National Girls' Programming Contest 2019

November 23, 2019

https://toph.co/c/ngpc-2019

Toph

(You get total 13 problems and 23 pages)

Problem A

Complex Operations

You are given an array A of length N. You have to perform two different types of operations.

In the first type of operation, you will be given an integer X and you need to subtract it from all numbers in the given array A.

For example, an operation denoted as 1 7 represents that you have to subtract 7 from all the numbers in array A. Here, the leading 1 represents that this operation is of first type.

In the second type of operation, you will be given 3 integers L, R, and K, and you need to print the K^{th} smallest number among the numbers of the array whose value are between L and R (both inclusive). If there is not enough numbers in between L and R, then print -1.

For example, an operation denoted as 2 1 7 4 represents that at first, you have to find all the numbers in array A whose values are within $[1, 7]$ range and then you have to print the 4^{th} number among these numbers. Here, the leading 2 represents that this operation is of second type.

Your task is to perform Q operations in the given array A.

Input

Input starts with two integers N and Q followed by a line of N space-separated non-negative integers, having value not greater than 10^{18}, representing array A. The following Q lines contain space-separated integer numbers and begin with either 1 or 2 representing the type of query and then followed by other space-separated integers depending upon type of query as described in the problem statement.

Constraints

$1 \leq N, Q, K \leq 10^5$

$1 \leq X, L \leq R \leq 10^{18}$

Output

For each query of type 2, output an integer in a line as described in the problem statement.

Sample

Input	Output
10 2 8 10 4 9 1 3 5 9 4 10 1 3 2 1 6 3	2

Problem B

Zer VS EEE

Zer is a programmer who has a friend named Nir. Nir always shows off how great EEE is. One day Nir came to Zer with a EEE'ish problem. Nir gave Zer a circuit. The circuit has N nodes and M wires where each wire connects two different nodes. Moreover, a wire that connects node U to node V can only pass electricity from U to V but not vice-versa, that means the wires are uni-directed.

Nir gave Zer a list of these wires detailing which wire connects which nodes. There are also a lower bound and an upper bound for each wire describing the minimum amount of electricity that must pass through the wire and the maximum amount of electricity that can pass through the wire, respectively. Also, according to KCL (Kirchhoff's Circuit Law), the net amount of electricity entering a node must be equal to the net amount of electricity exiting that node.

Zer has to give a valid configuration for the problem Nir gives. He has to tell the amount of electricity flowing through each wire such that all the above constraints are satisfied. As a good problem solver, your help would be highly appreciated by Zer.

Input

The input starts with two integers N and M, the number of nodes and the number of wires respectively.

Each of the next M lines contains four integers U, V, L, H, stating that a wire connects node U and V such that electricity can pass from U to V and the amount of electricity must be at least L and at most H.

It is guaranteed that no two wires will have exactly the same U and V i.e. there will be at most one wire that allows electricity to pass from a node U to another node V.

Constraints

$1 \leq N \leq 100$

For each wire,

$1 \leq U, V \leq N$
$U \neq V$
$0 \leq L \leq H \leq 10^6$

Output

If no valid configuration exists, print `NO` in a single line.

Otherwise, print `YES`, followed by M lines. Each line should contain the amount of electricity flowing through each wire in the same order as given in input.

If multiple valid configurations exist, print any of them in such case.

Samples

Input	Output
3 3 1 2 1 2 2 3 0 3 3 1 2 6	YES 2 2 2

Input	Output
3 3 1 2 1 2 2 3 0 3 3 1 4 5	NO

Input	Output
4 5 1 2 1 2 2 3 0 3 3 1 2 6 3 4 1 1 4 3 1 1	YES 2 2 2 1 1

Problem C

Mr. Xifu and His New School

After working as a teacher for a long time, Mr. Xifu has finally decided to open a new school of his own. In his school, he wants to assure the highest comfort to the teachers. He has decided that any teacher will be able to take a class at any time he wishes and the classes of this school will not have any fixed duration other than the fact that a class can't go on for more than 24 hours. In fact, classes can be happening even at midnight and classes may go over to the next day!!

All of the teachers of his school have submitted a list of the start and end times of their classes to Mr. Xifu. Minimum duration of a class is 1 minute. Now, Mr. Xifu does not want to change any of these class times but he is confused about how many classrooms he is going to need so that every class can start and end at the given times. In any single minute, if there are X amounts of classes running, there must be at least X rooms in Mr. Xifu's school. As building too many classrooms will be too costly, he wants to know the minimum number of classrooms he is going to need so that the classes which will be running at the same time can run simultaneously without any shortage of classrooms.

