Bangladesh Artificial Intelligence Olympiad (Preliminary)

https://toph.co/c/bd-artificial-intelligence-olympiad-preliminary

Toph

Schedule

The contest will run for **3h0m0s**.

The standings will be frozen for the last **1h0m0s** of the contest.

Authors

The authors of this contest are aymanrasheed7, and nafistiham.

Rules

This contest is formatted as per the official rules of ICPC Regional Programming Contests.

You can use PyPy 7.1 (3.6), and Python 3.12 in this contest.

Be fair, be honest. Plagiarism will result in disqualification. Judges' decisions will be final.

Notes

There are 8 challenges in this contest.

Please make sure this booklet contains all of the pages.

If you find any discrepencies between the printed copy and the problem statements in Toph Arena, please rely on the later.

A. Welcome to Bangladesh AI Olympiad!

This is the first time AI Olympiad is happening in Bangladesh. So, we would like to welcome you.

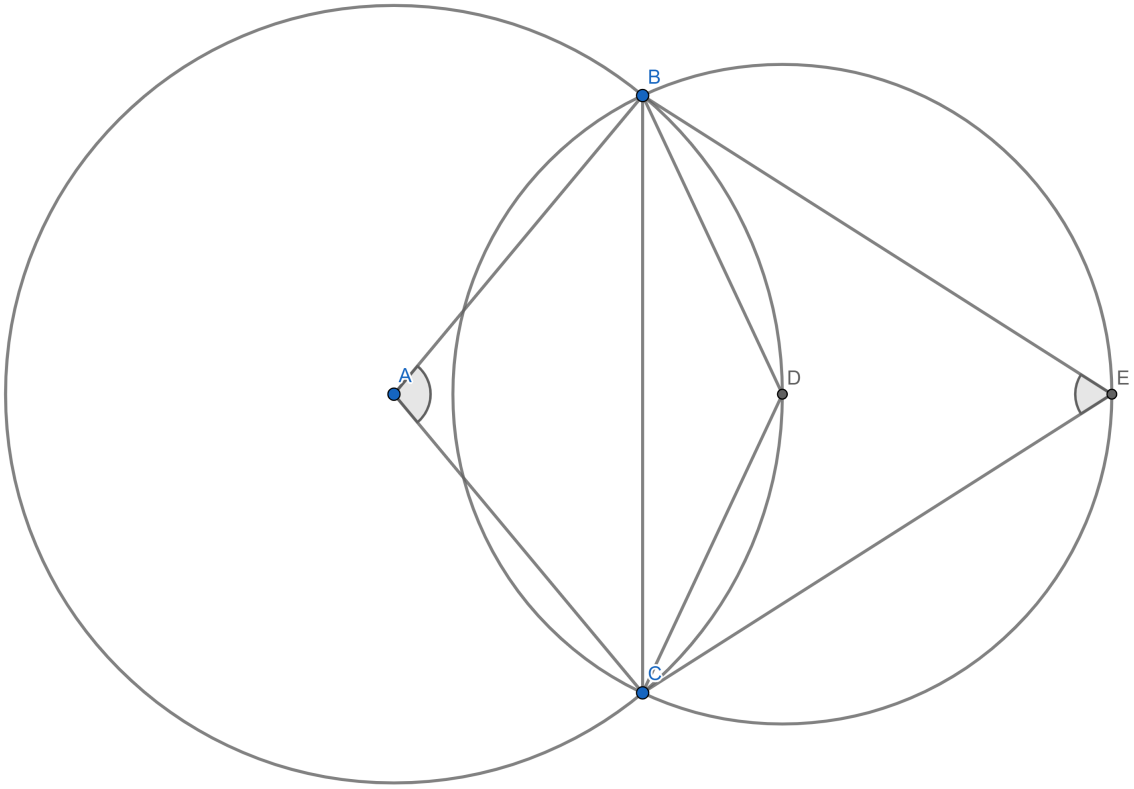
Input

- There won't be any input

Output

- The task is to output this single line, "Welcome to Bangladesh AI Olympiad!"

B. Take Angle, Give Angle



- The circumcircle of $\triangle BEC$ is centered at point D.
- The circumcircle of $\triangle BDC$ is centered at point A.
- The points E and D are at the same side of the line segment BC.
- The points D and A are at the opposite side of the line segment BC.
- In $\triangle BEC$, $\angle BEC = n$ degrees.
- In $\triangle BAC$, $\angle BAC = m$ degrees.

You are given n. You have to give m.

Input

The input contains only one integer n ($45 < n < 90$).

Output

Print only one integer, m. For the constraints given above, it is guaranteed that m is an integer.

Samples

Input	Output
60	120

C. Odd Subset XOR

You are given a set of n distinct positive integers. There can be many subsets of this set. However, we are only interested in the subsets of odd length.

Let us define the strength of a set as the bit-wise XOR of all the elements of the set.

The task is to find the bit-wise XOR of the strengths of all the subsets of odd length, of the given set.

Input

The first line contains n ($0 < n < 10^6$).

The second line contains n distinct positive integers. All these integers are less than 10^9.

Output

Print only one integer, the bit-wise XOR of the strengths of all the subsets of odd length, of the given set.

