# Lab: Multidimensional Arrays

Problems for exercises and homework for the ["CSharp Advanced" course @ Software University](https://softuni.bg/courses/csharp-advanced).

You can check your solutions here: <https://judge.softuni.bg/Contests/1452/Multidimensional-Arrays-Lab>

## Sum Matrix Elements

Write program that **reads a matrix** from the console and print:

* Count of **rows**
* Count of **columns**
* Sum of all **matrix elements**

On first line you will get matrix sizes in format **[rows, columns]**

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 3, 6  7, 1, 3, 3, 2, 1 1, 3, 9, 8, 5, 6 4, 6, 7, 9, 1, 0 | 3  6  76 |

### Hints

* On next **[rows]** lines you will get elements for each column separated with coma and whitespace
* Try to use only **foreach** for printing

## Sum Matrix Columns

Write program that **read a matrix** from console and print the sum for each column. On first line you will get matrix **rows**. On the next **rows** lines, you will get elements for each column separated with a space.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 3, 6  7 1 3 3 2 1  1 3 9 8 5 6  4 6 7 9 1 0 | 12  10  19  20  8  7 |
| 3, 3  1 2 3  4 5 6  7 8 9 | 12  15  18 |

### Hints

* Read matrix sizes.
* On the next row lines read the columns.
* Traverse the matrix and sum all elements in each column.
* Print the sum and continue with the other columns.

## Primary Diagonal

Write a program that finds the **sum of matrix primary diagonal**.



### Input

* On the **first line**, you are given the integer **N** – the size of the square matrix
* The next N **lines** holds the values for **every row** – N numbers separated by a space

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 3  11 2 4  4 5 6  10 8 -12 | 4 |
| 3  1 2 3  4 5 6  7 8 9 | 15 |

## Symbol in Matrix

Write a program that reads **N**, number representing **rows** and **cols** of a **matrix**. On the next **N** lines, you will receive rows of the matrix. Each row consists of ASCII characters. After that, you will receive a symbol. Find the **first occurrence** of that symbol in the matrix and print its position in the format: "({row}, {col})". If there is no such symbol print an error message   
"{symbol} does not occur in the matrix "

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 3  ABC  DEF  X!@  ! | (2, 1) |
| 4  asdd  xczc  qwee  qefw  4 | 4 does not occur in the matrix |

## Square with Maximum Sum

Write a program that **read a matrix** from console. Then find biggest sum of **2x2 submatrix** and print it to console.

On first line you will get matrix sizes in format **rows, columns.**

One next **rows** lines you will get elements for each **column** separated with coma.

Print **biggest top-left** square, which you find and sum of its elements.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 3, 6  7, 1, 3, 3, 2, 1 1, 3, 9, 8, 5, 6 4, 6, 7, 9, 1, 0 | 9 8  7 9  33 |
| 2, 4  10, 11, 12, 13  14, 15, 16, 17 | 12 13  16 17  58 |

### Hints

* Think about **IndexOutOfRangeException()**
* If you find more than one max square, print the top-left one

## Jagged-Array Modification

Write a program that **reads a matrix** from the console. On the first line you will get matrix **rows**. On next **rows** lines you will get elements for each **column** separated with **space**. You will be receiving commands in the following format:

* **Add {row} {col} {value}** – **Increase** the number at the given **coordinates** with the **value.**
* **Subtract {row} {col} {value}** – **Decrease** the number at the given **coordinates** by the **value**.

Coordinates might be invalid. In this case you should print "**Invalid coordinates**". When you receive "**END**" you should print the matrix and stop the program.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 3  1 2 3  4 5 6  7 8 9  Add 0 0 5  Subtract 1 1 2  END | 6 2 3  4 3 6  7 8 9 |
| 4  1 2 3 4  5 6 7 8  8 7 6 5  4 3 2 1  Add 4 4 100  Add 3 3 100  Subtract -1 -1 42  Subtract 0 0 42  END | Invalid coordinates  Invalid coordinates  -41 2 3 4  5 6 7 8  8 7 6 5  4 3 2 101 |

## 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 array
* Don’t be scary to use **more and more arrays**

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

1 13 78 286 715 1287 1716 1716 1287 715 286 78 13 1

1 14 91 364 1001 2002 3003 3432 3003 2002 1001 364 91 14 1

1 15 105 455 1365 3003 5005 6435 6435 5005 3003 1365 455 105 15 1

1 16 120 560 1820 4368 8008 11440 12870 11440 8008 4368 1820 560 120 16 1

1 17 136 680 2380 6188 12376 19448 24310 24310 19448 12376 6188 2380 680 136 17 1

1 18 153 816 3060 8568 18564 31824 43758 48620 43758 31824 18564 8568 3060 816 153 18 1

1 19 171 969 3876 11628 27132 50388 75582 92378 92378 75582 50388 27132 11628 3876 969 171 19 1

1 20 190 1140 4845 15504 38760 77520 125970 167960 184756 167960 125970 77520 38760 15504 4845 1140 190 20 1

