# Homework: JavaScript Functions and Objects

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

## Array object extractor

Write a JavaScript function **extractObjects(array)**. As a function **argument** you are given an **array** of different objects with different data types . Your task is to write the JavaScript function that **filters out** the **Objects** (all primitive data type objects and arrays are filtered) and **returns** a new array with the extracted elements. Example:  
*Note: Try to write the filter algorithm yourself and not use .filter() function. (Hint: Use procedural for loop)*

|  |  |
| --- | --- |
| **Input** | **Output** |
| [  "Pesho",  4,  4.21,  { name : 'Valyo', age : 16 },  { type : 'fish', model : 'zlatna ribka' },  [1,2,3],  "Gosho",  { name : 'Penka', height: 1.65} ] | [  { name: 'Valyo', age: 16 },  { type: 'fish', model: 'zlatna ribka' },  { name: 'Penka', height: 1.65 }  ] |

## String's letters organizer

Write a JavaScript function **sortLetters(string, boolean)** that gets as an input a string and a boolean. The function **sorts** all letters in the string in **alphabetical** order and **returns** the newly formed string. The sorting is **ascending** if the boolean is **true** otherwise the sorting is in **descending** order. Example:  
*Note:* *The sorting is* ***case-insensitive*** *but the output should use the* ***same casing as the input****!*   
*Hint: You are allowed to use .sort() function.*

|  |  |
| --- | --- |
| **Input** | **Output** |
| sortLetters('HelloWorld', **true**) | 'deHllloorW' |
| sortLetters('HelloWorld', **false**) | 'WroolllHed' |

## Find Youngest Person that has a smartphone

Write a JavaScript function **findYoungestPerson(array)** that accepts as parameter an **array** of **people,** finds the youngest person that **has a smartphone** and returns his **full name**. Write a JS program **youngestPerson.js** to execute your function for the below examples and print the result at the console.

|  |  |
| --- | --- |
| **Predefined array** | |
| var people = [  { firstname : 'George', lastname: 'Kolev', age: 32, hasSmartphone: false },  { firstname : 'Vasil', lastname: 'Kovachev', age: 40, hasSmartphone: true },  { firstname : 'Bay', lastname: 'Ivan', age: 81, hasSmartphone: true },  { firstname : 'Baba', lastname: 'Ginka', age: 40, hasSmartphone: false }] | |
| **Input** | **Output** |
| findYoungestPerson(people); | The youngest person is Vasil Kovachev |

## Count Number of DIVs

Write a JavaScript function **countDivs(html)** to count the number of all DIVs in given HTML fragment passed as string. Write a JS program **countOfDivs.js** that invokes your function and prints the output at the console. Examples:

|  |  |
| --- | --- |
| **Input** | **Output** |
| <!DOCTYPE html>  <html>  <head lang="en">  <meta charset="UTF-8">  <title>index</title>  <script src="/yourScript.js" defer></script>  </head>  <body>  <div id="outerDiv">  <div  class="first">  <div><div>hello</div></div>  </div>  <div>hi<div></div></div>  <div>I am a div</div>  </div>  </body>  </html> | 7 |

## \* Array Prototype Function

Write a JavaScript function **removeItem(value)** that accept as parameter a number or string. The function should **remove** all elements with the given value from an array. Attach the function to the **Array** type. You may need to read about **prototypes in JavaScript** and how to **attach** methods to object types. You should **return as a result** the modified array. Write a sample program to demonstrate that your function works correctly for the examples below:

|  |  |
| --- | --- |
| **Input** | **Output** |
| var arr = [1, 2, 1, 4, 1, 3, 4, 1, 111, 3, 2, 1, '1'];  arr.removeItem(1); | [2, 4, 3, 4, 111, 3, 2, '1'] |
| var arr = ['hi', 'bye', 'hello' ];  arr.removeItem('bye'); | ['hi', 'hello'] |

