Programming Problems
Week1

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Contents

1 TOPC

1.1 Bags

Your friend Bob is a garbage collector working in a factory. The factory manufactures various kinds of chemical substance, and the toxic waste they may produce must be collected with caution. Every piece of toxic waste has an identifier that represents its chemical composition. It is very dangerous to put two pieces of toxic waste with different identifiers into a garbage bag, since they might produce some chemical reactions that lead to explosion, fire toxic smoke or other chemical hazards.

Today, Bob has to collect n very small pieces of toxic waste, and their identifiers are $a_1, a_2, ..., a_n$, respectively. Thses pieces are small enough to fit in one garbage bag, but Bob might as well use more bags to avoid any potential hazard. Please weite a program to help Bob to calculate the minimum number of garbage bags requited to safely collect all n pieces of toxic waste.

Input

The first line of the input contains one integer n where n is the number of piece of toxic wastes. The second line of the input contain n positive integers $a_1, ...a_n$ which are the identifiers associated with the corresponding pieces.

Output

Output the answer in a line.

Technical Specification

- $2 \leq n \leq 10^5$ and $a_1, ...a_n$ are positive integers at most 10^9.
- There are multiple input files
- There is only one test case in each input file

Sample Input

```
3
1 1 3
```

Sample Output

```
2
```

Sample Input

```
5
5 5 6 8 8
```

Sample Output

```
3
```

Sample Input

```
7
4 1 2 8 8 8 8
```

Sample Output

```
4
```

1.2 Animal King Election

King Dragon, the king of Animal Kingdom, passed away this morning. This unfortunate news saddened every animal. Since no one sees any other living dragon nowadays, the government of Animal Kingdom cannot find any successor to King Dragon. But Animal Kingdom cannot operate without a king. The government of Animal Kingdom decided to elect a new king.

There are nine voters: Armadillo, Buffalo, Cat, Dog, Elephant, Fox, Goat, Hippo and Zebra and two candidates. Tiger and Lion.

The votes will be anonymously casted tomorrow. The government asked you to write a program to calculate the votes and announce the next king of Animal Kingdom. Note that the next king is the one who receives more than half the votes.

Input

The input has exactly nine lines. Each of them is a string which is either Tiger or Lion, and it represents a casted vote from an anonymous voter.

Output

Output one line containing the next king's name.

Technical Sepcification

- Every string in the input is either Tiger or Lion.
- The next king must be qualified by at least five votes.
- There are multiple input files.
- There is only one test case in each input file.

Sample Input

```
Lion
Lion
Tiger
Tiger
Lion
Lion
Tiger
Tiger
Tiger
```

Sample Output

```
Tiger
```

2 Competitive Programming

2.1 UVa357 - Let Me Count The Ways

After makeing a purchase at a large department store, Mel's change was 17 cents. He received 1 dime, 1 nickel, and 2 pennies. Later that day, he was shopping at a convenience store. Again his change was 17 cents. This time he received 2 nickels and 7 pennies. He begin to wonder "How many stores can I shop in and receive 17 cents change in a different configuration of coins?" After a suitable mental struggle, he decided the answer was 6. He then challenged you to consider the general problem.

Write a program which will determine the number of different combinations of US coins (penny: 1c, nickel: 5c, dime: 10c, quarter: 25c, half-dollar: 50c) which may be used to produce a given amount of money.

Input

The input will consist of a set of numbers between 0 and 30000 inclusive, one per line in the input file.

Output

The output will consist of the approriate statement from the selection below on a single line in the output file for each input value. The number m is the number your program computes, n is the input value.

There are m ways to produce n cents change.
There is only 1 way to produce n cents change.

Sample Input

17
11
4

Sample Output

There are 6 ways to produce 17 cents change.
There are 4 ways to produce 11 cents change.
There is only 1 way to produce 4 cents change.

2.2 UVa11340 - Newspaper

News agency pays money for articles according to some rules. Each character has its own value (some characters may have value equals to zero). Author gets his payment as a sum of all character's values in the article. You have to determine the amount of money that news agency must pay to an author.

Input

The first line contains integer N ($0 < N \leq 5$), it is a number of tests. Each test describes an integer K ($0 < K \leq 100$), the number of paid characters. On next K lines there are table of paid characters and its values (character values are written in cents). If character can not be found in the table, then its value is equal to zero. Next, there is integer M ($0 < M \leq 150000$). Next M lines contain an article itself. Each line can be up to 10000 characters length. Be aware of a large input size, the whole input file is about 7MB.