As Mr. Xifu is not good at calculations, your task is to help him to calculate the minimum number of class rooms he is going to need for his school given the class schedules of the teachers.

Input

The first line of the input contains an integer $T(0 < T \leq 100)$, the number of test cases.

Each test case will start with an integer N (N is positive and sum of N over all test cases is less than or equal to 1000000).

Each of the following N lines will contain the start time and the end time of a class. The time will be in the following format:

$$HH : MM$$

Note that time will be given in 24-Hour format ($00 \leq HH < 24, 00 \leq MM < 60$).

The start and end times will be separated by a single space. End time is exclusive, that means, if the start time of a class is S and the end time of class is E, the class is running in the S^{th} time, but must end right before E time. See sample I/O explanation for better understanding.

Output

For each test case print the minimum number of classrooms needed in the following format:
`Case #c: Mr.Xifu needs m classroom(s)`
where c is the number of test case and m is the answer.

Sample

Input	Output
3 4 23:50 02:10 12:10 20:00 08:00 10:00	Case #1: Mr.Xifu needs 2 classroom(s) Case #2: Mr.Xifu needs 1 classroom(s) Case #3: Mr.Xifu needs 4 classroom(s)

09:30 11:00 2 08:00 08:45 08:50 10:50 4 12:35 12:30 18:19 22:29 13:46 18:56 06:13 18:29	

Explanation

Consider the first class schedule of the first test case - 23:50 02:10 which means this class starts at 23:50 at midnight and ends at 02:10 of the following day.

As end time is exclusive, in the second test case, the first class schedule 08:00 08:45 means that, this class starts at 8 and ends just before 08:45 and thus the two classes in the second test case does not collide and only one class room is enough.

Problem D

Rivalry Friends

Ryo and his girlfriend loves to think about challenges. One day his girlfriend gave him a challenge to solve a problem. She gave him a function named `rivalryFriends()`.

The function counts the number of integers between 1 and n inclusive, which are relatively prime to n, i.e. the numbers whose highest common factor with n is 1. `rivalryFriends(1)` is defined to be 1. Examples:

```
rivalryFriends(5) = 4
rivalryFriends(6) = 2
```

Here, $\{1, 2, 3, 4\}$ are relatively prime to 5. So `rivalryFriends(5) = 4`.
Similarly, $\{1, 5\}$ are relatively prime to 6. Hence, `rivalryFriends(6) = 2`.

Now, Ryo has to calculate the function, `rivalryFriends()` for any n. As Ryo is very talented, he easily solved the problem. So Ryo and his girlfriend thought of making a new problem with a twist for you. Now you will be given an integer array $A[\,]$ of size n and q queries to perform on the array. The queries will be:

Query type 1: Set the value of the i^{th} element to v, i.e. $A[i] = v$. This type of query appears in the input in 1 i v format.

Query type 2: Print the value of the function given below:

$$\sum_{i=l}^{r} rivalryFriends(A[i])$$

This second type of query appears in the input in 2 l r format.

Input

The first line of input contains two integers n and q. Next line will contain n space-separated integers in the range $[1, 10^5]$.

Each of the next q lines contains a task in one of the following form:

`1 i v` - Set the value of i^{th} element to v.

`2 l r` - Print the value of the function.

Constraints

$1 \leq n, q, v \leq 10^5$

$1 \leq i \leq n$

$1 \leq l \leq r \leq n$

Output

For each query of type 2, print the value of the function.

Sample

Input	Output
3 3 1 2 3 2 1 3 1 3 5 2 1 3	4 6

Problem E

Fortis Fortuna Adiuvat

Your very close friend, John, also known as the Baba Yaga, is often on various missions to complete different tasks. For this, he needs to travel to different countries. For each of his missions, he has a peculiar ritual. Let's say, he is going from country s to country t. He will start his journey from s, visit Continental Hotel, located at country x, and then go to country t. Even if the country t falls on his path from s to x, he will first go to x and then return to t. Consider this as a professional courtesy. To travel from one country to another, he needs to spend a few markers for different favors like mission equipment, food, travel cost, etc. A marker is a small round metal object indicating a debt between two individuals. Markers are witnessed and recognized. That means, if one person offers a marker to another and asks for a favor, the offered person must comply. It is evident from previous statements that these markers are very precious. For this reason, John wants to minimize the number of markers used.

