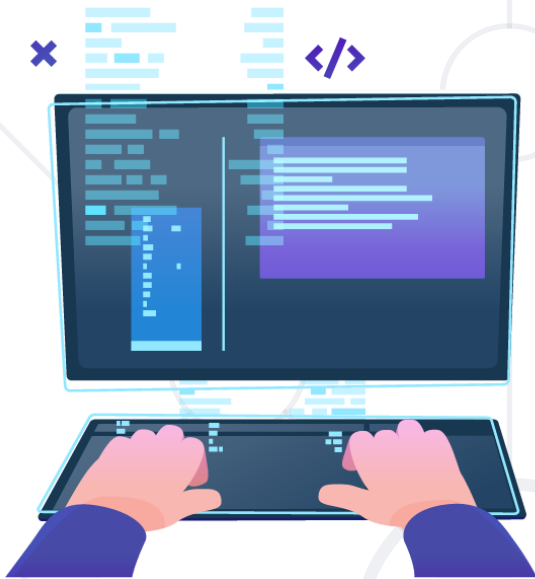


# JS Arrays and Strings

## Arrays and Strings



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# Working with Arrays of Elements

Arrays in JavaScript

# What is an Array?

- Arrays are **list-like objects**
- Arrays are a **reference type**, the variable points to an address in memory



Array of 5 elements

0 1 2 3 4

Element **index**

... ..

Array **element**

- Elements are **numbered** from **0** to **length - 1**
- Creating an array using **an array literal**

```
let numbers = [10, 20, 30, 40, 50];
```

# What is an Array?

- Neither the **length** of a JavaScript array **nor** the **types** of its elements are **fixed**
- An array's **length can be changed** at any time
- Data can be stored at non-contiguous locations in the array
- JavaScript arrays are not guaranteed to be dense



# Arrays of Different Types



```
// Array holding numbers
```

```
let numbers = [10, 20, 30, 40, 50];
```

```
// Array holding strings
```

```
let weekDays = ['Monday', 'Tuesday', 'Wednesday',  
  'Thursday', 'Friday', 'Saturday', 'Sunday'];
```

```
// Array holding mixed data (not a good practice)
```

```
let mixedArr = [20, new Date(), 'hello', {x:5, y:8}];
```

# Accessing Elements

- Array elements are accessed using their **index**

```
let cars = ['BMW', 'Audi', 'Opel'];  
let firstCar = cars[0];    // BMW  
let lastCar = cars[cars.length - 1]; // Opel
```

- Accessing indexes that do not exist in the array returns **undefined**

```
console.log(cars[3]);    // undefined  
console.log(cars[-1]);   // undefined
```





# Destructuring Syntax

- Expression that **unpacks values** from **arrays** or **objects**, into distinct **variables**

```
let numbers = [10, 20, 30, 40, 50];  
let [a, b, ...elems] = numbers;
```

Rest operator


```
console.log(a) // 10  
console.log(b) // 20  
console.log(elems) // [30, 40, 50]
```

- The **rest operator** can also be used to collect function parameters into an array




# For-of Loop

- Iterates through all **elements** in a collection
- Cannot access the current index



```
for (let el of collection) {  
    // Process the value here  
}
```

