JS - 103

0. Intro to ECMA versions (5 to 6)
1. Let & const
2. Template strings
3. Arrow functions
4. Destructuring
5. Spread operator
6. ES5 prototypes and ES6 classes

0. ES5 & ES6

EcmaScript is a scripting-language specification standarized by Ecma International created in order to standarize Javascript.

Created by Brendan Eich of NetScape.

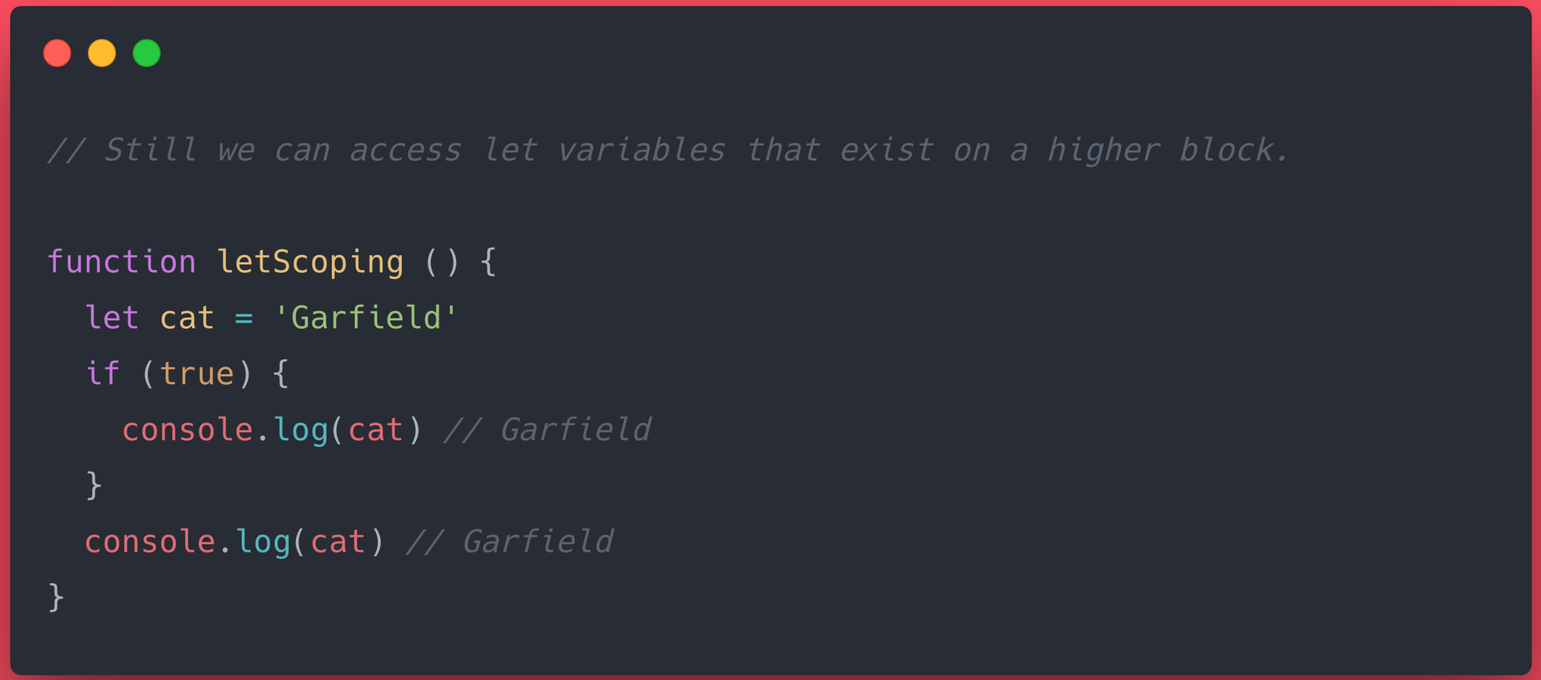
First version from 1997!

2015 -> ES6 with new features! 🎉🎉

1. let and const

```
// Let and const are never globally registered, which means they don't create
// properties of the window object when declared globally.

var human = 'Jon'
let dog = 'Odie'
const cat = 'Garfield'

console.log(this.human) // Jon
console.log(this.dog) // undefined
console.log(this.cat) // undefined
```

