Javascript

PART 2

Javascript variables

JavaScript variables are containers for storing data values

- Objects and functions are also variables
- All variables must be identified with unique names (identifiers):
  - Names can contain letters, digits, underscores, and dollar signs.
  - Names must begin with a letter. underscore (_) or dollar sign ($).
  - Names are case sensitive (y and Y are different variables)
  - Reserved words (like JavaScript keywords) cannot be used as names.
- Variables do not need to be declared, although it's a good programming practice to declare all variables at the beginning of a script.
  - Declare JS variables with var, let or const

Declaring variables in Javascript

- Var:
  - Function scoped
  - Can be defined before declaration (hoisting)
  - Can be redeclared
- Let:
  - Block scoped
  - Cannot be defined before declaration
- Const:
  - Block scoped
  - Cannot be defined before declaration
  - Value cannot be reassigned

Examples

```
x = 5;
var y;
y= 6;
var z = x + y;
```

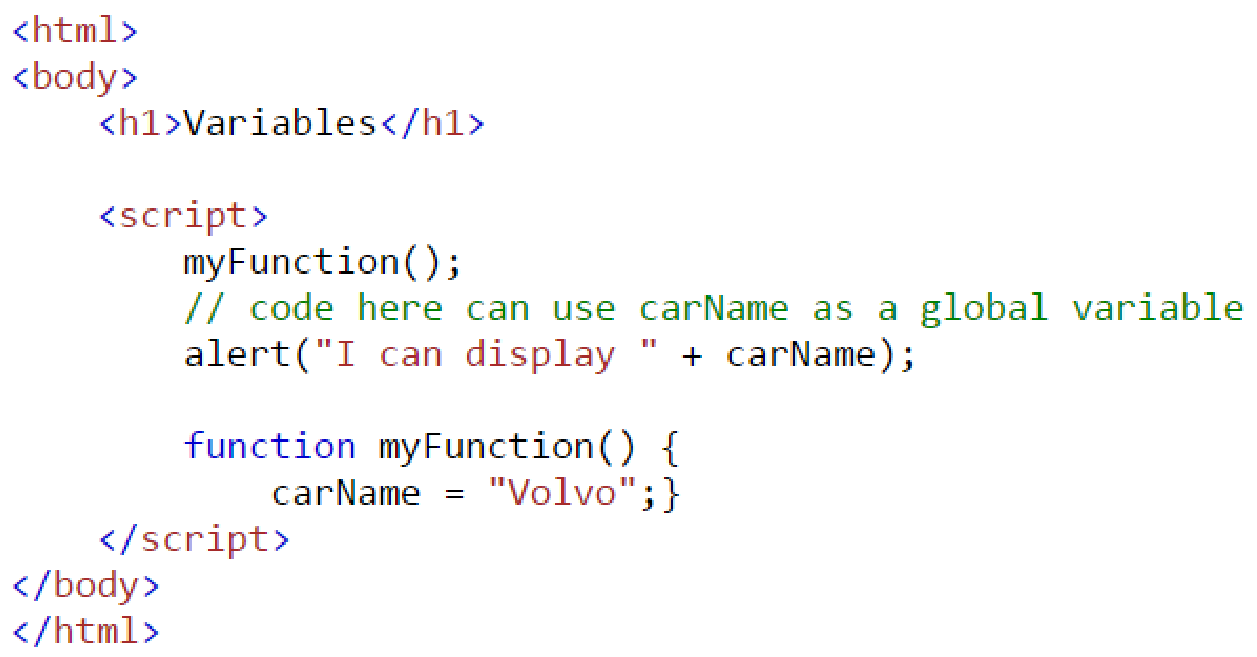
```
var carName;
var carName = "Volvo";
var person = "John Doe", carName = "Volvo", price = 200;
```

```
const price1 = 5;
const price2 = 6;
let total = price1 + price2;
```

```
let y;
console.log(typeof (y));
y = 9;
console.log(typeof (y));
y = true;
console.log(typeof (y));
y = "Hello";
console.log(typeof (y));
```

Javascript scope

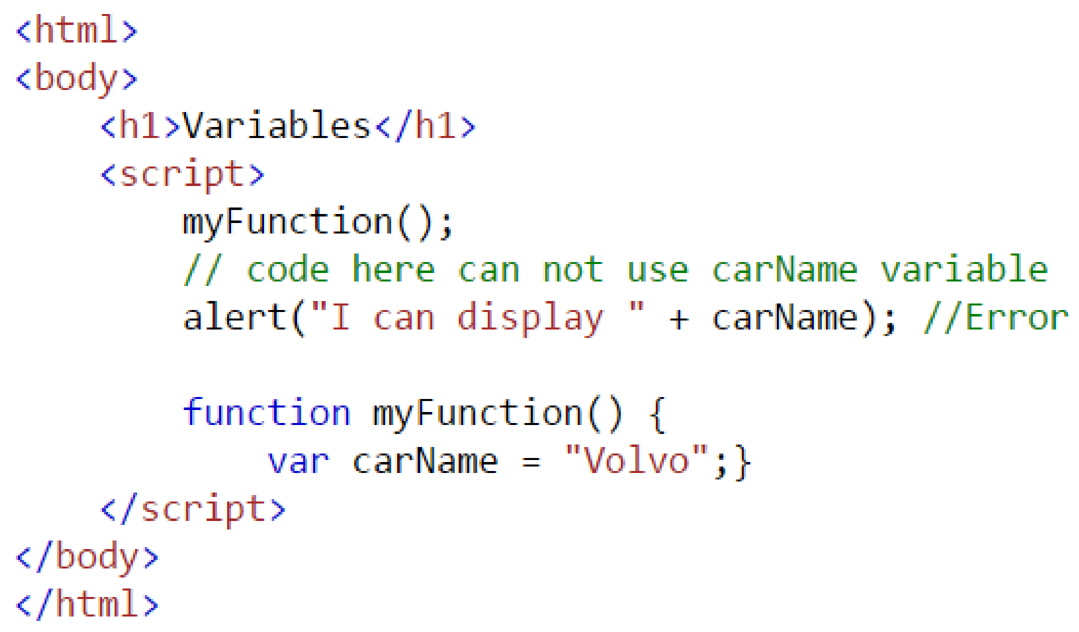
If you assign a value to a variable that has not been declared, it will automatically become a GLOBAL variable:



```
<html>
<body>
    <h1>Variables</h1>

    <script>
        myFunction();
        // code here can use carName as a global variable
        alert("I can display " + carName);

        function myFunction() {
            carName = "Volvo";}
    </script>
</body>
</html>
```

Javascript scope

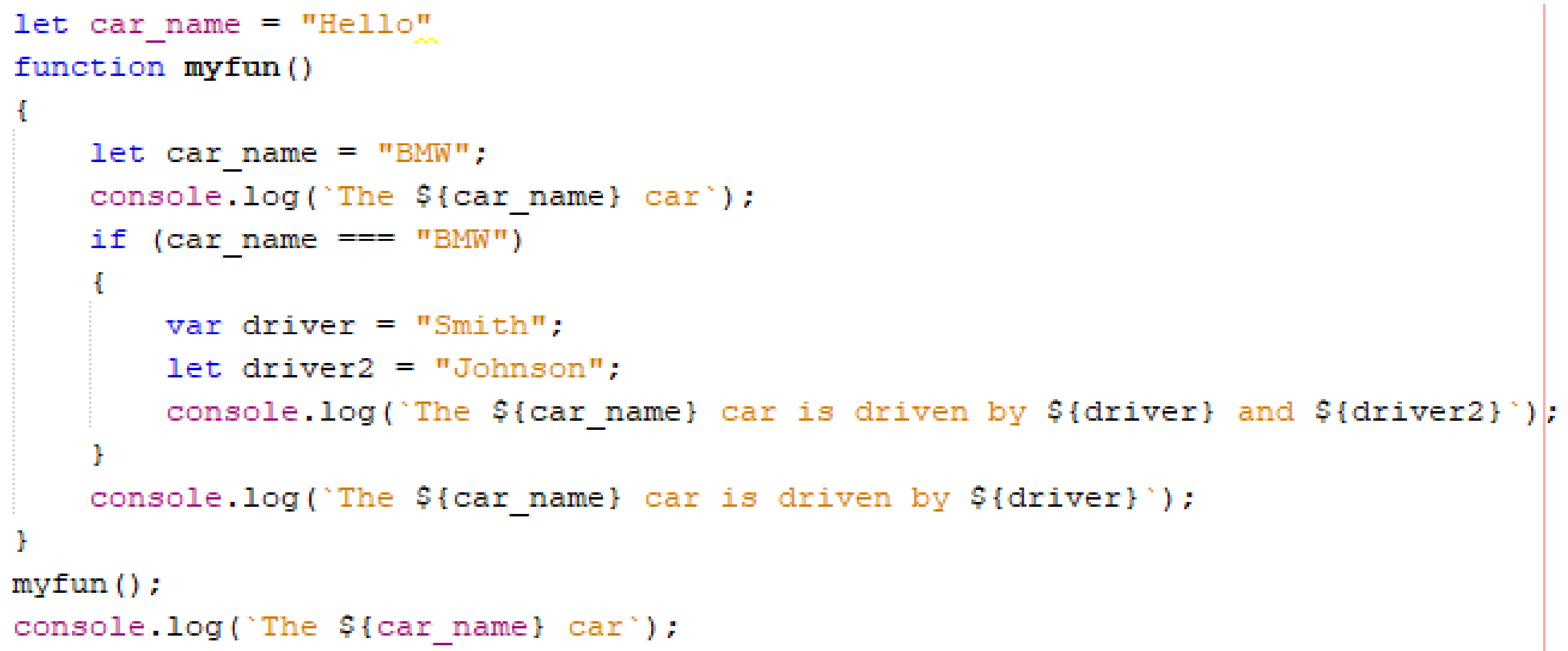
- Variables declared within a JavaScript function, become LOCAL to the function (local scope)
- Local variables with the same name can be used in different functions



```
<html>
<body>
    <h1>Variables</h1>
    <script>
        myFunction();
        // code here can not use carName variable
        alert("I can display " + carName); //Error

        function myFunction() {
            var carName = "Volvo";}
    </script>
</body>
</html>
```