Output

For each test print how much money publisher must pay for an article in format '$x.yy$\$'. Where x is a number of dollars without leading zeros, and yy number of cents with one leading zero if necessary. Examples: '3.32$', '13.07$', '71.30$', '0.09$',

Sample Input

```
1
7
a 3
W 10
A 100
, 10
k 7
. 3
I 13
7
ACM International Collegiate Programming Contest (abbreviated
as ACM-ICPC or just ICPC) is an annual multi-tiered competition
among the universities of the world. The ICPC challenges students
to set ever higher standards of excellence for themselves
through competition that rewards team work, problem analysis,
and rapid software development.
From Wikipedia.
```

Sample Output

```
3.74$
```

2.3 UVa11057 - Exact Sum

Peter received money from his parents this week and wants to spend it all buying books. But he does not read a book so fast, because he likes to enjoy every single word while he is reading. In this way, it takes him a week to finish a book.

As Peter receives money every two weeks, he dicided to buy two books. then he can read them until receive more money. As he withes to spend all the money, he should choose two books whose prives summed up are equal to the money that he has. It is a little bit difficult to find these books, so Peter asks your help to find them.

Input

Each test case starts with $2 \leq N \leq 10000$, the number of available books. Next line will have N integers, representing the price of each book, a book costs less than 1000001. Then there is another line with an integer M, representing how much money Peter has. There is a blank line after each test case. The input is terminated by end of file (EOF).

Output

For each test case you must pront hte message: 'Peter should buy books whose prices are i and j.', where i and j are the prices of the books whose sum is equal do M and $i \leq j$. You can consider that is always possible to find a solution, if there are multiple solutions print the solution that minimizes the difference between the prices i and j. After each test case you mst print a blank line.

Sample Input

```
2
40 40
80
5
10 2 6 8 4
10
```

Sample Output

Peter should buy books whose prices are 40 and 40.

Peter should buy books whose prices are 4 and 6.

2.4 UVa713 - Adding Reversed Numbers

The Antique Comedians of Malidinesia prefer comedies to tragedies. Unfortunately, most of the ancient plays are tragedies. Therefore the dramatic advisor of ACM has decided to transfigure some tragedies into comedies. Obviously, this work is very hard because the basic sense of the play must be kept intact, although all the things change to their opposites. For wxample the numbers: if any number appears in the tragedy, it must be converted to its reversed form before being accepted into the comedy play.

Reversed number is a number written in arabic numberals but the order of digits is reversed. The first digit becomes last and vice versa. For example, if the main hero had 1245 strawberries in the tragedy, he has 5421 of them now. Note that all the leading zeros are omitted. That means if the number ends with a zero, the zero is lost by reversing (e.g. 1200 gives 21). Also note that the reversed number never has any trailing zeros.

ACM needs to calculate with reversed numbers. Your task is to add two reversed numbers and output their reversed sum. Of course, the result is not unique because any particular number is a reversed form of several numbers (e.g. 21 could be 12, 120 or 1200 before reversing). Thus we must assume that no zeros were lost by reversing (e.g. assume that the original number was 12).

Input

The input consists of N cases. The first line of the input contains only positive integer N. Then follow the cases. Each case consists of exactly one line with two positive integers separated by space. These are the reversed numbers you are to add. Numbers will be at most 200 characters long.

Output

For each case, print exactly one line containing only one integer – the reversed sum of two reversed numbers. Omit any leading zeros in the output.

Sample Input

```
3
24 1
4358 754
305 794
```

Sample Output

```
34
1998
1
```

2.5 UVa11995 - I Can Guess the Data Structure!

There is a bag-like data structure, supporting two operations:

1 x	Throw an element x into the bag.
2	Take out an element from the bag.

Given a sequence of operations with return values, you're going to guess the data structure. It is a stack (Last-In, First-Out), a queue (First-In, First-Out), a priority-queue (Always take out larger elements first) or something else that you can hardly imagine!

