More Exercises: Arrays

Problems for more exercise for the "PHP Fundamentals" course @ SoftUni.

You can check your solutions in Judge.

1. Encrypt, Sort and Print Array

Write a program that reads a **sequence of strings** from the console. Encrypt every string by summing:

- The code of **each vowel multiplied by the string length**
- The code of **each consonant divided by the string length**

Sort the **number** sequence in ascending order and print it on the console.

On first line, you will always receive the number of strings you have to read.

Examples

Input	Output	Comments

4
Peter
Maria
Katya
Todor
	1032
	1071
	1168
	1532
		Peter = 1071
		Maria = 1532
		Katya = 1032
		Todor = 1168

3
Sofia
London
Washington
	1396
	1601
	3202
		Sofia = 1601
		London = 1396
		Washington = 3202

2. Pascal Triangle

The triangle may be constructed in the following manner: In row 0 (the topmost row), there is a unique nonzero entry 1. Each entry of each subsequent row is constructed by adding the number above and to the left with the number above and to the right, treating blank entries as 0. For example, the initial number in the first (or any other) row is 1 (the sum of 0 and 1), whereas the numbers 1 and 3 in the third row are added to produce the number 4 in the fourth row.

If you want more info about it: https://en.wikipedia.org/wiki/Pascal's_triangle

Print each row elements separated with whitespace.

Examples

Input	Output

4	1
	1 1
	1 2 1
	1 3 3 1

13	1
	1 1
	1 2 1
	1 3 3 1
	1 4 6 4 1

	1 5 10 10 5 1
	1 6 15 20 15 6 1
	1 7 21 35 35 21 7 1
	1 8 28 56 70 56 28 8 1
	1 9 36 84 126 126 84 36 9 1
	1 10 45 120 210 252 210 120 45 10 1
	1 11 55 165 330 462 462 330 165 55 11 1
	1 12 66 220 495 792 924 792 495 220 66 12 1

Hints

- The input number **n** will be **1 <= n <= 60**
- Think about proper **type** for elements in the array
- Don’t be scared to use **more and more arrays**

3. Recursive Fibonacci

The Fibonacci sequence is quite a famous sequence of numbers. Each member of the sequence is calculated from the sum of the two previous elements. The **first two** elements are 1, 1. Therefore the sequence goes as 1, 1, 2, 3, 5, 8, 13, 21, 34…
The following sequence can be generated with an array, but that’s easy, so your task is to implement recursively.

So if the function **GetFibonacci(n)** returns the n’th Fibonacci number we can express it using **GetFibonacci(n) = GetFibonacci(n-1) + GetFibonacci(n-2).**

However, this will never end and in a few seconds a StackOverflow Exception is thrown. In order for the recursion to stop it has to have a “**bottom**”. The bottom of the recursion is **GetFibonacci(2)** should return 1 and **GetFibonacci(1)** should return 1.

Input Format:

- On the only line in the input the user should enter the wanted Fibonacci number.

Output Format:

- The output should be the **n**’th Fibonacci number counting from 1.

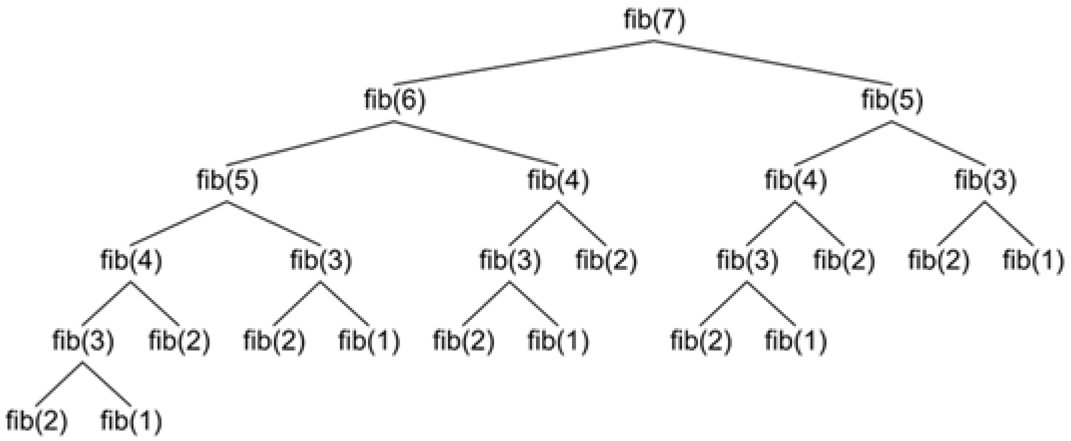
Constraints:

- 1 ≤ N ≤ 50

Examples

Input	Output
5	5
10	55
21	10946

For the Nth Fibonacci number, we calculate the **N-1th** and the **N-2th** number, but for the calculation of **N-1th** number we calculate the **N-1-1th(N-2th)** and the **N-1-2th** number, so we have a lot of repeated calculations.



