

Introduction

Javascript was designed to run only in browsers so every browser uses a Javascript Engine. Node combines C++ and JS so JS can run outside of browsers.

ECMAScript, Specification, defines JS standards.

The Javascript Console can be found in Chrome > Inspect > Console.

Just like browsers, Node includes the v8 JavaScript engine, so it can read and execute JavaScript scripts

Operator's precedence

The precedence is as follows: multiplication *, sum +

Bitwise operators

A little less practical.

1 = 00000001, 2 = 00000010

Bitwise are similar to Logical operators, but they operate on the singular bits of a number: each bit/8 is compared.

Bitwise OR `console.log(1 | 2); //3`

With OR, each individual bit is compared, if any of them is 1, the result is zero, like:

```
00000010
//2
```

```
00000011
//(1 | 2)
```

Bitwise AND `console.log(1 & 2); //`

With AND, each individual bit is compared, if both bits are 1, the result is one, otherwise 0:

```
00000011
//(1 & 2)
```

Logical operators with non-booleans

If the operand/'condition' is not 'true' or 'false'(boolean) JS will try to interpret it as 'truey' or 'falsey'.

"Falsey" undefined, null, 0, false, "", NaN

"Truthy" anything else - Strings, natural numbers

Logical operators

Logical AND (&&)	Returns 'true' if both operands or conditions are 'true'	<code>true && true => true; true && false => false</code>
------------------	--	---

Logical OR ()	Returns 'true' if one of the operands/-conditions are 'true'	<code>true false => true; true true => true; false true => true; false false => false</code>
-----------------	--	--

Logical NOT (!)	Will turn the operand /condition into false if true, true if false	<code>let happy = !sad</code>
-----------------	--	-------------------------------

Ternary operators

```
// Ternary operators
// If a customer has over 10
// points they're a GOLD customer,
// otherwise they're silver.
let points = 110;
// Condition (produces boolean),
// if true, set to 'gold',
// otherwise, 'silver'
let customerType = points > 100
? 'gold' : 'silver';
console.log(customerType);
There's a better way to shorten
this if the condition's result
is true or false:
```

Ternary operators (cont)

> return width > height;
instead of : return width > height ? true : false;

These conditions use booleans to return a value depending on the boolean type.

Operators

Operators are used alongside variables to create expressions. With these we can create logic and algorithms.

In JavaScript we have Arithmetic, Assignment, Comparison, Bitwise and Logical Operators.

Arithmetic

Assignment

Arithmetic Operators

```
let x = 10;
let y = 3;
console.log(x + y);
console.log(x - y);
console.log(x * y);
console.log(x / y);
console.log(x % y);
console.log(x ** y);
//// Increment and Decrement
Operators
// 10
console.log(x);
// 11+1 (operation applied
// first)
console.log(++x);
// 11+1 (operation applied
// later)
console.log(x++);
```

Used for performing calculations, like mathematics. Usually variables with numeric values are used (operands) to produce new values (expression - something that produces a value).

For increment and decrement operators, if applied before the variable, the operation will be performed before the action. If applied after, after the action is executed.

Assignment operators

```
// Assignment operators (=)
let m = 20;
let p = 3;
let r = 2;

m++;
// is the same as:
m = m + 1;

p += 5;
p = p + 5;

r *= 5;
r = r*5;
```

Comparison operators

```
// Relational operators
let xx = 1;
console.log(xx > 0);
// true, 1 is bigger than 0
console.log(xx >= 1);
// true, 1 is equal or bigger
// than 1
console.log(xx < 1);
// false, 1 is no less than 1
console.log(xx <= 1);
// true, 1 is equal or smaller
// to 1
// Equality operators
console.log(xx === 1);
// true, x is the same value and
// type as 1
console.log(xx !== 1);
// false, x is no different to 1
```

We use them to compare the value of a variable with something else. The result of an expression that includes a comparison operator is a boolean (true or false).

Equality operators

```
// Equality operators
console.log(xx === 1);
// true, x is the same value and
// type as 1
console.log(xx !== 1);
// false, x is no different to 1
//// Loose equality operators
console.log(xx == y);
//// Strict equality operators
console.log(xx === y);
// true
console.log('1' == 1);
// false
console.log('1' === 1);
```

Loose equality operators ensure that two variables share value, Strict equality operators ensure that two variables share value and type. Type such as number, string, etc.

Loose equality will take the first variable's type and convert the second to that type automatically when compared.

