

Practice Round APAC test 2017

[A. Lazy Spelling Bee](#)

[B. Robot Rock Band](#)

C. Not So Random

[D. Sums of Sums](#)

[Questions asked](#)

Submissions

Lazy Spelling Bee

5pt	Not attempted 698/1266 users correct (55%)
8pt	Not attempted 496/685 users correct (72%)

Robot Rock Band

6pt	Not attempted 480/622 users correct (77%)
14pt	Not attempted 142/407 users correct (35%)

Not So Random

11pt	Not attempted 204/310 users correct (66%)
20pt	Not attempted 109/158 users correct (69%)

Sums of Sums

8pt	Not attempted 230/395 users correct (58%)
28pt	Not attempted 13/128 users correct (10%)

Top Scores

Jayam	100
Seter	100
KillswitcherEngag...	100
onepunchman	100
Sumeet.Varma	100
gdragon007	100
libenchao	100
jpravishAA	100
vaibhav227	100
wrong	100

Problem C. Not So Random

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
11 points

Solve C-small

Large input
20 points

Solve C-large

Problem

There is a certain "random number generator" (RNG) which takes one nonnegative integer as input and generates another nonnegative integer as output. But you know that the RNG is really not very random at all! It uses a fixed number **K**, and always performs one of the following three operations:

- with probability **A**/100: return the bitwise AND of the input and **K**
- with probability **B**/100: return the bitwise OR of the input and **K**
- with probability **C**/100: return the bitwise XOR of the input and **K**

(You may assume that the RNG *is* truly random in the way that it chooses the operation each time, based on the values of **A**, **B**, and **C**.)

You have **N** copies of this RNG, and you have arranged them in series such that output from one machine will be the input for the next machine in the series. If you provide **X** as an input to the first machine, what will be the expected value of the output of the final machine in the series?

Input

The first line of the input gives the number of test cases, **T**. **T** test cases follow; each consists of one line with six integers **N**, **X**, **K**, **A**, **B**, and **C**. Respectively, these denote the number of machines, the initial input, the fixed number with which all the bitwise operations will be performed (on every machine), and 100 times the probabilities of the bitwise AND, OR, and XOR operations.

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 the expected value of the final output. y will be considered correct if it is within an absolute or relative error of 10^{-9} of the correct answer. See the [FAQ](#) for an explanation of what that means, and what formats of real numbers we accept.

Limits

$1 \leq T \leq 50$.
 $0 \leq A \leq 100$.
 $0 \leq B \leq 100$.
 $0 \leq C \leq 100$.
 $A+B+C = 100$.

Small dataset

$1 \leq N \leq 10$.
 $0 \leq X \leq 10^4$.
 $0 \leq K \leq 10^4$.

Large dataset

$1 \leq N \leq 10^5$.
 $0 \leq X \leq 10^9$.
 $0 \leq K \leq 10^9$.

Sample

Input	Output
3	Case #1: 3.0000000000
1 5 5 10 50 40	Case #2: 3.6000000000
2 5 5 10 50 40	Case #3: 15.6850579098
10 15 21 70 20 10	

In sample test case #1, the final output will be 5 if AND or OR happens and 0 if XOR happens. So the probability of getting 5 is $(0.1 + 0.5)$ and the probability

of getting 0 is 0.4. So the expected final output is $5 * 0.6 + 0 * 0.4 = 3$.

In sample test case #2, the final output will be 5 with probability 0.72, and 0 otherwise.

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