4. Jump Around

You will receive an **integer array** from the console. You **start** from the **beginning** of the array and try to **move right** by a **step**, equal to the **value** at position **0**. If that is **possible** you should **collect** the **value** from the **index** on which you landed, and try to move to the **right** by **its value**, if that is **not** possible – try to move to the **left**. If that is also **not** possible **stop** the program and print the **sum** of the collected **values**. Example:

Example: We have the array [**3 7 12 2 10**]. We **start** from **3** and move **3 indices** to **2**. We have to move **2 indices**, but we **can't move** to the **right**, so we move to the **left** to **7**. From there we **cannot** move **anywhere** and we **stop** the program and we print the sum of the collected cells: **3 + 2 + 7 = 12**

3	7	12	2	10

Input

The input consists of **single** line, which will be an **array** of **integers**.

Constraints

- The array will have at most **50** elements
- The elements in the array will be in the interval **[1…50]**

Examples

Input	Output
10 50 7 30 8 5	10

Input	Output
2 3 5 7 5 4 8 4	18

5. Longest Increasing Subsequence (LIS)

Read a **list of integers** and find the **longest increasing subsequence** (LIS). If several such exist, print the **leftmost**.

Examples

Input	Output
1	1
7 **3 5** 8 -1 0 **6 7**	3 5 6 7
1 2 5 **3 5** 2 4 1	1 2 3 5
0 10 20 30 30 40 **1** 50 **2 3 4 5 6**	0 1 2 3 4 5 6

11 12 13 **3** 14 **4** 15 **5** **6** **7** **8** 7 **16** 9 8	3 4 5 6 7 8 16
3 14 **5** 12 15 **7** **8** **9** **11** 10 1	3 5 7 8 9 11

Hints

- Assume we have **n** numbers in an array **`nums[0…n-1]`**.
- Let **`len[p]`** holds the length of the longest increasing subsequence (LIS) ending at position **p**.
- In a for loop, we shall calculate **`len[p]`** for **p** = **`0`** … **`n-1`** as follows:
  - Let **`left`** is the leftmost position on the left of **p** (**`left`** < **p**), such that **`len[left]`** is the largest possible.
  - Then, **`len[p]`** = **1** + **`len[left]`**. If **`left`** does not exist, **`len[p]`** = **1**.
  - Also, save **`prev[p]`** = **`left`** (we hold if **`prev[]`** the previous position, used to obtain the best length for position **p**).
- Once the values for **`len[0…n-1]`** are calculated, restore the LIS starting from position **p** such that **`len[p]`** is maximal and go back and back through **p** = **`prev[p]`**.
- The table below illustrates these computations:

`index`	0	1	2	3	4	5	6	7	8	9	10
`nums[]`	**3**	**14**	**5**	**12**	**15**	**7**	**8**	**9**	**11**	**10**	**1**
`len[]`	1	2	2	3	4	3	4	5	6	6	1
`prev[]`	-1	0	0	2	3	2	5	6	7	7	-1
`LIS`	{3}	{3,14}	{3,5}	{3,5,12}	{3,5,12,15}	{3,5,7}	{3,5,7,8}	{3,5,7,8,9}	{3,5,7,8,9,11}	{3,5,7,8,9,10}	{1}

6. Kamino Factory

The clone factory in Kamino got another order to clone troops. But this time you are tasked to find **the best DNA** sequence to use in the production.

You will receive the **DNA length** and until you receive the command **"Clone them!"** you will be receiving a **DNA sequences of ones and zeroes, split by "!" (one or several).**

You should select the sequence with the **longest subsequence of ones**. If there are several sequences with **same length of subsequence of ones**, print the one with the **leftmost starting index**, if there are several sequences with same **length and starting index**, select the sequence with the **greater sum** of its elements.

