A. Multiple Choice

2 seconds, 128 megabytes

In this problem, you will have 5 questions to answer. Each question has 4 choices (marked A, B, C and D), and only one of them is correct. You should choose the correct answer for each question.

Subtasks

Easy (57 points):

You must pass this subtask to get any score.

1. Which of the following is logically equivalent to $p \rightarrow q$?

   A. $\neg p \rightarrow \neg q$

   B. $\neg p \vee q$

   C. $p \wedge q$

   D. $q \rightarrow \neg q$

2. Which of the following should be avoided in floating-point calculation?

   A. Multiplying two numbers with greatly different magnitudes

   B. Multiplying two similar numbers

   C. Adding two numbers with greatly different magnitudes

   D. Adding two similar numbers

3. Generally speaking, which of the following is not suitable for linked list?

   A. A large number of random access operations

   B. A large number of deletion operations

   C. A large number of element swapping operations

D. A large number of traversal operations

Hard (43 points):

Partial score is calculated by the number of correct answers.

4. The following table shows the passing status of 10 students in a class for Advanced Mathematics and Introduction to Artificial Intelligence. What is $H(\text{Introduction to Artificial Intelligence}|\text{Advanced Mathematics})$? (23 points)

Advanced Mathematics	Introduction to Artificial Intelligence
Failed	Failed
Failed	Passed
Failed	Passed
Passed	Failed
Passed	Passed
Passed	Passed
Passed	Passed
Passed	Passed
Passed	Passed
Passed	Passed

A. 1.5710

B. 0.5027

C. 0.9183

D. 0.6897

5. Which of the following is not a regular language? (20 points)

A. $\{w|w \text{ is an decimal number divisible by } 7\}$

B. $\{w|w \text{ is an decimal odd number}\}$

C. $\{w|w \text{ is an decimal number whose length is prime}\}$

D. $\{w|w \text{ is an decimal negative number}\}$

Input

Output

Output 5 letters in any format, each letter represents the answer to the corresponding question.

The checker is case-insensitive and it will ignore all unrelated characters, such as spaces, line-breaks, numbers, punctuations and emojis.

Example

Input

```

```

Output

```
AAAAA
```

Note

The sample output is only for the purpose of explanation. It is not the correct answer.

B. Comparing Sets

2 seconds, 128 megabytes

In this problem, you are given 2 sets X and Y. Please compare them in the following way:

- If X is a proper subset of Y, output `<`.
- If Y is a proper subset of X, output `>`.
- If X equals Y, output `=`.
- Otherwise, output `.`.

Input

The first line starts with an integer n ($0 \leq n \leq 10^5$), the number of elements in set X, followed by n strictly increasing integers x_i ($0 \leq x_i \leq 10^9$), the elements in set X. ($\forall i \in [1, n-1], x_i < x_{i+1}$)

The second line starts with an integer m ($0 \leq m \leq 10^5$), the number of elements in set Y, followed by m strictly increasing integers y_i ($0 \leq y_i \leq 10^9$), the elements in set Y. ($\forall i \in [1, m-1], y_i < y_{i+1}$)

Output

One line, one of `<`, `>`, `=`, `.` as described in the problem statement.

Examples

Input #1

```
0
0
```

Output #1

```
=
```

Input #2

```
2 1 2
1 1
```

Output #2

```
>
```

Note

In input #1,

$$\varnothing = \varnothing$$

In input #2,

$$\{1, 2\} \supset \{1\}$$

Subtasks

Easy (57 points): $n, m \leq 5$. **You must pass this subtask to get any score.**

Hard (43 points): $n, m \leq 10^5$. Partial score is calculated by the number of passed test cases.

Language Knowledge

Some contestants may be unfamiliar with data structures, so we provide some useful functions or classes in the standard library of C/C++/Java/Python. If you have done our data structure homework, you may not need them.

- C bsearch
- C++ set
- Java HashSet
- Python set

C. Egyptian Fraction

2 seconds, 128 megabytes

The Egyption fraction of a fraction $\frac{p}{q}$ is a finite strictly increasing sequence of positive integers $n_1, n_2, ..., n_k$ whose reciprocal sum is equal to $\frac{p}{q}$.

From the textbook:

The Egyptians of antiquity expressed a fraction as a sum of fractions whose numerators were 1. For example, 5/6 might be expressed as

$$\frac{5}{6} = \frac{1}{2} + \frac{1}{3}$$

We say that a fraction p/q, where p and q are positive integers, is
in Egyptian form if

$$\frac{p}{q} = \frac{1}{n_1} + \frac{1}{n_2} + ... + \frac{1}{n_k}$$

where $n_1, n_2, ..., n_k$ are positive integers satisfying $n_1 < n_2 < ... < n_k$.

