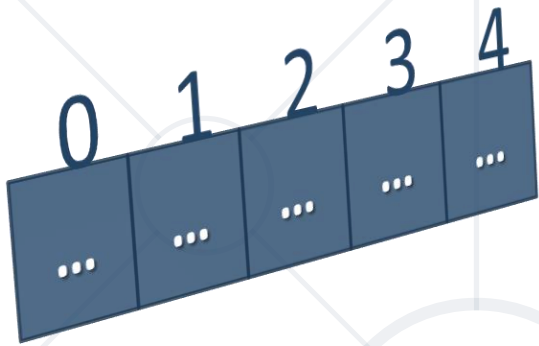


# Arrays Advanced

## Additional Array Operations



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1. Basic Operations
2. Manipulating Arrays
3. Processing Elements
  - Transform (Map)
  - Filter
  - Sort



sli.do

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# Basic Operations

Add, Remove and Find Elements

# Advanced Overview

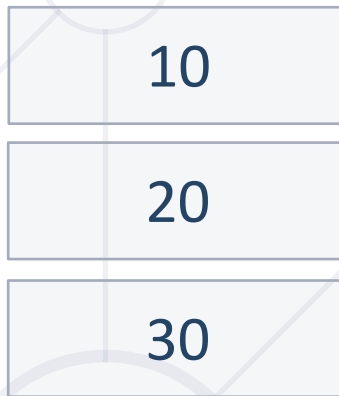
Advanced functionality of the array consists of the following **functions**:

- **push()** – add to the end
- **pop()** – remove from the end
- **unshift()** – add to the beginning
- **shift()** – remove from the beginning
- **includes()** – look for value
- **indexOf()** – find index of value



# Add at the End, Remove from the End

- **push()** adds at the end of the **array**
- **pop()** removes from the end of the **array**



Use **push()** to add at the end.

Use **pop()** to remove from the end.

# Add at the Start, Remove from the Start

- **unshift()** adds at the start of the **array**
- **shift()** removes from the start of the **array**



20

| Array |
|-------|
| 10    |
| 20    |
| 30    |

Use **shift()** to remove from the start.

Use **unshift(20)** to add at the start.

# Pop() – Removes the Last Element

- The **pop** method removes the **last** element from an array and **returns** that value to the caller
- If you call **pop()** on an empty array, it returns **undefined**

```
let myArray = ["one", "two", "three", "four", "five"];  
let popped = myArray.pop();  
console.log(myArray); //["one", "two", "three", "four"]  
console.log(popped);  //"five"
```



# Problem: Sum First Last

- Calculate and print the sum of the **first** and the **last** elements in an array
- The input comes as an **array of string** elements holding numbers
- The output is printed on the console.

['5', '10']



15

['20', '30', '40']



60

```
function solve(input) {  
  input = input.map(Number);  
  console.log(input[0]  
    + input.pop());  
}
```

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

```
let fruits = ["apple", "banana", "kiwi"];  
fruits.push("pineapple");  
console.log(fruits);  
// ["apple", "banana", "kiwi", "pineapple"]
```

Element is added at the **end**

# Shifting and Unshifting

- **shift()** - Removes the first element of an array

```
let myArray = ["one", "two", "three", "four", "five"];  
myArray.shift(); // ["two", "three", "four", "five"]
```

- **unshift()** - Adds elements to the beginning

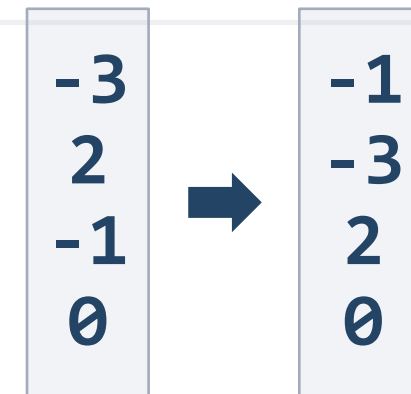
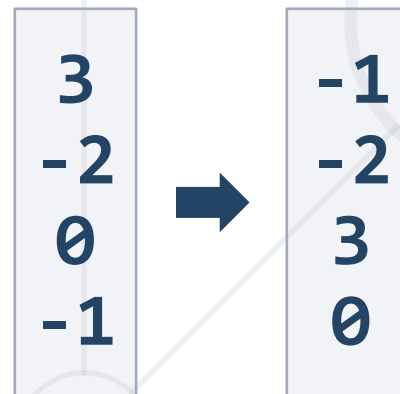
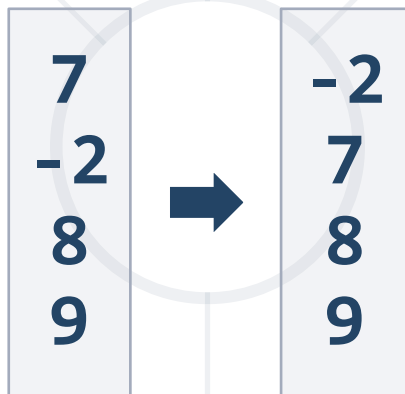
```
let myArray = ["red", "green", "blue"];  
myArray.unshift("purple");  
// ["purple", "red", "green", "blue"]
```