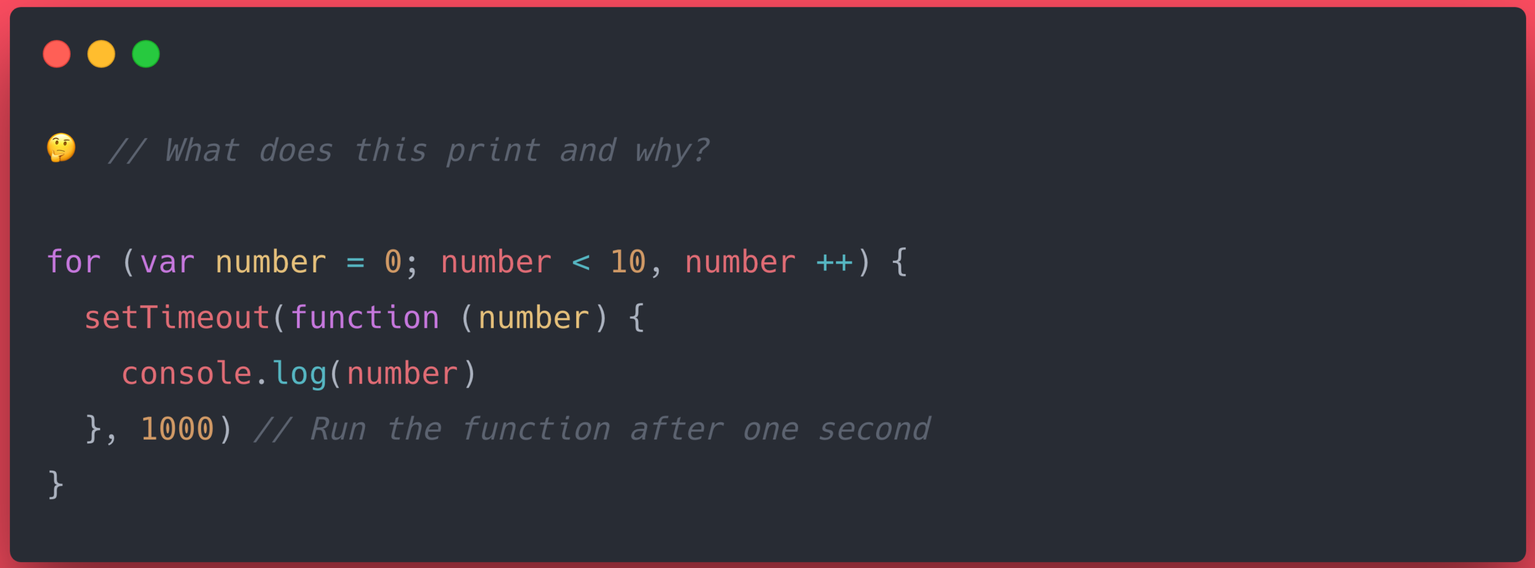
```
// let is blocked scoped (that means that let doesn't care about local or
// global, it just cares about the {block} it is declared within). They are
// never globally registered.

function letScoping () {
  let cat = 'Garfield'
  if (true) {
    let cat = 'Snowball II'
    console.log(cat) // Snowball II
  }
  console.log(cat) // Garfield
}

// VS.

function varScoping () {
  var cat = 'Garfield'
  if (true) {
    var cat = 'Snowball II' // Same variable!
    console.log(cat) // Snowball II
  }
  console.log(cat) 🤔  // Snowball II
}
```