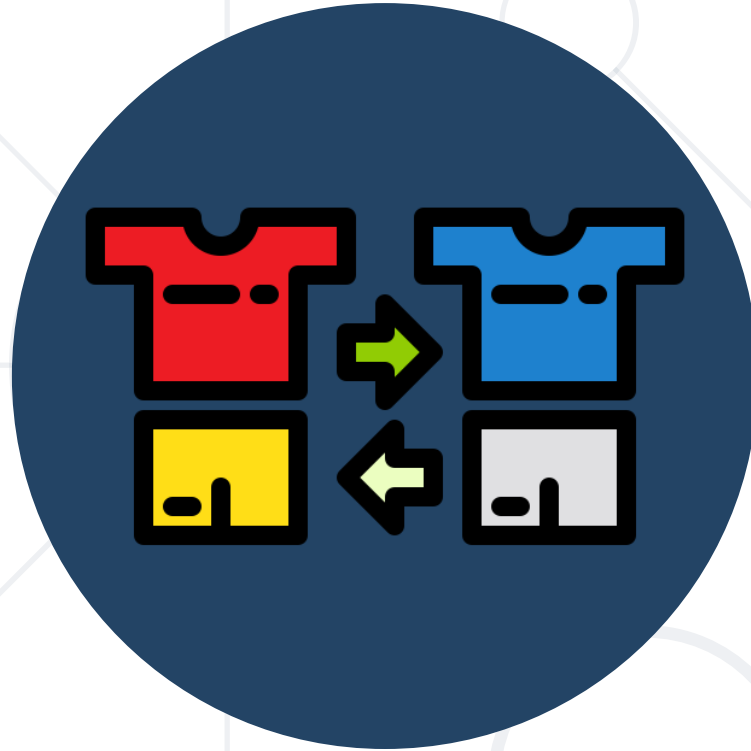


# Print an Array with For-of

```
let numbers = [ 1, 2, 3, 4, 5 ];  
let output = '';  
for (let number of numbers)  
    output += `${number} `;  
console.log(output);
```



1 2 3 4 5




# Methods

Modify the Array

# Pop


- Removes the **last element** from an array and returns that element
- This method **changes** the **length** of the array



```
let nums = [10, 20, 30, 40, 50, 60, 70];  
console.log(nums.length); // 7  
console.log(nums.pop());  // 70  
console.log(nums.length); // 6  
console.log(nums);        // [ 10, 20, 30, 40, 50, 60 ]
```

# Push

- The **push()** method **adds one or more** elements to the **end** of an array and **returns** the new **length** of the array



```
let nums = [10, 20, 30, 40, 50, 60, 70];  
console.log(nums.length); // 7  
console.log(nums.push(80)); // 8 (nums.Length)  
console.log(nums); // [ 10, 20, 30, 40, 50, 60, 70, 80 ]
```

# Shift

- The **shift()** method **removes** the **first element** from an array and **returns** that **removed element**
- This method **changes** the **length** of the array

```
let nums = [10, 20, 30, 40, 50, 60, 70];  
console.log(nums.length); // 7  
console.log(nums.shift()); // 10 (removed element)  
console.log(nums); // [ 20, 30, 40, 50, 60, 70 ]
```



# Unshift

- The **unshift()** method **adds one or more** elements to the **beginning** of an array and **returns** the new **length** of the array



```
let nums = [40, 50, 60];  
console.log(nums.length);           // 3  
console.log(nums.unshift(30));      // 4 (nums.Length)  
console.log(nums.unshift(10,20));  // 6 (nums.Length)  
console.log(nums);                 // [ 10, 20, 30, 40, 50, 60 ]
```



# Splice

- Changes the contents of an array by **removing** or **replacing** existing **elements** and / or **adding new** elements

```
let nums = [1, 3, 4, 5, 6];  
nums.splice(1, 0, 2); // inserts at index 1  
console.log(nums); // [ 1, 2, 3, 4, 5, 6 ]  
nums.splice(4, 1, 19); // replaces 1 element at index 4  
console.log(nums); // [ 1, 2, 3, 4, 19, 6 ]  
let e1 = nums.splice(2, 1); // removes 1 element at index 2  
console.log(nums); // [ 1, 2, 4, 19, 6 ]  
console.log(e1); // [ 3 ]
```



# Reverse

- Reverses the array
  - The **first** array **element becomes** the **last**, and the last array element becomes the first

```
let arr = [1, 2, 3, 4];  
arr.reverse();  
console.log(arr); // [ 4, 3, 2, 1 ]
```



# Join

- Creates and returns a **new string** by **concatenating** all of the elements in an array (or an array-like object), **separated** by commas or a **specified separator** string

```
let elements = ['Fire', 'Air', 'Water'];  
console.log(elements.join()); // "Fire,Air,Water"  
console.log(elements.join('')); // "FireAirWater"  
console.log(elements.join('-')); // "Fire-Air-Water"  
console.log(['Fire'].join(".")); // Fire
```



# Slice

- The **slice()** method **returns** a shallow **copy** of a **portion** of an array into a **new array** object selected from begin to end (end not included)
- The **original array** will **not** be **modified**



```
let fruits = ['Banana', 'Orange', 'Lemon', 'Apple'];  
let citrus = fruits.slice(1, 3);  
let fruitsCopy = fruits.slice();  
// fruits contains ['Banana', 'Orange', 'Lemon', 'Apple']  
// citrus contains ['Orange', 'Lemon']
```

