Functions and Statements

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#js-front-end

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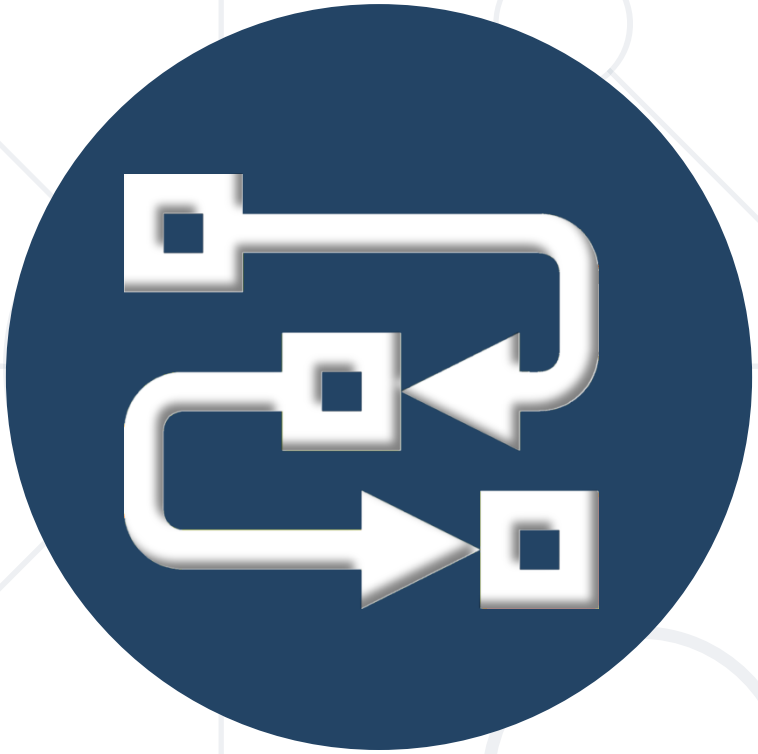

Functions Overview

Definition and Objectives

Functions in JS

- A **function** is a **named subprogram** designed to perform a particular task
  - Functions are executed when they are called. This is known as **invoking** a function
  - Values can be **passed** into functions and used within the function

Use camelCase

Parameter

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

Why Use Functions?

- More **manageable programming**
  - **Splits** large problems into small pieces
  - Better **organization** of the program
  - Improves code **readability** and **understandability**
- Avoiding **repeating code**
  - Improves code maintainability
- Code **reusability**
  - Using existing functions several times

Declaring and Invoking Functions

Declaring Function

- Functions can be declared in two ways:
  - **Function declaration** (recommended way)

```
function printText(text){
  console.log(text);
}
```

  - **Function expression** (useful in **functional programming**)

```
let printText = function(text){
  console.log(text);
}
```

Declaring Function

- Functions can have **parameters**
- Functions **always** return a value (custom or default)

```
function printText(text){
  console.log(text);
}
```

Name

Parameters

Body

Invoking a Function

- Functions are first **declared**, then **invoked** (many times)

```
function hLine() {
  console.log("----------");
}
```

Function Declaration

- Functions can be **invoked (called)** by their name

```
hLine();
```

Function Invocation

Invoking a Function

- Invocation from another function:

```
function printDocument() {
  printLabel();
  printContent();
}
```

Function invoking functions

- Self-invocation (**recursion**):

```
function countDown(x) {
  console.log(x);
  if (x > 0) { countDown(x - 1); }
}
```

Function invoking itself

Functions Without Parameters

- Does **not** receive arguments when invoked
- The result is **always the same** (unless it reads data from outside)

```
function printHeader() {
  console.log('~~~-   {@}   -~~~');
  console.log('~- Certificate -~');
  console.log('~~~-  ~----~  -~~~');
}
printHeader();   // Output is always the same
```

Functions With Parameters

- Can receive **any number** and **type** of arguments when invoked

```
function multiply(a, b) {
  console.log(a*b);
}
multiply(5, 7); // 35
```

Pass two numbers

```
function printName(nameArr) {
  console.log(nameArr[0] + ' ' + nameArr[1]);
}
printName(['John', 'Smith']); // John Smith
```

Pass array of strings

Problem : Format Grade

- Write a function that **receives a grade** between 2.00 and 6.00 and prints a formatted line with **grade and description**
  - Grade < 3.00 → **Fail**
  - Grade >= 3.00 and < 3.50 → **Poor**
  - Grade >= 3.50 and < 4.50 → **Good**
  - Grade >= 4.50 and < 5.50 → **Very good**
  - Grade >= 5.50 → **Excellent**

Input	Output
3.33	Poor (3.33)
4.50	Very good (4.50)
2.99	Fail (2)