John knows that you're a great programmer. So he has asked you to calculate the number of markers he requires to go on his missions.

Input

Input starts with an integer T ($1 \leq T \leq 5$), the number of test cases.
The first line of each test case contains 4 integers, N ($1 \leq N \leq 10^5$), the number of countries, M ($1 \leq M \leq 10^5$), the number of flights connecting them, x ($1 \leq x \leq N$), the location of Continental Hotel and Q ($1 \leq Q \leq 10^5$), the number of missions John needs to participate in. The countries are conveniently numbered from 1 to N.
The next M lines each will contain three integers u, v and w ($1 \leq u, v \leq N, 1 \leq w \leq 10^9$) indicating that there is a flight from u to v which costs w markers. Then the following Q lines each will contain two integers s ($1 \leq s \leq N$), the country where John currently is in, and t ($1 \leq t \leq N$), the country he needs to go to. There can be multiple flights between two countries.

Output

For each case, print the case number first. Then for all the missions, you have to print the number of markers required in a newline. If such required path from country s to country t doesn't exist, print "`Be seeing ya, John`" (without the quotation marks).

Sample

Input	Output
1 4 4 3 2 1 2 4 1 3 20 2 3 4 3 4 4 1 4 4 1	Case 1: 12 Be seeing ya, John

Explanation

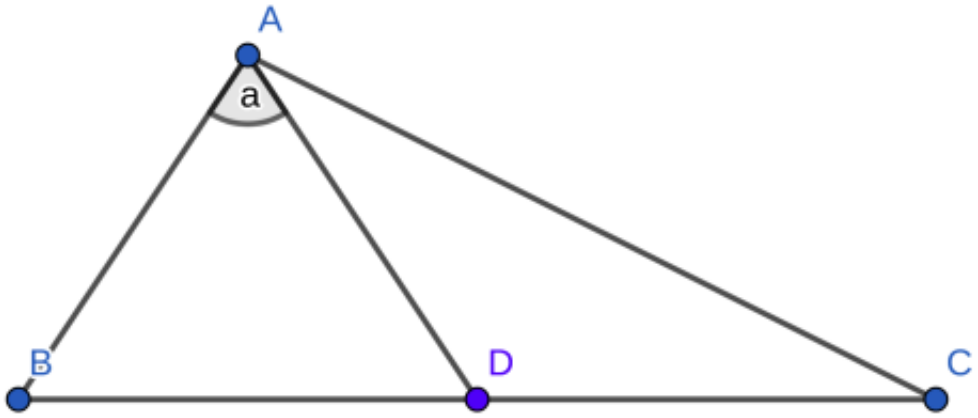
For the first query, John will go through the following sequence of countries: $1 \rightarrow 2 \rightarrow 3 \rightarrow 4$. The number of markers required: $(4 + 4 + 4) = 12$.
For the second query, there is no path from country 4 to country 1.

Note

Dataset is huge, use faster I/O methods.

Problem F

Piece of Cake



Diya has got a nice birthday cake for Arshiya and Alayna, her twin daughters. The two sisters were amazed to see the strange triangular-shaped birthday cake. On the cake ABC, there is a line from one of the vertex A to the midpoint of the opposite line BC. On her daughters' birthday, Diya declared a quiz competition. She told her daughters that she will make two more square-shaped cake as the prize of that quiz competition. The length of each side of Arshiya's cake will be equal to AB, one side of the triangle-shaped cake. The length of each side of Alayna's cake will be equal to AC, another side of the triangle-shaped cake. For getting the prize, Arshiya and Alayna have to calculate the sum of the area of these two square-shaped cake. As they want to win the prize, they want your help.

You will be given some information about the triangle-shaped cake for solving the challenge. You will be given AB, the length of the one side of the triangular-shaped cake, AD, the length of the line from vertex A to the midpoint of BC and the angle DAB.

Consider $\pi = cos^{-1}(1.0)$, if needed.

Input

First line of the input contains an integer $T(1 < T < 100000)$ which denotes the number of test cases. Then for each test case, there will be three real numbers: X, which denotes the length of AB, Y, which denotes the length of AD and A which denotes the angle DAB. All lengths are less than 10^4. Also angles and lengths are greater than zero.

It is guaranteed that the input forms a valid triangle with positive area.

Output

For each test case, output the total sum of the area of the two square-shaped cake. Absolute error less than 10^{-6} will be ignored.