Input

There are several test cases. Each test case begins with a line containing a single integer n ($1 \leq n \leq 1000$). Each of the next n lines is either a type-2 command, we get an element x without error. The value of x is always a positive not larger not larger than 100. The input is terminated by end-of-file (EOF)

Output

For each test case, output one of the following:

stack	It's definitely a stack.
queue	It's definitely a queue.
priority queue	It's definitely a priority queue.
impossible	It can't be a stack, a queue or a priority queue.
not sure	It can be more than one of the three data structures mentioned above.

Sample Input

```
6
1 1
1 2
1 3
2 1
2 2
2 3
6
1 1
1 2
1 3
2 3
2 2
2 1
2
1 1
2 2
4
1 2
1 1
2 1
```

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

Sample Output

queue
not sure
impossible
stack
priority queue

3 CPE

3.1 UVa679 - Dropping Balls

A number of K balls are dropped one by from the root of a fully binary tree structure FBT. Each time the ball begin dropped first visits a non-terminal node. It then keeps moving down, either follows the path of the left subtree, or follows the path of the right subtree, until it stops at one of the leaf nodes of FBT. To determine a ball's moving direction a flag is set up in every non-terminal node with two values, either **false** or **true**. Initially, all of the flags are **false**. When visiting a non-terminal node if the flag's current value at this node is **false**, then the ball will first switch this flag's value, i.e., from the **false** or **true**, and then follow the left subtree of this node to keep moving down. Otherwise, it will also swith this flag's value, i.e., from the **true** to the **false**, but will follow the right subtree of this node to keep moving down. Futhermore, all nodes of FBT are sequentially numbered, starting at 1 with nodes on depth 1, and then those on depth 2, and so on. Nodes on any depth are numbered from left to right.

For example, Fig. 1 represents a fully binary tree of maximun depth 4 with the node numbers 1, 2, 3, ..., 15. Since all of the flags are initially set to be false, the first ball being dropped will switch flag's values at node 1, node 2, and node 4 before it finally stops at position 8. The second ball being dropped will switch flag's values at node 1, node 3, and node 6, and stop at position 12. Obviously, the third ball being deopped will switch flag's values at node 1, node 2, and node 5 before it stops at position 10.

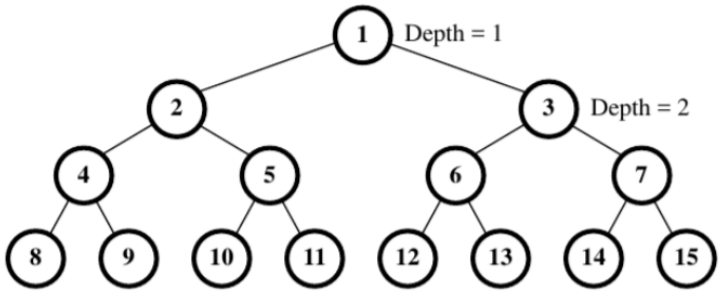

Fig. 1: An example of FBT with the maximum depth 4 and sequential node numbers.

Now consider a number of test cases where tow values will be given for each test. The first value is D, the maximum depth of FBT, and the second one is I, the I-th ball being deopped. You may assume the value of I will not exceed the total number of leaf nodes for the given FBT.

Please write a program to determine the stop position P for each test case.

For each test cases the range of two parameters D and I is as below:

$$2 \leq D \leq 20, \ and \ 1 \leq I \leq 524288$$

Input

Contains $l + 2$ lines.
Line 1 l the number of test cases
Line 2 $D_1 I_1$ test case #1, tow decimal numbers that are separated by one blank

...
Line k $D_k I_k$ test case #k
Line l+1 $D_l I_l$ test case #l
Line l+2 -1 a constant '-1' representing the end of the input file

Output

Contain l lines.
Line 1 the stop position P for the test case #1
...
Line k the stop position P for the test case #k
...
Line l the stop position P for the test case #l

Sample Input

```
5
4 2
3 4
10 1
2 2
8 128
-1
```

Sample Output

```
12
7
512
3
255
```

3.2 UVa11636 - Hello World!

When you first made the computer to print the sentence "Hello World!", you felt so happy, not knowing how complex and interesting the world of programming and algorithm will turn out to be. Then you did not know anything about loops, so to print 7 lines of "Hello World!" is shown in Figure 1. By of copying the single print statement and pasting it we get a program that prints two "Hello World!" lines. Then copying these two print statements and pasting them, we get a program that prints four "Hello World!" lines. Then copying three of these four statements and pasting them we can get a program that prints seven "Hello World!" lines (Figure 4). So three pates commands are needed in total and of course you are not allowed to delete any line after pasting. Given the number of "Hello World!" lines you need to print, you will have to find out the minimun number of pastes required to make that program from the origin program shown in Figure 1.