Javascript scope

- Variables declared with *let* in a block, become LOCAL to that block.



```
let car_name = "Hello"
function myfun()
{
    let car_name = "BMW";
    console.log(`The ${car_name} car`);
    if (car_name === "BMW")
    {
        var driver = "Smith";
        let driver2 = "Johnson";
        console.log(`The ${car_name} car is driven by ${driver} and ${driver2}`);
    }
    console.log(`The ${car_name} car is driven by ${driver}`);
}
myfun();
console.log(`The ${car_name} car`);
```

Javascript scope

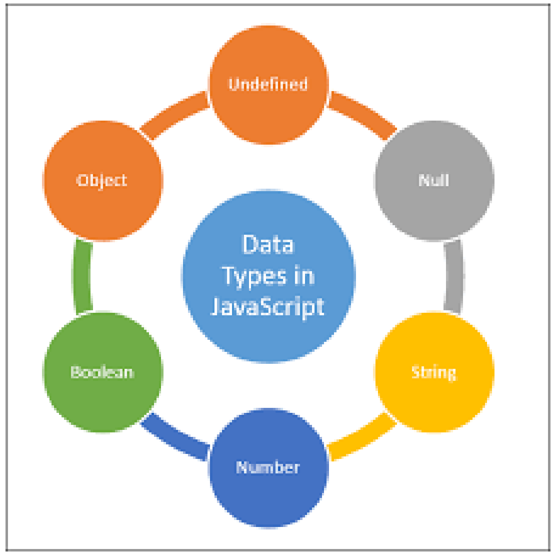
The lifetime of a JavaScript variable starts when it is declared.

- Local variables are deleted when the function is completed.
- In a web browser, global variables are deleted when you close the browser window (or tab), but remains available to new pages loaded into the same window.

Javascript datatypes

Primitive data types:

Data Type	Description
String	represents sequence of characters e.g. "hello"
Number	represents numeric values e.g. 100
Boolean	represents boolean value either false or true
Undefined	represents undefined value
Null	represents null i.e. no value at all



Non-primitive data types:

Data Type	Description
Object	represents instance through which we can access members

Javascript datatypes: String

A string is textual content.
It must be enclosed in single or double quotation marks.

```
var str1 = "Hello World";
```

Concatenation: You can use single or double quotation marks

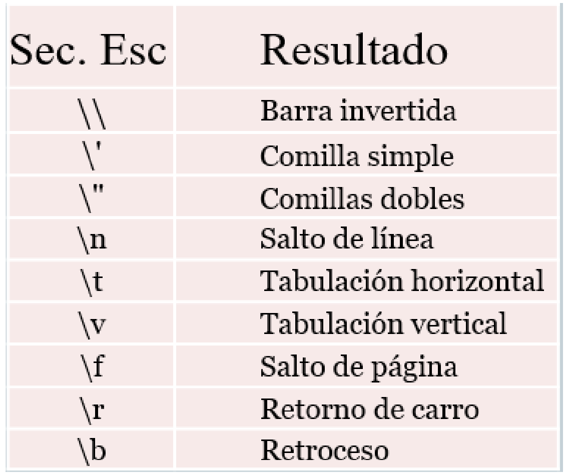
```
var str = 'Hello ' + "World " + 'from ' + 'TutorialsTeacher ';
```

Quotes in String: Can be applied in two ways:

```
var str1 = "This is 'simple' string";
```

```
var str1 = "This is \"simple\" string";
```

Javascript datatypes: Code charts



Sec. Esc	Resultado
\\	Barra invertida
\'	Comilla simple
\"	Comillas dobles
\n	Salto de línea
\t	Tabulación horizontal
\v	Tabulación vertical
\f	Salto de página
\r	Retorno de carro
\b	Retroceso

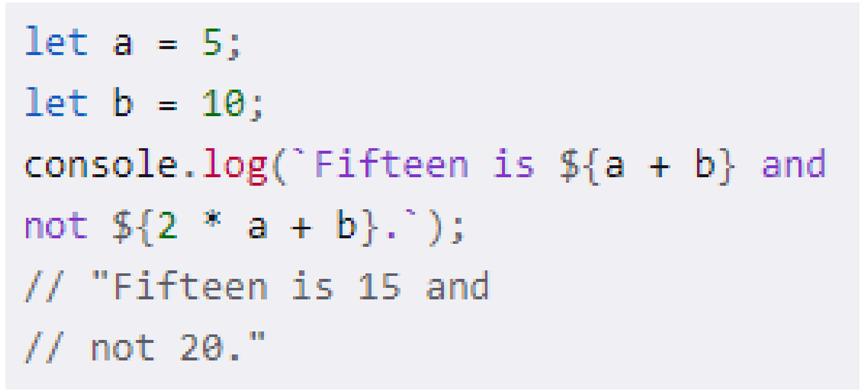
á	é	í	ó	ú	Á	É	Í
\u00e1	\u00e9	\u00ed	\u00f3	\u00fa	\u00c1	\u00c9	\u00cd
Ó	Ú	ü	Ü	ñ	Ñ	¡	¿
\u00d3	\u00da	\u00fc	\u00dc	\u00f1	\u00d1	\u00a1	\u00bf

https://www.unicode.org/charts/PDF/U0080.pdf

Javascript datatypes: String

Template literals:

- Enclosed by backtick (`) characters
- Allow multiline strings and string interpolation



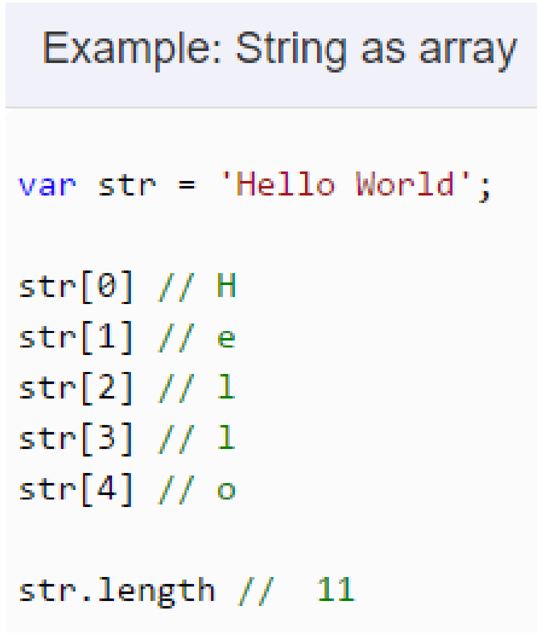
```
let a = 5;
let b = 10;
console.log(`Fifteen is ${a + b} and
not ${2 * a + b}.`);
// "Fifteen is 15 and
// not 20."
```

Javascript datatypes: String

A string can also be treated like character array

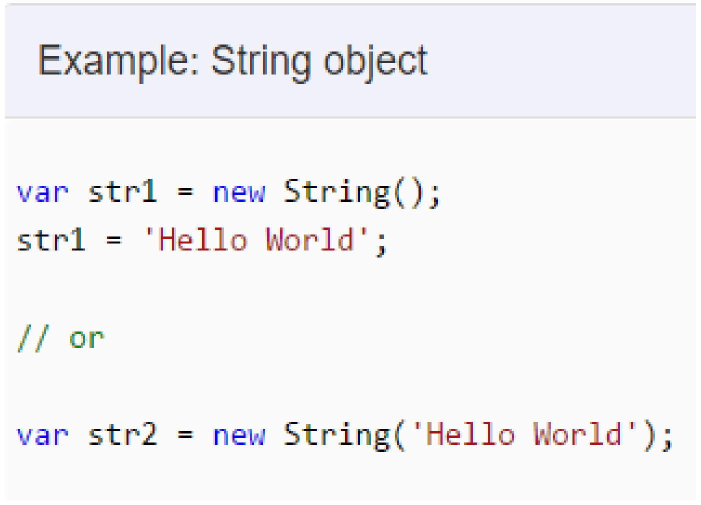
Or

JavaScript also provides you String object to create a string using new keyword



Example: String as array

```
var str = 'Hello World';

str[0] // H
str[1] // e
str[2] // l
str[3] // l
str[4] // o

str.length //  11
```



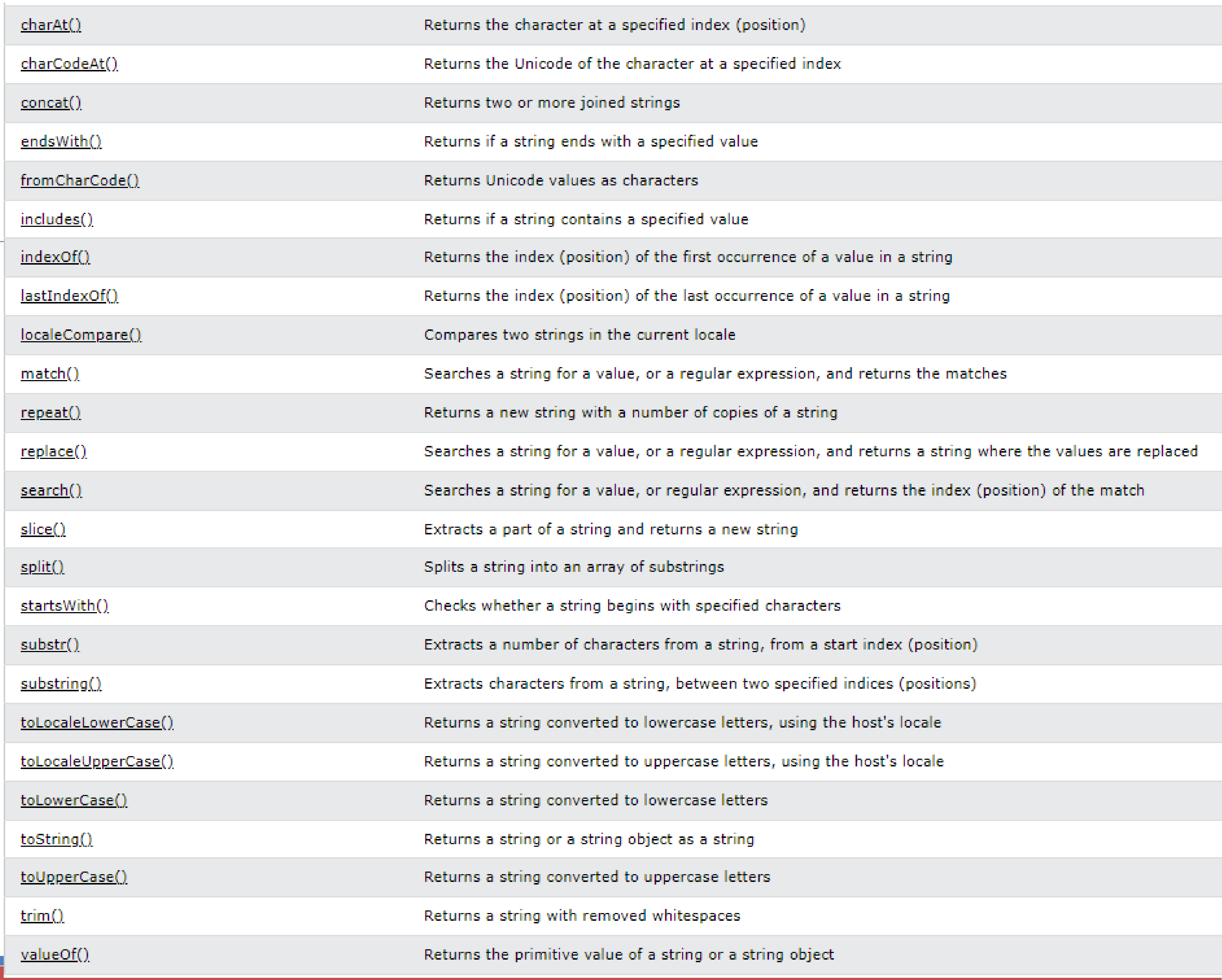
Example: String object

```
var str1 = new String();
str1 = 'Hello World';

// or

var str2 = new String('Hello World');
```

