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B. Tech – CE, Semester: III
Subject: Data Structure and Algorithm

Lab 1

Aim: Working with dynamic arrays

1 Add two equations and produce third equation as a result. First read coefficients of two input equations using dynamic memory and then process them to get desired result.

Example : $7x^2 + 3x + 5 + 8x^2 + 9 = 15x^2 + 3x + 14$

Input format:

- First line will contain number **n.** Number **n** represents the order of the equation (highest power of the equation). For example for equation $\mathbf{7x^2 + 3x + 5}$ value of **n** will be 2.
- Second line will contain coefficients (separated by spaces) for first equation.
- Third line will contain coefficients (separated by spaces) for second equation.

For example,

- Coefficients for $\mathbf{7x^2 + 3x + 5}$ will be **7 3 5**.
- Please note if the order of equation is 2, then there will be three coefficients.

Output format:

- Output should be one line containing coefficients of resultant equation (separated by spaces).

Range:

- 0 <= **n** <= 10
- -10000 <= **coefficient of each term** <= 10000

Sample Input:

2
7 3 5
8 0 9

Sample Output:

15 3 14

Test cases:

Test Case No	Input	Output
1	0 4	10

	6	
2	4 2 5 0 3 8 4 0 0 2 5	6 5 0 5 13

2 Multiply two equations and produce third equation as a result. First read coefficients of two input equations using dynamic memory and then process them to get desired result.

Example : $7x^2 + 3x + 5$ * $8x^2 + 9$ = $56x^4 + 24x^3 + 103x^2 + 27x + 45$

Input format:

- First line will contain number **n.** Number **n** represents the order of the equation (highest power of the equation). For example for equation $7x^2 + 3x + 5$ value of **n** will be 2.
- Second line will contain coefficients (separated by spaces) for first equation.
- Third line will contain coefficients (separated by spaces) for second equation.

For example,

- Coefficients for $7x^2 + 3x + 5$ will be **7 3 5**.
- Please note if the order of equation is 2, then there will be three coefficients.

Output format:

- Output should be one line containing coefficients of resultant equation (separated by spaces). If some power have zero coefficient then please do not skip it, show that in output as zero. For example $8x^2 + 9$ does not have coefficient for x^1, hence we are showing coefficients as 8 0 9.

Clarification:

- Power of output equation may be higher than power of two input equations.

Range:

0 <= **n** <= 10000

-10000 <= **coefficient of each term** <= 10000

Sample Input:

2

7 3 5

8 0 9

Sample Output:

56 24 103 27 45

Test cases:

Test Case No	Input	Output
1	0 3 8	24

2	10 2 5 8 12 9 7 3 4 6 3 21 4 6 0 0 8 3 7 2 9 100 -35	8 32 62 96 124 128 147 193 240 476 736 967 1096 619 639 187 502 529 279 1995 -735

3 For a given string, find out occurrences of alphabets. We want to count occurrences of alphabets only. So, ignore numbers, white space characters and special characters. Ignore case and consider both ‘A’ and ‘a’ as frequency of that letter. First read entire input in memory using dynamic memory allocation and then process it to get desired output.

Input format:

- First line will contain number **n** (number of characters in the input).
- Second line onwards there will be **n** characters for which we want to find occurrences of letters.

Output format:

- Output should be in one line and should contain 26 numbers (frequency of each letter) separated by single space.

Range:

- 0 <= **n** <= 10
- 0 <= **frequency of each letter in input string** <= 10000

Sample Input:
10
abAB
1d bZ

Sample Output:
2 3 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1

Test cases:

Test Case No	Input	Output
1	18 jbbb vhb 0 vvn pira	0 4 0 0 0 0 0 1 1 1 0 0 0 1 0 1 0 1 0 0 0 3 0 0 0 0
2	1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

4 Write a program using dynamic memory to multiply two matrices.

Input format:
Input will contain **2+m+x** lines.

- First line will contain dimensions of first matrix (**m by n**)
- Second line will contain dimensions of second matrix (**x by y**).
- Next **m** lines will contain rows of first matrix; one row of first matrix per line, and each line would have **n** integers separated by tab.
- Next **x** lines will contain rows of second matrix; one row of second matrix per line, and each line would have **y** integers separated by tab.

Output format:

If multiplication is possible, output should have **1+p** lines.

- First line should have dimensions of resultant matrix (**p by q**).
- Next **p** lines should have rows of resultant matrix; one row of resultant matrix per line, and each line should have **q** integers separated by tab.

If multiplication is not possible, output should be **-1**

Range:

0 < **m, n, x, y** <= 5

-1000 < **each element of input matrices** <= 1000

Sample Input:

```
4	3
3	4
1	5	9
20	-6	10
3	71	-75
4	88	98
79	12	24	11
19	34	1	0
-5	-19	23	57
```

Sample Output:

```
4	4
129	11	236	524
1416	-154	704	790
1961	3875	-1582	-4242
1498	1178	2438	5630
```

Test cases:

Test Case No	Input	Output
1	3 5 4 5	-1
2	1 1 1 1 3 5	1 1 15