# Includes

- Determines whether an array contains a certain element, returning **true** or **false** as appropriate

```
// array length is 3
// fromIndex is -100
// computed index is 3 + (-100) = -97
let arr = ['a', 'b', 'c'];
arr.includes('a', -100); // true
arr.includes('b', -100); // true
arr.includes('c', -100); // true
arr.includes('a', -2); // false
```



# IndexOf

- The `indexOf()` method returns the first index at which a given element can be found in the array
  - Output is `-1` if element is not present



```
const beasts = ['ant', 'bison', 'camel', 'duck', 'bison'];

console.log(beasts.indexOf('bison')); // 1
// start from index 2
console.log(beasts.indexOf('bison', 2)); // 4
console.log(beasts.indexOf('giraffe')); // -1
```

# ForEach

- The **forEach()** method **executes a provided function** once for each array element
- Converting a for loop to forEach

```
const items = ['item1', 'item2', 'item3'];  
const copy = [];
```

```
// For Loop
```

```
for (let i = 0; i < items.length; i++) {  
  copy.push(items[i]);  
}
```

```
// ForEach
```

```
items.forEach(item => { copy.push(item); });
```



# Map

- **Creates a new array** with the results of calling a **provided function** on every element in the calling array

```
let numbers = [1, 4, 9];  
let roots = numbers.map(function(num, i, arr) {  
    return Math.sqrt(num)  
});  
// roots is now [1, 2, 3]  
// numbers is still [1, 4, 9]
```





# Find


- Returns the **first found value** in the array, if an **element** in the array **satisfies** the **provided** testing **function** or **undefined** if not found

```
let array1 = [5, 12, 8, 130, 44];  
let found = array1.find(function(element) {  
    return element > 10;  
});  
console.log(found); // 12
```



# Filter

- Creates a **new array** with **filtered elements only**
- Calls a **provided** callback **function** once for each element in an array
- **Does not mutate** the **array** on which it is called



```
let fruits = ['apple', 'banana', 'grapes', 'mango', 'orange'];  
// Filter array items based on search criteria (query)  
function filterItems(arr, query) {  
  return arr.filter(function(el) {  
    return el.toLowerCase().indexOf(query.toLowerCase()) !== -1;  
  });  
};  
console.log(filterItems(fruits, 'ap')); // ['apple', 'grapes']
```



**Live Exercises**

# Problem: Match Full Name

- You are given a list of names
  - Match all full names

Ivan Ivanov, Ivan ivanov, ivan Ivanov, IVan Ivanov, Test  
Testov, Ivan Ivanov



Ivan Ivanov Test Testov

# Solution: Match Full Name

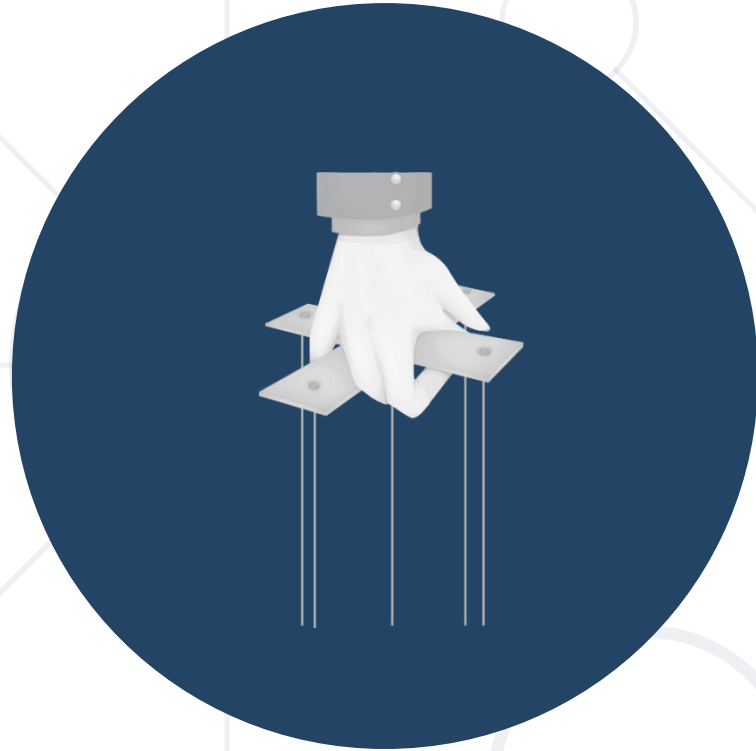
```
function solve(input) {  
  let pattern = /\b[A-Z][a-z]+[ ]+[A-Z][a-z]+\b/g;  
  let validNames = [];  
  let validName = null;  
  while((validName = pattern.exec(input)) !== null){  
    validNames.push(validName[0]);  
  }  
  console.log(validNames.join(' '));  
}
```