Sample

Input	Output
2 100 86.60254037844386 30 30.341180 50.312433 52.911429	20000.000000000 8284.228534779

Problem G

Is Bita Happy?

Bita has learned bitwise-operations recently. She is doing some experiments with these operations now. Whenever she becomes happy, she frees doves. At this moment, she becomes happy when the following equation becomes correct for some integers a, b and k:

$$(a \,\&\, b) \,\&\, (1 \ll k) \neq 0$$

where '&' is bitwise AND operator, '$\ll$' is bitwise left-shit operator.

You'll be given a, k, L and R. Find out the values of b in the range $[L, R]$ for which Bita becomes happy. Calculate the summation of those b values. If Bita never becomes happy, the summation is 0. Since Bita dislikes printed numbers, you have to tell whether this summation is `odd` or `even`.

Input

Input will starts with an integer T, the number of test cases. In each test case, there will be 4 integers a, k, L, R in a line.

Constraints

$1 \leq T \leq 10^5$

$1 \leq a, L, R \leq 10^9$

$0 \leq k \leq 30$

$L \leq R$

Output

For each test case, if the summation described in the statement is odd, print "`Odd`", otherwise print "`Even`" in a single line.

Sample

Input	Output
2 5 2 1 6 5 0 14 17	Odd Even

Explanation

In the first case, the valid values of b are $4, 5, 6$. The summation is: $(4 + 5 + 6) = 11$, which is odd. In the second case, the valid values of b are $15, 17$. The summation is: $(15 + 17) = 32$, which is even.

Note

1. The '&' (bitwise AND) operator takes two numbers as operands and does AND on every bit of two numbers. The result of AND is 1 if and only if both bits are 1. For example, $(16\&11) = 12$. It will be understandable if the numbers are converted to binary: $(1110_{(2)}\&1011_{(2)}) = 1010_{(2)}$.

2. The '$\ll$' (bitwise left-shift operator) takes two numbers, left shifts the bits of the first operand, the second operand decides the number of places to shift. For example, $(1 \ll 3) = 8$. Because, the binary form of 1 is $1_{(2)}$ and after shifting it 3 places to left, it will be $1000_{(2)}$, which is 8 in decimal.

Problem H

The Story of Stringland

The king of Stringland is employing an elite force of undercover agents to protect the kingdom from the attack of Integerland. The king has decided to give each of these agents a code name. These code names will be chosen according to the following rules:

- Each agent's code name must be a non-empty sub-string of the string S.
- Each agent's code name must be a palindrome.
- Code names of any two agents can't be the same.

Since the number of possible code names is limited, the king has ensured that the number of agents is equal to the number of possible code names. These agents will operate secretly in Integerland. They cannot directly use their code names because strings are not allowed in Integerland. They will communicate with each other using the lexicographical order of their code names. For example, if there are three agents with code names `a`, `b` and `aba`, then `a` will be called `1` because it's the lexicographically smallest code name, `aba` will be called `2` because it's the lexicographically second-smallest code name and `b` will be called `3` because it's the lexicographically third-smallest code name.

But it's very difficult for them to remember the ordering of code names of all the agents. Since you are the royal programmer of Stringland, the king has given you the responsibility to solve this problem.

Your task is to write a program that will take the string S as input and answer Q queries. In each query, it should take an integer K as input and find out the K^{th} lexicographically smallest code name. Since only integers are allowed in Integerland, your program should print two integers L and R as output for each query, where L and R are starting and ending indices (according to 1-based indexing) of the first occurrence of the K^{th} lexicographically smallest code name in the string S. If the K^{th} lexicographically smallest code name does not exist, your program should print `-1`.

Input

First line of the input contains a non-empty string S containing only lowercase English letters. The length of S will not be more than 10^6.

The second line of the input contains an integer $Q(1 \leq Q \leq 10^5)$ where Q is the number of queries.

Each of the next Q lines of the input will contain an integer $K(1 \leq K \leq 10^6)$ as query.

Output

Print Q lines as output where i^{th} line contains the answer of the i^{th} query.

Samples

Input	Output
bab 4 1 2 3 4	2 2 1 1 1 3 -1

Input	Output
aabbcbbacc 5 1 5 10 3 6	1 1 3 4 -1 2 8 3 7

Note

A sub-string of a string S is a contiguous sequence of characters within the string S. For example, a, b, ab, ba, bab are sub-strings of the string bab, but aa, bb, c are not.
A palindrome is a sequence of characters which reads the same backward as forward. For example, a, b, aa, aba are palindromes, but ab, ba, abb, baa are not.