1 21 210 1330 5985 20349 54264 116280 203490 293930 352716 352716 293930 203490 116280 54264 20349 5985 1330 210 21 1

1 22 231 1540 7315 26334 74613 170544 319770 497420 646646 705432 646646 497420 319770 170544 74613 26334 7315 1540 231 22 1

1 23 253 1771 8855 33649 100947 245157 490314 817190 1144066 1352078 1352078 1144066 817190 490314 245157 100947 33649 8855 1771 253 23 1

1 24 276 2024 10626 42504 134596 346104 735471 1307504 1961256 2496144 2704156 2496144 1961256 1307504 735471 346104 134596 42504 10626 2024 276 24 1

1 25 300 2300 12650 53130 177100 480700 1081575 2042975 3268760 4457400 5200300 5200300 4457400 3268760 2042975 1081575 480700 177100 53130 12650 2300 300 25 1

1 26 325 2600 14950 65780 230230 657800 1562275 3124550 5311735 7726160 9657700 10400600 9657700 7726160 5311735 3124550 1562275 657800 230230 65780 14950 2600 325 26 1

1 27 351 2925 17550 80730 296010 888030 2220075 4686825 8436285 13037895 17383860 20058300 20058300 17383860 13037895 8436285 4686825 2220075 888030 296010 80730 17550 2925 351 27 1

1 28 378 3276 20475 98280 376740 1184040 3108105 6906900 13123110 21474180 30421755 37442160 40116600 37442160 30421755 21474180 13123110 6906900 3108105 1184040 376740 98280 20475 3276 378 28 1

1 29 406 3654 23751 118755 475020 1560780 4292145 10015005 20030010 34597290 51895935 67863915 77558760 77558760 67863915 51895935 34597290 20030010 10015005 4292145 1560780 475020 118755 23751 3654 406 29 1

1 30 435 4060 27405 142506 593775 2035800 5852925 14307150 30045015 54627300 86493225 119759850 145422675 155117520 145422675 119759850 86493225 54627300 30045015 14307150 5852925 2035800 593775 142506 27405 4060 435 30 1

1 31 465 4495 31465 169911 736281 2629575 7888725 20160075 44352165 84672315 141120525 206253075 265182525 300540195 300540195 265182525 206253075 141120525 84672315 44352165 20160075 7888725 2629575 736281 169911 31465 4495 465 31 1

1 32 496 4960 35960 201376 906192 3365856 10518300 28048800 64512240 129024480 225792840 347373600 471435600 565722720 601080390 565722720 471435600 347373600 225792840 129024480 64512240 28048800 10518300 3365856 906192 201376 35960 4960 496 32 1

1 33 528 5456 40920 237336 1107568 4272048 13884156 38567100 92561040 193536720 354817320 573166440 818809200 1037158320 1166803110 1166803110 1037158320 818809200 573166440 354817320 193536720 92561040 38567100 13884156 4272048 1107568 237336 40920 5456 528 33 1

1 34 561 5984 46376 278256 1344904 5379616 18156204 52451256 131128140 286097760 548354040 927983760 1391975640 1855967520 2203961430 2333606220 2203961430 1855967520 1391975640 927983760 548354040 286097760 131128140 52451256 18156204 5379616 1344904 278256 46376 5984 561 34 1

1 35 595 6545 52360 324632 1623160 6724520 23535820 70607460 183579396 417225900 834451800 1476337800 2319959400 3247943160 4059928950 4537567650 4537567650 4059928950 3247943160 2319959400 1476337800 834451800 417225900 183579396 70607460 23535820 6724520 1623160 324632 52360 6545 595 35 1

1 36 630 7140 58905 376992 1947792 8347680 30260340 94143280 254186856 600805296 1251677700 2310789600 3796297200 5567902560 7307872110 8597496600 9075135300 8597496600 7307872110 5567902560 3796297200 2310789600 1251677700 600805296 254186856 94143280 30260340 8347680 1947792 376992 58905 7140 630 36 1

1 37 666 7770 66045 435897 2324784 10295472 38608020 124403620 348330136 854992152 1852482996 3562467300 6107086800 9364199760 12875774670 15905368710 17672631900 17672631900 15905368710 12875774670 9364199760 6107086800 3562467300 1852482996 854992152 348330136 124403620 38608020 10295472 2324784 435897 66045 7770 666 37 1

1 38 703 8436 73815 501942 2760681 12620256 48903492 163011640 472733756 1203322288 2707475148 5414950296 9669554100 15471286560 22239974430 28781143380 33578000610 35345263800 33578000610 28781143380 22239974430 15471286560 9669554100 5414950296 2707475148 1203322288 472733756 163011640 48903492 12620256 2760681 501942 73815 8436 703 38 1

1 39 741 9139 82251 575757 3262623 15380937 61523748 211915132 635745396 1676056044 3910797436 8122425444 15084504396 25140840660 37711260990 51021117810 62359143990 68923264410 68923264410 62359143990 51021117810 37711260990 25140840660 15084504396 8122425444 3910797436 1676056044 635745396 211915132 61523748 15380937 3262623 575757 82251 9139 741 39 1