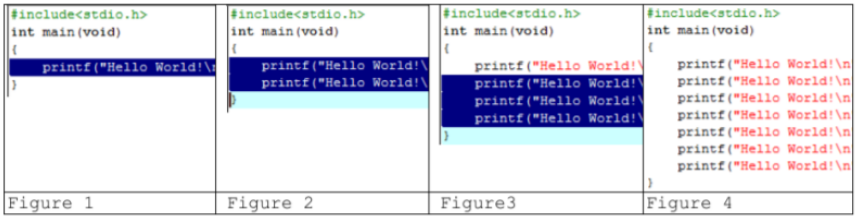

Figure 1 | Figure 2 | Figure3 | Figure 4

Input

The input file can contain up to 2000 lines of inputs. Each line contains an integer N $(0 < N < 10001)$that denotes the number of "Hello World!" lines are required to be printed.

Input is terminated by a line containing a negative integer.

Output

For each line of input except the last one, produce one line of output of the form **'Case** X**:** Y**'** where X is the serial of output and Y denotes the minimum number of paste commands required to make a program that prints N lines of "Hello World!".

Sample Input

2
10
-1

Sample Output

Case 1: 1
Case 2: 4

3.3 UVa11364 - Optimal Parking

When shopping on Long Street, Michael usually parks his car at some random location, and then walks to the stores he needs. Can you help Nichael choose a place to park which minimizes the distance he needs to walk on his shopping round?

Long Street is a straight line, where all positions are integer. You pay for parking in a specific slot, which is an integer position on Long Street. Michael does not want to pay for more than one parking though. He is very strong, and does not mind carrying all the bags around.

Input

The first line of input gives the number of test cases, $1 \leq t \leq 100$. There are two lines for each test case. The first gives the number of stores Michael wants to visit, $1 \leq n \leq 20$, and the second gives their n integer positions on Long Street, $0 \leq x_i \leq 99$.

Output

Output for each test case a line with the minimal distance Michael must walkk given optimal parking.

Sample Input

```
2
4
24 13 89 37
6
7 30 41 14 39 42
```

Sample Output

```
152
70
```

3.4 UVa10036 - Divisibility

Consider an arbitrary sequence of intergers. One can place + or − operators between integers in the sequence, thus deriving different arithmaetical expressions that evaluate to different values. Let us, for example, take the sequence: $17, 5, -21, 15$. There are eight possible expressions:

$$17 + 5 + -21 + 15 = 16$$

$$17 + 5 + -21 - 15 = -14$$

$$17 + 5 - -21 + 15 = 58$$

$$17 + 5 - -21 - 15 = 28$$

$$17 - 5 + -21 + 15 = 6$$

$$17 - 5 + -21 - 15 = -24$$

$$17 - 5 - -21 + 15 = 48$$

$$17 - 5 - -21 - 15 = 18$$

We call the sequence of integers divisible by K if + or - operators can be placed between integers in the sequence in such way that resulting value is divisible by K. In the above example, the sequence is divisible by $7(17 + 5 + -21 - 15 = -14)$ but is not divisible by 5.

You are to write a program that will determine divisibility of sequence of integers.

Input

The first line of the input file contain a integer M indicating the number of cases to be analyzed. Then M couples of lines follow.

For each one of this couples, the first line of the input file contains two integers, N and K $(1 \leq N \leq 10000, 2 \leq K \leq 100)$ separated by a space.

The second line contains a sequence of N integers separated by spaces. Each integer is not greater than 10000 by it's absolute value.

Output

For each case in the input file, write to the output file the word 'Divisible' if given sequence of integers is divisible by K or 'Not divisible' if it's not.

Sample Input

```
2
4 7
17 5 -21 15
4 5
17 5 -21 15
```

Sample Output

```
Divisible
Not Divisible
```

3.5 UVa11541 - Decoding

Encoding is the process of transforming information from one format into another. There exist several different tyoes of encoding scheme. In this problem we will talk about a very simple encoding technique; Run-Length Encoding.