Solution: Format Grade

```
function formatGrade(grade) {
  if (grade < 3.00) {
    console.log('Fail (2)');
  } else if (grade < 3.5) {
    console.log(`Poor (${grade})`);
  }
  // TODO: Add other conditions
}
```

Problem : Math Power

- Create a function that **calculates** the result of a number, raised to the given power
  - **Print** the result to the console

Input	Output	Details
2,8	256	2^8=2*2*2*2*2*2*2*2=256
3,4	81	3^4=3*3*3*3=81

Solution: Math Power

```
function pow(num, power){
  let result = 1;
  // loop exponent times
  for(let i = 0; i < power; i++){
    //multiply the base value
    result *= num;
  }
  console.log(result);
}
```

Returning Values

The Return Statement

- The **return** keyword immediately **stops the function's execution**
- **Returns** the specified value to the caller

```
function readFullName(firstName, lastName) {
  return firstName + " " + lastName;
}

const fullName = readFullName("John","Smith");
console.log(fullName) //John Smith
```

Using the Return Values

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- Return value can be:
  - **Assigned** to a variable

```
let max = getMax(5, 10);
```

  - **Used** in expression

```
let total = getPrice() * quantity * 1.20;
```

  - **Passed** to another function

```
multiply(getMax(5,10), 20)
```

Returning Values: Examples

- Check if **array index** is valid:

```
function isValid(index, arr) {
  if (Number.isInteger(index) && index >= 0 && index < arr.length) {
    return true;
  } else {
    return false;
  }
}
```

- Does the student pass the exam:

```
function pass(grade) {
  return grade >= 3;
}
```

Problem : Repeat String

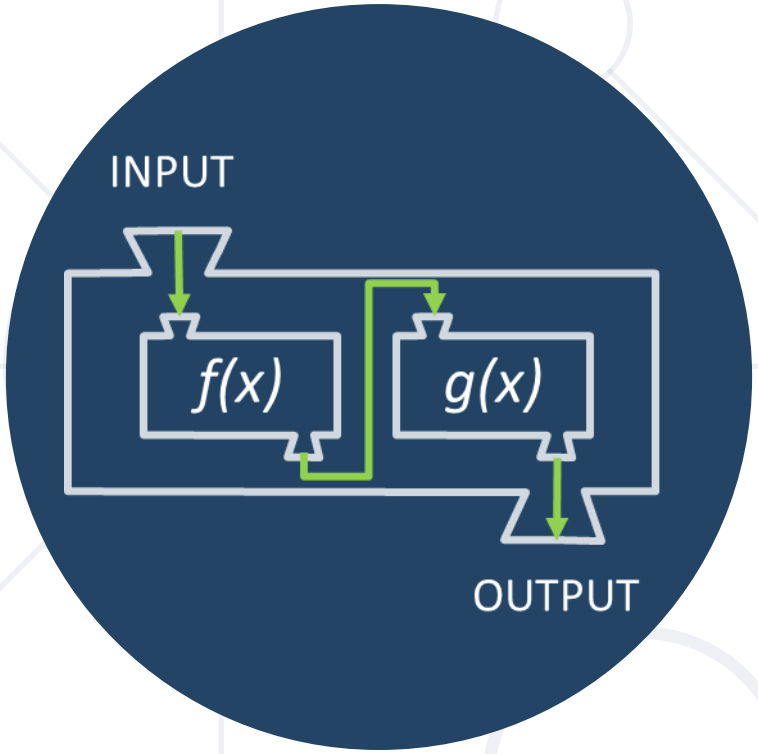
- Create a function that takes a **string** and a **number n** and returns the string repeated **n times**
  - **Return** the result as a string

Input	Output
`"abc", 3`	`abcabcabc`
`"String", 2`	`StringString`

Solution: Repeat String

```
function repeat(str, n) {
  let result = '';
  for (let i = 0; i < n; i++) {
    result += str;
  }

  return result;
}
```



Nested Functions

Nested Functions: Example

- Functions can be **nested**, i.e. hold other functions

```
function swapElements(arr) {
  for (let i = 0; i < arr.length/2; i++) {
    swap(arr, i, arr.length - 1 - i);
  }
  console.log(arr.join(' '));
  function swap(elements, i, j) {
    let temp = elements[i];
    elements[i] = elements[j];
    elements[j] = temp;
  }
}
```

Nested function

Problem: Print Certificate

- Write a function that receives a **grade** and an **array**, containing two strings and **prints** a formatted certificate
  - If the student failed, **print** **"Student does not qualify"**

```
printCertificate(5.25, ['Peter', 'Carter']);
// ~~~-   {@}   -~~~
// ~- Certificate -~
// ~~~-  ~---~  -~~~
// Peter Carter
// Very good (5.25)
```

