DOCENTE	Shadi Lahham
Corso	Software Developer
Unità Formativa	Programmazione WEB – Javascript
Argomento	Specificato nel titolo della slide successiva

Functions

Code Reusability

Shadi Lahham - Web development

Functions in Javascript

Functions

Functions are reusable collections of statements.

```
// declare
function sayMyName() {
    console.log('Hi Bob!');
}

// use
sayMyName();

// use again
sayMyName();
```

Parameters & arguments

```
// function definition with one parameter: name
function sayMyName(name) {
    console.log('Hi, ' + name);
}

sayMyName('James'); // calling the function with one argument: 'James'
sayMyName('Adam'); // calling the function with one argument: 'Adam'
```

Parameters & arguments

```
function addNumbers(num1, num2) {
    let result = num1 + num2;
    console.log(result);
}

addNumbers(7, 21);
addNumbers(3, 10);
```

You can also pass variables in function calls:

```
let number = 10;
addNumbers(number, 2);
addNumbers(number, 4);
```

Parameters & arguments

Parameters

- variables listed in the function's definition
- act as placeholders for values that are passed into the function when called

Arguments

- the actual values passed to the function when it is invoked
- assigned to the corresponding parameters in the function's definition

Parameter - MDN
Argument - MDN

Parameters & arguments

```
// function definition with two parameters: a and b
function add(a, b) {
    // the function returns the sum of the two parameters
    return a + b;
}

// calling the function with two arguments: 5 and 3
let result = add(5, 3);

// output the result to the console
console.log(result); // output: 8
```

Return Values

The return keyword returns a value to whoever calls the function and exits the function

```
function addNumbers(num1, num2) {
    let result = num1 + num2;
    return result; // Anything after this line won't be executed
}

let sum = addNumbers(5, 2);
```

Return Values

You can use function calls in expressions

```
let biggerSum = addNumbers(2, 5) + addNumbers(3, 2);
```

You can even call functions inside function calls:

```
let hugeSum = addNumbers(addNumbers(5, 2), addNumbers(3, 7));
```

Circular Dependencies

```
function chicken() {
    egg();
}

function egg() {
    chicken();
}

egg();
```

Recursion

```
function fibonacci(n) {
  if (n < 2) {
    return n;
  }
  return fibonacci(n - 1) + fibonacci(n - 2);
}

fibonacci(30); // 1439 ms
fibonacci(35); // 12765 ms
fibonacci(40); // 121211 ms
```

Note: recursive functions can be exponentially slow

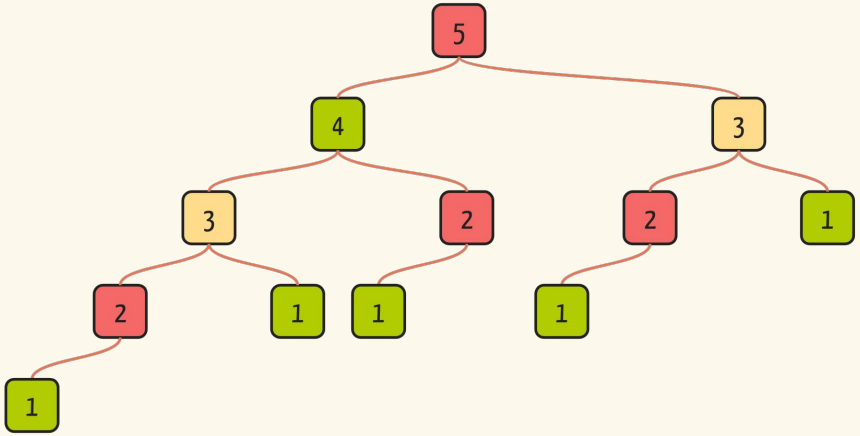
Recursion: The Pros and Cons

Big O Notation and the Nonsense Therein

Recursion

Fibonacci tree

Recursion
An exponential calculation



Variable Scope

- JS Variables are either "block scoped" or "function scope", depending on how they were declared, with let or var
- They are visible in the block or function where they're defined
- Variables can belong to the local or global scope

Local Scope

A variable with "local" scope

```
function addNumbers(num1, num2) {
  let localResult = num1 + num2;
  console.log("The local result is: " + localResult);
}

addNumbers(5, 7);
console.log(localResult);
```

Global Scope

A variable with "global" scope

```
let globalResult;

function addNumbers(num1, num2) {
  globalResult = num1 + num2;
  console.log("The global result is: " + globalResult);
}

addNumbers(5, 7);
console.log(globalResult);
```

Global Scope - side effects

Forgetting to use let has "global" consequences

```
function addNumbers(num1, num2) {
  localResult = num1 + num2;
  console.log("The local result is: " + localResult);
}

addNumbers(5, 7);
console.log(localResult);
```

Coding Conventions: Indentation

Use newlines between statements and use spaces or tabs to indent blocks.

Bad:

```
function addNumbers(num1,num2) {return num1 + num2;}
```

Bad:

```
function addNumbers(num1, num2) {
return num1 + num2;
}
```

Better:

```
function addNumbers(num1, num2) {
    return num1 + num2;
}
```

Convention: Comments & documentation

Comment functions properly.