# Problem: Match Phone Number

- Match a **valid phone number** from **Sofia**. After you find all **valid phones**, **print** them on the console, separated by **", "**
- A valid number has the following characteristics:
  - Starts with **" +359"**
  - Followed by the area code (always **2**)
  - Followed by the **number** itself, which consists of **7 digits** (separated into **two groups** of **3** and **4 digits** respectively)
  - The different **parts** are **separated** by either a **space** or a **hyphen** ('-')

# Solution: Match Phone Number

```
function regExPhones(input) {  
  let validNames = [];  
  let pattern = /(?<!\d)[+]359([ -])2\1\d{3}\1\d{4}\b/g;  
  while ((validName = pattern.exec(input)) !== null) {  
    validNames.push(validName[0]);  
  }  
  console.log(validNames.join(', '));  
}
```



# Manipulating Strings



- Use the "+" or the "+=" operators

```
let text = "Hello" + ", ";  
// Expected output: "Hello, "  
text += "JS!"; // "Hello, JS!"
```

- Use the `concat()` method

```
let greet = "Hello, ";  
let name = "John";  
let result = greet.concat(name);  
console.log(result); // Expected output: "Hello, John"
```

- **indexOf(substr)**

```
let str = "I am JavaScript developer";  
console.log(str.indexOf("Java")); // Expected output: 5  
console.log(str.indexOf("java")); // Expected output: -1
```

- **lastIndexOf(substr)**

```
let str = "Intro to programming";  
let last = str.lastIndexOf("o");  
console.log(last); // Expected output: 11
```

- **substring(startIndex, endIndex)**

```
let str = "I am JavaScript developer";  
let sub = str.substring(5, 10);  
console.log(sub); // Expected output: JavaS
```

- `replace(search, replacement)`

```
let text = "Hello, john@softuni.bg, you have been  
using john@softuni.bg in your registration.";  
let replacedText = text.replace(".bg", ".com");  
console.log(replacedText);  
// Hello, john@softuni.com, you have been using  
john@softuni.bg in your registration.
```

# Problem: Substring

- Receives a **string**, a **start index**, and **count** characters
- Print the **substring** of the received string

"ASentence", 1, 8



Sentence

"JavaScript", 4, 6



Script

# Solution: Substring

```
function solve(text, startIndex, count) {  
  let substring = text  
    .substring(startIndex, startIndex + count);  
  console.log(substring);  
}
```

- **split(separator)**

```
let text = "I love fruits";  
let words = text.split(' ');  
console.log(words); // Expected output: ['I', 'love', 'fruits']
```

- **includes(substr)**

```
let text = "I love fruits.";  
console.log(text.includes("fruits")); // Expected output: True  
console.log(text.includes("banana")); // Expected output: False
```

- **repeat(count)** - Creates a new string repeated count times

```
let n = 3;  
for(let i = 1; i <= n; i++) {  
  console.log('*'.repeat(i));  
}
```



```
// *  
// **  
// ***
```



# Problem: Censored Words

- Receives a **text** and a **single word**
- Find all **occurrences** of that word in the text and **replace** them with the corresponding amount of **'\*'**

A small sentence with some words,  
small



A \*\*\*\*\* sentence with some words

# Solution: Censored Words

```
function solve(text, word) {  
  while (text.includes(word)) {  
    text = text.replace(word, '*'.repeat(word.length));  
  }  
  console.log(text);  
}
```

- Use **trim()** method to remove **whitespaces** (spaces, tabs, no-break space, etc. ) from **both ends** of a string

```
let text = "    Annoying spaces    ";  
console.log(text.trim()); // Expected output: "Annoying spaces"
```

- Use **trimStart()** or **trimEnd()** to remove whitespaces **only** at the beginning or at the end

```
let text = "    Annoying spaces    ";  
text = text.trimStart(); text = text.trimEnd();  
console.log(text); // Expected output: "Annoying spaces"
```

# Starts With/Ends with

- Use **startsWith()** to determine whether a string **begins** with the characters of a specified substring

```
let text = "My name is John";  
console.log(text.startsWith('My')); // Expected output: true
```

- Use **endsWith()** to determine whether a string **ends** with the characters of a specified substring

```
let text = "My name is John";  
console.log(text.endsWith('John')); // Expected output: true
```