New element added

# Problem: Negative / Positive Numbers

You are given an array of string elements holding numbers

- Process them one by one and create a new array -> **result**
  - Prepend each negative element at the front of the array
  - Append each positive (or 0) element at the end of the array
  - Print the **result** array, each element at a separate line



# Solution: Negative / Positive Numbers

```
function negativePositiveNumbers(arr) {  
  let result = [];  
  for (let num of arr){  
    if (num < 0){  
      result.unshift(num); // Insert at the start  
    } else {  
      result.push(num); // Append at the end  
    }  
  }  
  console.log(result.join('\n'));  
}
```

- **includes()** – returns **true** if the given value is part of the array

```
let myArray = ["Peter", "George", "Mary"];  
myArray.includes("George"); // true  
myArray.includes("John");   // false
```

- **indexOf()** – returns the **index** where the given value is stored
  - Returns **-1** if the value is **not found**

```
myArray.indexOf("Mary"); // 2  
myArray.indexOf("Nick"); // -1
```



# Manipulating Arrays

- The **slice()** function creates a new array from part of another
- Gets a range of elements from selected **start** to **end** (exclusive)
- Note that the original array will **not be modified**

```
let myArray = ["one", "two", "three", "four", "five"];  
let sliced = myArray.slice(2);  
console.log(myArray);  
// ["one", "two", "three", "four", "five"]  
console.log(sliced); // ["three", "four", "five"]  
console.log(myArray.slice(2, 4)); // ["three", "four"]
```



# Splice: Cut and Insert Array Elements

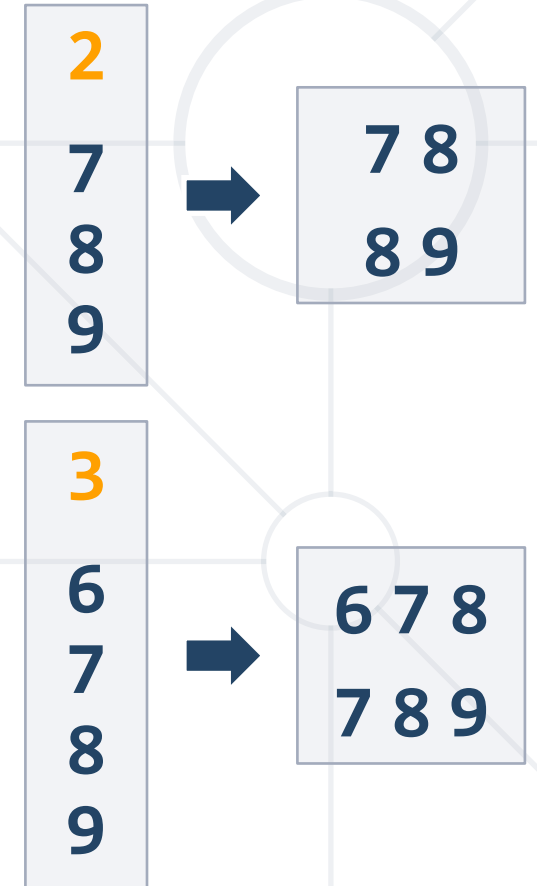
- The **splice()** adds/removes items to/from an array, and **returns** the removed item(s)
- This function **changes the original array**

```
let nums = [5, 10, 15, 20, 25, 30];  
let mid = nums.splice(2, 3); // start, delete-count  
console.log(mid.join('|')); // 15|20|25  
console.log(nums.join('|')); // 5|10|30
```

```
nums.splice(3, 2, "twenty", "twenty-five");  
console.log(nums.join('|')); // 5|10|15|twenty|twenty-five|30
```

