Functions and Arrow Functions

Functions, Parameters, Return Value, Arrow Functions (Lambda)

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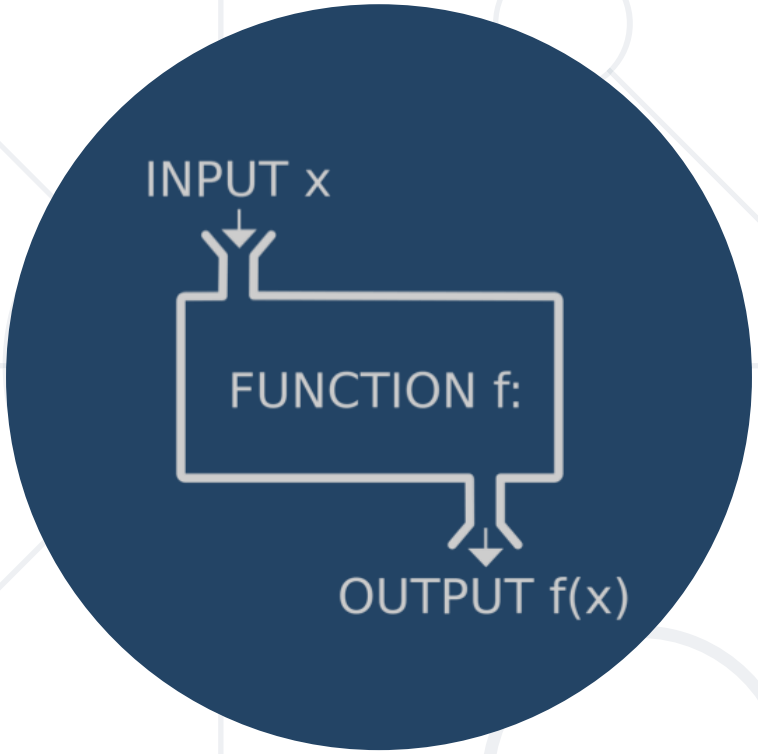
#JSCORE



JavaScript Functions Overview

Declaring and Invoking Functions

Functions in JS

- **Function** == named piece of code
  - Can take **parameters** and return **result**

Function name: use **camelCase**

Function **parameters**: use **camelCase**

```
function printStars(count) {
  console.log("*".repeat(count));
}
```

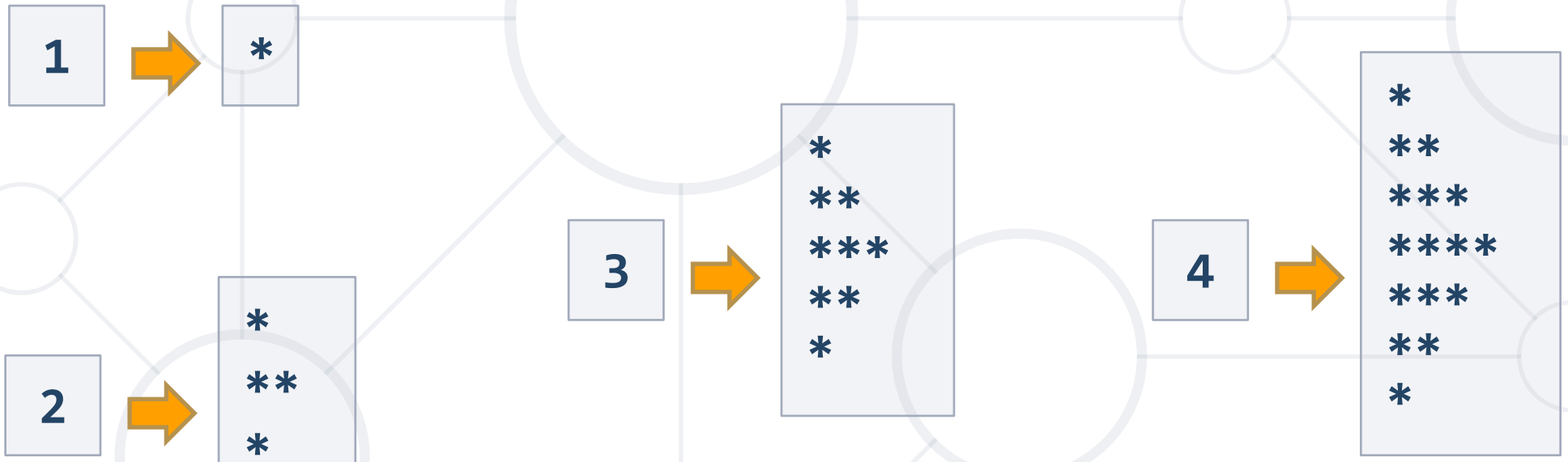
The { stays at the same line

```
printStars(10);
```