# Padding at the Start and End

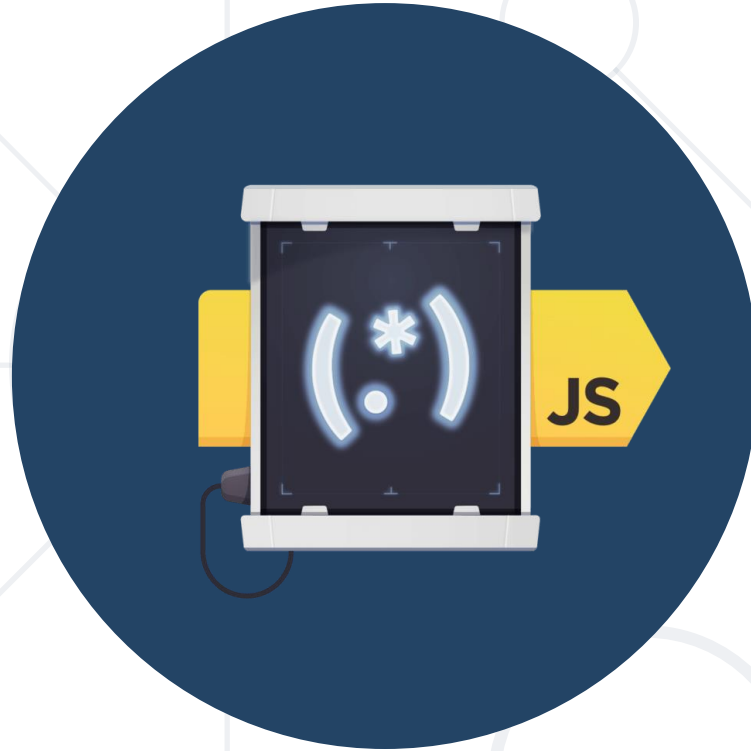
- Use **padStart()** to add to the current string **another substring** at the **start** until a **length** is reached

Receives **length** and **substring**

```
let text = "010";  
console.log(text.padStart(8, '0')); // Expected output: 00000010
```

- Use **padEnd()** to add to the current string **another substring** at the **end** until a **length** is reached

```
let sentence = "He passed away";  
console.log(sentence.padEnd(20, '.'));  
// Expected output: He passed away.....
```



# Regular Expressions in JS

- In JS you construct a regular expression in one of two ways:
  - Regular Expression Literal
  - The constructor function **RegExp**

*// Provides compilation when the script is loaded*

```
let regLiteral = /[A-Za-z]+/g
```

*// Provides runtime compilation*

*// Used when the pattern is from another source*

```
let regExp = new RegExp('[A-Za-z]+', 'g');
```

- The method **test(string)**
  - Determines whether there is a match

```
let text = 'Today is 2015-05-11';  
let regexp = /\d{4}-\d{2}-\d{2}/g;  
  
let containsValidDate = regexp.test(text);  
console.log(containsValidDate); // true
```



- The method **match(regex)**
  - Returns an **array** of all matches (strings)

```
let text = 'Peter: 123 Mark: 456';  
let regexp = /([A-Z][a-z]+): (\d+)/g;  
let matches = text.match(regexp);  
  
console.log(matches.length); // 2  
console.log(matches[0]); // Peter: 123  
console.log(matches[1]); // Mark: 456
```

# Using the Exec() Method

- The method **exec(string, text)**
  - Works with a pointer & returns the **groups**

```
let text = 'Peter: 123 Mark: 456';  
let regexp = /([A-Z][a-z]+): (\d+)/g;  
let firstMatch = regexp.exec(text);  
let secondMatch = regexp.exec(text);  
console.log(firstMatch[0]) // Peter: 123  
console.log(firstMatch[1]); // Peter  
console.log(firstMatch[2]); // 123
```

- The method **replace(regex, stringReplacement)**
  - Replaces all strings that **match the pattern** with the provided replacement

```
let text = 'Peter: 123 Mark: 456';  
let replacement = '999';  
let regexp = /\d{3}/g;  
let result = text.replace(regexp, replacement);  
// Peter: 999 Mark: 999
```

- The method **matchAll(regex)**
  - returns an iterator of all results matching a string against a **regular expression**, including **capturing groups**

```
const regexp = /t(e)(st(\d?))/g;  
const str = 'test1test2';  
const array = [...str.matchAll(regexp)];  
console.log(array[0]);  
// ['test1', 'e', 'st1', '1', index: 0, input: 'test1test2', length: 4]
```