Now, given an Egyption fraction $n_1, n_2, ..., n_k$.

Please give another sequence of positive integers $m_1, m_2, ..., m_l$ such that these two sequences represent the same proper fraction.

Please note that in this problem we only discuss proper fractions, i.e. fractions greater than 0 and less than 1.

Input

The first line contains an integer k, the number of integers in the Egyption fraction. ($1 \leq k \leq 50$).

The second line contains k positive integers n_i, the positive integers in the Egyption fraction. ($2 \leq n_i \leq 10^4$). ($\forall i \in [1, k-1], n_i < n_{i+1}$)

Output

The first line contains an integer l, the number of integers in the Egyption fraction. ($1 \leq l \leq 100$).

The second line contains l positive integers m_i, the positive integers in the Egyption fraction. ($2 \leq m_i \leq 10^9$). ($\forall i \in [1, l-1], m_i < m_{i+1}$)

The output must not be exactly the same as the input, where exactly the same means $l = k$ and $\forall i \in [1, l], m_i = n_i$.

Example

Input

```
3
2 4 30
```

Output

```
3
3 4 5
```

Note

In example,

$$\frac{1}{2} + \frac{1}{4} + \frac{1}{30} = \frac{47}{60} = \frac{1}{3} + \frac{1}{4} + \frac{1}{5}$$

Subtasks

Easy (57 points): $k \leq 12$. **You must pass this subtask to get any score.**

Hard (43 points): $k \leq 50$. Partial score is calculated by the number of passed test cases.

D. Polynomial Family

2 seconds, 128 megabytes

Noticing that we always get an arbitrary constant C when we perform indefinite integration. For example, $\int x^2 \mathrm{d}x = \frac{1}{3}x^3 + C$. In this case, the right side is called a original function family.

To make it easier to study, Paimon decides to propose a narrower definition, polynomial family[1], which is in the form of

$$a_n x^n + a_{n-1} x^{n-1} + ... + a_2 x^2 + a_1 x + C$$

Paimon calls two polynomials f and g **in the same family**[1] if and only if there exists a constant $C \in \mathbb{R}$ such that for any $x \in \mathbb{R}$, we have

$$f(x) = g(x) + C$$

[1]: This concept is made up by the problem setter, you probably can't find it anywhere else.

Now, there are two polynomials f and g with order at most n.

Paimon knows the function values of f at $n + 1$ points, and the function values of g at $n + 1$ points.

Now, she wonders whether f and g are in the same family. If so, she wants to know the constant $C = f(x) - g(x)$.

Input

The first line contains an integer n, indicating that the order of f and g is at most n. ($0 \le n \le 8$)

The next $n + 1$ lines, each line contains two integers $x_{f,i}$ and $f(x_{f,i})$, indicating the i-th point on the function $f(x)$, and there will be no duplicate points. ($-100 \le x_{f,i} \le 100$, $-10^9 \le f(x_{f,i}) \le 10^9$)

The next $n + 1$ lines, each line contains two integers $x_{g,i}$ and $g(x_{g,i})$, indicating the i-th point on the function $g(x)$, and there will be no duplicate points. ($-100 \le x_{g,i} \le 100$, $-10^9 \le g(x_{g,i}) \le 10^9$)

Output

The first line contains `YES` or `NO` (case insensitive), answering whether f and g are in the same family.

If the first line answers `YES`, the second line contains a floating point number C (no requirement on the number of digits after the decimal point), indicating the constant difference. If the first line answers `NO`, there will be no second line.

Your answer will be accepted if and only if the relative or absolute error between your answer and the jury's answer does not exceed 10^{-6}.

Examples

Input #1

```
2
0 0
1 1
2 4
3 10
4 17
5 26
```

Output #1

```
YES
-1.000000000
```

Input #2

```
1
0 1
1 2
0 2
3 2
```

Output #2

```
NO
```

Note

In input #1, $f(x) = x^2$, $g(x) = x^2 + 1$, so are in the same family and the constant difference is $C = f(x) - g(x) = -1$.

In input #2, $f(x) = x + 1$, $g(x) = 2$, so they are not in the same family.

Subtasks

Easy (57 points): $n \leq 1$, that is f and g are both linear functions. **You must pass this subtask to get any score.**

Hard (43 points): $n \leq 8$. Partial score is calculated by the number of passed test cases.

In particular, the sample data of this problem is not Test #1 of Subtask #0, because it does not meet the data range of the easy subtask.