## \* Deep Copy of Object

Write a JavaScript function **clone(obj)** that accepts as parameter an object of **reference type**. The function should **return** a **deep copy** of the object. Write a second function **compareObjects(obj, objCopy)** that compare the two objects **by reference (==)** and print on the console the output given below. Read in Internet about "**deep copy**"of an object and how to create it. Examples:

|  |  |
| --- | --- |
| **Input** | **Output** |
| var a = {name: 'Pesho', age: 21}  var b = clone(a); // a deep copy  compareObjects(a, b); | a == b --> false |
| var a = {name: 'Pesho', age: 21} ;  var b = a; // not a deep copy  compareObjects(a, b); | a == b --> true |

# Exam Problems

All problems below are given from the JavaScript Basics exam from **29-July-2014**. You can submit your solutions [here](http://judge.softuni.bg/Contests/21/JavaScript-Basics-Exam-29-July-2014). **You are not obligated** to submit any of them in your homework, but it is highly recommend that you solve some or all of them so you can be well prepared for the upcoming exam. You may read [this post](https://softuni.bg/forum/questions/details/1627) to see how to submit JS code in the Judge system.

## \*Prices Trends

You are given a **list of prices**. Your task is to **print them in a HTML table**: the first column holds a **price**; the second column holds a **trend**. The trend is either fixed (no change) or moving up or moving down. **Fixed** is the trend of the first price and when the previous price is the same as the current price (after rounding). **Moving up** is when the current price is greater than the previous price (after rounding). **Moving down** is when the current price is less than the previous price (after rounding). All numbers are **rounded to 2 digits after the decimal point**. See the examples below for better understanding.

### Input

The input is passed to the first JavaScript function found in your code as **array of strings** holding the input numbers. The input data will always be valid and in the format described. There is no need to check it explicitly.

### Output

Print at the console the prices / trends HTML table following the examples below. The table has a fixed header defining 2 columns: **Price** and **Trend**. The prices column should hold the price, **rounded to 2 decimal places**. The trend is calculated **after rounding** (with 2 decimal places) and can be "**fixed**", "**up**" or "**down**". **Whitespace** and character **casing** are important, so please use the same as in the below examples.

### Constraints

* The **count** of input numbers is in the range [0…1 000].
* All **input numbers** are in the range [0…1 000 000].
* Allowed working time: 0.2 seconds. Allowed memory: 16 MB.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 50  60 | <table>  <tr><th>Price</th><th>Trend</th></tr>  <tr><td>50.00</td><td><img src="fixed.png"/></td></tr>  <tr><td>60.00</td><td><img src="up.png"/></td></tr>  </table> |

|  |  |
| --- | --- |
| **Input** | **Output** |
| 36.333  36.5  37.019  35.4  35  35.001  36.225 | <table>  <tr><th>Price</th><th>Trend</th></tr>  <tr><td>36.33</td><td><img src="fixed.png"/></td></tr>  <tr><td>36.50</td><td><img src="up.png"/></td></tr>  <tr><td>37.02</td><td><img src="up.png"/></td></tr>  <tr><td>35.40</td><td><img src="down.png"/></td></tr>  <tr><td>35.00</td><td><img src="down.png"/></td></tr>  <tr><td>35.00</td><td><img src="fixed.png"/></td></tr>  <tr><td>36.23</td><td><img src="up.png"/></td></tr>  </table> |