Run-length encoding is a very simple and easy form of data compression in which consecutive occurrences of the same characters are replaced by a single character followed by its frequency. As an example, the string 'AABBBBDAA' would be encoded to 'A2B4D1A2', quotes for clarity.

In this problem, we are interseted in decoding strings that were encoded using the above porcedure.

Input

The first line of input is an integer T (T<50) that indicates the number of test cases. Each case is a line consisting of an encoded string. The string will contain only digits [0-9] and letters [A-Z]. Every inputted string will be valid. That is, every letter will be followed by 1 or more digits.

Output

For each case, output the case number followed by the decoded string. Adhere to the sample for exact format.

You may assume the decoded string wont have a length greater than 200 and it will only consist of upper case alphabets.

Sample Input

3
A2B4D1A2
A12
A1B1C1D1

Sample Output

Case 1: AABBBBDAA
Case 2: AAAAAAAAAAAA
Case 3: ABCD

4 NCPU

4.1 Predix Sums

Let n be a positive integer and $a_i \in \{1, 2, 3\}$ for all $i \in \{1, 2, ..., n\}$. We want to perform n opeations, each in one of the following two forms.

- Calculate $a_1 + a_2 + ... + a_k$ for a given $k \in \{1, 2, ..., n\}$.
- Update a_i to x given $i \in \{1, 2, ..., n\}$ and $x \in \{1, 2, 3\}$.

Input

The input begins with $n, a_1, a_2, ..., a_n$, where two consecutive numbers are separated either by space(s) or newline character(s). The n opeations are specified in the order in which they are to be performed. In detail, we specify each operation in one of the following two ways.

- An operation of the form **"sum** k**"**, where $k \in \{1, 2, ..., n\}$, asks to calculate $a_1 + a_2 + ... + a_k$.
- An operation of the form **"update** i x**"**, where $i \in \{1, 2, ..., n\}$ and $x \in \{1, 2, 3\}$, asks to update a_i to x. Note that x may equal a_i, in which case the update does nothing.

Output

For each operation of the form **"sum** k**"**, where $k \in \{1, 2, ..., n\}$, output $a_1 + a_2 + ... + a_k$ in one line. Any operation of the other form requires no output but may affect subsequent outputs.

Technical Specification

- $n \leq 500000$.

Sample Input

```
7
1 3 2 2 1 3 1
sum 7
update 4 1
sum 5
update 4 1
update 2 2
update 3 2
sum 6
```

Sample Output

```
13
8
10
```

4.2 Minimum Factorial as a Multiple

Let k be a positive integer. The factorial of k, denoted by $k!$, is equal to $1 \times 2 \times ... \times k$. Given an input number n, we want to find the smallest positive integer k such that $k!$ is a multiple of n.

Input

The input begins with a single positive m, which specifies the number of test cases. Then, each of the following m lines corresponds to a test case, which contains a single positive integer n.

Output

For each test cases, output, on a separate line, the smallest positive integer k such that its factorial $k!$ is a multiple of n. (Note: For all test cases, it is graranteed that the corresponding output k would be at most 12.)

Technical Specification

- $1 \leq m \leq 100$
- $1 \leq n \leq 10^7$
- For each integer n in the input test cases, there exists some k with $1 \leq k \leq 12$ such that k! is a multiple of n.

Sample Input

```
3
1
40
136080
```

Sample Output

```
1
5
12
```

4.3 Convert Floating-point Numbers into Fractions

Write a program to convert floating-point numbers into fractions. For exanple, on input 3.14 print out 157/50.

Input

The input file may contain many test data. Each test data contains a positive floating-point number stored in a line Note that a whole number without decimal point, such as 3, can also be a valid input data. The maximum number of digits of the floating-point number is 16, not including a possible decimal point. The last line of the input file contain 0. Your program must exit if the input data is 0.

Output

For each test data x print a fraction number p/q whose value is equal to x. Note that p and q must be relatively prime, i.e., $gcd(p, q) = 1$. For example, 4/6 is not allowed.

Sample Input

```
3
3.14
1.234567890123456
0
```

Sample Output

```
3/1
157/50
19290123283179/15625000000000
```

4.4 Population Count

In Binary City, there are numberous houses. The city government numbered the house from 1 to n. Amazingly, house k can accoummodate up to $c(k)$ persons where $c(k)$ is the number of 1's in the binary representation of k. For example, house 113 can accommedate 4 persons, since 113 in decimal is 1110001_2 in binary numberal system.