Note: It is recommended to use primitive string instead of String object.

Javascript datatypes: String

String methods: (https://www.w3schools.com/jsref/jsref_obj_string.asp)



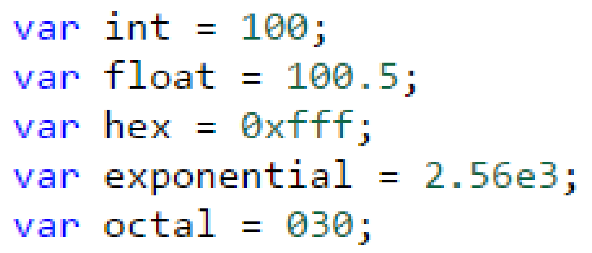
charAt()	Returns the character at a specified index (position)
charCodeAt()	Returns the Unicode of the character at a specified index
concat()	Returns two or more joined strings
endsWith()	Returns if a string ends with a specified value
fromCharCode()	Returns Unicode values as characters
includes()	Returns if a string contains a specified value
indexOf()	Returns the index (position) of the first occurrence of a value in a string
lastIndexOf()	Returns the index (position) of the last occurrence of a value in a string
localeCompare()	Compares two strings in the current locale
match()	Searches a string for a value, or a regular expression, and returns the matches
repeat()	Returns a new string with a number of copies of a string
replace()	Searches a string for a value, or a regular expression, and returns a string where the values are replaced
search()	Searches a string for a value, or regular expression, and returns the index (position) of the match
slice()	Extracts a part of a string and returns a new string
split()	Splits a string into an array of substrings
startsWith()	Checks whether a string begins with specified characters
substr()	Extracts a number of characters from a string, from a start index (position)
substring()	Extracts characters from a string, between two specified indices (positions)
toLocaleLowerCase()	Returns a string converted to lowercase letters, using the host's locale
toLocaleUpperCase()	Returns a string converted to uppercase letters, using the host's locale
toLowerCase()	Returns a string converted to lowercase letters
toString()	Returns a string or a string object as a string
toUpperCase()	Returns a string converted to uppercase letters
trim()	Returns a string with removed whitespaces
valueOf()	Returns the primitive value of a string or a string object

Javascript datatypes: Number

Number type represents integer, float, hexadecimal, octal or exponential value.

First character in a Number type must be an integer value

It must not be enclosed in quotation marks.



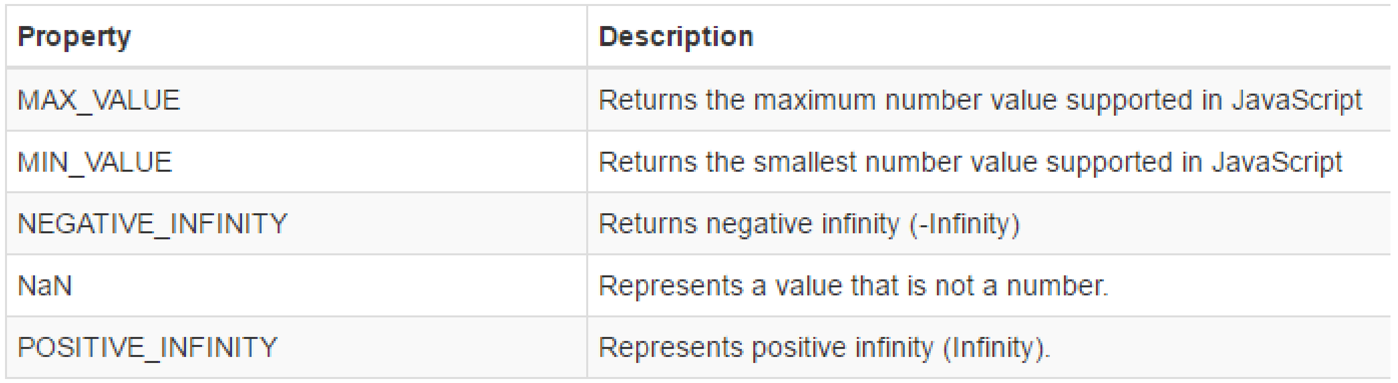
```
var int = 100;
var float = 100.5;
var hex = 0xfff;
var exponential = 2.56e3;
var octal = 030;
```

Javascript datatypes: Number

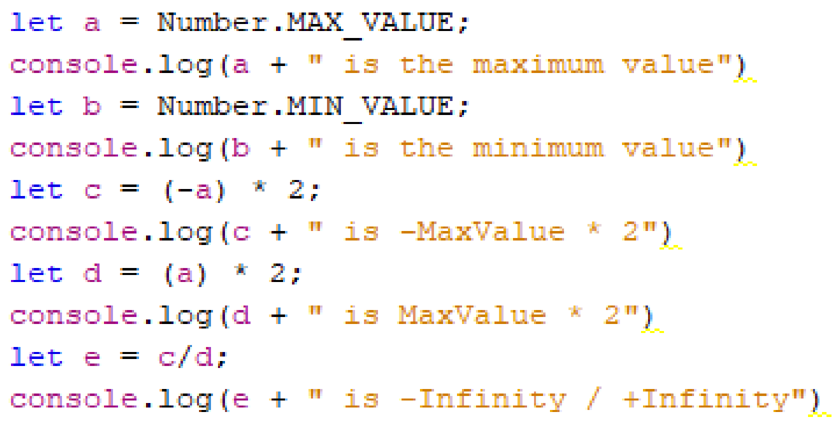
JavaScript also provides Number object which can be used with **new** keyword

```
var hex = new Number(0xfff);
```

The following table lists all the properties of Number type:



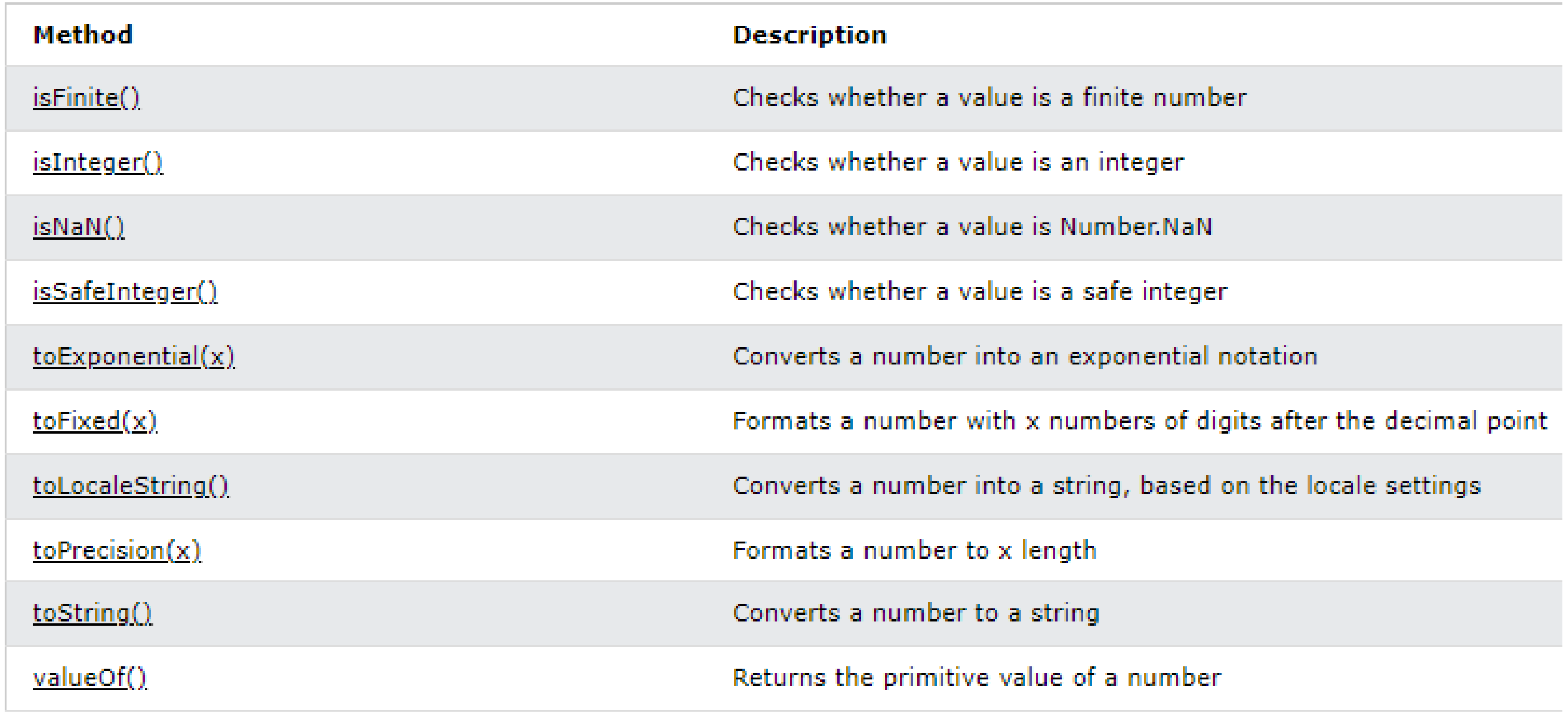
Property	Description
MAX_VALUE	Returns the maximum number value supported in JavaScript
MIN_VALUE	Returns the smallest number value supported in JavaScript
NEGATIVE_INFINITY	Returns negative infinity (-Infinity)
NaN	Represents a value that is not a number.
POSITIVE_INFINITY	Represents positive infinity (Infinity).



```
let a = Number.MAX_VALUE;
console.log(a + " is the maximum value")
let b = Number.MIN_VALUE;
console.log(b + " is the minimum value")
let c = (-a) * 2;
console.log(c + " is -MaxValue * 2")
let d = (a) * 2;
console.log(d + " is MaxValue * 2")
let e = c/d;
console.log(e + " is -Infinity / +Infinity")
```