## \*Tetris Figures

In the classical Tetris game we have 7 Tetris figures (also called "**tetriminos**"), shown at the figure on the right: **I**, **L**, **J**, **O**, **Z**, **S** and **T**. You are given a rectangular Tetris **game field** consisting of full end empty cells. Your task is to write a JavaScript function to **count the number of each of these 7 tetriminos** (with overlapping, without rotations). For example, on the figure below we have a game field with 2 "**I**", 1 "**L**", 5 "**J**", 3 "**O**", 3 "**Z**", 4 "**S**" and 3 "**T**" figures on it.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| - | - | o | - | - | o | - |  | - | - | **o** | - | - | **o** | - |  | - | - | o | - | - | o | - |  | - | - | **o** | - | - | **o** | - |  | - | - | o | - | - | o | - |
| - | - | o | o | - | o | o | - | - | **o** | o | - | **o** | o | - | - | **o** | o | - | o | o | - | - | **o** | o | - | **o** | o | - | - | **o** | o | - | **o** | o |
| o | o | o | - | o | o | - | o | o | **o** | - | o | **o** | - | o | o | **o** | - | o | o | - | o | **o** | **o** | - | **o** | **o** | - | o | o | **o** | - | o | **o** | - |
| - | o | o | o | o | o | - | - | o | **o** | o | o | **o** | - | - | o | **o** | **o** | o | o | - | - | o | o | o | **o** | o | - | - | **o** | **o** | o | **o** | **o** | - |
| - | - | - | o | o | - | - | - | - | - | o | o | - | - | - | - | - | o | o | - | - | - | - | - | **o** | **o** | - | - | - | - | - | o | o | - | - |
| The game field | | | | | | | 2 pieces "**I**" | | | | | | | 1 piece "**L**" | | | | | | | 3 pieces "**J**" | | | | | | | +2 more pieces "**J**" | | | | | | |
| - | - | o | - | - | o | - |  | - | - | o | - | - | o | - |  | - | - | o | - | - | o | - |  | - | - | o | - | - | o | - |  | - | - | o | - | - | o | - |
| - | - | o | o | - | o | o | - | - | o | o | - | o | o | - | - | **o** | **o** | - | **o** | **o** | - | - | o | o | - | o | o | - | - | o | o | - | o | o |
| o | **o** | **o** | - | **o** | **o** | - | **o** | **o** | **o** | - | o | o | - | o | **o** | **o** | - | **o** | **o** | - | o | o | o | - | **o** | **o** | - | **o** | **o** | **o** | - | o | o | - |
| - | **o** | **o** | **o** | **o** | **o** | - | - | **o** | **o** | **o** | o | o | - | - | o | o | o | **o** | **o** | - | - | o | o | **o** | **o** | o | - | - | **o** | **o** | **o** | **o** | **o** | - |
| - | - | - | **o** | **o** | - | - | - | - | - | **o** | **o** | - | - | - | - | - | **o** | **o** | - | - | - | - | - | o | o | - | - | - | - | - | **o** | **o** | - | - |
| 3 pieces "**O**" | | | | | | | 3 pieces "**Z**" | | | | | | | 3 pieces "**S**" | | | | | | | + 1 more piece "**S**" | | | | | | | 3 pieces "**T**" | | | | | | |

### Input

The input is passed to the first JavaScript function found in your code as **array of strings** holding the game field lines. Each game field line holds only two letters: '**-**' and '**o**' (empty and full cells). All game field lines have the same length. The input data will always be valid and in the format described. There is no need to check it explicitly.

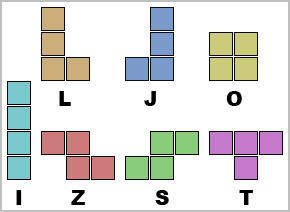
### Output

Print at the console the number of **I**, **L**, **J**, **O**, **Z**, **S** and **T** tetriminos found in the game field (with overlapping and without rotations) as **JSON string**, in the same format like in the sample output below.

### Constraints

* The **size of the game field** is in the range [2…100].
* All **input lines** have the same length and consist only of '**-**' and '**o**' (empty and full cells).
* Allowed working time: 0.2 seconds. Allowed memory: 16 MB.

### Examples



|  |  |
| --- | --- |
| **Input** | **Output** |
| --o--o-  --oo-oo  ooo-oo-  -ooooo-  ---oo-- | {"I":2,"L":1,"J":5,"O":3,"Z":3,"S":4,"T":3} |

|  |  |
| --- | --- |
| **Input** | **Output** |
| -oo  ooo  ooo | {"I":0,"L":1,"J":2,"O":3,"Z":1,"S":2,"T":1} |

## \*Biggest Table Row

You are given a **HTML table** of 4 columns: **Town**, **Store1**, **Store2** and **Store3**. It consists of sequence of text lines: the "**<table>**" tag, the header row, several data rows, and **"</table>**" tag (see the examples below). The **Store1**, **Store2**, and **Store3** columns hold either numbers or "**-**" (which means "**no data**"). Your task is to write a JavaScript function which parses the table data rows and finds the row with a **maximal sum** of its values.

### Input

The input is passed to the first JavaScript function found in your code as **array of strings** holding the table lines. The input data will always be valid and in the format described. There is no need to check it explicitly.

