

VG101 Lab Manual

Lab 9

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Workflow

Content	Approx. Time
Warmup: Sort	30 mins
Break	10 mins
Mid2 Sample Exam	70 mins
Break	10 mins
Practical Exercise	60 mins

Mid 2 Sample Exam

Ex1. Simple I/O

#string #I/O

Description

Write a program to find the number of times that a key substring occurs in some sentences. The last lines will be the key substring (it can be a word or phrase).

Input

- several lines of string

Sample #1

input

```
1 I want to learn courses well.
2 I want to survive.
3 ktt wants 14d2.
4 cls wanted qhh and shanhx to come to his office hour.
5 want
```

output

```
1 | 2
```

Sample #2

input

```
1 | Four hundred cannon have been thundering without a break since morning on
   | both sides.
2 | At the front, the cavalcades of horsemen clash with the firing squares,
   | drumsticks come down hard on the drumheads, the whole plain is shaking with
   | the noise since morning.
3 | But above the battle, since morning on the two hills, the field marshals are
   | listening to a softer sound above the human storm.
4 | since morning
```

output

```
1 | 3
```

Update

- Sample code available on Canvas

Ex2. Perplexity

#loop

Description

It is known that the multiplication of polynomials are just a convolution:

$$f(x) = a_0 + a_1x + a_2x^2 + \dots, \quad g(x) = b_0 + b_1x + b_2x^2 + \dots,$$
$$(f * g)(x) = (a_0b_0) + (a_0b_1 + a_1b_0)x + (a_0b_2 + a_1b_1 + a_2b_0)x^2 + \dots$$

That is to say, the polynomial coefficient of $f * g$ is

$$c_n = \sum_{k=0}^n a_k b_{n-k}$$

Now given the polynomial coefficient of f and g at both n degrees, find the sum of all the coefficient of $f * g$.

Input

The first line contain only one integer n .

The second and the third lines both contain n integers, denoting the polynomial coefficient $a_0 \dots a_{n-1}$ and $b_0 \dots b_{n-1}$.

Output

You should print only one integer, the sum of

Sample #1

input

```
1 | 4
2 | 1 2 3 4
3 | 5 6 7 8
```

output

1 | 260

Specification

For all test cases, $n \leq 10^6$, $|a_i|, |b_i| \leq 10^3$.

Explanation

$$(1 + 2x + 3x^2 + 4x^3)(5 + 6x + 7x^2 + 8x^3) = 5 + 16 + 34x^2 + 60x^3 + 61x^4 + 52x^5 + 32x^6$$

So the coefficient sum is $5 + 16 + 34 + 60 + 61 + 52 + 32 = 260$.

Ex3. Chess Movement

#recursion

Description:

Provided $2n$ chesses in a single line where n white chesses are on the left and n black chesses are on the right. There are two extra blank position on the right. For example, if we denote `o` as white chess, `*` as black chess and `-` as blank position, we have the following condition when $n = 5$: `ooooo*****--`.

Now you need to move the chess so as to let every black chess alternating with a white one. For example, when $n = 5$, your final chess board should look like: `--o*o*o*o*o*`. However, you can only move two adjacent chess at a time.

Input Format

an integer n indicating the number of a kind of chess.

Output Format

m lines, each line indicating your movement of the chess. Note that you only need to output m lines with a feasible solution.

Sample #1

input

1 | 7

output

```
1  ooooooo*****--
2  oooooo--*****o*
3  oooooo*****--o*
4  ooooo--*****o*o*
5  ooooo*****--o*o*
6  oooo--*****o*o*o*
7  oooo*****--o*o*o*
8  ooo--***o*o*o*o*
9  ooo*o*--*o*o*o*
10 o--*o**oo*o*o*o*
11 o*o*o*--o*o*o*o*
12 --o*o*o*o*o*o*o*
```

Specification:

- For 100% input, $n < 15$

Notes:

- We will use Special Judge to grade your code

Grading Rubric

Criteria	Weight	Available Time	Due Time	Entry
Sample Exam	60%	4:00pm , July.10	11:59am , July.12	JOJ
Algorithmic Exercise	40%	9:00pm , July.10	11:59pm , July.12	JOJ

- For Sample Exam and algorithmic exercise, you need to submit your code to JOJ before Sunday midnight. You'll earn most partial points as long as you submit the code.