# Lab: Abstraction

This document defines the exercises for ["Java Advanced" course @ Software University](https://softuni.bg/courses/java-advanced). Please submit your solutions (source code) of all below described problems in [Judge](https://judge.softuni.bg/Contests/775).

# Methods and Arrays

## Calculate Triangle Area Method

Create a method that calculates a triangle area by a given:

* Base
* Height

Return the **area** as an output of the program. Format the result to the **second digit** after the decimal separator.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 4.00 2 | Area = 4.00 |
| 3 6 | Area = 9.00 |

### Hints

* Make you program more readable by using a **Method**

## 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 alphabetically and print it on the console.

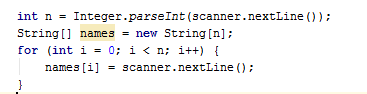
On first line, you will always receive the number of strings you have to read.

### 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 |

### Hints

* Thinks about the **Arrays** class
* You might help yourself with the **code** below:



# Multidimensional Arrays

## Sum Matrix Elements

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

* The count of **rows**
* The count of **columns**
* The sum of all **matrix’s elements**

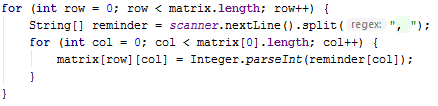
On the first line you will get the dimensions of the matrix in format **{rows, columns}.** On the next lines you will get the elements for each **row** separated with a coma.

### 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

* Help yourself with the code below for reading the matrix
* Try to use a **foreach**-loop



## Maximum Sum of 2x2 Submatrix

Write a program that **reads a matrix** from the console. Then find the biggest sum of a **2x2 submatrix.** Print the submatrix and its sum.

On the first line you will get the dimensions of the matrix in format **{rows, columns}.** On the next lines you will get the elements for each **row** separated with a coma.

### 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

* Ensure that your program doesn’t throw an **IndexOutOfBoundsException()**

## Pascals Triangle

Your task is to print the first **N** rows of the Pascal Triangle. You will receive a single integer number **N** as an input.

The Pascal triangle is constructed in the following manner: On 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**.

If you can get more info about it here: <https://en.wikipedia.org/wiki/Pascal's_triangle>

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 4 | 1  1 1  1 2 1  1 3 3 1 |
| 15 | 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 |

### Hints

* The Input number **N** will be in range [**1…100]**
* Think about a proper **type** for the elements of the array