Javascript datatypes: Number

Number methods: (
https://www.w3schools.com/jsref/jsref_obj_number.asp
)



Method	Description
isFinite()	Checks whether a value is a finite number
isInteger()	Checks whether a value is an integer
isNaN()	Checks whether a value is Number.NaN
isSafeInteger()	Checks whether a value is a safe integer
toExponential(x)	Converts a number into an exponential notation
toFixed(x)	Formats a number with x numbers of digits after the decimal point
toLocaleString()	Converts a number into a string, based on the locale settings
toPrecision(x)	Formats a number to x length
toString()	Converts a number to a string
valueOf()	Returns the primitive value of a number

Javascript datatypes: Boolean

Boolean is a primitive data type in JavaScript. Boolean can have only two values, true or false.

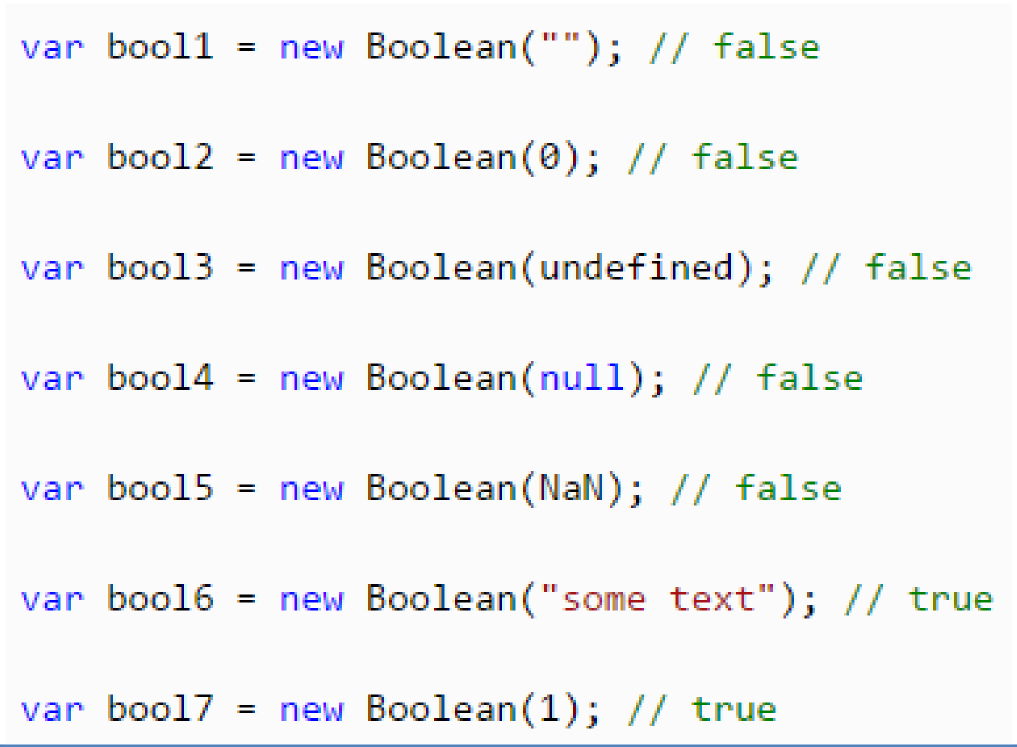
```
var YES = true;
var NO = false;
```

JavaScript includes Boolean object to represent true or false. It can be initialized using **new** keyword.

```
var bool = new Boolean(true);
alert(bool); // true
```

Javascript datatypes: Boolean

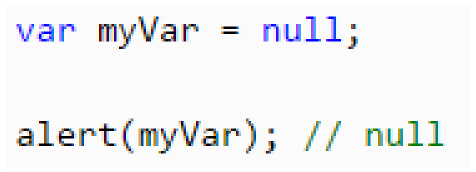
JavaScript treats empty string (""), 0, undefined, NaN and null as false. Everything else is true.



```
var bool1 = new Boolean(""); // false

var bool2 = new Boolean(0); // false

var bool3 = new Boolean(undefined); // false

var bool4 = new Boolean(null); // false

var bool5 = new Boolean(NaN); // false

var bool6 = new Boolean("some text"); // true

var bool7 = new Boolean(1); // true
```

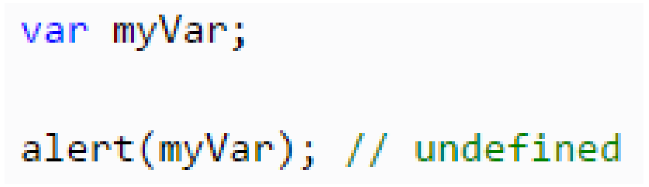
Javascript datatypes: Null and undefined

A null means absence of a value. It means we have defined a variable but have not assigned any value yet, so value is absence.



```
var myVar = null;

alert(myVar); // null
```

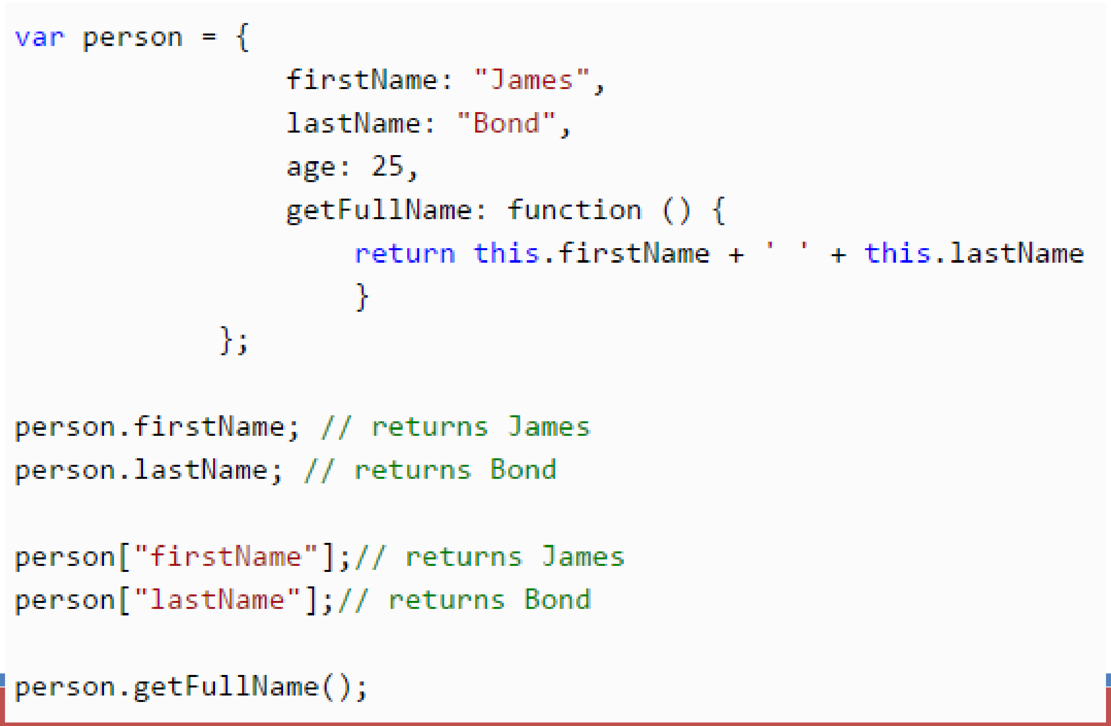
A variable or an object has an undefined value when no value is assigned before using it. Undefined means lack of value or unknown value.



```
var myVar;

alert(myVar); // undefined
```

Javascript datatypes: Object

- Object is a non-primitive data type in JavaScript.
- An object holds multiple values in terms of properties and methods.
  - Properties can hold values of primitive data types
  - Methods are functions.



```
var person = {
                firstName: "James",
                lastName: "Bond",
                age: 25,
                getFullName: function () {
                    return this.firstName + ' ' + this.lastName
                    }
            };

person.firstName; // returns James
person.lastName; // returns Bond

person["firstName"];// returns James
person["lastName"];// returns Bond

person.getFullName();
```