Samples

Input	Output
3 1 2 3	0
The subsets of odd lengths are $\{1\}$, $\{2\}$, $\{3\}$, $\{1, 2, 3\}$. The strengths of these sets are $1, 2, 3, 0$. Bitwise XOR of these numbers is 0.	

In most programming languages, the ^ operator does the bit-wise XOR operation.

D. Can you predict?

You are provided with data from an online advertising campaign where each ad impression is scored by a model based on how likely it is that a user will click on the ad. The score is a real number which can range from negative infinity to positive infinity. Your task is to convert these scores into a probability that represents the likelihood of a user clicking on the ad.

Given a list of scores from an advertising model, convert each score into a probability between 0 and 1. Your program should output the probabilities with high precision, as they directly influence budgeting decisions in the advertising campaign.

Input

- The first line contains an integer T, the number of test cases. $1 < T < 100$
- Each test case starts with an integer N, the number of scores in that test case. $1 < N < 100$
- This is followed by N real numbers R, each representing a model score. $-100000 < R < 100000$

Output

- For each score in each test case, output the corresponding probability.
- Each value should be on a new line.

Samples

Input	Output
2 3 -1.0 0.0 1.0 2 3.0 5.0	0.268941421 0.500000000 0.731058579 0.952574127 0.993307149

The probability should be calculated with a function that maps any real number to a value between 0 and 1. Your answer should be correct to at least 5 digits after the decimal point.

E. Cycle of life

Pritom has discovered a mathematical game involving the divisors of integers. He finds it intriguing that every integer greater than 1 can be reduced to 1 by successively dividing the number by one of its divisors. Fascinated by this property, Pritom decides to analyze the game mathematically.

Pritom wants to understand how many divisions, on average, it will take to reduce a number N to 1 by repeatedly selecting a divisor of N (including N itself) and dividing N by this divisor. Your task is to help Pritom calculate the expected number of divisions required to terminate the game for various starting values of N.

Input

- The input begins with an integer T, representing the number of test cases $(T \leq 10000)$.
- Each test case consists of an integer N, where $1 \leq N \leq 100,000$ representing the starting number for that game instance.

Output

- For each number, output the expected number of steps in separate lines.

Samples

Input	Output
3 1 2 50	0.000000000 2.000000000 3.033333333

Your answers should be correct to at least 5 digits after decimal point.

F. Lost in brackets

Given a string consisting of parentheses `(` and `)` and lowercase English letters, determine if the sequence of parentheses is balanced and if the characters between any pair of balanced parentheses are unique. Everything out of all the parentheses will be considered in the global parentheses.

Input

- An integer T will be in the input. $1 < T < 1000$
- T lines containing the string which may include characters from `(`, `)`, and lowercase English letters `a` to `z`.

Output

- Print `YES` if the parentheses in the string are balanced and the characters between any pair of balanced parentheses are unique. Otherwise, print `NO`.
- All results will be in separate lines.

Samples

Input	Output
8 (a(b)c(d)e)f (a(b(c)d)e)f (a(bcc)d)ef fa(b(cd)e)f (a(bc)(d(e)f ((a)b)cde ()())	YES YES NO NO NO YES YES NO

G. Sum in summer

Summer vacation is going on. Lamiya is teaching her younger sister Samiya how to do addition and subtraction with small numbers. Samiya is given a sentence containing three words, where the first word is a number, the second word is either "plus" or "minus", and the third word is another number. Samiya needs to perform the corresponding operation and find the result.

For example, if the input is "one plus six", Samiya needs to add 1 and 6 to get the output "seven". Similarly, if the input is "seven minus three", Samiya needs to subtract 3 from 7 to get the output "four".

Input

- The input will start with an integer T where 1 < T < 1000.
- T lines will follow.
- Each line will consist of three words separated by spaces.
- The first and third words will be numbers between 0 and 10 (inclusive), represented in English. All small letters.
- The second word will be either "plus" or "minus".

Output

- The output will consist of T lines.
- Each line should be a single number representing the result of the operation in English. All small letters.
- The test case will not generate a result less than “zero“ and more than “ten“

Samples

Input	Output
3 nine minus three eight plus one one plus two	six nine three

H. I think, therefore I am

You are given a Cartesian plane divided into four quadrants. The task is to determine if a straight line segment defined by two points $(x1, y1)$ and $(x2, y2)$ crosses any integer coordinate points other than its endpoints.

Input

- The first line contains an integer $T (1 \leq T \leq 100000)$, the number of test cases.
- Each of the next T lines contains four integers $x1, y1, x2, y2$ representing the coordinates of the two endpoints of the line segment.
- The values of the coordinates will be in the range $[-999999, 999999]$.

Output

- For each test case, output "YES" if the line segment crosses any integer points between the endpoints $(x1, y1)$ and $(x2, y2)$, excluding the endpoints themselves. Otherwise, output "NO".

Samples

Input	Output
4 0 0 1 1 0 0 2 2 0 0 2 1 3 3 6 6	NO YES NO YES

Explanation

1. The line segment from (0,0) to (1,1) passes directly through the points and does not cross any other integer points.
2. The line segment from (0,0) to (2,2) crosses through the integer point (1,1).
3. The line segment from (0,0) to (2,1) does not cross any other integer points directly.

4. The line segment from (3,3) to (6,6) crosses through the integer points (4,4) and (5,5).