Invoke the function

Problem: Triangle of Stars

- Write a JS function to print a triangle of stars of size n



Solution: Triangle of Stars

- Functions in JS can be nested (function inside a function)

```
function printTriangle(n) {
  function printStars(count) {
    console.log("*".repeat(count));
  }

  for (let i=1; i<=n; i++) printStars(i);
  for (let i=n-1; i>0; i--) printStars(i);
}
```

```
*
**
***
**
*
```

```
printTriangle(3);
```

Check your solution here: https://judge.softuni.bg/Contests/306

Default Function Parameter Values

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- Functions in JS can have default parameter values

```
function printStars(count = 5) {
  console.log("*".repeat(count));
}
```

```
printStars(); // *****
```

```
printStars(2); // **
```

```
printStars(3, 5, 8); // ***
```

Problem: Square of Stars

- Write a JS function to print a square of stars

```
function squareOfStars(n) {
  function printStars(count = n) {
    console.log("*" +
      " *".repeat(count-1));
  }
  for (let i=1; i<=n; i++)
    printStars();
}
```

3 →

```
* * *
* * *
* * *
```

4 →

```
* * * *
* * * *
* * * *
* * * *
```

Check your solution here: https://judge.softuni.bg/Contests/306

Function Overloading

- In C# / Java / C++ functions can be overloaded
  - **Function overloading** == same name, different parameters
- JavaScript (like Python and PHP) does not support overloading

```
function printName(firstName, lastName) {
  let name = firstName;
  if (lastName != undefined)
    name += ' ' + lastName;
  console.log(name);
}
```

Simulate overloading by parameter checks

```
printName('Maria');
printName('Maria','Nikolova');
```

Variable Number of Arguments

- JS functions have special array **arguments**

```
function sum() {
  console.log("args count: " + arguments.length);
  console.log(arguments);
  let sum = 0;
  for (let x of arguments)
    sum += x;
  console.log("sum = " + sum);
}
```

```
sum(); // 0 [] 0
```

```
sum(5, 3); // 2 [5, 3] 8
```

```
sum(4, 2, 3); // 3 [4, 2, 3] 9
```

Returning Values from a Function

Functions Can Return Values

```
function multiply(a, b) {
  return a * b;
}
```

```
let m = multiply(3, 5);
console.log(m); // 15
```

```
function hello() {
  console.log("hello");
}
```

```
let v = hello();
console.log(v); // undefined
```

Returning Values – Examples

```
function check(a) {
  if (a > 0)
    return "positive";
  if (a < 0)
    return "negative";
}
```

The function sometimes returns a **string**, sometimes returns **undefined**

```
console.log(check(5)); // positive
console.log(check(-5)); // negative
console.log(check(0)); // undefined
console.log(check()); // undefined
console.log(check("hello")); // undefined
```

Problem: Symmetry Check (Palindrome)

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- Write a JS function to check a string for symmetry
  - Examples: "abcccba" → true; "xyz" → false

```
function isPalindrome(str) {
  for (let i=0; i<str.length/2; i++)
    if (str[i] !== str[str.length-i-1])
      return false;
  return true;
}
```

```
isPalindrome("abba"); // true
```

Check your solution here: https://judge.softuni.bg/Contests/306

Problem: Day of Week

- Write a JS function to return the day number by day of week
  - Example: "Monday" → 1, …, "Sunday" → 7, other → "error"

```
function dayOfWeek(day) {
  if (day === 'Monday') return 1;
  …
  if (day === 'Sunday') return 7;
  return "error";
}
```

JS functions can return **mixed data type**: e.g. number or string

```
dayOfWeek("Monday"); // 1
```

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Function Variables

Variables Holding Functions

Variables Holding Functions

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- In JS variables can hold functions as their values

```
let f = function(x) { return x * x; }
console.log(f(3)); // 9
console.log(f(5)); // 25

f = function(x) { return 2 * x; }
console.log(f(3)); // 6
console.log(f(5)); // 10

f = undefined;
console.log(f(3)); // TypeError: f is not a function(…)
```

Functions as Parameters

```
function repeatIt(count, func) {
  for (let i = 1; i <= count; i++)
    func(i);
}

let starsFunc = function(i) {
  console.log("**".repeat(i))
};

repeatIt(3, starsFunc);

repeatIt(3, function(x) { console.log(2 * x); } );
```

```
**
****
******
```

```
2
4
6
```