JavaScript Arithmetic Operators

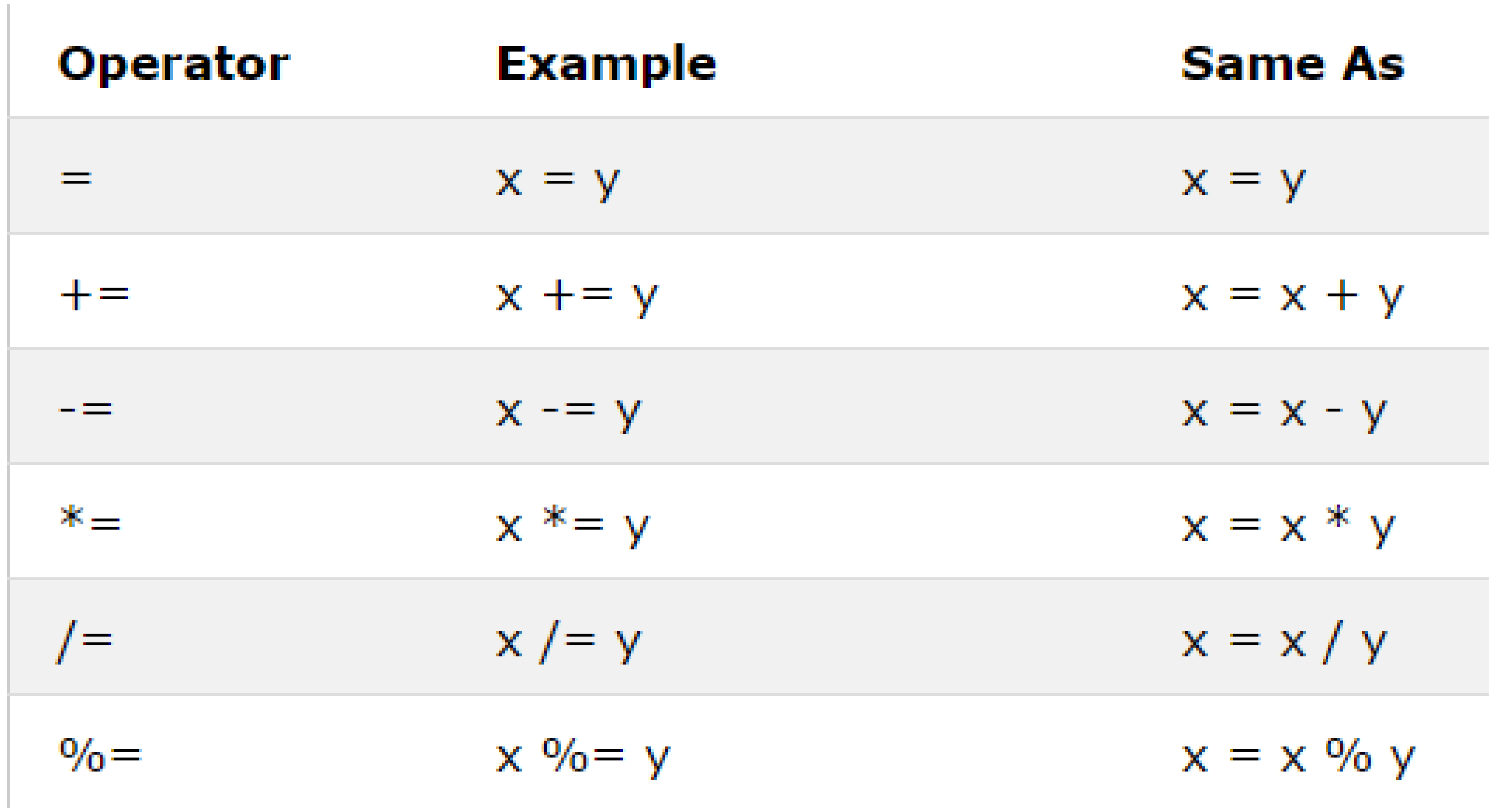
Operator	Description
+	Addition
-	Subtraction
*	Multiplication
/	Division
%	Modulus
++	Increment
--	Decrement

```
var x = 5;
var y = 2;
var z = x % y; //1 --Division remainder
```

```
var a, b;
a = 3;
b = 5;
alert (a);
alert (b);
a = ++b;
alert (a);
alert (b);
```

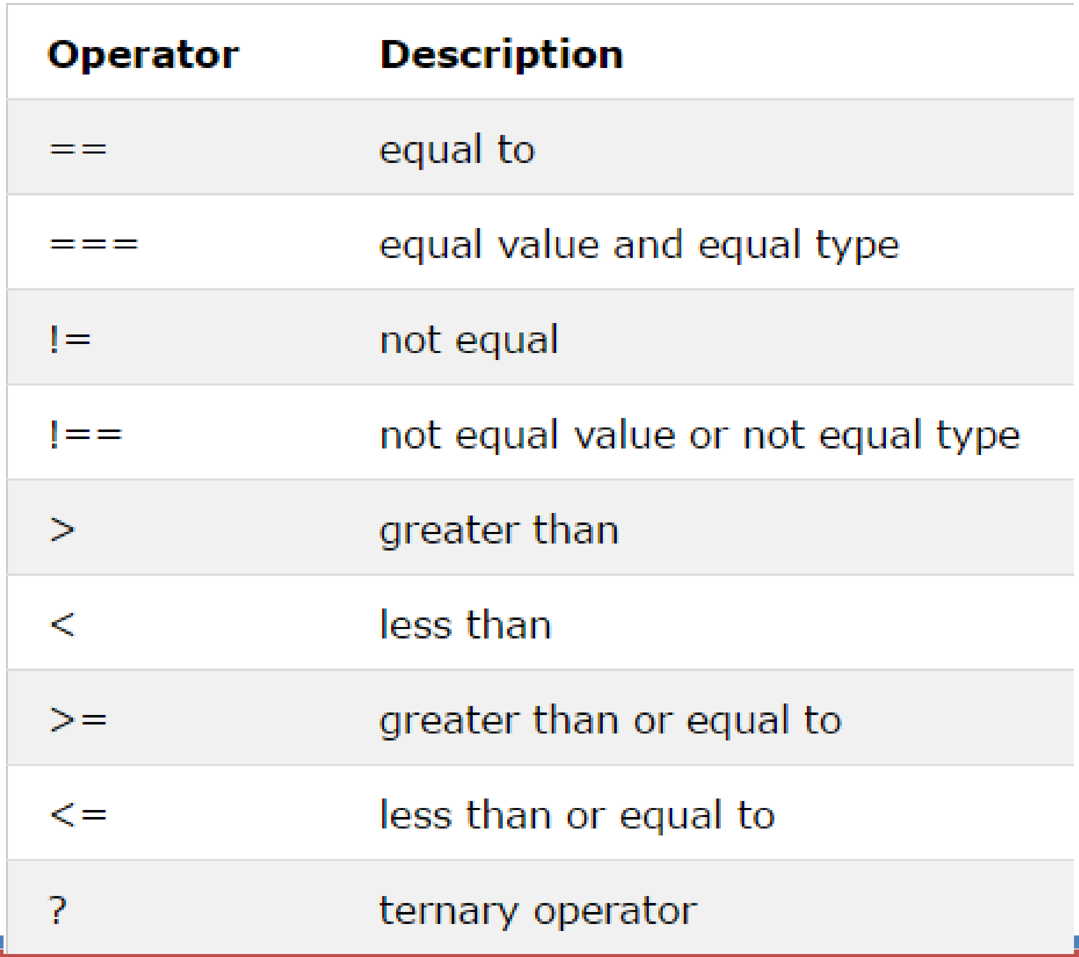
```
a=3;
b=5;
alert (a);
alert (b);
a = b++;
alert (a);
alert (b);
```

JavaScript Assignment Operators



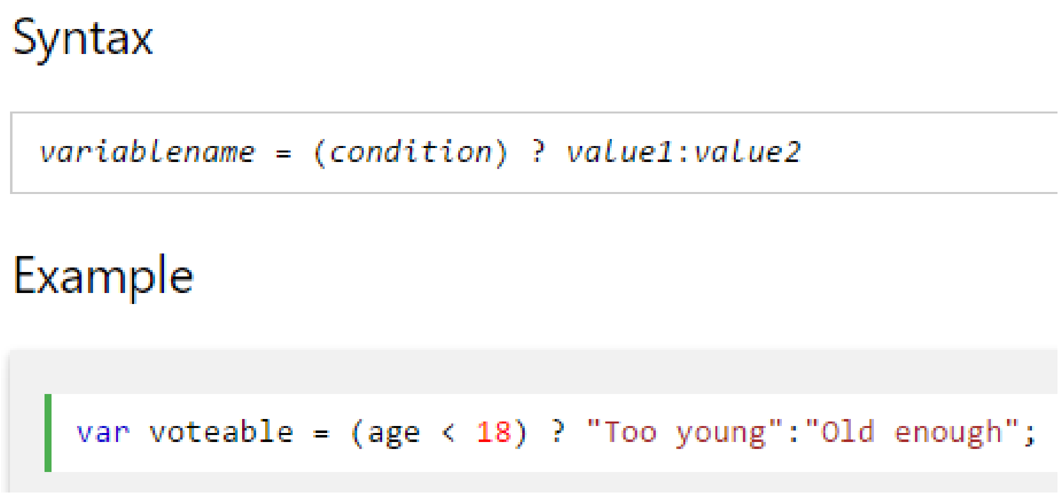
Operator	Example	Same As
=	x = y	x = y
+=	x += y	x = x + y
-=	x -= y	x = x - y
*=	x *= y	x = x * y
/=	x /= y	x = x / y
%=	x %= y	x = x % y

JavaScript Comparison Operators



Operator	Description
==	equal to
===	equal value and equal type
!=	not equal
!==	not equal value or not equal type
>	greater than
<	less than
>=	greater than or equal to
<=	less than or equal to
?	ternary operator

Ternary operator:



