# Homework: Java Syntax

This document defines homework assignments from the [“Java Basics“ Course @ Software University](https://softuni.bg/courses/java-basics/). Please submit as homework a single zip / rar / 7z archive holding the solutions (source code) of all below described problems.

## Rectangle Area

Write a program that enters the **sides of a rectangle** (two integers **a** and **b**) and calculates and prints the rectangle's area. Format the result to the second digit after the decimal separator.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 7 20 | 140.00 |
| 5 12 | 60.00 |

## Triangle Area

Write a program that enters 3 points in the plane (as integer **x** and **y** coordinates), calculates and prints the **area of the triangle** composed by these 3 points. Round the result to a whole number. In case the three points do not form a triangle, print "**0**" as result.

### Examples

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |  | **Input** | **Output** |
| -5 10  25 30  60 15 | 575 | 53 18  56 23  24 27 | 86 | 1 1  2 2  3 3 | 0 |

This resource could help you: <http://www.mathopenref.com/coordtrianglearea.html>.

## Formatting Numbers

Write a program that reads 3 numbers:

* an integer a (0 ≤ a ≤ 500)
* a floating-point b
* floating-point c

**Print them in 4 virtual columns** on the console, separated with a pipe '|'. Each column should have a width of 10 characters.

* First, the number a should be printed in **hexadecimal, left aligned**
* Second, the number a should be printed in binary form, padded with zeroes
* Third, the number b should be **printed with 2 digits after the decimal point, right aligned**
* Lastly, the number c should be **printed with 3 digits after the decimal point, left aligned**

You will receive **a**, **b** and **c** on a **single line**, separated by **one or more white spaces**.

### Examples

|  |  |  |  |
| --- | --- | --- | --- |
| **a** | **b** | **c** | **result** |
| 254 | 11.6 | 0.5 | |FE |0011111110| 11.60|0.500 | |
| 499 | -0.5559 | 10000 | |1F3 |0111110011| -0.56|10000.000 | |
| 0 | 3 | -0.1234 | |0 |0000000000| 3.00|-0.123 | |
| 444 | -7.5 | 7.5 | |1BC |0110111100| -7.50|7.500 | |

## Calculate Expression

Write a program that reads three floating point numbers from the console and calculates their result with the following formulae:

**((a2 + b2)/ (a2 – b2))(a + b + c) / √c  (a2 + b2 - c3)(a – b)**

Then calculate the **absolute value** of the **difference between** the average of the three numbers and the average of the two formulae.

**Abs (Avg (a, b, c) – Avg (f1, f2))**

You will receive **a**, **b** and **c** on a **single line**, separated by **one or more white spaces**.

### Examples

|  |  |  |  |
| --- | --- | --- | --- |
| **a** | **b** | **c** | **result** |
| 5 | 2 | 3 | F1 result: 6.45; F2 result: 8.00; Diff: 3.89 |
| 3.8 | 2.5 | 1.2 | F1 result: 569.60; F2 result: 45.84; Diff: 305.22 |
| 0 | 0 | 0 | F1 result: NaN; F2 result: 1.00; Diff: NaN |
| 1.25 | 1.22 | 1.24 | F1 result: 239530.27; F2 result: 1.00; Diff: 119764.40 |
| 3.21 | 1 | 2.1 | F1 result: 2.33; F2 result: 4.85; Diff: 1.49 |

## Convert from Decimal System to Base-7

Write a program that **takes an integer** number and **converts it to base-7**.

### Examples

|  |  |
| --- | --- |
| **Decimal** | **Base-7** |
| 10 | 13 |
| 7 | 10 |
| 123 | 234 |
| 1000 | 2626 |
| 1 | 1 |

## Convert from Base-7 to Decimal

Write a program that **converts number from a base-7** to its **decimal representation**.

### Examples

|  |  |
| --- | --- |
| **Base-7** | **Decimal** |
| 13 | 10 |
| 10 | 7 |
| 234 | 123 |
| 2626 | 1000 |
| 1 | 1 |

## \*Odd and Even Pairs

You are given an array of integers as a single line, separated by a space. Write a program that checks consecutive pairs and prints if both are odd/even or not. Note that the array length should also be an even number.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 1 2 3 4 | 1, 2 -> different  3, 4 -> different |
| 2 8 11 15 3 2 | 2, 8 -> both are even  11, 15 -> both are odd  3, 2 -> different |
| 1 8 11 1 2 | invalid length |

## \*Hit the Target

Write a program that takes as input an integer – the target – and outputs to the console all pairs of numbers between 1 and 20, which, if added or subtracted, result in the target.