Problem: Functional Calculator

- Write a calculator that takes two numbers and an operator and performs a calculation between them using the operator

```
function calculate(a, b, op) {

  let calc = function(a, b, op) { return op(a, b) };
  let add = function(a, b) { return a + b };
  let subtract = function(a, b) { return a - b };
  let multiply = function(a, b) { return a * b };
  let divide = function(a, b) { return a / b };
```

Problem: Functional Calculator (2)

```
  switch (op) {
    case '+': return calc(a, b, add);
    case '-': return calc(a, b, subtract);
    case '*': return calc(a, b, multiply);
    case '/': return calc(a, b, divide);
  }
}
```

```
console.log(calculate(2, 4, '+')) // 6
```

```
console.log(calculate(9, 2, '/')) // 4.5
```

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IIFE

- Immediately-invoked function expression (IIFE)

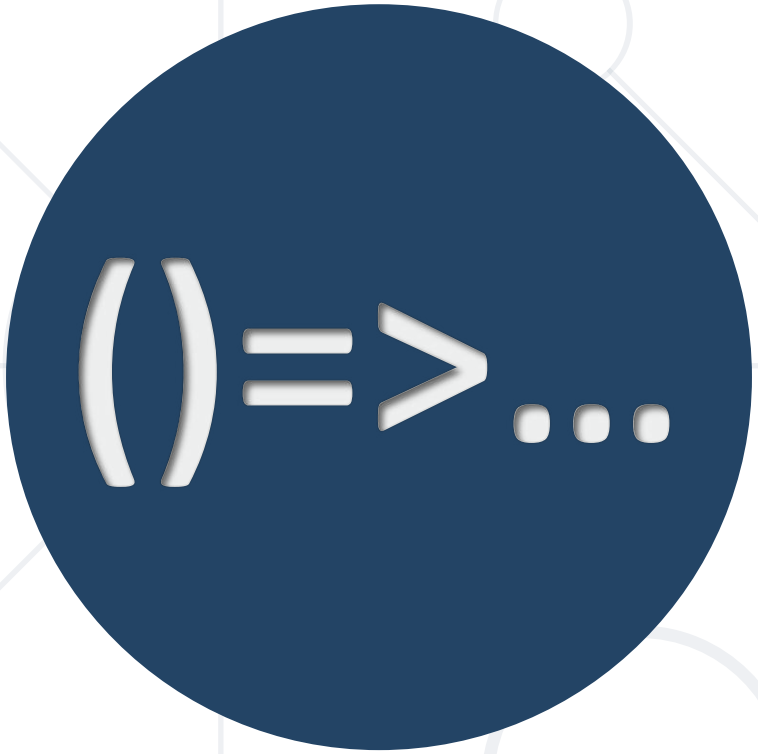
```
(function (count) {
  for (let i = 1; i <= count; i++)
    console.log('+'.repeat(i));
})(4);
```

```
+
++
+++
++++
```

```
let f = (function () {
  let x = 0;
  return function() { console.log(++x); }
})(); f(); f(); f(); f();
```

This is called "**closure**" (a state is closed inside)

```
1
2
3
4
```



Arrow (Lambda) Functions in JS

Short Syntax for Anonymous Functions

Arrow Functions

- Functions in JS can be written in short form using "=>" (arrow)

```
let increment = x => x + 1;
console.log(increment(5)); // 6
```

```
let increment = function(x) {
  return x + 1;
}
```

This is the same as the above function

```
let sum = (a, b) => a + b;
console.log(sum(5, 6)); // 11
```

Problem: Aggregate Elements

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- Write a function to aggregate elements
  - The elements are given as array, e.g. [1, 2, 3]
  - Start by given initial value, e.g. 0
  - At each iteration apply given aggregate function e.g. a + b

```
aggregate([10, 20, 30], 0, (a, b) => a + b); // 60
```

```
aggregate([10, 20, 30], 1, (a, b) => a * b); // 6000
```

Input elements

Initial value

Aggregate functioan

Problem: Sum / Inverse Sum / Concatenate

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- Using the aggregating function, calculate:
  - Sum of elements
    - e.g. [1, 2, 4] → 1 + 2 + 4 → 7
  - Sum of inverse elements ($1/a_i$)
    - E.g. [1, 2, 4] → 1/1 + 1/2 +1/4 → 7/4 → 3.5
  - Concatenation of elements
    - e.g. ['1', '2', '4'] → '1'+'2'+'4' → '124'

Solution: Aggregate Elements

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```
function aggregateElements(elements) {
  aggregate(elements, 0, (a, b) => a + b);
  aggregate(elements, 0, (a, b) => a + 1 / b);
  aggregate(elements, '', (a, b) => a + b);
  function aggregate(arr, initVal, func) {
    let val = initVal;
    for (let i = 0; i < arr.length; i++)
      val = func(val, arr[i]);
    console.log(val);
  }
}
```