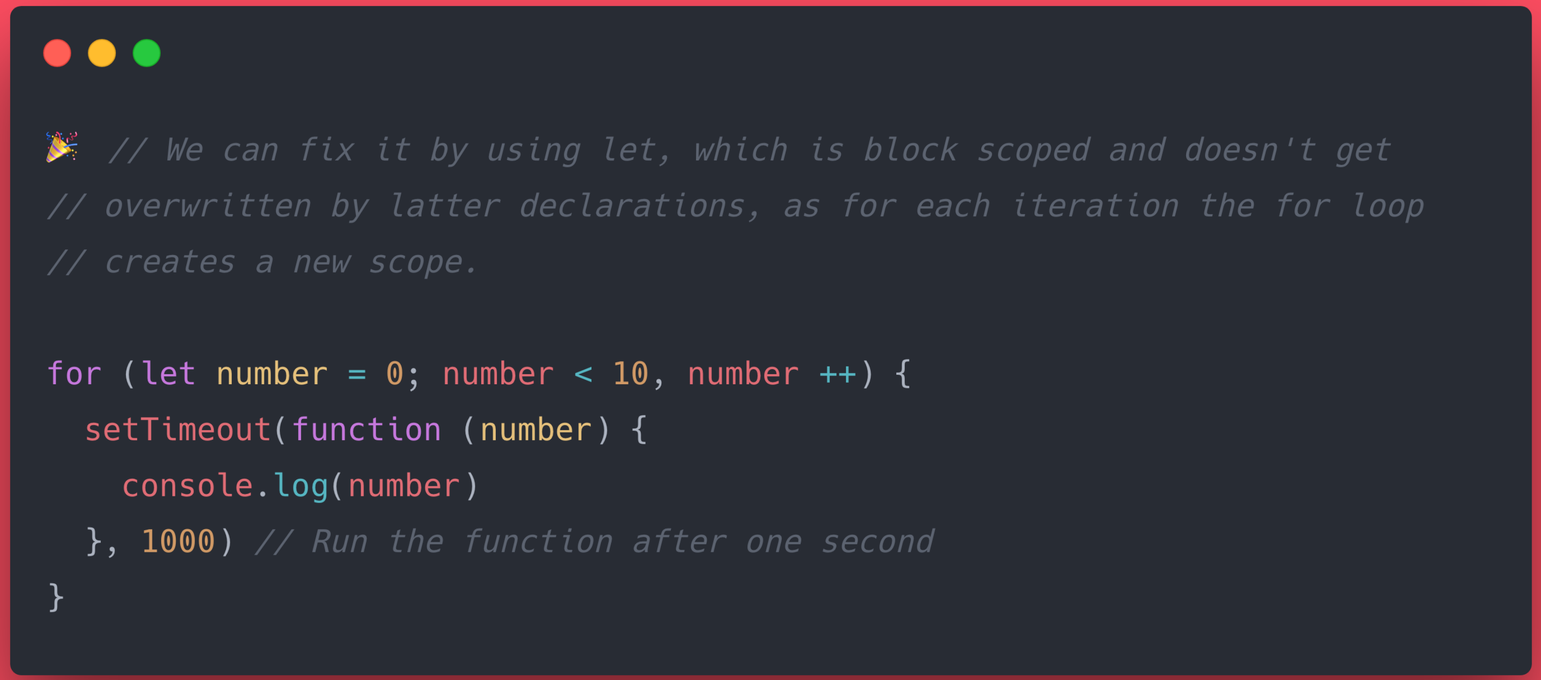


```
// Still we can access let variables that exist on a higher block.

function letScoping () {
  let cat = 'Garfield'
  if (true) {
    console.log(cat) // Garfield
  }
  console.log(cat) // Garfield
}
```

```
🤔 // Will this work?

function getHuman (petName) {
  switch (petName) {
    case 'Garfield':
      let human = 'Jon'
      break
    case 'Cheshire':
      let human = 'Alice'
      break
    default
      let human = ''
      break
  }
  return human
}
```

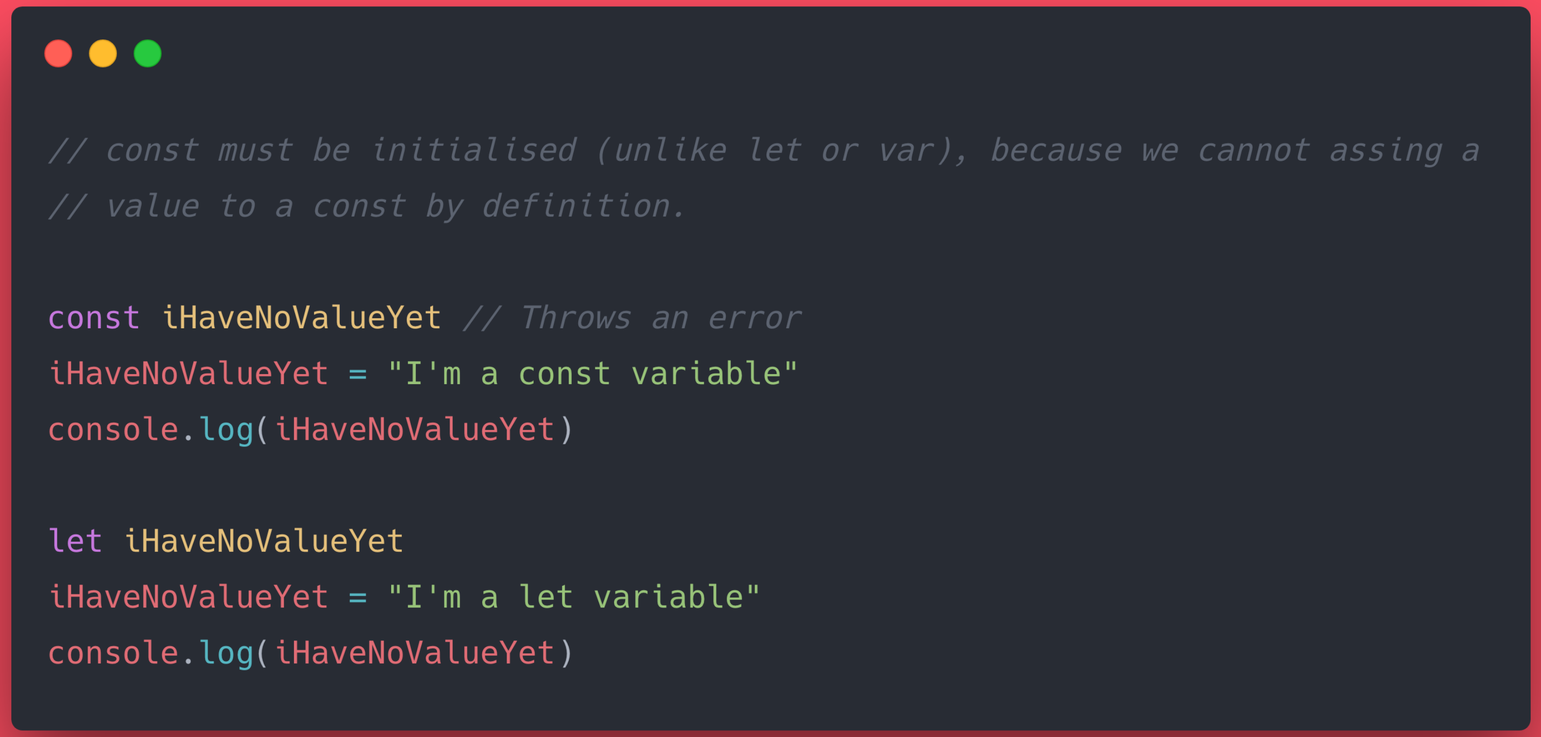
```
🎉 // We can fix it by declaring new scopes inside the cases.

function getHuman (petName) {
  switch (petName) {
    case 'Garfield': {
      let human = 'Jon'
      break
    }
    case 'Cheshire': {
      let human = 'Alice'
      break
    }
    default {
      let human = ''
      break
    }
  }
  return human
}
```


