Exercises: Arrays

Problems for exercises and homework for the "Programming Fundamentals" course @ SoftUni.

You can check your solutions here: https://judge.softuni.bg/Contests/207/Arrays-Exercises.

1. Largest Common End

Read **two arrays of words** and find the length of the **largest common end** (left or right).

Examples

Input	Output	Comments
hi php java csharp sql html css js **hi php java** js softuni nakov java learn	3	The largest common end is at the left: **hi php java**
hi php java xml csharp **sql html css js** nakov java **sql html css js**	4	The largest common end is at the right: **sql html css js**
I love programming Learn Java or C#	0	No common words at the left and right

Hints

- Scan the arrays from left to right until the end of the shorter is reached and count the equal elements.
- Scan the arrays form right to left until the start of the shorter is reached.
- Keep the start position and the length of the longest equal start / end.

2. Rotate and Sum

To "**rotate** an array on the right" means to move its last element first: {1, 2, 3} → {3, 1, 2}.

Write a program to read an array of **n integers** (space separated on a single line) and an integer **k**, rotate the array right **k times** and sum the obtained arrays after each rotation as shown below.

Examples

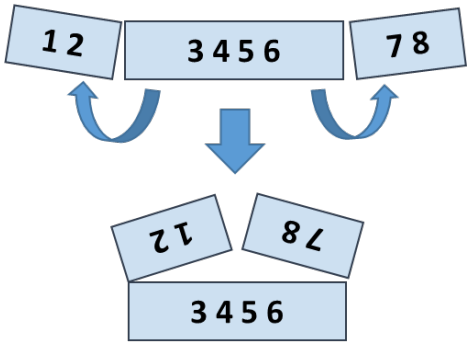
Input	Output	Comments
3 2 4 -1 2	3 2 5 6	rotated1[] = -1 3 2 4 rotated2[] = 4 -1 3 2 sum[] = 3 2 5 6
1 2 3 1	3 1 2	rotated1[] = 3 1 2 sum[] = 3 1 2
1 2 3 4 5 3	12 10 8 6 9	rotated1[] = 5 1 2 3 4 rotated2[] = 4 5 1 2 3 rotated3[] = 3 4 5 1 2 sum[] = 12 10 8 6 9

Hints

- After **r** rotations the element at position **i** goes to position **(i + r) % n**.
- The **sum[]** array can be calculated by two nested loops: for **r** = **1** … **k**; for **i** = **0** … **n-1**.

3. Fold and Sum

Read an array of **4*k** integers, fold it like shown below, and print the sum of the upper and lower two rows (each holding 2 * k integers):



Examples

Input	Output	Comments
5 **2 3** 6	7 9	5 6 + 2 3 = 7 9
1 2 **3 4 5 6** 7 8	5 5 13 13	2 1 8 7 + 3 4 5 6 = 5 5 13 13
4 3 -1 **2 5 0 1 9 8** 6 7 -2	1 8 4 -1 16 14	-1 3 4 -2 7 6 + 2 5 0 1 9 8 = 1 8 4 -1 16 14

Hints

- Create the **first row** after folding: the first **k** numbers reversed, followed by the last **k** numbers reversed.
- Create the **second row** after folding: the middle 2***k** numbers.
- **Sum** the first and the second rows.

4. Sieve of Eratosthenes

Write a program to find **all prime numbers in range [1…n]**. Implement the algorithm called "Sieve of Eratosthenes": https://en.wikipedia.org/wiki/Sieve_of_Eratosthenes. Steps in the "Sieve of Eratosthenes" algorithm:

1. Assign **primes**[0…**n**] = **true**
2. Assign **primes**[0] = **primes**[1] = **false**
3. Find the smallest **p**, which holds **primes**[**p**] = **true**
    - Print **p** (it is prime)
    - Assign **primes**[2***p**] = **primes**[3***p**] = **primes**[4***p**] = … = **false**
4. Repeat for the next smallest **p** < **n**.

Examples

Input	Output
6	2 3 5

25	2 3 5 7 11 13 17 19 23

5. Compare Char Arrays

Compare two char arrays lexicographically (letter by letter).