- The method **split(regex)**
  - Splits the text by the pattern
  - Returns an array of strings

```
let text = '1 2 3 4';  
let regexp = /\s+/g;  
let result = text.split(regexp);  
console.log(result) // ['1', '2', '3', '4'];
```

# Problem: Count String Occurrences

- Receive a **text** and a **word** that you need to **search**
- Find the number of **all occurrences** of that word and print it

"This is a word and it also is a sentence",  
"is"



2

# Solution: Count String Occurrences

```
function solve(text, search) {  
  let words = text.split(' ');  
  let counter = 0;  
  for (let w of words) {  
    if (w === search) {  
      counter++;  
    }  
  }  
  console.log(counter);  
}
```



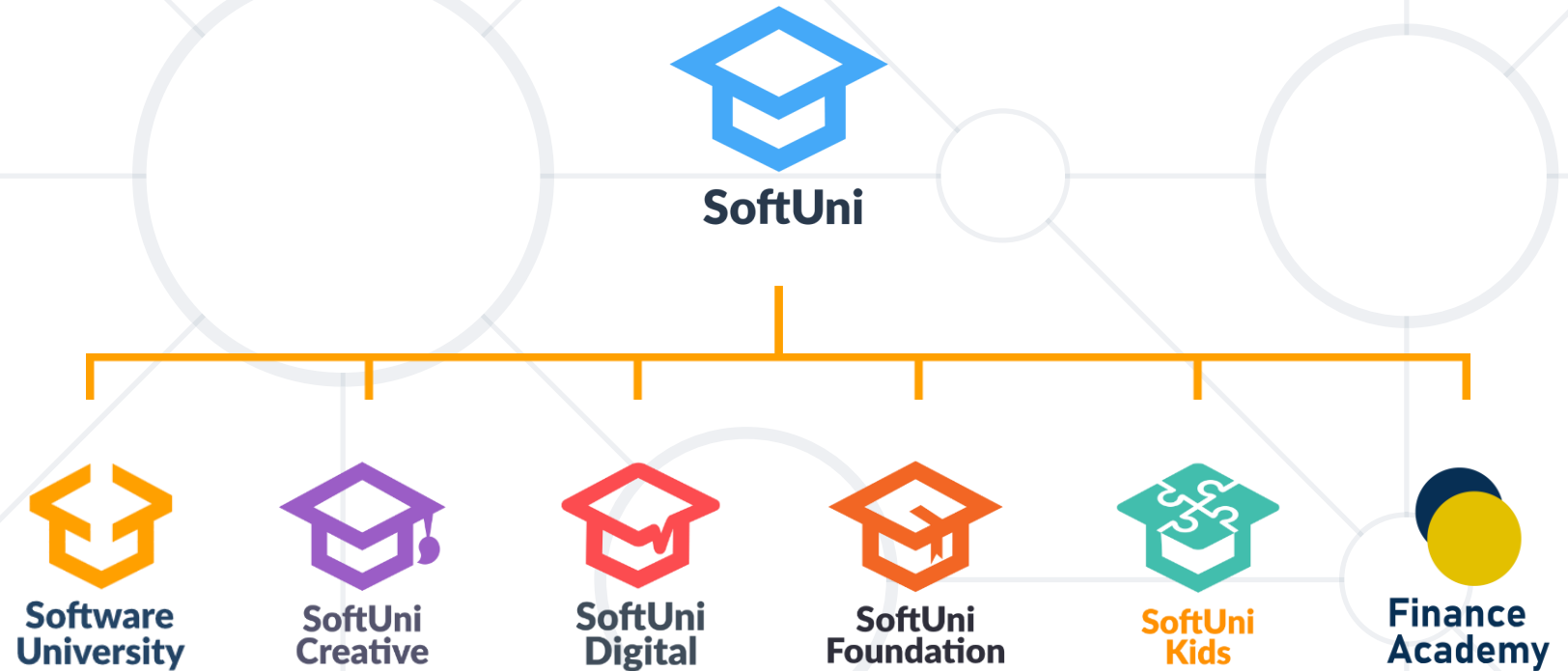
**Live Exercises**



- Array
  - Methods
- Associative Array
- Text Processing
  - **Regular expressions** describe **patterns** for searching through text.



# Questions?



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