🤔 // What does this print and why?
for (var number = 0; number < 10, number ++) {
setTimeout(function (number) {
console.log(number)
}, 1000) // Run the function after one second
}


🎉 // We can fix it by using let, which is block scoped and doesn't get
// overwritten by latter declarations, as for each iteration the for loop
// creates a new scope.
for (let number = 0; number < 10, number ++) {
setTimeout(function (number) {
console.log(number)
}, 1000) // Run the function after one second
}

```
// const is used to create variables that cannot be reassigned. It's used
// for constants or any variable that we want to protect, so it doesn't get
// assigned any other unexpected value.

const API_ENDPOINT = 'https://www.onesait-api-services.com/api/v1/'
const API_KEY = '2ejovPwSdjOHCnG7TuS0Y0KSU1kQRoEO'

function double (numbers) {
  const two = 2
  const doubledNumbers = numbers.map(function (number) {
    return number * two
  })
  return doubledNumbers
}
```

```
// const is block scoped (so is let), so in different scopes we can declare
// variables using let and const using the same name without issues.

function blockScope () {
  const human = 'Jon'
  let dog = 'Oddie'
  const cat = 'Garfield'
  if (true) {
    const human = 'Alice'
    let cat = 'Cheshire'
    console.log(human) // 'Alice'
    console.log(dog) // 'Oddie'
  }
  console.log(cat) // Garfield
}
```

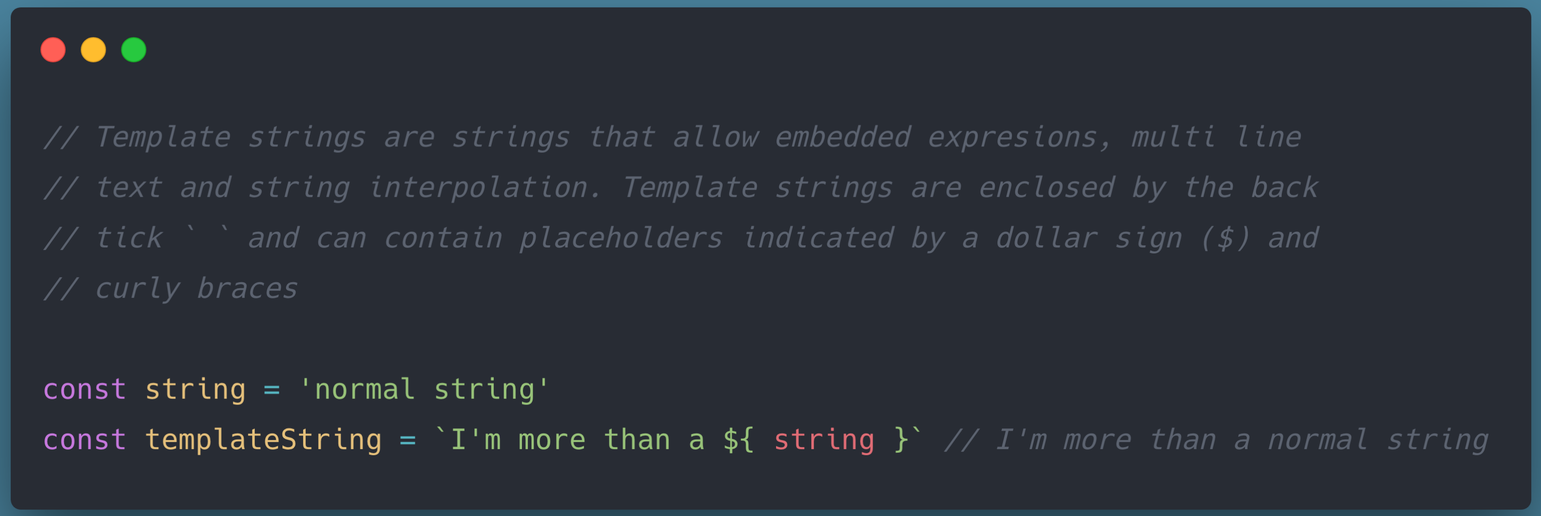


```
// const must be initialised (unlike let or var), because we cannot assing a
// value to a const by definition.

const iHaveNoValueYet // Throws an error
iHaveNoValueYet = "I'm a const variable"
console.log(iHaveNoValueYet)

let iHaveNoValueYet
iHaveNoValueYet = "I'm a let variable"
console.log(iHaveNoValueYet)
```