### Examples

|  |  |
| --- | --- |
| **Target** | **Output** |
| 5 | 1 + 4 = 5  2 + 3 = 5  3 + 2 = 5  …  19 - 14 = 5  20 - 15 = 5 |
| 35 | 15 + 20 = 35  16 + 19 = 35  17 + 18 = 35  18 + 17 = 35  19 + 16 = 35  20 + 15 = 35 |
| 0 | 1 - 1 = 0  2 - 2 = 0  …  19 - 19 = 0  20 - 20 = 0 |

## Character Multiplier

Create a **method** that takes two strings as arguments and returns the sum of their character codes multiplied (multiply str1.charAt (0) with str2.charAt (0) and add to the total sum). Then continue with the next two characters. If one of the strings is longer than the other, add the remaining character codes to the total sum without multiplication.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| Gosho Pesho | 53253 |
| 123 522 | 7647 |
| a aaaa | 9700 |

## Get First Odd or Even Elements

Write a **method** that returns the first N odd/even elements from a collection. Return as many as you can.

Format: **[Get <number of elements> <odd/even>]**

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 1 2 3 4 5  Get 3 odd | 1 3 5 |
| 11 6 2 8 1 0  Get 8 even | 6 2 8 0 |

## Game of Names

Write a program to **calculate points** **for all players** and **find who the winner is**. You will be given **the count of the players**, **their names** and **initial scores**. **Score** for every player **depends on his name**. To the **player score** **add** or **subtract** the **ASCII code** **of** **each letter**. If **ASCII code** is **even,** **add** it to the score. If is **odd** – **subtract** it from the score. Find **the one with highest score** and print his name and score on the console. If **two or more players** are with **same points** – **the winner is the first one**.

### Input

On the **first input line,** you will be given **number N -** **the count of players**.

On the **next 2\*N lines** you will be given player name and hi initial score.

### Output

**The output** should be printed on the console and consist **the name of the winner** and **his score** in the following format:

“The winner is {name} - {points} points”

### Constraints

* **N – the count of players** will be a **positive integer** in the range **[1...100]**
* **Names** will be **strings** with **length between 3 and 30**
* **The score** **for each player** will be an **integer** in the range **[-100,000...100,000]**

### Examples

|  |  |  |
| --- | --- | --- |
| **Input** | **Output** | **Comments** |
| 3  Bojidar  123  Preslav  123  Pesho  123 | The winner is Preslav - 230 points | B(66)o(111)j(106)i(105)d(100)a(97)r(114) Initial points 123 scores  123 +66 -111 +106 -105 +100 -97 +114 = 196  P(80)r(114)e(101)s(115)l(108)a(97)v(118)  Initial points 123 scores  123 +80 +114 -101 -115 +108 -97 +118 = 230  P(80)e(101)s(115)h(104)o(111)  Initial points 123 scores  123 +80 -101 -115 +104 -111 = -20  Preslav(230) > Bojidar(196) > Pesho(-20) |

## \*Vehicle Park

You are manager on a vehicle park. Your job is to sell cars and give reports to the accounting. You will be given all vehicles that are available for selling in format like the example below:

**c2 c4 v10 v20 b50**

Each car is described by **vehicle type** (single character ‘**b**’, ‘**c**’ or ‘**v**’) and **number of seats** in the vehicle (natural number). For example, **“c4”** means **car with 4 seats**, “**b50**” means **bus with 50 seats** and “**v10**” means **van with 10 seats**.

You need to **process** a sequence of **incoming requests**. Each request holds **type of vehicle** and **number of seats** in the following format:

**Car with 4 seats**

**Bus with 20 seats**

**…**

If you have **vehicle** that **matches** the description of the **desired vehicle**, you should **sell it**, otherwise print “**No**”. The **price** is calculated as а **product** of the **character ASCII code** andthe **number of seats**. For example, the **price** for “**c4**” (**car with 4 seats**), will be calculated as **99(‘c’) \* 4 = 396**. If there are **2 or more matching vehicles** you should **sell the leftmost** one.

After you **run out of customers**, you need to **print the vehicles** that you **didn’t sell** and the **count of sold vehicles**.

### Input

The input data should be read from the console.