### Output

Print at the console a single line, holding the data row values with a **maximal sum** in format: "**sum = value1 + values2 + …**". Print the values exactly as they were found in the input (no rounding, no reformatting). If all rows contain no data, print "**no data**". If two rows have the **same maximal sum**, print the first of them.

### Constraints

* The **count** of input numbers is in the range [0…1 000].
* The columns **Store1**, **Store2** and **Store3** hold numbers in the range [-100 0000…100 000].
* There is **no whitespace** anywhere in the data rows.
* Allowed working time: 0.2 seconds. Allowed memory: 16 MB.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| <table>  <tr><th>Town</th><th>Store1</th><th>Store2</th><th>Store3</th></tr>  <tr><td>Sofia</td><td>26.2</td><td>8.20</td><td>-</td></tr>  **<tr><td>Varna</td><td>11.2</td><td>18.00</td><td>36.10</td></tr>**  <tr><td>Plovdiv</td><td>17.2</td><td>12.3</td><td>6.4</td></tr>  <tr><td>Bourgas</td><td>-</td><td>24.3</td><td>-</td></tr>  </table> | 65.3 = 11.2 + 18.00 + 36.10 |

|  |  |
| --- | --- |
| **Input** | **Output** |
| <table>  <tr><th>Town</th><th>Store1</th><th>Store2</th><th>Store3</th></tr>  <tr><td>Sofia</td><td>-</td><td>-</td><td>-</td></tr>  </table> | no data |

|  |  |
| --- | --- |
| **Input** | **Output** |
| <table>  <tr><th>Town</th><th>Store1</th><th>Store2</th><th>Store3</th></tr>  <tr><td>Sofia</td><td>12850</td><td>-560</td><td>20833</td></tr>  **<tr><td>Rousse</td><td>-</td><td>50000.0</td><td>-</td></tr>**  <tr><td>Bourgas</td><td>25000</td><td>25000</td><td>-</td></tr>  </table> | 50000 = 50000.0 |

## \*Students, Courses, Grades, Visits

You are given a **list of students score** given as text table with the following columns: **student** name, **course**, **grade**, number of **visits**. A student can have several grades and visits for the same course. Write a JavaScript function to **aggregate the results** and print then as **JSON string** as shown in the examples below.

### Input

The input is passed to the first JavaScript function found in your code as **array of strings** holding the table lines. The input data will always be valid and in the format described. There is no need to check it explicitly.

### Output

Print at the console a **JSON string** that holds the **courses** (in alphabetical order), the **average grade** and average visits for each course and a **list of students** for each course (in alphabetical order). **Duplicates** should be removed (all strings are **case-sensitive**). Please follow exactly the **JSON format** from the example below.

The average numbers should be **rounded to 2 digits** after the decimal point and printed **without trailing zeroes**:

* 5 🡪 5; 5.50 🡪 5.5; 5.491 🡪 5.49; 5.495 🡪 5.5; 5.000001 🡪 5; 5.500 🡪 5.5

### Constraints

* The numbers of **input lines** is between 1 and 10 000.
* The names of **students** and **courses** consists of Latin letters and spaces. Their **length** is between 1 and 50 characters. Leading and trailing **whitespace** should be removed.
* The values of **grades** and **visits** will be numbers in the range [0…50].
* Allowed working time: 0.2 seconds. Allowed memory: 16 MB.

### Examples

|  |
| --- |
| **Input** |
| Peter Nikolov | PHP | 5.50 | 8  Maria Ivanova | Java | 5.83 | 7  Ivan Petrov | PHP | 3.00 | 2  Ivan Petrov | C# | 3.00 | 2  Peter Nikolov | C# | 5.50 | 8  Maria Ivanova | C# | 5.83 | 7  Ivan Petrov | C# | 4.12 | 5  Ivan Petrov | PHP | 3.10 | 2  Peter Nikolov | Java | 6.00 | 9 |
| **Output** |
| {"C#":{"avgGrade":4.61,"avgVisits":5.5,"students":["Ivan Petrov","Maria Ivanova","Peter Nikolov"]},"Java":{"avgGrade":5.92,"avgVisits":8,"students":["Maria Ivanova","Peter Nikolov"]},"PHP":{"avgGrade":3.87,"avgVisits":4,"students":["Ivan Petrov","Peter Nikolov"]}} |