Syntax

```
variablename = (condition) ? value1:value2
```

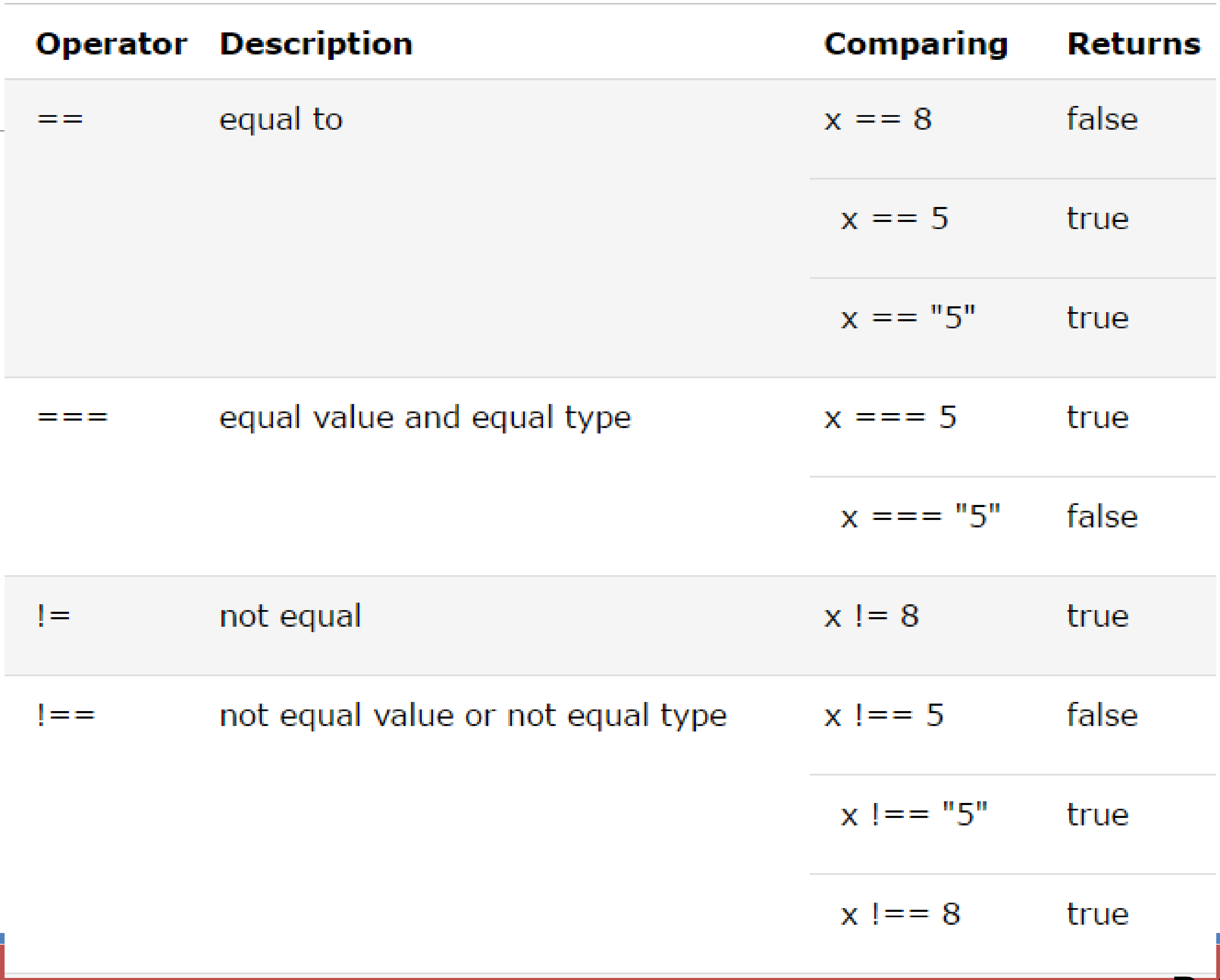
Example

```
var voteable = (age < 18) ? "Too young":"Old enough";
```

JavaScript Comparison Operators: Example

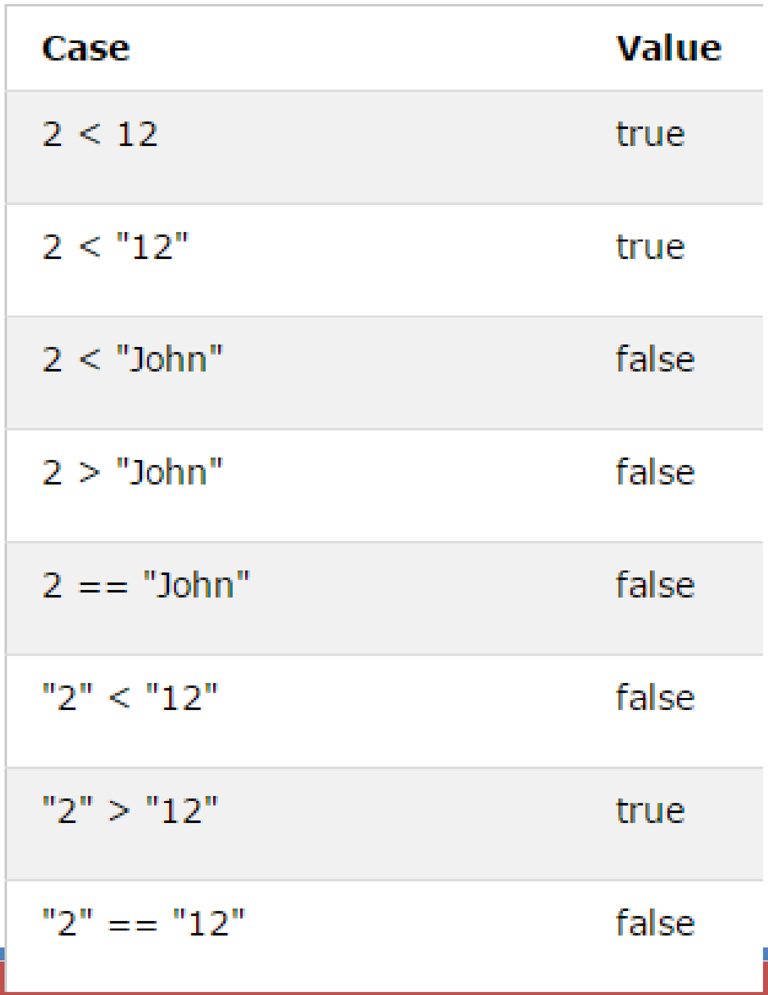
Use three equals unless you fully understand the conversions that take place for two-equals:

Given that **x = 5:**



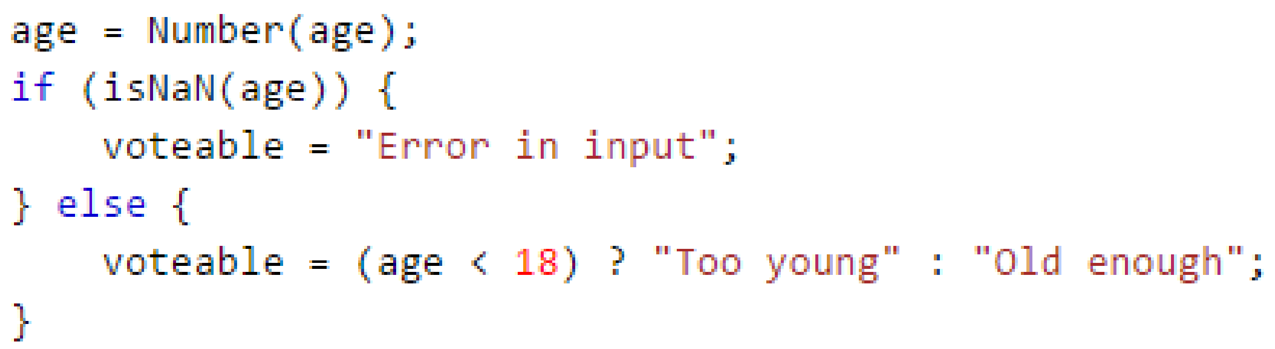
Operator	Description	Comparing	Returns
==	equal to	x == 8	false
		x == 5	true
		x == "5"	true
===	equal value and equal type	x === 5	true
		x === "5"	false
!=	not equal	x != 8	true
!==	not equal value or not equal type	x !== 5	false
		x !== "5"	true
		x !== 8	true

JavaScript Comparison Operators: Example



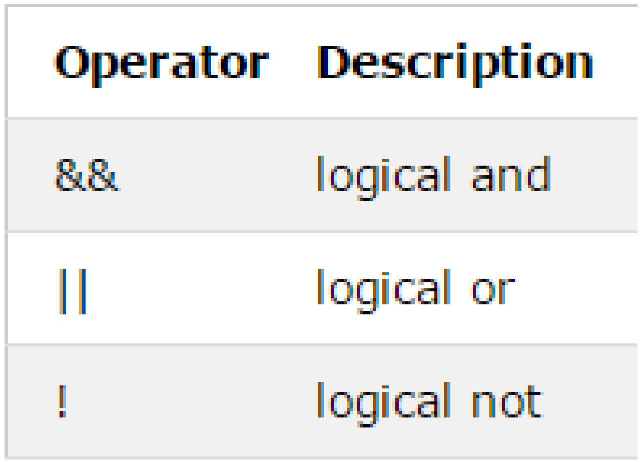
Case	Value
2 < 12	true
2 < "12"	true
2 < "John"	false
2 > "John"	false
2 == "John"	false
"2" < "12"	false
"2" > "12"	true
"2" == "12"	false

To secure a proper result, variables should be converted to the proper type before comparison:



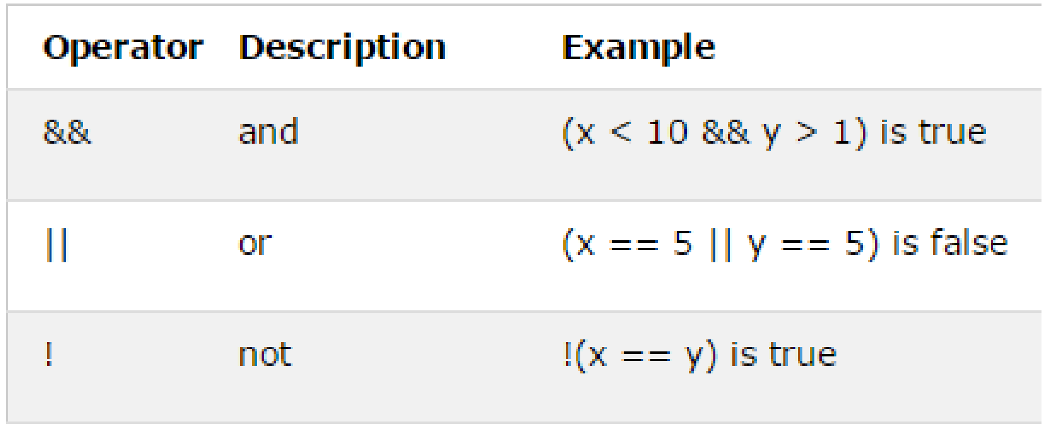
```
age = Number(age);
if (isNaN(age)) {
    voteable = "Error in input";
} else {
    voteable = (age < 18) ? "Too young" : "Old enough";
}
```