Solution: Print Certificate

- Use the functions we declared in **earlier examples**:

```
function printCertificate(grade, nameArr) {
  if (pass(grade)) {
    printHeader();
    printName(nameArr);
    formatGrade(grade);
  } else {
    let msg = `${nameArr[0]} ${nameArr[1]} does not qualify`;
    console.log(msg);
  }
}
```

Functional Programming in JS

First Class

First-Class Functions

- **First-class functions** are treated like any other variable
  - Passed as an **argument**
  - **Returned** by another function
  - Assigned as a **value** to a **variable**

> The term "first-class" means that something is just a value. A first-class function is one that can go anywhere that any other value can go - there are few to no restrictions.
>
> *Michael Fogus, Functional Javascript*

First-Class Functions

- Can be passed as an **argument** to another function

```
function sayHello() {
    return "Hello, ";
}
```

```
function greeting(helloMessage, name) {
    return helloMessage() + name;
}
```

```
console.log(greeting(sayHello, "JavaScript!"));
// Hello, JavaScript!
```

First-Class Functions

- Can be **returned** by another function
  - We can do that, because we treated functions in JavaScript as a **value**

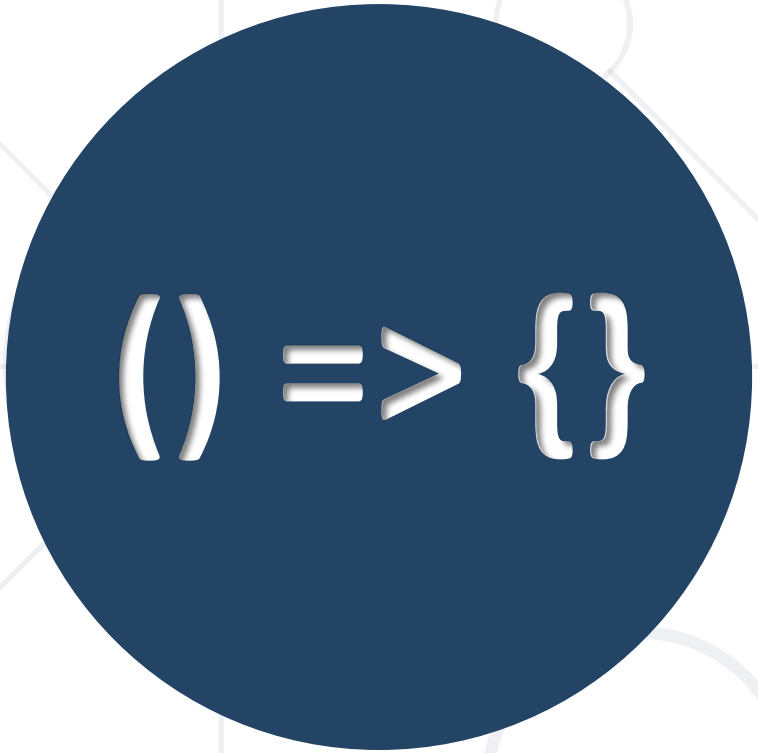
```
function sayHello() {
    return function () {
        console.log('Hello!');
    }
}
```

First-Class Functions

- Can be assigned as a **value** to a **variable**

```
const write = function () {
    return "Hello, world!";
}
```

```
console.log(write());
// Hello, world!
```



Arrow Functions

Arrow Functions

- Special **shorthand syntax** for declaration
- They operate in the **context** of their **enclosing scope**
- Useful in **functional programming**

```
let increment = x => x + 1;

console.log(increment(5));  // 6
```

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

```
let sum = (a, b) => a + b;

console.log(sum(5, 6));  // 11
```

"=>" (arrow)

This is the same as the function above

Naming and Best Practices

Naming Functions

- Use **meaningful** names
- Should be in **camelCase**
- Names should answer the question:
  - **What does this function do**?

```
findStudent, loadReport, add
```

Self explaining

```
Method1, DoSomething, handleStuff, DirtyHack
```

Puzzling

- If you cannot find a good name for a function, think about whether it has a **clear intent**

Naming Function Parameters

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- Function parameter names:
  - Preferred form: [**Noun**] or [**Adjective**] + [**Noun**]
  - Should be in **camelCase**
  - Should be **meaningful**

```
firstName, report, speedKmH,
usersList, fontSizeInPixels, font
```

  - Unit of measure should be obvious

```
p, p1, p2, populate, LastName, last_name, convertImage
```

Functions – Best Practices

- Each **function** should perform a **single**, well-defined task
  - A name should **describe that task** in a clear and non-ambiguous way
- **Avoid** functions **longer than one screen**
  - **Split them** into several shorter functions

```
function printReceipt(){
    printHeader();
    printBody();
    printFooter();
}
```