1 40 780 9880 91390 658008 3838380 18643560 76904685 273438880 847660528 2311801440 5586853480 12033222880 23206929840 40225345056 62852101650 88732378800 113380261800 131282408400 137846528820 131282408400 113380261800 88732378800 62852101650 40225345056 23206929840 12033222880 5586853480 2311801440 847660528 273438880 76904685 18643560 3838380 658008 91390 9880 780 40 1

1 41 820 10660 101270 749398 4496388 22481940 95548245 350343565 1121099408 3159461968 7898654920 17620076360 35240152720 63432274896 103077446706 151584480450 202112640600 244662670200 269128937220 269128937220 244662670200 202112640600 151584480450 103077446706 63432274896 35240152720 17620076360 7898654920 3159461968 1121099408 350343565 95548245 22481940 4496388 749398 101270 10660 820 41 1

1 42 861 11480 111930 850668 5245786 26978328 118030185 445891810 1471442973 4280561376 11058116888 25518731280 52860229080 98672427616 166509721602 254661927156 353697121050 446775310800 513791607420 538257874440 513791607420 446775310800 353697121050 254661927156 166509721602 98672427616 52860229080 25518731280 11058116888 4280561376 1471442973 445891810 118030185 26978328 5245786 850668 111930 11480 861 42 1

1 43 903 12341 123410 962598 6096454 32224114 145008513 563921995 1917334783 5752004349 15338678264 36576848168 78378960360 151532656696 265182149218 421171648758 608359048206 800472431850 960566918220 1052049481860 1052049481860 960566918220 800472431850 608359048206 421171648758 265182149218 151532656696 78378960360 36576848168 15338678264 5752004349 1917334783 563921995 145008513 32224114 6096454 962598 123410 12341 903 43 1

1 44 946 13244 135751 1086008 7059052 38320568 177232627 708930508 2481256778 7669339132 21090682613 51915526432 114955808528 229911617056 416714805914 686353797976 1029530696964 1408831480056 1761039350070 2012616400080 2104098963720 2012616400080 1761039350070 1408831480056 1029530696964 686353797976 416714805914 229911617056 114955808528 51915526432 21090682613 7669339132 2481256778 708930508 177232627 38320568 7059052 1086008 135751 13244 946 44 1

1 45 990 14190 148995 1221759 8145060 45379620 215553195 886163135 3190187286 10150595910 28760021745 73006209045 166871334960 344867425584 646626422970 1103068603890 1715884494940 2438362177020 3169870830126 3773655750150 4116715363800 4116715363800 3773655750150 3169870830126 2438362177020 1715884494940 1103068603890 646626422970 344867425584 166871334960 73006209045 28760021745 10150595910 3190187286 886163135 215553195 45379620 8145060 1221759 148995 14190 990 45 1

1 46 1035 15180 163185 1370754 9366819 53524680 260932815 1101716330 4076350421 13340783196 38910617655 101766230790 239877544005 511738760544 991493848554 1749695026860 2818953098830 4154246671960 5608233007146 6943526580276 7890371113950 8233430727600 7890371113950 6943526580276 5608233007146 4154246671960 2818953098830 1749695026860 991493848554 511738760544 239877544005 101766230790 38910617655 13340783196 4076350421 1101716330 260932815 53524680 9366819 1370754 163185 15180 1035 46 1

1 47 1081 16215 178365 1533939 10737573 62891499 314457495 1362649145 5178066751 17417133617 52251400851 140676848445 341643774795 751616304549 1503232609098 2741188875414 4568648125690 6973199770790 9762479679106 12551759587422 14833897694226 16123801841550 16123801841550 14833897694226 12551759587422 9762479679106 6973199770790 4568648125690 2741188875414 1503232609098 751616304549 341643774795 140676848445 52251400851 17417133617 5178066751 1362649145 314457495 62891499 10737573 1533939 178365 16215 1081 47 1

1 48 1128 17296 194580 1712304 12271512 73629072 377348994 1677106640 6540715896 22595200368 69668534468 192928249296 482320623240 1093260079344 2254848913647 4244421484512 7309837001104 11541847896480 16735679449896 22314239266528 27385657281648 30957699535776 32247603683100 30957699535776 27385657281648 22314239266528 16735679449896 11541847896480 7309837001104 4244421484512 2254848913647 1093260079344 482320623240 192928249296 69668534468 22595200368 6540715896 1677106640 377348994 73629072 12271512 1712304 194580 17296 1128 48 1

1 49 1176 18424 211876 1906884 13983816 85900584 450978066 2054455634 8217822536 29135916264 92263734836 262596783764 675248872536 1575580702584 3348108992991 6499270398159 11554258485616 18851684897584 28277527346376 39049918716424 49699896548176 58343356817424 63205303218876 63205303218876 58343356817424 49699896548176 39049918716424 28277527346376 18851684897584 11554258485616 6499270398159 3348108992991 1575580702584 675248872536 262596783764 92263734836 29135916264 8217822536 2054455634 450978066 85900584 13983816 1906884 211876 18424 1176 49 1