Problem A. Frog Jumping

Time limit 1000 ms
Mem limit 262144 kB

A frog is currently at the point 0 on a coordinate axis Ox. It jumps by the following algorithm: the first jump is a units to the right, the second jump is b units to the left, the third jump is a units to the right, the fourth jump is b units to the left, and so on.

Formally:

- if the frog has jumped an even number of times (before the current jump), it jumps from its current position x to position $x + a$;
- otherwise it jumps from its current position x to position $x - b$.

Your task is to calculate the position of the frog after k jumps.

But... One more thing. You are watching t different frogs so you have to answer t independent queries.

Input

The first line of the input contains one integer t ($1 \leq t \leq 1000$) — the number of queries.

Each of the next t lines contain queries (one query per line).

The query is described as three space-separated integers a, b, k ($1 \leq a, b, k \leq 10^9$) — the lengths of two types of jumps and the number of jumps, respectively.

Output

Print t integers. The i-th integer should be the answer for the i-th query.

Examples

Input	Output

6
5 2 3
100 1 4
1 10 5
1000000000 1 6
1 1 1000000000
1 1 999999999
	8
	198
	-17
	2999999997
	0
	1

Note

In the first query frog jumps 5 to the right, 2 to the left and 5 to the right so the answer is $5-2+5=8$.

In the second query frog jumps 100 to the right, 1 to the left, 100 to the right and 1 to the left so the answer is $100-1+100-1=198$.

In the third query the answer is $1-10+1-10+1=-17$.

In the fourth query the answer is $10^9-1+10^9-1+10^9-1=2999999997$.

In the fifth query all frog's jumps are neutralized by each other so the answer is 0.

The sixth query is the same as the fifth but without the last jump so the answer is 1.

Problem B. Vacations

Time limit 1000 ms
Mem limit 262144 kB

Vasya has n days of vacations! So he decided to improve his IT skills and do sport. Vasya knows the following information about each of this n days: whether that gym opened and whether a contest was carried out in the Internet on that day. For the i-th day there are four options:

1. on this day the gym is closed and the contest is not carried out;
2. on this day the gym is closed and the contest is carried out;
3. on this day the gym is open and the contest is not carried out;
4. on this day the gym is open and the contest is carried out.

On each of days Vasya can either have a rest or write the contest (if it is carried out on this day), or do sport (if the gym is open on this day).

Find the minimum number of days on which Vasya will have a rest (it means, he will not do sport and write the contest at the same time). The only limitation that Vasya has — *he does not want to do the same activity on two consecutive days: it means, he will not do sport on two consecutive days, and write the contest on two consecutive days.*

Input

The first line contains a positive integer n ($1 \leq n \leq 100$) — the number of days of Vasya's vacations.

The second line contains the sequence of integers $a_1, a_2, ..., a_n$ ($0 \leq a_i \leq 3$) separated by space, where:

- a_i equals 0, if on the i-th day of vacations the gym is closed and the contest is not carried out;
- a_i equals 1, if on the i-th day of vacations the gym is closed, but the contest is carried out;
- a_i equals 2, if on the i-th day of vacations the gym is open and the contest is not carried out;

- a_i equals 3, if on the i-th day of vacations the gym is open and the contest is carried out.

Output

Print the minimum possible number of days on which Vasya will have a rest. Remember that Vasya refuses:

- to do sport on any two consecutive days,
- to write the contest on any two consecutive days.

Examples

Input	Output
4 1 3 2 0	2

Input	Output
7 1 3 3 2 1 2 3	0

Input	Output
2 2 2	1

Note

In the first test Vasya can write the contest on the day number 1 and do sport on the day number 3. Thus, he will have a rest for only 2 days.

In the second test Vasya should write contests on days number 1, 3, 5 and 7, in other days do sport. Thus, he will not have a rest for a single day.

In the third test Vasya can do sport either on a day number 1 or number 2. He can not do sport in two days, because it will be contrary to the his limitation. Thus, he will have a rest for only one day.

Problem C. Not So Simple Polygon Embedding

Time limit 2000 ms

Mem limit 262144 kB

The statement of this problem is the same as the statement of problem C1. The only difference is that, in problem C1, n is always even, and in C2, n is always odd.

You are given a regular polygon with $2 \cdot n$ vertices (it's convex and has equal sides and equal angles) and all its sides have length 1. Let's name it as $2n$-gon.

Your task is to find the square of the minimum size such that you can embed $2n$-gon in the square. Embedding $2n$-gon in the square means that you need to place $2n$-gon in the square in such way that each point which lies inside or on a border of $2n$-gon should also lie inside or on a border of the square.

You can rotate $2n$-gon and/or the square.