JavaScript Logical Operators



Operator	Description
&&	logical and
||	logical or
!	logical not

Example: Given that **x = 6** and **y = 3**



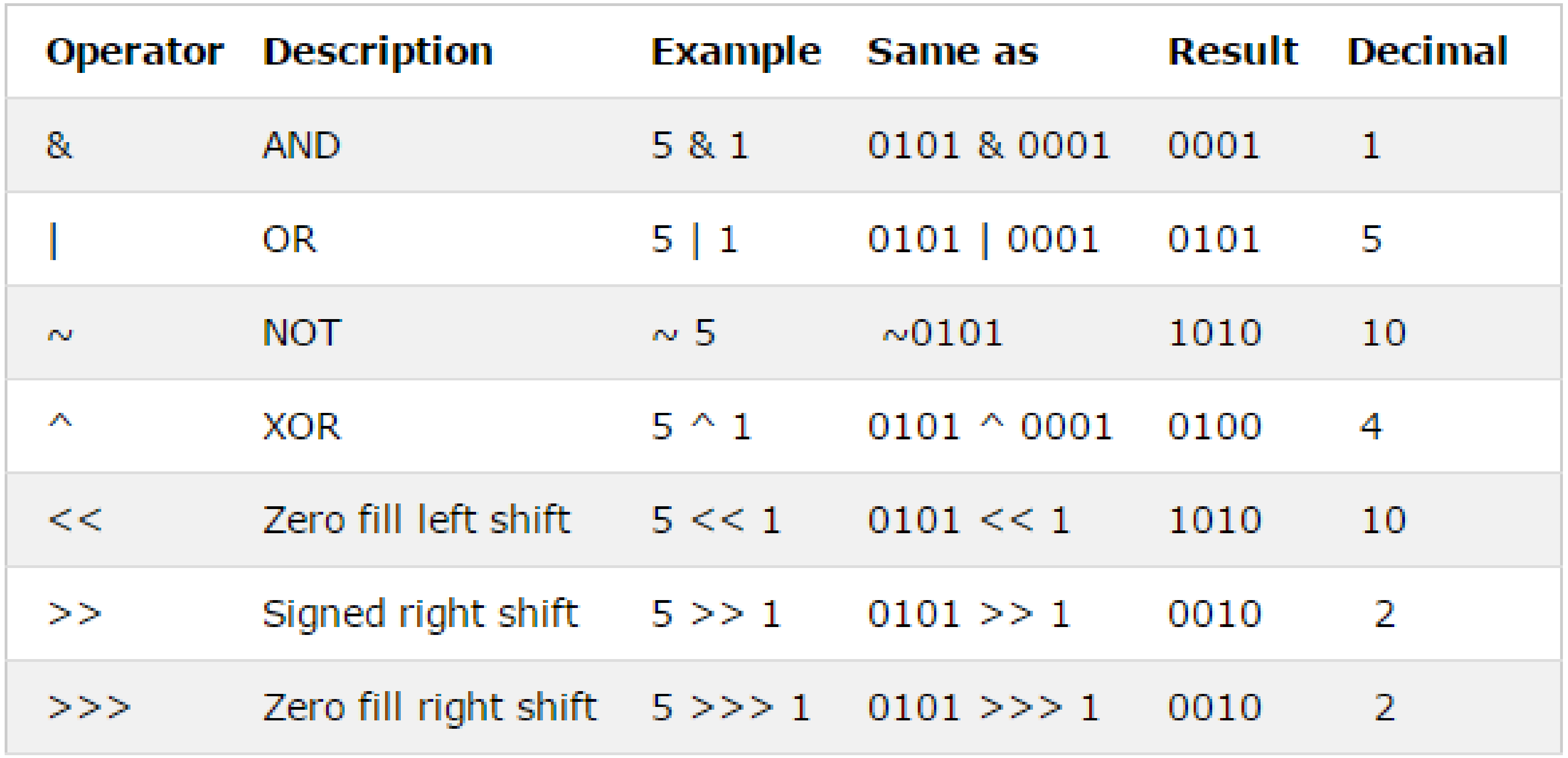
Operator	Description	Example
&&	and	(x < 10 && y > 1) is true
||	or	(x == 5 || y == 5) is false
!	not	!(x == y) is true

JavaScript Type Operators

Operator	Description
typeof	Returns the type of a variable
instanceof	Returns true if an object is an instance of an object type

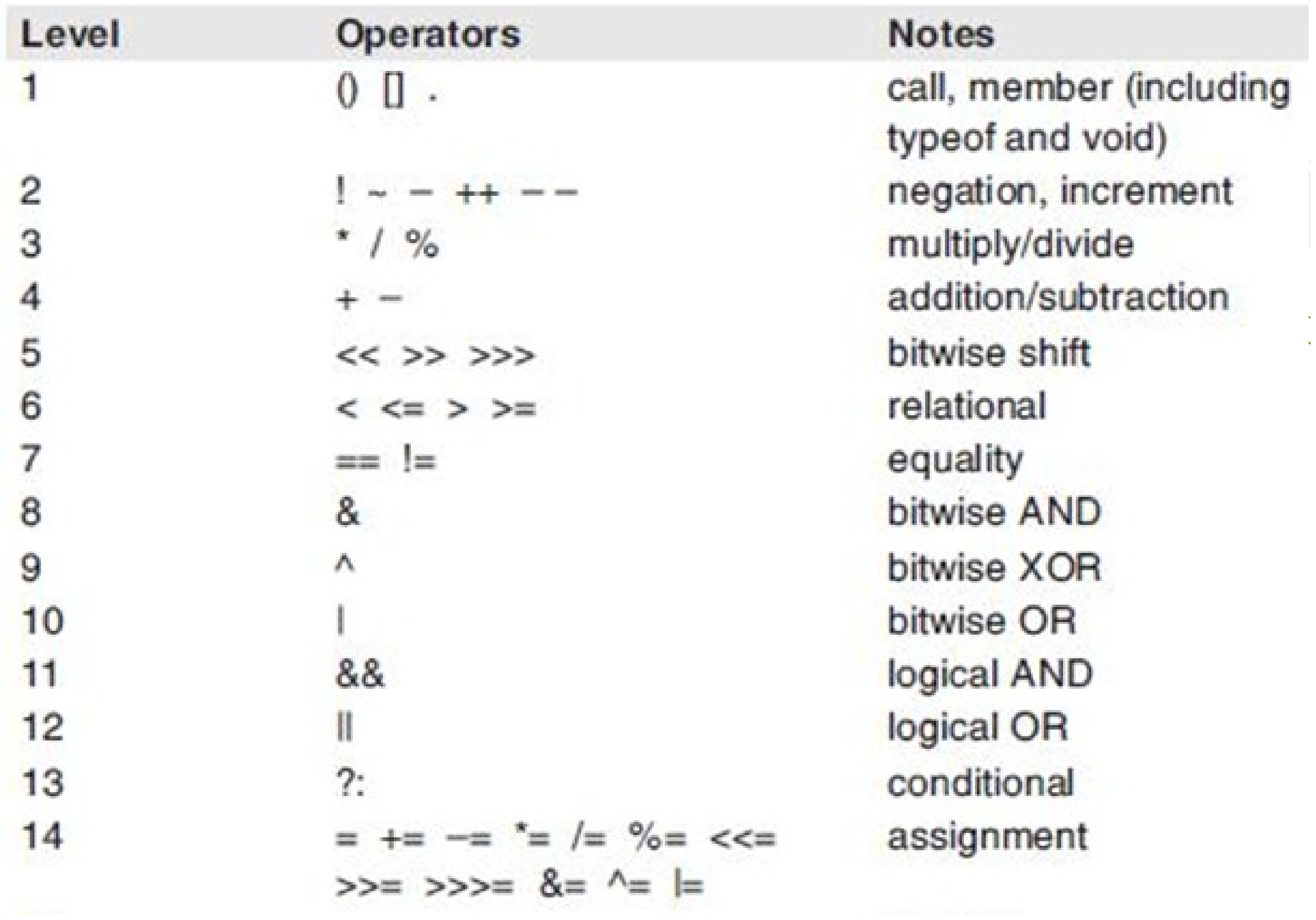
```
typeof "John"                 // Returns "string"
typeof 3.14                   // Returns "number"
typeof NaN                    // Returns "number"
typeof false                  // Returns "boolean"
typeof [1,2,3,4]              // Returns "object"
typeof {name:'John', age:34}  // Returns "object"
typeof new Date()             // Returns "object"
typeof function () {}         // Returns "function"
typeof myCar                  // Returns "undefined"
typeof null                   // Returns "object"
```

JavaScript Bitwise Operators



Operator	Description	Example	Same as	Result	Decimal
&	AND	5 & 1	0101 & 0001	0001	1
|	OR	5 | 1	0101 | 0001	0101	5
~	NOT	~ 5	~0101	1010	10
^	XOR	5 ^ 1	0101 ^ 0001	0100	4
<<	Zero fill left shift	5 << 1	0101 << 1	1010	10
>>	Signed right shift	5 >> 1	0101 >> 1	0010	2
>>>	Zero fill right shift	5 >>> 1	0101 >>> 1	0010	2

JavaScript operator precedence values



Level	Operators	Notes
1	() [] .	call, member (including typeof and void)
2	! ~ − ++ −−	negation, increment
3	* / %	multiply/divide
4	+ −	addition/subtraction
5	<< >> >>>	bitwise shift
6	< <= > >=	relational
7	== !=	equality
8	&	bitwise AND
9	^	bitwise XOR
10	|	bitwise OR
11	&&	logical AND
12	||	logical OR
13	?:	conditional
14	= += −= *= /= %= <<= >>= >>>= &= ^= |=	assignment

Type conversion

JavaScript variables can be converted to a new variable and another data type:

- By the use of a JavaScript function (Explicit)
- **Automatically** by JavaScript itself (Implicit)

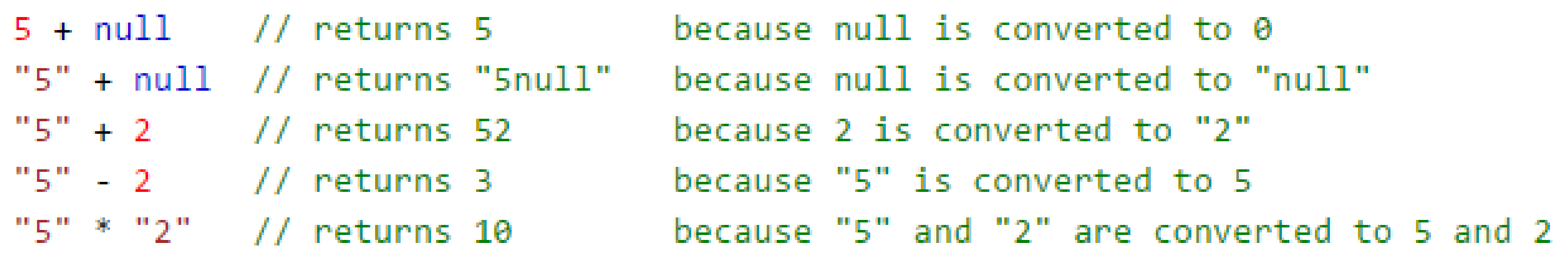
Automatic type conversion happens in many cases. In most cases it is somewhat logical, in others you either need to know exactly what you're doing or you need to do an explicit type conversion.