After you receive the last command **`"Clone them!"`** you should print the collected information in the following format:

`"Best DNA sample {bestSequenceIndex} with sum: {bestSequenceSum}."`

`"{DNA sequence, joined by space}"`

Input / Constraints

- The **first line** holds the **length** of the **sequences** – **integer in range [1…100];**
- On the next lines until you receive **"Clone them!"** you will be receiving sequences (at least one) of ones and zeroes, **split by "!"** (one or several).

Output

The output should be printed on the console and consists of two lines in the following format:

`"Best DNA sample {bestSequenceIndex} with sum: {bestSequenceSum}."`

```
"{DNA sequence, joined by space}"
```

Examples

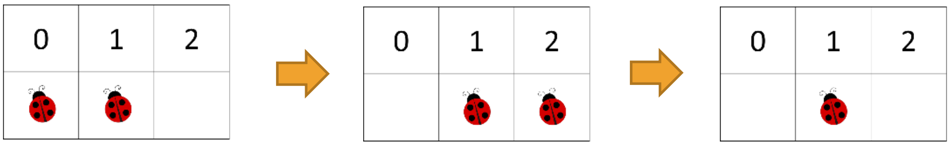
Input	Output	Comments
5 1!0!1!1!0 0!1!1!0!0 Clone them!	Best DNA sample 2 with sum: 2. 0 1 1 0 0	We receive 2 sequences with **same length of subsequence of ones**, but the second is printed, because its subsequence starts at **index[1].**
Input	**Output**	**Comments**
4 1!1!0!1 1!0!0!1 1!1!0!0 Clone them!	Best DNA sample 1 with sum: 3. 1 1 0 1	We receive 3 sequences. Both 1 and 3 **have same length** of subsequence of ones -> 2, **and both start from index[0]**, but the first is printed, because its **sum is greater.**

7. LadyBugs

You are **given a field size** and the **indexes of ladybugs** inside the field. After that on every new line **until the "end" command** is given, a **ladybug changes its position** either to its **left or to its right by a given fly length**.

A **command to a ladybug** looks like this: "**0 right 1**". This means that the little insect placed on index 0 should fly one index to its right. If the ladybug **lands on a fellow ladybug**, it **continues to fly** in the same direction **by the same fly length**. If the ladybug **flies out of the field, it is gone**.

For example, imagine you are given a field with size 3 and ladybugs on indexes 0 and 1. If the ladybug on index 0 needs to fly to its right by the length of 1 (0 right 1) it will attempt to land on index 1 but as there is another ladybug there it will continue further to the right by additional length of 1, landing on index 2. After that, if the same ladybug needs to fly to its right by the length of 1 (2 right 1), it will land somewhere outside of the field, so it flies away:



If you are given ladybug index that does not have ladybug there, nothing happens. If you are given ladybug index that is outside the field, nothing happens.

Your job is to create the program, simulating the ladybugs flying around doing nothing. At the end, **print all cells in the field separated by blank spaces**. For each cell that has a ladybug on it print '**1**' and for each empty cells print '**0**'. For the example above, the output should be **'0 1 0'**.

Input

- On the first line you will receive an integer - the size of the field
- On the second line you will receive the initial **indexes** of all ladybugs separated by a blank space. **The given indexes** may or may not be inside the field range
- On the next lines, until you get the "end" command you will receive commands in the format: "**{ladybug index} {direction} {fly length}**"

Output

- Print the **all cells within the field in format: "{cell} {cell} … {cell}"**
  - If a cell has ladybug in it, print **'1'**

  - If a cell is empty, print **'0'**

Constrains

- The size of the field will be in the range [0 … 1000]
- The ladybug indexes will be in the range [-2,147,483,647 … 2,147,483,647]
- The number of commands will be in the range [0 … 100]
- The fly length will be in the range [-2,147,483,647 … 2,147,483,647]

Examples

Input	Output	Comments
3 0 1 0 right 1 2 right 1 end	0 1 0	1 1 0 - Initial field 0 1 1 - field after "0 right 1" 0 1 0 - field after "2 right 1"

Input	Output
3 0 1 2 0 right 1 1 right 1 2 right 1 end	0 0 0

Input	Output
5 3 3 left 2 1 left -2 end	0 0 0 1 0