Input

The first line contains a single integer T ($1 \leq T \leq 200$) — the number of test cases.

Next T lines contain descriptions of test cases — one per line. Each line contains single **odd** integer n ($3 \leq n \leq 199$). Don't forget you need to embed $2n$-gon, not an n-gon.

Output

Print T real numbers — one per test case. For each test case, print the minimum length of a side of the square $2n$-gon can be embedded in. Your answer will be considered correct if its absolute or relative error doesn't exceed 10^{-6}.

Examples

Input	Output
3 3 5 199	1.931851653 3.196226611 126.687663595

Problem D. Enemy is weak

Time limit	5000 ms
Mem limit	262144 kB
Input file	stdin
Output file	stdout

The Romans have attacked again. This time they are much more than the Persians but Shapur is ready to defeat them. He says: "A lion is never afraid of a hundred sheep".

Nevertheless Shapur has to find weaknesses in the Roman army to defeat them. So he gives the army a weakness number.

In Shapur's opinion the weakness of an army is equal to the number of triplets i, j, k such that $i < j < k$ and $a_i > a_j > a_k$ where a_x is the power of man standing at position x. The Roman army has one special trait — powers of all the people in it are distinct.

Help Shapur find out how weak the Romans are.

Input

The first line of input contains a single number n ($3 \le n \le 10^6$) — the number of men in Roman army. Next line contains n different positive integers a_i ($1 \le i \le n$, $1 \le a_i \le 10^9$) — powers of men in the Roman army.

Output

A single integer number, the weakness of the Roman army.

Please, do not use `%lld` specificator to read or write 64-bit integers in C++. It is preffered to use `cout` (also you may use `%I64d`).

Examples

Input	Output
3 3 2 1	1

Input	Output
3 2 3 1	0

Input	Output
4 10 8 3 1	4

Input	Output
4 1 5 4 3	1

Problem E. Vanya and Exams

Time limit	1000 ms
Mem limit	262144 kB
Input file	stdin
Output file	stdout

Vanya wants to pass n exams and get the academic scholarship. He will get the scholarship if the average grade mark for all the exams is at least avg. The exam grade cannot exceed r. Vanya has passed the exams and got grade a_i for the i-th exam. To increase the grade for the i-th exam by 1 point, Vanya must write b_i essays. He can raise the exam grade multiple times.

What is the minimum number of essays that Vanya needs to write to get scholarship?

Input

The first line contains three integers n, r, avg ($1 \le n \le 10^5$, $1 \le r \le 10^9$, $1 \le avg \le min(r, 10^6)$) — the number of exams, the maximum grade and the required grade point average, respectively.

Each of the following n lines contains space-separated integers a_i and b_i ($1 \le a_i \le r$, $1 \le b_i \le 10^6$).

Output

In the first line print the minimum number of essays.

Examples

Input	Output

5 5 4
5 2
4 7
3 1
3 2
2 5
	4

Input	Output

2 5 4
5 2
5 2
	0

Note

In the first sample Vanya can write 2 essays for the 3rd exam to raise his grade by 2 points and 2 essays for the 4th exam to raise his grade by 1 point.

In the second sample, Vanya doesn't need to write any essays as his general point average already is above average.

Problem F. Team Training

Time limit 2000 ms
Mem limit 262144 kB

At the IT Campus "NEIMARK", there are training sessions in competitive programming — both individual and team-based!

For the next team training session, n students will attend, and the skill of the i-th student is given by a positive integer a_i.

The coach considers a team strong if its *strength* is at least x. The *strength* of a team is calculated as the number of team members multiplied by the minimum skill among the team members.

For example, if a team consists of 4 members with skills $[5, 3, 6, 8]$, then the team's *strength* is $4 \cdot min([5, 3, 6, 8]) = 12$.

Output the maximum possible number of strong teams, given that each team must have at least one participant and every participant must belong to exactly one team.

Input

Each test contains multiple test cases. The first line contains the number of test cases t ($1 \leq t \leq 10^4$). The description of the test cases follows.

The first line of each test case contains two integers n and x ($1 \leq n \leq 2 \cdot 10^5, 1 \leq x \leq 10^9$) — the number of students in training and the minimum *strength* of a team to be considered strong.

The second line of each test case contains n integers a_i ($1 \leq a_i \leq 10^9$) — the skill of each student.

It is guaranteed that the sum of n over all test cases does not exceed $2 \cdot 10^5$.

Output

For each test case, output the maximum possible number of teams with *strength* at least x.

Examples

Input	Output

5
6 4
4 5 3 3 2 6
4 10
4 2 1 3
5 3
5 3 2 3 2
3 6
9 1 7
6 10
6 1 3 6 3 2
	4
	0
	4
	2
	1