After the mayor of Binary City proposed his "Make Big Money!" project, numerous people moved to Binary City, since they want to become the richest people in the world. Now, all houses in Binary City are full of people.

The civil affairs director of Binary City asks you to help the city government to do some statistics for answering inquireies from the city council. Each inquiry consists of two integers b and e, and your task is to compute the population living in houses $b, b+1, ..., e-1, e$ which is $\sum_{k=b}^{e} c(k)$.

Input

The first line if the input contains an integer m indicating the number of inquiries. Each of the following lines is an inquiry, and there are two numbers b and e separated by blanks.

Output

For each inquiry, output the population living in houses $b, b+1, ..., e-1, e$ on one line.

Technical Specification

- $1 \leq m \leq 20$, $1 \leq b \leq e \leq 10^4$, and $e \leq n$.

Sample Input

```
3
1 10
113 113
1 10000
```

Sample Output

```
17
4
64613
```

5 ICPC

5.1 Automatic Control Machine

Angela is very envious of beautiful long hair. She is very annoyed that her hair grows too slow. Through a friend's suggestion, she found a magical shampoo that claims to make hair grow fast and long. Angela found that each time she used the magical shampoo, her hair would be 10% longer the next day. Angela regularly shapoos her hair once every 3 days, and she uses the magical shampoo whenever she washes her hair. However, Angela's family loves to travel. Every two weeks, they will use the weekend to travel for two days. If she encounters regular shampoo on those two days, Angela can only use the regular shampoo given by the hotel. Angela just came back from a family tour yesterday. Let today be the first day, as the family travel tour is scheduled on every other weekend, next trip will be on the 13th and 14th days. Suppose that her current hair length is 20 cm and she starts to use the magical shampoo starting from today. On the second day, her hair length will become 22 cm. On the fourth day she will wash her hair again and her hair has a length of 24.2 cm on the fifth day, etc. Abgela's hair length is illustrated as Table 1.

Table 1: The day-by-day variation of Angela's hair length.

Day	Hair length	Action		Day	Hair length	Action
1	20	shampoo		13	29.282	shampoo, travel
2	22			14	29.282	travel
3	22			15	29.282	
4	22	shampoo		16	29.282	shampoo
5	24.2			17	32.2102	
6	24.2			18	32.2102	
7	24.2	shampoo		19	32.2102	shampoo
8	26.62			20	35.43122	
9	26.62			21	35.43122	
10	26.62	shampoo		22	35.43122	shampoo
11	29.282			23	38.974342	
12	29.282			24	38.974342	

By Table 1, Angela's hair will be more than 30 cm on the 17th day and more than 35 cm from the 20th day. Please help Angela to find on which day her hair will reach (or beyond) a certain length.

Input

The first line contain an integer T indicating the number of test cases, following T lines each contains two space-separated integers A and B indicating the length of Angela's hair now and the desired length (both in cm), respectively.

- $1 \leq T \leq 10$
- $10 \leq A \leq B \leq 2147483647$

Output

For each test case, please output one line containing only one integer indicating the day number of the first day for Angela to have hair length reach (or beyond) the desired length.

Sample Input

```
1
20 30
```

Sample Output

```
17
```

Sample Input

```
2
20 35
10 20
```

Sample Output

```
20
26
```

5.2 No Tabs

Disaster is coming! A virus named **TABX-4869** is developed by a mad scientist. **TABX-4869** can infect all creatures on a planet instantly. People infected with **TABX-4869** will always enter TAB when they want to enter SPACE!

The mad scientist plans to spread **TABX-4869** to the whole galaxy through star routes. The galaxy contains N plantes and M undirected routes. **TABX-4869** can spread to all neighbor planets at a time, but it needs D time unit(s) when sperad through a route with distance D. You can assume that the galaxy is connected via star routes.

To prevent the worst, the Galaxy Govenment (**GG**) developed the vaccine and eant to spread it as soon as possible. The vaccine can prevent uninfected creature from getting infected but cannot cure infected creatures. In addition, the vaccine can be spread rapidly exactly like **TABX-4869**.

GG has observed that the mad scientist will begin to spread TABX-4869 from a particular planet as source. Unfortunately, **GG** cannot predict which planet is the source. Due to the linited amount of vaccine, **GG** can only select exactly one planet as the source of vaccine as soon as the source of **TABX-4869** is observed. (You can assume that **GG** and the mad scientist will start spreading both at the same time.)