# Problem: First and Last K Numbers

- You are given an array of numbers
  - The first element holds an integer **k**
  - All other elements are from the array that needs to be processed
  - Print the first **k** and the last **k** elements of the array on a new line (space separated)



# Solution: First and Last K Numbers

```
function firstLastKElements(arr) {  
  let k = arr.shift();  
  console.log(arr.slice(0, k).join(' '));  
  console.log(arr.slice(arr.length-k,  
    arr.length).join(' '));  
}
```

# Problem: Sum Last K Numbers Sequence

- Take two integers **n** and **k**
- Generate and print the following sequence:
  - The first element is: **1**
  - All other elements = the **sum** of the previous **k** elements
  - The length of the sequence is **n** elements

6  
3 → Sequence:  
1 1 2 4 7 13

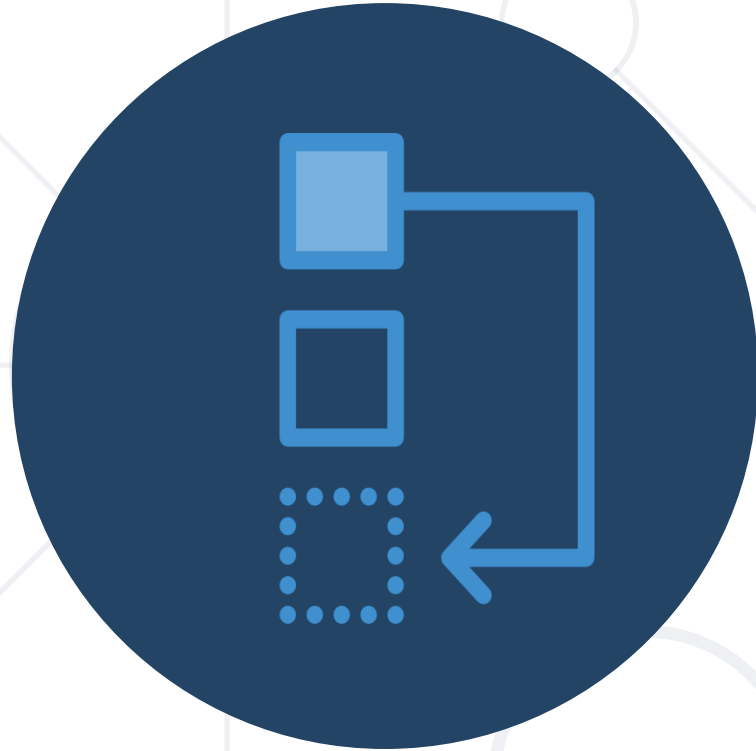
8  
2 → Sequence:  
1 1 2 3 5 8 13 21

9  
5 → Sequence:  
1 1 2 4 8 16 31 61 120



# Solution: Sum Last K Numbers Sequence

```
function sumLastKNumbersSequence(n, k) {  
  let seq = [1];  
  for (let current = 1; current < n; current++) {  
    let start = Math.max(0, current - k);  
    let end = current - 1;  
    let sum = // TODO: Sum the values of seq[start ... end]  
    seq[current] = sum;  
  }  
  console.log(seq.join(' '));  
}
```



# Processing Arrays

Transforming, Filtering and Sorting Elements

- **map()** – creates a **new array** by applying a **function** to every element

```
let myArr = ['one', 'two', 'three', 'four'];  
let lengths = myArr.map(x => x.length);  
console.log(lengths); // [3, 3, 5, 4]
```

```
let numsAsStrings = ["5", "3", "14", "-2", "8"];  
let nums = numsAsStrings.map(Number);  
console.log(nums); // [5, 3, 14, -2, 8]  
let incr = nums.map(x => x+1);  
console.log(incr); // [6, 4, 15, -1, 9]
```

- **filter()** – creates a **new array** from elements matching **predicate**
  - Predicate is a **function** returning a Boolean value (**true** or **false**)

```
let myArr = ['one', 'two', 'three', 'four'];  
let longWords = myArr.filter(x => x.length > 3);  
console.log(longWords); // ['three', 'four']
```

```
let nums = [5, -11, 3, -2, 8]  
let positiveNums = nums.filter(x => x > 0);  
console.log(positiveNums); // [5, 3, 8]
```