* On the **first input line,** you will receive **all vehicles** in the park, separated with **single whitespace**.
* On the nextlines, you will receive **requests for vehicles** in the following format:

“**{Vehicle Type} with {Number of seats} seats**”

until you receive **“End of customers!”**

The input data will always be valid and in the format described. There is no need to check it explicitly.

### Output

The output should consist of:

* For **each vehicle request** you either need to **print**:
  + “Yes, sold for {price}$” – if the **wanted vehicle** is **available** in the park.
  + “No” – if there is no such vehicle in the vehicle park.
* After you **stop receiving request**, you need to **print** **two** **lines**:
  + On the first line, you need to print the remaining vehicles in the format:

“Vehicles left: x1, x2, x3…”

* + On the second line, you need to print the total number of vehicles sold in the following format: “Vehicles sold: x1, x2, x3…”

### Constraints

* The **number of vehicles** will be in range [**0 – 10,000**].
* The **amount of request** for vehicles will be in range [**0 – 10,000**].
* The **number of seats** for **each vehicle** will be in range [**1 – 10,000**].
* The **vehicle type** can only be one of the following **Car – c**; **Bus – b**; **Van – v;**
* Allowed working time for your program: 0.1 seconds. Allowed memory: 16 MB.

### Examples

|  |  |  |
| --- | --- | --- |
| **Input** | **Output** | **Comments** |
| c2 c4 v10 v20 b50  Car with 4 seats  Bus with 20 seats  Bus with 33 seats  Van with 20 seats  Bus with 50 seats  End of customers! | Yes, sold for 396$  No  No  Yes, sold for 2360$  Yes, sold for 4900$  Vehicles left: c2, v10  Vehicles sold: 3 | c4 -> 99(‘c’) \* 4 = 396$  v20 -> 118(‘v’) \* 20 = 2360$  b50 -> 98(‘b’) \* 50 = 4900$ |
| **Input** | **Output** | |
| c2 v1 b2 v2 c20 b150 v1  Van with 50 seats  Van with 1 seats  Bus with 1000 seats  End of customers! | No  Yes, sold for 118$  No  Vehicles left: c2, b2, v2, c20, b150, v1  Vehicles sold: 1 | |

## \*\*Blur Filter

Bojo is a bad photo editor, but he wants to do some amazing pictures for his Facebook page. He can’t do it alone, so he needs your help. For each picture, you will be given a **matrix** with pixels. Each pixel has **weight**. The **blur filter** is applied to a certain cell (pixel) and **all cells around** it. **The blur** has **amount**, which needs to be **added to the weight of the pixel** that it blurs. Print the matrix after the blur applied as output.

**Example:** on the picture on the left **apply blur** with amount **2** over the **pixel** at position **[2, 2]**.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 🡪 | 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 | 5 | 8 | 9 | 10 |
| 9 | 10 | 11 | -12 | 9 | 12 | 13 | -10 |
| -13 | 14 | 15 | 16 | -13 | 16 | 17 | 18 |

### Input

The input data should be read from the console.

* The **first line** holds the **blur amount**.
* The **second line** holds the number of rows **r** andcolumns **c** separated by aspace.
* The **next r lines** hold the matrix numbers. Each line holds **c** integers, separated by space.
* The **last line** holds the **coordinates** **of the blur** – **row** and **column**, separated by space.

The input data will always be valid and in the format described. There is no need to check it explicitly.

### Output

The output should consist of the matrix after the blur filter is applied.

### Constraints

* The **blur amount** will be an integer number in the range [-2,147,483,648...2,147,483,647].
* The **pixel** **weight** will be an integer number in range [-2,147,483,648...2,147,483,647].
* The number of **rows** and **columns** will be an integer number in the range [1...20].

### Examples

|  |  |  |
| --- | --- | --- |
| **Input** | **Output** | **Comments** |
| 9  3 3  1 1 1  1 1 1  1 1 1  1 1 | 10 10 10  10 10 10  10 10 10 | **Blur amount = 9**  Target = **[1, 1]**  **[0, 0] = 1+9; [0, 1] = 1+9;** **[0, 2] = 1+9;**  **[1, 0] = 1+9; [1, 1] = 1+9;** **[1, 2] = 1+9;**  **[2, 0] = 1+9; [2, 1] = 1+9;** **[2, 2] = 1+9;** |
| **Input** | **Output** | |
| 3  3 4  0 -5 4 20  0 20 4 -5  20 4 -5 0  1 2 | 0 -2 7 23  0 23 7 -2  20 7 -2 3 | |