Self documenting and easy to test

Code Structure and Code Formatting

- Make sure to use correct **indentation**

```
function sum() {
    // some code…
    // some more code…
}
```

```
function sum()
    {
        // some code…
// some more code…}
```

- Leave a **blank line** between **functions** and after **blocks**
- Always use **curly brackets** for **conditional** and **loop bodies**
- **Avoid long lines** and **complex expressions**

Problem: Simple Calculator

- Write a function that **receives three parameters** and calculates the result, depending on a given operator
- The operator can be '**multiply**', '**divide**', '**add**', '**subtract**'
- The input comes as three parameters - two **numbers** and an operator as a **string**

Input	Output
`5, 10, 'multiply'`	`50`

- **Bonus task:** use **arrow functions** for the solution

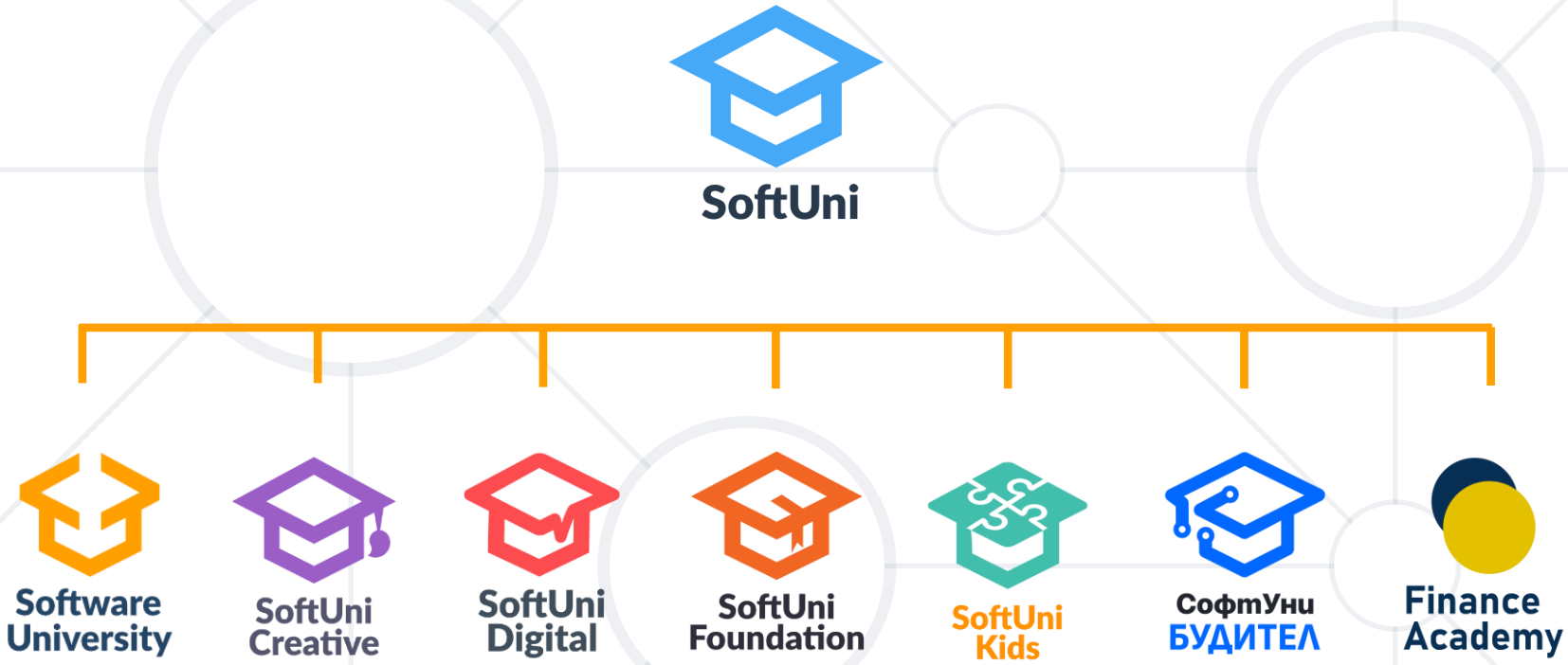
Solution: Simple Calculator

```
function solve(a, b, operator) {
  switch (operator) {
    case 'multiply':
      multiply(a, b);
      break;
    //TODO: other cases
  }
  function multiply(a, b) { // …body }
  //TODO: other operations
}
```

Summary

- Functions:
  - Break large programs into simple functions that solve small sub-problems
  - Consist of declaration and body
  - Are invoked by their name
  - Can accept parameters

Questions?



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