OK, but not great:

```
/*
 * Adds two numbers and returns the sum
 */
function addNumbers(num1, num2) {
    return num1 + num2;
}
```

Convention: Comments & documentation

Comment functions properly. Use JSDoc

Much better:

```
/**
 * Returns the sum of num1 and num2
 * @param {number} num1 - the first number
 * @param {number} num2 - the second number
 * @returns {number} Sum of num1 and num2
 */
function addNumbers(num1, num2) {
    return num1 + num2;
}
```

[Use JSDoc: Documentation]

[JSDoc on github]

Let & var

Let vs var

```
function worker() {
   let x = 88;
   for (let i = 0; i < 4; i++) {
       console.log('i block =', i);
   }
   console.log('x func =', x);
   console.log('i !block =', i); // undefined
}

worker();
console.log('x !func =', x); // undefined
```

let: Block-scoped

Access restricted to nearest enclosing block

```
function worker() {
   var x = 88;
   for (var i = 0; i < 4; i++) {
       console.log('i block =', i);
   }
   console.log('x func =', x);
   console.log('i !block =', i); // output?
}
worker();
console.log('x !func =', x); // undefine
```

var: Function-scoped

Access restricted to nearest enclosing function
Common in older Javascript code

Let vs var

let provides more predictable and understandable scoping behavior compared to var, making it the preferred choice in modern JavaScript development

var should be used sparingly, typically in legacy (old) code where refactoring to let might not be practical

Advanced functions

Another way to look at functions

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

let mad = add;

let resultA = add(5, 4); // 9

let resultB = mad(21, 7); // 28

console.log(typeof add); // function
```

note: functions are regular objects with the additional capability of being callable

Another way to look at functions

```
function add(a, b) {
 return a + b;
}

let mult = function(a, b) {
 return a * b;
};

let calculate = function(fn, a, b) {
 console.log('This is your result:', fn(a, b));
};

calculate(add, 2, 4);
calculate(mult, 2, 4);
```

note: functions can be passed as parameters

Arrow Functions

Arrow Functions: Syntax

- A function shorthand
- Use the => syntax
- Share the same lexical **this** as their surrounding code

Syntax

```
(x, y, z) => { statements }
(x, y, z) => expression // same as: (x, y, z) => { return expression; }
```

Optional parentheses

```
(x) => { statements }
x => { statements }
```

No parameters syntax

```
() => { statements }
```

Arrow Functions: Variants

```
function square(a) {
 return a * a;
}

let square = (a) => {
 return a * a;
};

// equivalent
let square = (a) => a * a;

// equivalent
let square = a => a * a;
```

Arrow functions are functions

```
let add = (x, y) => { return x + y; };

console.log(typeof add); // function

console.log(add instanceof Function); // true
```

note: instanceof is a binary operator

Your turn

1.Variable Scope

- Write a .js file that uses both local and global variables in the same project
- Recreate the local and global scope examples in your browser
- Try to call the function “addNumbers” a few more times
- Make sure that you understand exactly what’s happening at every stage

2.Fortune calculator

- Write a function named tellFortune that:
  - Takes 4 parameters: number of children, partner's name, geographic location, job title.
  - outputs your fortune to the screen like so: "You will be a X in Y, and married to Z with N kids."

- Call that function 3 times with 3 different values for the arguments

3.Dog age calculator

Calculate a puppy’s age in dog years

- Write a function named calculateDogAge that:
  - takes 1 parameter: the dog's age in human years
  - calculates the dog's age based on the conversion rate of 1 human year to 7 dog years
  - outputs the result to the screen like so: "Your dog is NN years old in dog years!"

- Call the function three times with different sets of values
- Bonus:
  - Add another parameter to the function that takes the conversion rate of human to dog years

4.Coffee supply calculator

- Write a function named calculateSupply that:
  - takes 2 parameters: age, amount per day.
  - calculates the amount consumed for rest of the life (based on a constant max age).
- outputs the result to the screen like so: "You will need NN cups of coffee to last you until the age of X"

- Call that function three times, passing in different values each time
- Bonus:
  - Calculate in liters, accepting floating point values for amount per day (0.3 liters of coffee)
  - Round the result to a round number

5.Geometry library

- Create a function called calcCircumference:
  - Pass the radius to the function
  - Calculate the circumference based on the radius, and output "The circumference is NN"
- Create a function called calcArea:
  - Pass the radius to the function.
  - Calculate the area based on the radius, and output "The area is NN"

Reference:

JavaScript Math Object

Circles

Bonus

6.Temperature conversion

Create a function called celsiusToFahrenheit:

- Store a celsius temperature into a variable.
- Convert it to fahrenheit and output "NN°C is NN°F".

Create a function called fahrenheitToCelsius:

- Now store a fahrenheit temperature into a variable.
- Convert it to celsius and output "NN°F is NN°C."

7.Math library

- Write a function called squareNumber that will take one parameter (a number), square that number, and return the result. It should also log a string like "The result of squaring the number 3 is 9."

- Write a function called halfNumber that will take one parameter (a number), divide it by 2, and return the result. It should also log a string like "Half of 5 is 2.5."

7.Math library

- Write a function called **percentOf** that will take two numbers, figure out what percent the first number represents of the second number, and return the result. It should also log a string like "2 is 50% of 4."
- Write a function called **areaOfCircle** that will take one parameter (the radius), calculate the area based on that, and return the result. It should also log a string like "The area for a circle with radius 2 is 12.566370614359172."

- Bonus: round the result so there are only two digits after the decimal

8.Calculator

Write a function that will take one parameter (a number) and perform the following operations, using the functions you wrote earlier:

- Take half of the number and store the result
- Square the result of #1 and store that result
- Calculate the area of a circle with the result of #2 as the radius
- Calculate what percentage that area is of the squared result (#3)

9.Merger

Write a function called merger() that takes two parameters and performs the following operation:

- If both parameters are numbers, return the sum
- If both parameters are strings, return the concatenation of the strings
- If the parameters are anything else, return null

Include a doc file in which you explain why two operators might have the same symbol but work differently based on the type of the parameters

References

JavaScript Function Definitions

JavaScript - Functions

Javascript validation

Code quality tools

ESLint

JSHint

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