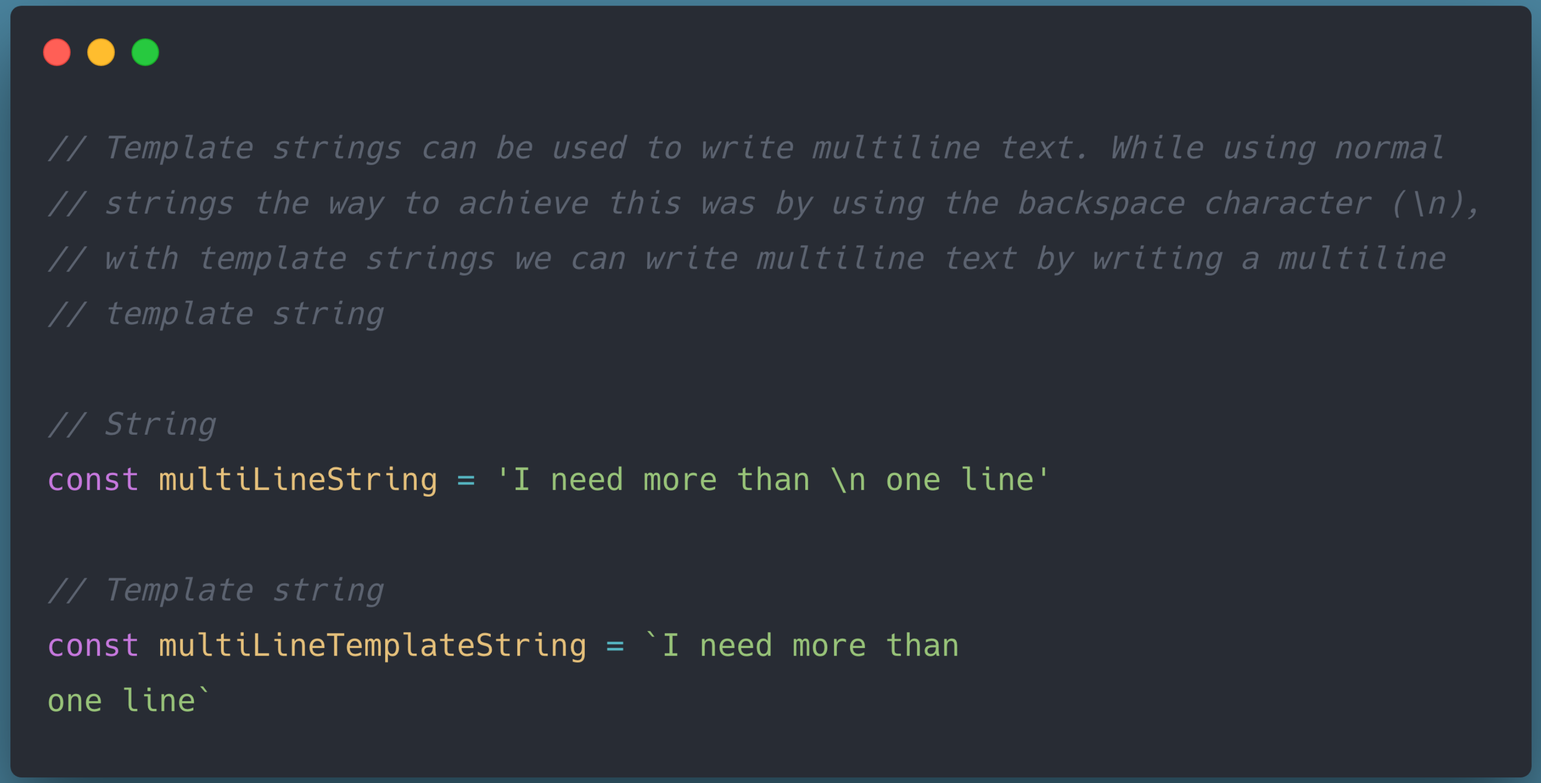
```
// const also works on objects and arrays, so they are protected against re
// assignation, but object key-value pairs and array values are not, and can
// change. Remember, const only protects against reassignation

const house = {
  human: 'Alice',
  cat: 'Cheshire'
}

// Attempting to reassign the object throws an error
house = {
  human: 'Jon',
  cat: 'Garfield'
}

// However we can change the values
house.human = 'Jon'
house.cat = 'Garfield'
house.dog = 'Oddie' // Even assign new key-value pairs
```

```
// It works the same way with arrays

const cats = ['Cheshire', 'Garfield']

// Attempting to reassign the array throws an error
cats = ['Snowball II', 'Cheshire', 'Garfield']

// However we can add new values
cats.push('Snowball II')
```

