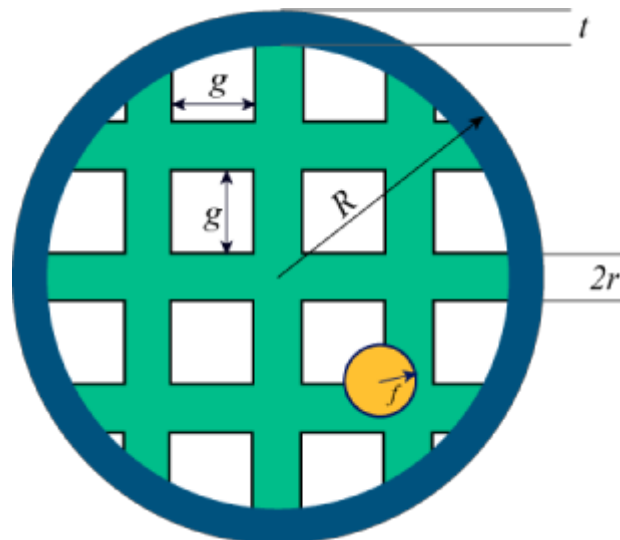
Problem

What are your chances of hitting a fly with a tennis racquet?

To start with, ignore the racquet's handle. Assume the racquet is a perfect ring, of outer radius R and thickness t (so the inner radius of the ring is $R-t$).

The ring is covered with horizontal and vertical strings. Each string is a cylinder of radius r . Each string is a chord of the ring (a straight line connecting two points of the circle). There is a gap of length g between neighbouring strings. The strings are symmetric with respect to the center of the racquet i.e. there is a pair of strings whose centers meet at the center of the ring.

The fly is a sphere of radius f . Assume that the racquet is moving in a straight line perpendicular to the plane of the ring. Assume also that the fly's center is inside the outer radius of the racquet and is equally likely to be anywhere within that radius. Any overlap between the fly and the racquet (the ring or a string) counts as a hit.



Input

One line containing an integer **N**, the number of test cases in the input file.

The next **N** lines will each contain the numbers **f**, **R**, **t**, **r** and **g** separated by exactly one space. Also the numbers will have at most 6 digits after the decimal point.

Output

N lines, each of the form "Case #**k**: **P**", where **k** is the number of the test case and **P** is the probability of hitting the fly with a piece of the racquet.

Answers with a relative or absolute error of at most 10^{-6} will be considered correct.

Limits

f, **R**, **t**, **r** and **g** will be positive and smaller or equal to 10000.

$$t < R$$

$$f < R$$

$$r < R$$

Small dataset

$$1 \leq N \leq 30$$

The total number of strings will be at most 60 (so at most 30 in each direction).

Large dataset

$$1 \leq N \leq 100$$

The total number of strings will be at most 2000 (so at most 1000 in each direction).

Sample

Input	Output
5	Case #1: 1.000000
0.25 1.0 0.1 0.01 0.5	Case #2: 0.910015
0.25 1.0 0.1 0.01 0.9	Case #3: 0.000000
0.00001 10000 0.00001 0.00001 1000	Case #4: 0.002371
0.4 10000 0.00001 0.00001 700	Case #5: 0.573972
1 100 1 1 10	

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