# Problem: Process Odd Numbers

- You are given an **array of numbers**
  - Print the elements at **odd** positions, **doubled** and **reversed**

```
function solve(arr) {  
  let result = arr  
    .filter((num, i) => i % 2 == 1)  
    .map(x => 2*x)  
    .reverse();  
  return result.join(' ');  
}
```

10  
15  
20  
25



50 30

3  
0  
10  
4  
7  
3



6 8 0

# Sorting Arrays

- The **sort()** function sorts the items of an array
- Depending on the provided **compare function**, sorting can be **alphabetic** or **numeric**, and either **ascending (up)** or **descending (down)**
- By default, the **sort()** function sorts the values as strings in **alphabetical** and **ascending** order
- If you want to sort numbers or other values, you need to provide the correct **compare function**!



# Sorting Arrays – Example

```
let names = ["Peter", "George", "Mary"];  
names.sort(); // Default behaviour – alphabetical order  
console.log(names); // ["George", "Mary", "Peter"]
```

```
let numbers = [20, 40, 10, 30, 100, 5];  
numbers.sort(); // Unexpected result on arrays of numbers!  
console.log(numbers); // [10, 100, 20, 30, 40, 5]
```

- A **function** receiving **two parameters**, e.g. **a** and **b**
  - **Returns** either a **positive** number, a **negative** number, or **zero**
  - If **result**  $< 0$ , a is sorted **before** b
  - If **result**  $> 0$ , a is sorted **after** b
  - If **result**  $= 0$ , a and b are **equal** (no change)

```
let nums = [20, 40, 10, 30, 100, 5];  
nums.sort((a, b) => a-b); // Compare elements as numbers  
console.log(nums.join('|')); // 5/10/20/30/40/100
```

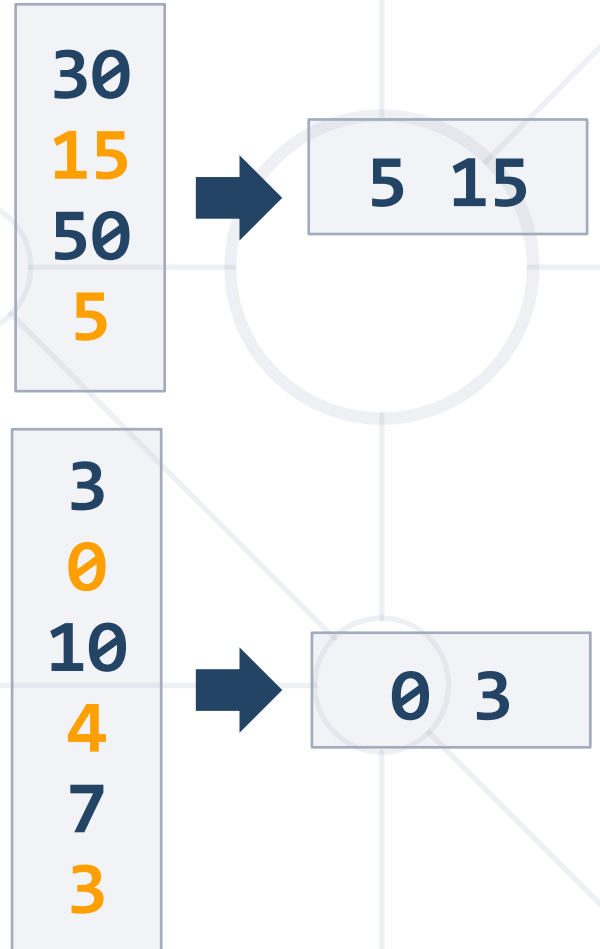
- The **localeCompare()** method is used to compare any two characters without regard for the case used
  - It's a string method so it can't be used directly on an array
  - Pass localeCompare() as the comparison function:

```
let words = ['nest', 'Eggs', 'bite', 'Grip', 'jAw'];  
words.sort((a, b) => a.localeCompare(b));  
console.log(words);  
// ['bite', 'Eggs', 'Grip', 'jAw', 'nest']
```

# Problem: Smallest 2 Numbers

- You are given an **array of numbers**
  - Print the **smallest** two numbers

```
function smallestTwoNumbers(arr) {  
  arr.sort((a, b) => a-b);  
  let result = arr.slice(0, 2);  
  console.log(result.join(' '));  
}
```