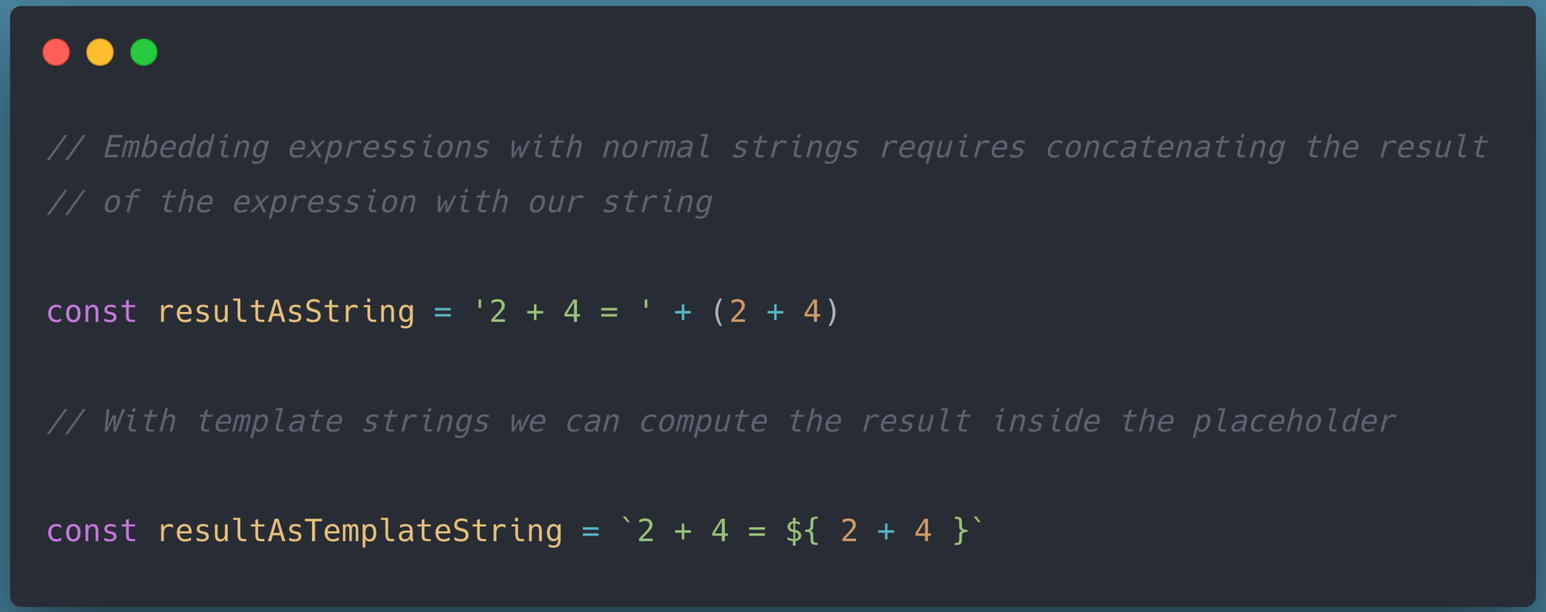
2. template strings



```
// Template strings are strings that allow embedded expresions, multi line
// text and string interpolation. Template strings are enclosed by the back
// tick ` ` and can contain placeholders indicated by a dollar sign ($) and
// curly braces

const string = 'normal string'
const templateString = `I'm more than a ${ string }` // I'm more than a normal string
```