Problem I

Solve This Giveaway Problem First

This problem is straightforward and easy. You will be given two integers N, P and a list L of positive integers.

You have to count how many numbers in the range $[1, N^P]$ are divisible by at least one of the numbers from the list L.

Input

The first line of the input will contain an integer T. Then there will be T test cases.
The first line of each case will contain two integer numbers N and P. The second line of each case will contain an integer S, size of the list L. The third line of each case will contain S space-separated positive integer numbers.

Constraints

$1 \leq T \leq 10^5$

$1 \leq N \leq 10^{100000}$

$1 \leq P \leq 10^5$

$1 \leq S \leq 5$

$1 \leq$ numbers in the list $L \leq 10^9$

N.B.: It is guaranteed that multiplication of all numbers in the list L will not exceed 10^9 and the summation of the length of number N over all test cases will not exceed 10^6.

Output

For each test case, print "`Case x: y`" (without quotation marks) where x is the test case number and y is the required answer modulo 1000000007.
See the sample input-output for better understanding.

Sample

Input	Output
2 4 2 2 2 4 4 2 2 1 2	Case 1: 8 Case 2: 16

Problem J

Let's See

There is a math wizard in the University of Mathcraft. In the inter-university problem-solving contest, you faced that wizard in the final round of this contest. Basically, the rule is in a particular round two problem solver will face each other and one will set a problem for his opponent.

In the final round, the problem you set for the wizard has been solved by him. So to equalize the points in this round, you need to solve the problem set by the wizard. Or you will lose the trophy. You don't want that, do you?

In this problem, you will get to play a box game where you will receive some boxes. In a particular box, there is some money stored in it. In box no. x, the total money stored is: $(x\%1) + (x\%2) + (x\%3) + \cdots + (x\%x)$.

Calculate the sum of all x, where $total\_money\_in\_box(x) = total\_money\_in\_box(x-1)$ and $L \leq x \leq R$

Remember in box no. 0, the total money stored in it $= 0$. x should be in between L and R.

Input

First line contains an integer T. T denotes the number of test cases here.
Next T lines will contain two integers L and R.

Constraints

$1 \leq T \leq 100000$

$1 \leq L, R \leq 1000000000000000000$

Output

Print the output according to the statement.
It is guaranteed that the answer will fit the 64-bit integer.

Sample

Input	Output
1 1 3	3

Note

In this problem, the '%' operator denotes the **modulo** operation.

Problem K

Happy Sub-Sequence

Recently Alex has participated in a programming contest.
He became 1st runner up. He couldn't solve one problem. He is so upset. Now Alex comes to you and gives you the problem.
Alex gives you an integer array $arr_1, arr_2, arr_3, \ldots, arr_n$.
An array p is called to be a sub-sequence of arr, if it is possible to remove some elements from arr to get p.
Array $p_1, p_2, p_3, \ldots, p_m$ is called to be "Happy" if it is not empty and for every $i (1 \leq i \leq m)$, p_i is divisible by i.
The array a has exactly $2^n - 1$ different sub-sequences (excluding an empty sub-sequence).
Find the number of "Happy" sub-sequences.

Input

The first line contains an integer $n (1 \leq n \leq 100000)$ - the length of the array arr.
The next line contains integers $arr_1, arr_2, arr_3, \ldots, arr_n (1 \leq arr_i \leq 10^6)$.

Output

Print exactly one integer - the number of "Happy" subsequences taken modulo $10^9 + 7$.

Samples

Input	Output
5 2 2 1 22 14	13

Input	Output
1 5	1

Problem L

Information Retrieval

When you search in Google or any other search engines, you are provided with a list of links that are relevant to your search query. In this problem, you are given queries with some candidate results/answers to each query. You have to sort these candidate answers based on their relevance with the respective query.

The relevance is calculated based on counting the number of overlaps of words that occur between each query and the candidate answer.

Here, the overlap is computed based on the following:

1. If a word x appears in both query A and candidate answer B.
2. If the similar word of x is y, and if x appears in query A but not in B, and if y appears only in B, then x and y will also be considered as an overlap between X and Y. The overlap between words should be calculated based on the "`case insensitive`" comparison.
3. If a word x or its similar word y appears more than once in the query or in the candidate answer, it will be counted as only one overlap.

It is to be noted that, one word can have only one similar word. It cannot have multiple different similar words. Uppercase and lowercase versions of a word should be considered as same.