Boilerplate project

To start off, create an HTML document. Set a `<script>` tag on the head or body, but best practice is at the end of the `<body>` element because the browser will parse the content the DOM first.

```
// This is a comment.
```

```
console.log("This is a sequence. It logs this message from the console.")
```

```
<script src="index.js"/>
```

From the terminal, launch "node index.js" to run the JavaScript script

From VSCode, run View > Terminal to run the JavaScript script

Reference types

Objects	A type that holds multiple properties related we can fit them inside an Object.	let person = {}
	Inside an object	{ name: 'Mosh', age: 27 }
	Objects can also be printed	console.log(-person);
	Object properties can be changed. (Dynamic typing, remember?)	person.name = 'Sara'
		person['name'] = "Mary"
Arrays	A type used to store other types in a list-like manner. Technically an Object.	let selectedColors = [];
		let selectedColors = ['red', 'blue'];
	Array elements each have an index, in this case: red is 0, blue is 1. To access them	selectedColors[0]; // red

Reference types (cont)

Because JavaScript is a dynamic language, variables can be set, added, deleted at runtime or any time. And they can be of any type

```
selectedColors[2] = 'yellow';
selectedColors[3] = 8;
```

Because Arrays are Objects, they have their own inherited properties like `indexOf`, `length`...

Functions A set of statements that perform a task or calculates a value

The variable we parse into the function is an 'argument'.

```
greet('María');
```

If we don't parse a second variable, it will print undefined.

```
greet("-Jua-na",lastName);
```

All functions in JavaScript are objects, so they have properties and methods that we can access using the dot notation (I.e.: `Object.keys`

JavaScript is a Dynamic Typing language

```
// Dynamic typing
let input;

input = "Sara";
typeof input;

input = 7;
typeof input;
```

Primitive variable types

```
let surname = 'raposinha'; // String literal
let age = 27; // Number literal
let isApproved = true; // Boolean - used for yes/no logic
let zodiacSign; // Undefined
let favoriteColor = null; // Null - for explicitly clearing the variable
```

To check a primitive variable type `typeof` is used:

```
typeof n !== 'number'
```

Control flow

- If ... Else

```
switch(case) {
```

Switch

...

Case

```
case 'guest':
  console.log('Guest');

  break;

case 'moderator':
  console.log('Moderator');

  default:
  console.log('Unknown');
}
```

Note 1: If `break` is not added, the condition doesn't skip and case doesn't work, it just executes the next statement within the first case read.

Control flow (cont)

Note 2: An expression is any valid unit of code that resolves to a VALUE. Case is an expression, whether it is 2, 'a', or true. When case matches the variables, whether with a given variable or a set expression like 'true', code will execute, check the condition and if matching, execute and break.

- 'for' includes 3 statements: Initial expression, where a variable is initialized, it's usually set like 'i', short for Index. Condition, where we usually compare the value of the Index to something else; the loop will continue unless this condition is false. If we want the loop to go on 5 times, we make it like so: `1 < 5` and add the next expression. `IncrementExpression` will be next, so for each time the statements under for are executed it will sum one to the initial expression, check for the condition, and when `i` is no longer less than 5 it will stop.

```
for (let i = 0; i < 5; i++);
```

```
for (let i = 5; i >= 1; i--);
```

Control flow (cont)

- while(condition){statement}

While

...

- Do ... while
Do-whiles are always executed once even if the condition is not true.

```
do { sentence } while ( condition )
```

Infinite loops
You can create them accidentally, causing a system break. Check for them on the console

- For ... in
for(let key in person){}
For each iteration the key variable will hold the name of one of the properties of the object.

To access object's values:
person.name, person["name"] or person[key] if we don't know the properties name beforehand and we need to calculate it at runtime. Here, 'key' inside the brackets is the throwaway name for the properties' value. 'key' on its own will print the property name (name, age...)

- For ... of
for (let color of colors)

In this type of loop, the property's value is selected instead of the whole object

Control flow (cont)

Objects are not iterable, only Arrays and Maps. To force an Object into an array, use Object.keys(object) like For ... in or Object.entries(object)

Break and continue
They can be used in any kind of loop. 'break;' interrupts the code, 'continue' jumps to the beginning of the loop on its breakpoint and the next execution happens.

Arrays

Adding elements

Even on const declarations, arrays can be written onto.
const numbers = [3,4]

But not like numbers = [3, 4, 5]; Because Arrays are Objects, we can use their function properties, like: push (adding to the end), .unshift (pushes existing elements to the right, adds new elements to beginning), .splice (access a specific position and add or remove elements - args: start, amount of numbers to delete, items to add)

```
numbers.push(5,6)
numbers.unshift(1,2)
numbers.splice(2,0,2.5,'b')
console.log(numbers)
// 1, 2, 2.5, 'b', 3, 4, 5, 6
```

Finding elements

Arrays (cont)

- Primitives:
numbers = [1,2,3,4,1]

.indexOf()
->
Looks for a given input inside the array and, if existing, will return the index number of said array. If not will return -1.

number-
s.inde-
xOf(1) ->
0
.lastInde-
xOf() ->
number-
s.lastInd-
exOf(1) ->
4
Looks for a given input inside the array and, if existing, will return the index number of said array. If not will return -1.

.includes()
->
Checks for a given element exist in the array. Returns true or false

number-
s.incl-
udes(3) ->
true

fromI-
ndex': A
second
argument
available
for all last
3
methods.
It starts
the search
from the
given
index
number.
console.log(apples.indexOf(1)) //
console.log(apples.indexOf(1,1))
console.log(apples.lastIndexOf(1))
//4
console.log(apples.lastIndexOf(1))
//0

3
methods.
It starts
the search
from the
given
index
number.