Implicit Type conversion

Automatic conversion using arithmetic operators:

+ operator: If any of the operands of the addition is an string, Javascript will try to convert the other operand into an string too.

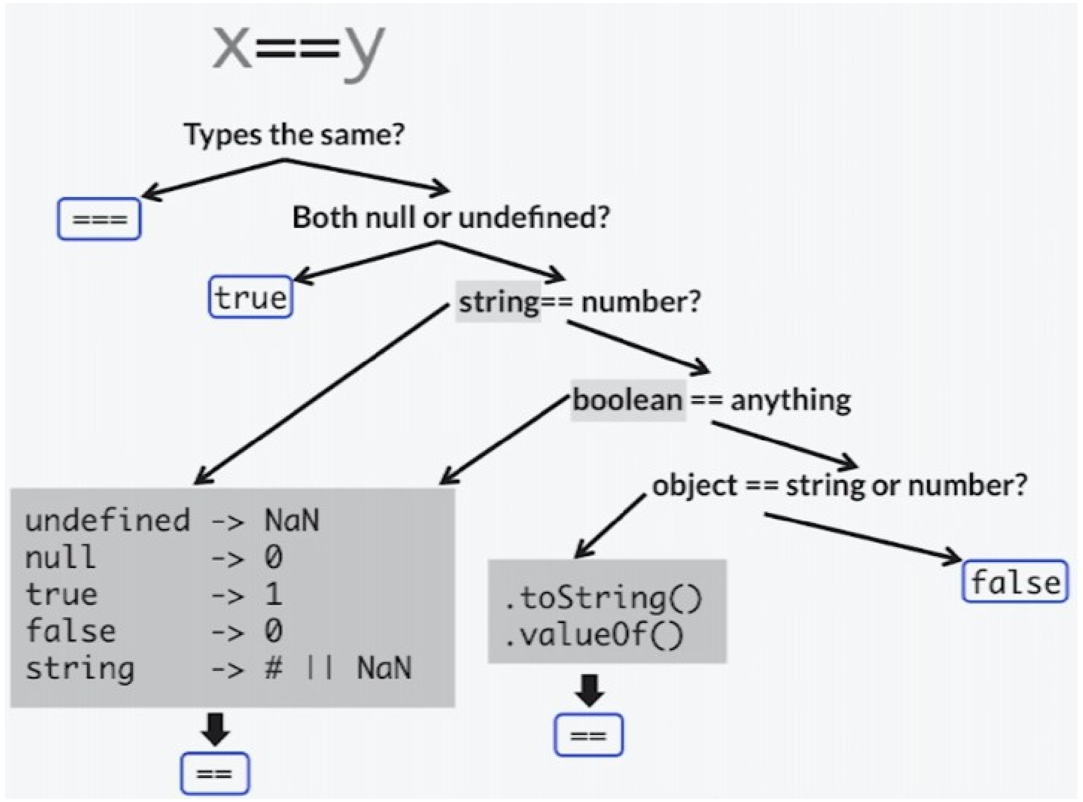
Any other arithmetic operator: If any of the operands of the operation is an string, Javascript will try to convert it into a number. If this is not posible, it would take value NaN.



```
5 + null    // returns 5         because null is converted to 0
"5" + null  // returns "5null"   because null is converted to "null"
"5" + 2     // returns 52        because 2 is converted to "2"
"5" - 2     // returns 3         because "5" is converted to 5
"5" * "2"   // returns 10        because "5" and "2" are converted to 5 and 2
```

Implicit Type conversion

Automatic conversion with operator ==:

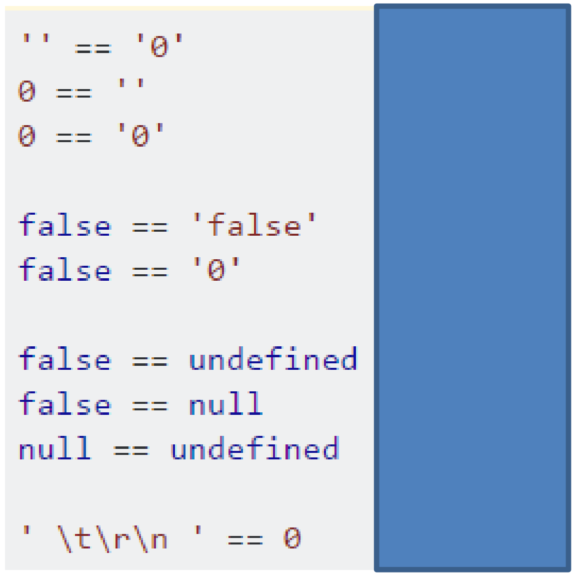


```
undefined -> NaN
null      -> 0
true      -> 1
false     -> 0
string    -> # || NaN
```

- true gets value 1 within a == comparison
- false gets value 0 within a == comparison
- When comparing an string with a number, Javascript tries to convert the string into a decimal or an hexadecimal number. If this is not posible, it would take value NaN except for the empty string, that becomes a 0.

Implicit Type conversión

Some interesting cases…



```
'' == '0'
0 == ''
0 == '0'

false == 'false'
false == '0'

false == undefined
false == null
null == undefined

' \t\r\n ' == 0
```

```
"0" == true
"0.1e1" == true
```

Explicit type conversion

The global method **String()** convert different objects to strings:

```
String(x)          // returns a string from a number variable x
String(123)        // returns a string from a number literal 123
String(100 + 23)   // returns a string from a number from an expression
String(false)        // returns "false"
String(true)         // returns "true"
String(Date())      // returns "Thu Jul 17 2014 15:38:19 GMT+0200 (W. Europe Daylight Time)"
```

The toString() method returns the value of a String object.

```
x.toString()
(123).toString()
(100 + 23).toString()
false.toString()     // returns "false"
true.toString()      // returns "true"
Date().toString()
(15).toString(2) // returns "1111‶ → Converts to binary value
(15).toString(16) // returns "f‶ → Converts to hexadecimal value
```

Explicit type conversion

The global method **Number()** can convert different objects to numbers

```
Number("3.14")    // returns 3.14
Number(" ")       // returns 0
Number("")        // returns 0
Number("99 88")   // returns NaN
Number(false)     // returns 0
Number(true)      // returns 1
d = new Date();
Number(d)          // returns 1404568027739
```

```
Number("2"+2) // returns 22
Number("2")+2 // returns 4
```

Explicit type conversion

The global method **Boolean()** can convert different objects to booleans

Everything With a "Real" Value is True

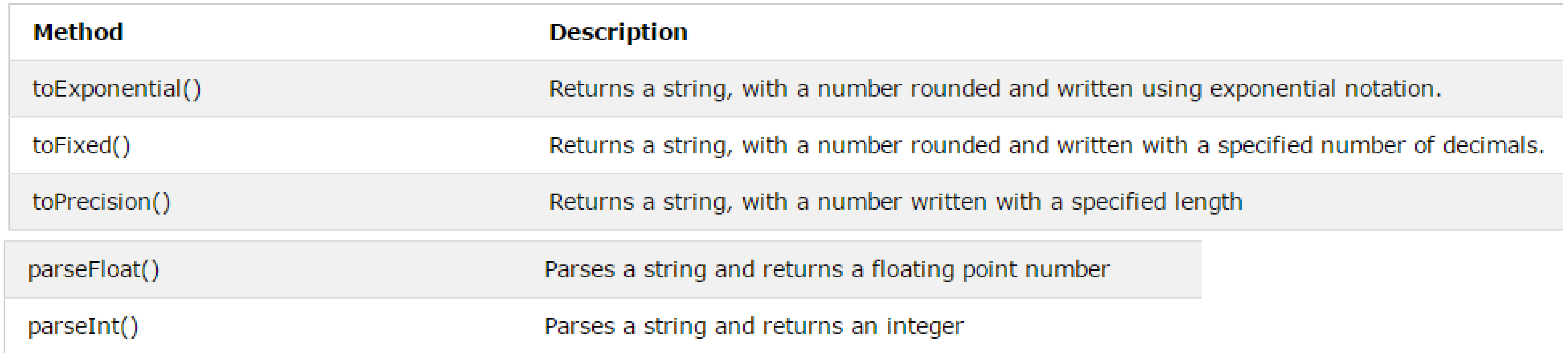
```
var b1 = Boolean(100);  //true
var b2 = Boolean(3.14);  //true
var b3 = Boolean(-15);  //true
var b4 = Boolean("Hello");  //true
var b5 = Boolean('false');  //true
var b6 = Boolean(1 + 7 + 3.14);  //true
```

Everything Without a "Real" Value is False

```
var b1 = Boolean(0);  //false
var b2 = Boolean(-0);  //false
var b3 = Boolean('');  //false
var b4 = Boolean(undefined);  //false
var b5 = Boolean(null);  //false
var b6 = Boolean(false);  //false
var b7 = Boolean(10 / "H");  //false  --> Es NaN
```

Explicit type conversion

The toString() method returns the value of a String object.



Method	Description
toExponential()	Returns a string, with a number rounded and written using exponential notation.
toFixed()	Returns a string, with a number rounded and written with a specified number of decimals.
toPrecision()	Returns a string, with a number written with a specified length
parseFloat()	Parses a string and returns a floating point number
parseInt()	Parses a string and returns an integer

Examples:

```
parseInt("38.5kilos") // returns 38
parseFloat('38.5kilos') // returns 38.5
```