Input

First line of Input contains the string "`Similar`". Some of the following lines will contain exactly two words (separated by a *SPACE*) which indicates that these two words are similar to each other i.e the words in each line should be considered as same or as overlap for all queries.

Inputs for similar words list will be ended with the string "`Query`". Some of the following lines of input will contain a query and a candidate search result. A query and candidate answer pair is followed by zero or more same queries with different candidate answers in the following lines. In a single line, each query and candidate answer is separated by a *TAB* character "\t" and each word in the Query and Answer is separated by *SPACE*.

Input is terminated by the string "`QUIT`". You have to sort the search result of each query based on the relevance with the candidate answer.

Constraints

A "word" consists on any ASCII character except any white-space character i.e. *SPACE*, *TAB*, *NEWLINE* etc. List of similar words will not be more than 70 and the total number of query-answer pairs will not be more than 6500. The length of each query can be at most 200 and the length of each answer can be at most 800.

Output

Output the candidate answers of each query based on their relevance with it. The output should be printed by grouping the candidate answers of each distinct query together and sorting them based on their relevance with the query.

Note that, for a single query (which may span through multiple lines), you have to sort its candidate answers together and candidate answer of a different query will not be considered for this query.

In output section, the order of different queries should be strictly maintained based on the order they are given in input. If more than one candidate answers have the same relevance with a given query, then they should appear in the output based on the order they are given in input.

See the sample I/O and explanation section for better understanding.

Sample

Check next page.
(See the sample test case from the web version for proper formatting)

Explanation

Note that the Query-Answer pairs on lines 5-7 of input are of the same query. Thus the "Answer"s on these lines should be sorted within themselves as they are the only candidates to this particular query.

1. Which country **won FIFA World Cup 2018** → France have **won** the **FIFA World Cup 2018**
2. Which country **won** FIFA **World Cup** 2018 → England **won** ! England have won the Cricket **World Cup** 2019
3. Which country **won** FIFA World Cup 2018 → Rafael Nadal **won** French Open 2019
4. Who **created Microsoft** → Bill Gates **Created Microsoft**
5. Who **created** Microsoft → Steve Jobs **create** Apple
6. Who **created** Microsoft → Sergey Brin **created** Google

And the relevance value for each pair of query-answer is as follows:

1. Relevance **5**
2. Relevance **3** (The word "won" appears twice in the candidate answer. But it is counted as only one overlap.)
3. Relevance **1**
4. Relevance **2**
5. Relevance **1**
6. Relevance **1**

Input

```
Similar
win won
create created
Query
Which country won FIFA World Cup 2018    England won ! England have won the Cricket World Cup 2019
Which country won FIFA World Cup 2018    Rafael Nadal won French Open 2019
Which country won FIFA World Cup 2018    France have won the FIFA World Cup 2018
Who created Microsoft    Steve Jobs create Apple
Who created Microsoft    Bill Gates Created Microsoft
Who created Microsoft    Sergey Brin created Google
QUIT
```

Output

```
Which country won FIFA World Cup 2018    France have won the FIFA World Cup 2018
Which country won FIFA World Cup 2018    England won! England have won the Cricket World Cup 2019
Which country won FIFA World Cup 2018    Rafael Nadal won French Open 2019
Who created Microsoft    Bill Gates Created Microsoft
Who created Microsoft    Steve Jobs create Apple
Who created Microsoft    Sergey Brin created Google
```

Problem M

Ada Lovelace

According to Wikipedia, "Augusta Ada King, Countess of Lovelace, popularly known as Ada Lovelace, was an English mathematician and writer, chiefly known for her work on Charles Babbage's proposed mechanical general-purpose computer, the Analytical Engine. She was the first to recognize that the machine had applications beyond pure calculation, and published the first algorithm intended to be carried out by such a machine. As a result, she is sometimes regarded as the first to recognize the full potential of a "computing machine" and one of the first computer programmers."

In this problem, we will pay tribute to her by printing a part of her name "Ada". But instead of printing just these three letters, let's print the summation of their ASCII values. That is, let's print the sum of ASCII values of 'A', 'd' and 'a'.

Input

This problem does not have any inputs.

Output

Please print one line of output, the result of the summation of ASCII values of the string "Ada".

Note

The following C++ code will print the ASCII value of 'F':

```
#include <iostream>
using namespace std;

int main() {
    char ch = 'F' ;
    printf("%d",ch);
    return 0;
}
```