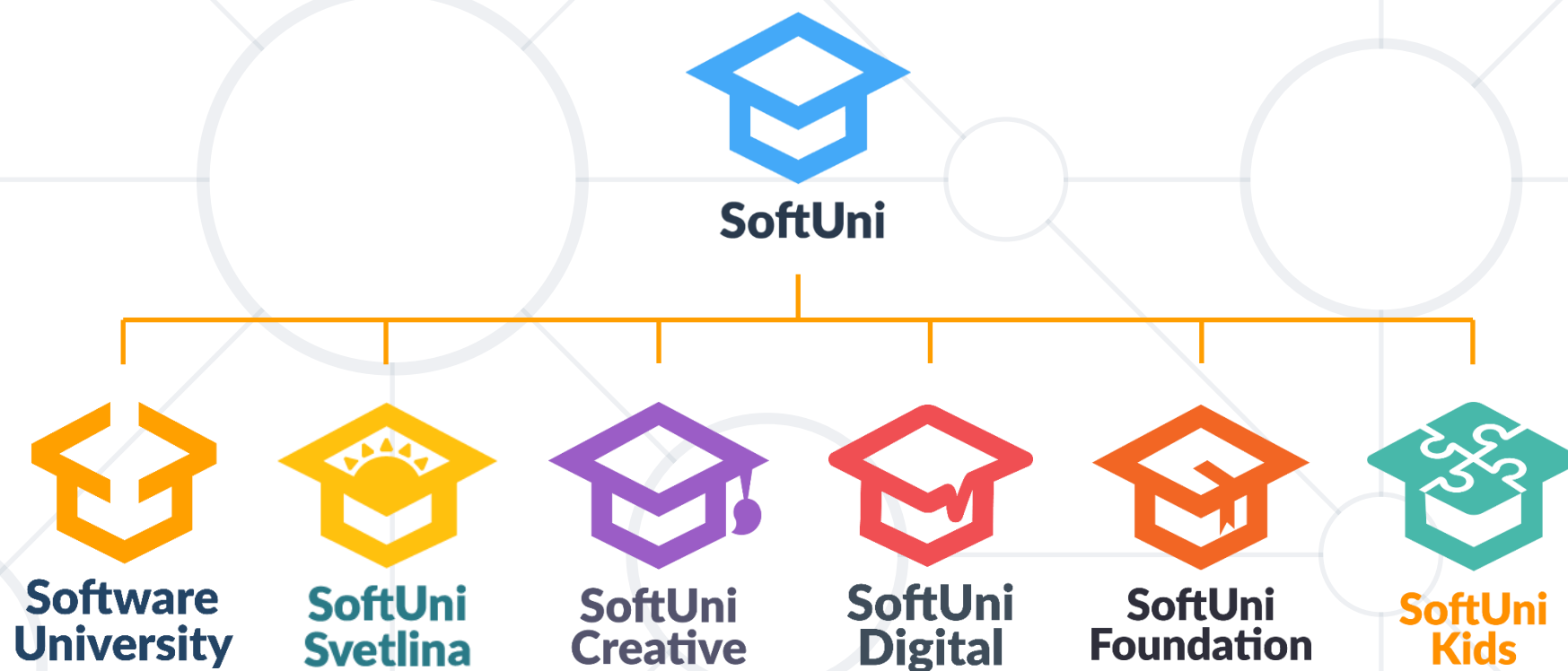
**Live Exercises**

- Arrays in JavaScript aren't **fixed**
- Can **add** / **remove** / **insert** elements at runtime
- Sorting arrays can be done with a **compare function**





# Questions?



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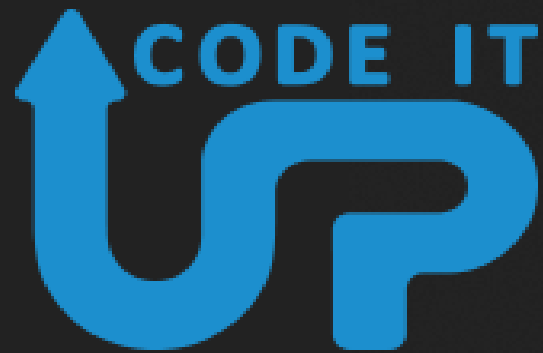
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