There are many great engineers and mathematicians in **GG**, so **GG** will always find the best vaccine source to minimize the disaster. However, they may not save all planets if the mad scientist is smart enough. Please help **GG** to compute the largest possible number of planets that will be infected.

Note that a planet will be infected even if **TABX-4869** and the vaccine are spread to it at the same time.

Input

The first line contains an integer T indicating the number of test cases, described by the following lines.

For each test case, the first line contains two space-separated integers N and M. Each of the following M lines contains three space-separated integers A, B, D that denote a route between planet A and planet B with distance D. Planets are numbered from 1 to N. Each pair of planets has at most one star route between them.

- $1 \leq T \leq 20$
- $3 \leq N \leq 200$
- $N \leq M \leq N(N-1)/2$
- $0 < D < 10000$

Output

For each test case, please output one line containing only one integer indicating the largest number of planet will be infected.

Sample Input

```
2
3 3
1 2 5
2 3 8
3 1 6
5 5
1 2 1
1 3 1
1 4 1
1 5 1
3 4 1
```

Sample Output

```
2
4
```

6 NCPC

6.1 Longest Common Substrings

Given two nonempty 0-1 strings A and B, output the length of a longest common substring of A and B.

Input

The first line is an integer t, $1 \leq r \leq 10$, indicating the number of test caes. Each test case is specified simply by A and B, with a single whitespace character in-between on a single line.

Output

For each test case, output the length of a longest common substring of A and B.

Technical Specification

1. There are at most 10 test cases.
2. Each of A and B has length no more than 100.

Sample Input

```
3
001 10010
11111 0111101
000 111
```

Sample Output

```
3
4
0
```

6.2 Covering a Hole

Tom works in a company that produces covers for all kind of holes, such as holes on streets and wells. He encounter a problem as follows: given a hole H which is a polygon with interior angles of only 90 or 270 degrees, determine the smallest rectangular cover that can completely cover H. In this problem, H is given in a coordinate system such that each of its edges is either vertical or horizontal. When covering a hole, each edge of the cover should also be wither vertical or horizontal in the same coordinate system.

Consider the example in Figure 1. It is easy to see that the smallest rectangular cover that can completely cover H is a rectangle of size 4×8.

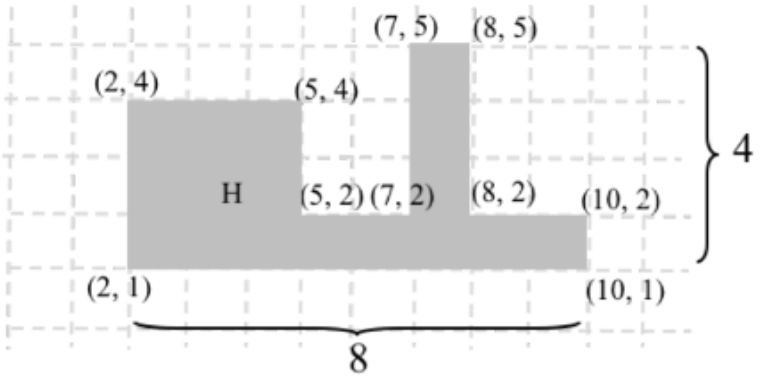

Figure 1: a rectangular hole H.

In this problem, you are asked to find the area of the smallest rectangular cover that can completely cover H. For example, in Figure 1, the output is 32.

Input

The first line is an integer t, $1 \leq t \leq 10$, indicating the number of test cases. Each test case starts with one line containing the number n. $4 \leq n \leq 100$. of vertices of the hole H. Then, n lines follow, each of which contains two integers x and y, $0 \leq x, y \leq 1000$, which are the coordinates of the vertices of the hole's polygon in the order they would be visited in a trip around the polygon.

Output

For each test case. output the area of the smallest rectangular cover that can completely cover H in one line.

Technical Specification

1. The number of the vertices of H, denoted by n, is a positive integer between 4 and 100.
2. The x-coordinates and y-coordinates of vertices are integers between 0 and 1000.

Sample Input

```
2
10
10 1
10 2
8 2
8 5
7 5
7 2
5 2
5 4
2 4
2 1
4
2 1
5 1
5 4
2 4
```

Sample Output

```
32
9
```