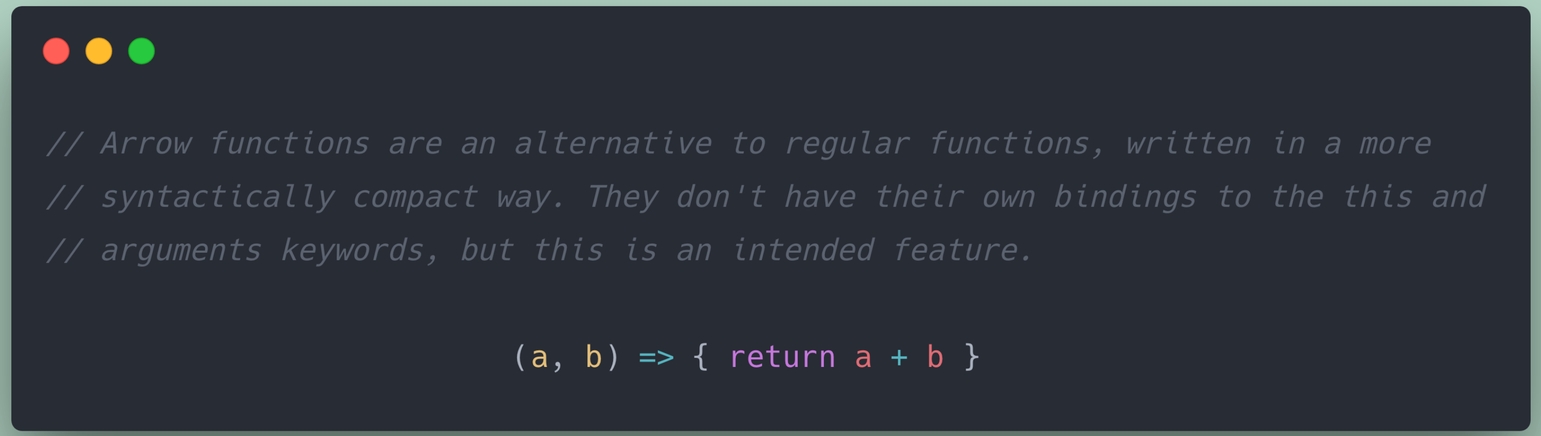
```
// Template strings can be used to write multiline text. While using normal
// strings the way to achieve this was by using the backspace character (\n),
// with template strings we can write multiline text by writing a multiline
// template string

// String
const multiLineString = 'I need more than \n one line'

// Template string
const multiLineTemplateString = `I need more than
one line`
```

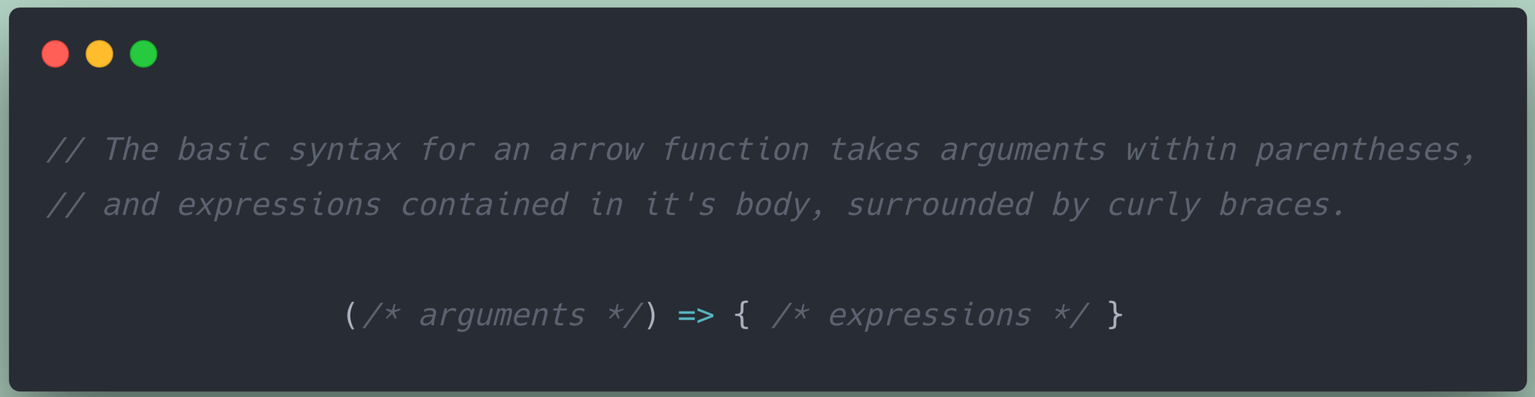


```
// Embedding expressions with normal strings requires concatenating the result
// of the expression with our string

const resultAsString = '2 + 4 = ' + (2 + 4)

// With template strings we can compute the result inside the placeholder

const resultAsTemplateString = `2 + 4 = ${ 2 + 4 }`
```