- const courses = [{id: 1, name: 'a'
{id: 2, name: 'b'}]

Reference types:

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Arrays (cont)

.find() -> courses.find(function(course){ return course.name === 'a' }) -> true

Here because the reference is allocated in another memory slot, '.includes()' can't be used.

Arrow functions Used to call functions, pre-existent or not

```
const course = courses.find( course =>{
return course.name
=== 'a'; })
```

```
const courseB =
courses.find( course
=> course.name ===
'a');
```

```
const courseC =
courses.find( (course)
=>{ return
course.name === 'a';
})
```

Functions

```
// Functions
// Performing a task:
function greet (name, lastName){
    console.log( 'Hello '
+ name + ' ' + lastName + '!!!')
}
greet( " Juliana");
let lastName = "la Loca"
greet( " Juliana", lastName);
// Calculating a value:
function square (Number) {
    return Number * Number;
}
let n = square(2);
console.log(n);
```

Functions (cont)

```
> //4
console.log(4/2);
```

Basic concepts

Variables Variables are data stored somewhere in memory temporarily. When addressed, the variable address will be accessed by the variable's name. Like a box. The name will describe its content, the contents will be stored in the box.

Declaring/initializing variables (as of ES6)

```
let name = 'raposinha';
```

Variables cannot be reserved keywords. They should be concise and meaningful, meaning they give us a clue of the contents. They cannot start with a number. They can't contain spaces or hyphens. Camel notation should be used (firstName). They're case sensitive. They can be declared in the same line (let name, firstName, lastName;)

Basic concepts (cont)

Constant variables They are used when we don't want the values to ever change. If you don't want to redefine constant should be the default.

Types There are primitive and reference types.

Primitive types: String, number, boolean, undefined, null

Objects

Declaring an object

```
const circle = {
radius:1,
location : {
x: 1,
y : 1
}
draw: function(){ console.log('w')
}
```

Factory functions Functions that create objects in or code everytime you need a new object



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Objects (cont)

```
function create Circle (radius, x, y){
  return {
    radius: radius,
    location: {
      x: x,
      y: y
    },
    draw() {
      console.log('draw')
    }
  };
}
```

Constructor functions Written in Pascal Notation. These are also functions to generate objects.

function Object() {} is an example of a Constructor function. Whenever we create an object using the Object literal syntax, a call is made into that object-constructor function

The keyword 'this' is used instead of return, it's a reference to the object executing this code.

Objects (cont)

When using the 'new' operator a new empty object is created, then the properties used with 'this' are set dynamically, then the object is returned.

```
function Address (street, city, zipcode) {
  this.street = street;
  this.city = city;
  this.zipcode = zipcode;
  this.showAddress = function showAddress() {
    for (let key in Address){
      console.log(key, Address[key])
    }
  }
}
```

Dynamic Objects in JavaScript are dynamic, which means that once created you can always add new properties or methods, or remove existing ones.

Circle.constructor -> f

objects, they have constructors

Objects (cont)

Circle.call({},1) and const circle7 = new Circle(1) are the same. **.call** is a function prebuilt method. {} stands for the first argument, an empty object - then **this** will reference the new empty object instead of the base object, window. The rest of the arguments will be passed explicitly (like -> this.radius = radius; Circle(radius);circle7({},5). Which is to mean that if the 'new' keyword isn't used, 'this' will point to window object.

The **apply** method can also be used the same as "call", but the explicit argument are parsed through an array, like Circle.apply({}, [1,2])

In JavaScript, radius: radius, and 'radius,' is the same when defining an object. camelCaseNotation, PascalNotation

Objects

Cloning for (let key in circle) another1[key] = circle[key]

Object.assign(another2, circle)

const another3 = Object.assign({ color: 'yellow' }, circle)

const another4 = {...circle}

Garbage collection

In low level languages when creating an object we have to allocate memory for it then deallocate it, not with JS. This is where the Garbage Collector comes in. It finds the variables and constants that are not used and deallocate the memory

Math Object

It's a built-in Object.

The Math namespace object contains static properties and methods for mathematical constants and functions.



Math Object (cont)

It's designed for mathematical calculations and so are its Properties and Functions (Math.PI, Math.floor(), ...)

Math.random(), Math.round(), Math.max(-1,2,3), Math.min(1,2,3) (...)

https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/Math

String Objects

String is a primitive type, primitive types don't have properties and methods, only objects. But a String Object also exists for JavaScript.

```
const message = new String('hi');
```

It's typeof will be 'object'

However, the internal JavaScript engine will automatically convert a String primitive type onto a String Object if we use the dot notation

String.length, String[3], String.includes('my'), String.startsWith('a'), String.indexOf('my')

https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/String

Strings

\n adds a new line within a String

Template literals With these, ``, the text formats prints as it's written

Date Object (Built-in)

```
const now = new Date()
// Creates the current date and time when object is created
```

Has get, set methods

https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/Date -> to check formats, methods



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