Print the them in alphabetical order, each on separate line.

Examples

Input	Output
a b c d e f	abc def
p e t e r a n n i e	annie peter
a n n i e a n	an annie
a b a b	ab ab

Hints

- Compare the first letter of **`arr1[]`** and **`arr2[]`**, if equal, compare the next letter, etc.
- If all letters are equal, the smaller array is the **shorter**.
- If all letters are equal and the array lengths are the same, the arrays are **equal**.

6. Max Sequence of Equal Elements

Write a program that finds the **longest sequence of equal elements** in an array of integers. If several longest sequences exist, print the leftmost one.

Examples

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

Hints

- Start with the sequence that consists of the first element: **`start`**=**`0`**, **`len`**=**`1`**.
- Scan the elements from left to right, starting at the second element: **`pos`**=**`1`**…**`n-1`**.
  - At each step compare the current element with the element on the left.
    - Same value → you have found a sequence longer by one → **`len`**++.
    - Different value → start a new sequence from the current element: **`start`**=**`pos`**, **`len`**=**`1`**.
  - After each step remember the sequence it is found to be longest at the moment: **`bestStart`**=**`start`**, **`bestLen`**=**`len`**.
- Finally, print the longest sequence by using **`bestStart`** and **`bestLen`**.

7. Max Sequence of Increasing Elements

Write a program that finds the **longest increasing subsequence** in an array of integers. The longest increasing subsequence is a **portion of the array** (subsequence) that is strongly **increasing** and has the **longest possible length**. If several such subsequences exist, find the left most of them.

Examples

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

Hints

- Use the same algorithm like in the previous problem (Max Sequence of Equal Elements).

8. Most Frequent Number

Write a program that finds the **most frequent number** in a given sequence of numbers.

- Numbers will be in the range [0…65535].
- In case of multiple numbers with the same maximal frequency, print the leftmost of them.

Examples

Input	Output	Output
4 1 1 **4** 2 3 **4 4** 1 2 **4** 9 3	4	The number **4** is the most frequent (occurs 5 times)
2 2 2 2 1 **2 2 2**	2	The number **2** is the most frequent (occurs 7 times)
7 7 7 0 2 2 2 0 10 10 10	7	The numbers **2**, **7** and **10** have the same maximal frequence (each occurs 3 times). The leftmost of them is **7**.

9. Index of Letters

Write a program that creates an array containing all letters from the alphabet (**a**-**z**). Read a lowercase word from the console and print the **index of each of its letters in the letters array**.

Examples

Input	Output
abcz	a -> 0 b -> 1 c -> 2 z -> 25
softuni	s -> 18 o -> 14 f -> 5 t -> 19 u -> 20

	n -> 13 i -> 8

10. Pairs by Difference

Write a program that **count the number of pairs** in given array **which difference is equal to given number**.

Input

- The **first line** holds the **sequence of numbers**.
- The **second line** holds the **difference**.

Examples

Input	Output	Comments
1 5 3 4 2 2	3	Pairs of elements with difference 2 -> {1, 3}, {5, 3}, {4, 2}
5 3 8 10 12 1 1	0	No pairs with difference 1

11. Equal Sums

Write a program that determines if there **exists an element in the array** such that the **sum of the elements on its left** is **equal** to the **sum of the elements on its right**. If there are **no elements to the left / right**, their **sum is considered to be 0**. Print the **index** that satisfies the required condition or **"no"** if there is no such index.

Examples

Input	Output	Comments
1 2 3 3	2	At a[2] -> left sum = 3, right sum = 3 a[0] + a[1] = a[3]
1 2	no	At a[0] -> left sum = 0, right sum = 2 At a[1] -> left sum = 1, right sum = 0 No such index exists
1	0	At a[0] -> left sum = 0, right sum = 0
1 2 3	no	No such index exists
10 5 5 99 3 4 2 5 1 1 4	3	At a[3] -> left sum = 20, right sum = 20 a[0] + a[1] + a[2] = a[4] + a[5] + a[6] + a[7] + a[8] + a[9] + a[10]