```
aggregateElements([10, 20, 30]); // 60 1.833 102030
```

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Nested Functions

Problem: Words Uppercase

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- Functions in JS can be nested, i.e. hold other functions
  - Inner functions have access to variables from their parent

```
function wordsUppercase(str) {
  let strUpper = str.toUpperCase();
  let words = extractWords();
  words = words.filter(w => w != '');
  return words.join(', ');

  function extractWords() { return strUpper.split(/\W+/); }
}
```

```
wordsUppercase('Hi, how are you?'); // "HI, HOW, ARE, YOU"
```

```
extractWords('Hello functions'); // ReferenceError
```

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Live Exercises

Summary

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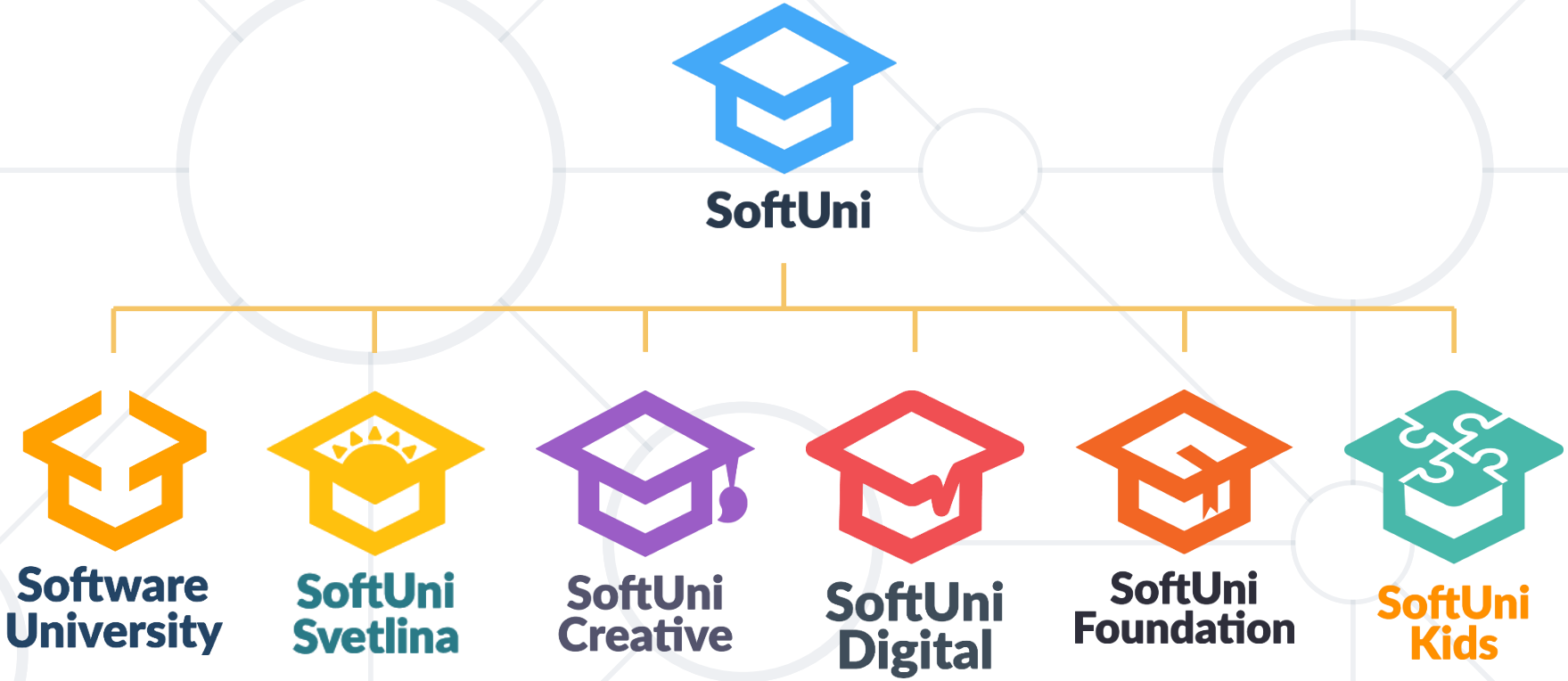
- Function == named piece of code
  - Can take parameters and return result

```
function calcSum(a, b) {
  let sum = a + b;
  return sum;
}
```

  - Arrow functions ≈ short function syntax

```
[10, 20, 30].filter(a => a > 15);
```

Questions?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