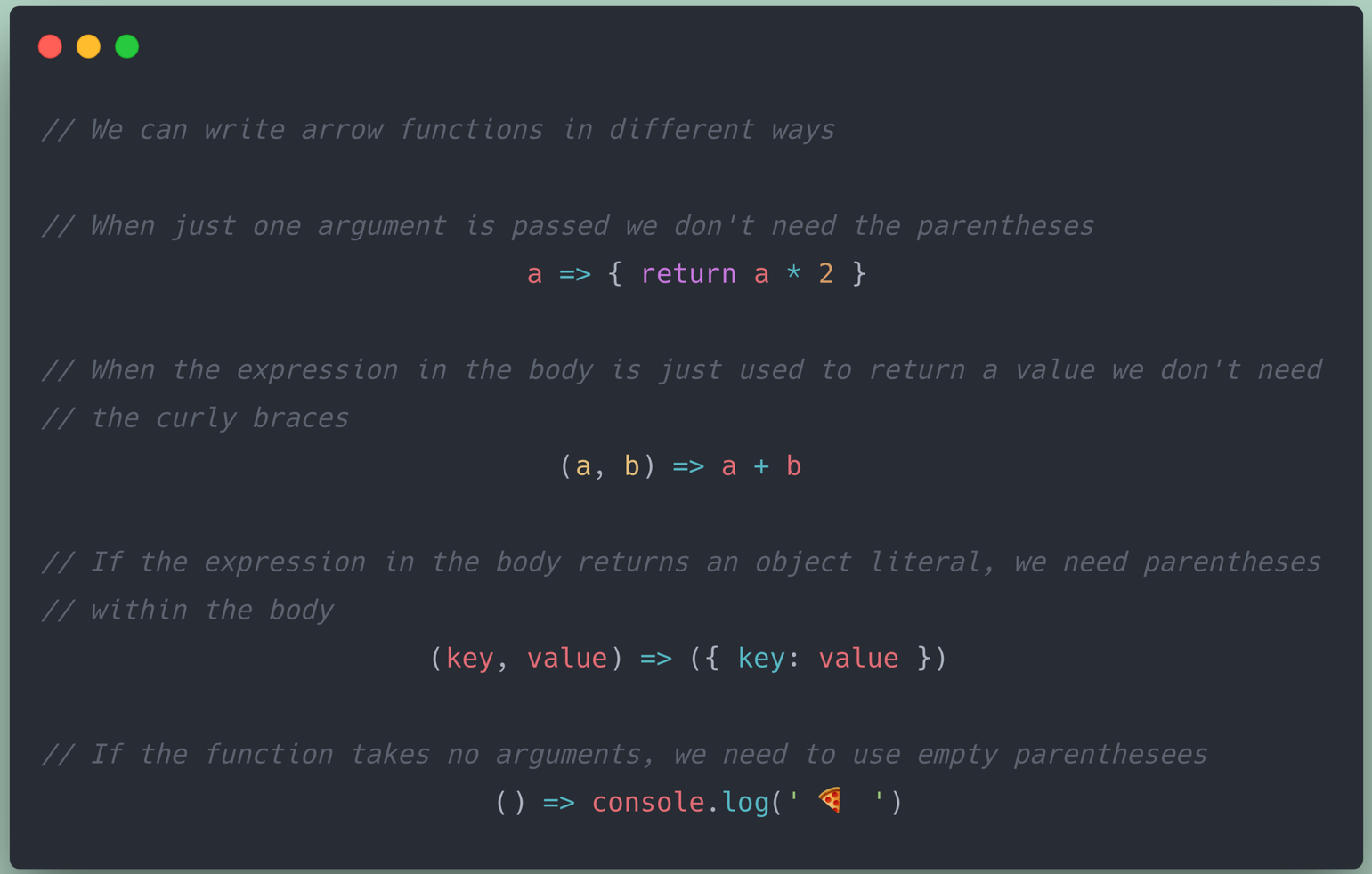
```
// A more advanced type of template strings is tagged templates, which allow us
// to parse template strings with a function. This function takes as the first
// argument a list of the normal strings contained in the template and the
// remaining arguments are the result of the expressions. They can return anything.

const house = {
  human: 'Jon',
  pets: ['Garfield', 'Oddie', 'Bird']
}

function pets (strings, name, pets) {

  let petCount = pets.length

  if (petCount > 2) {
    petCount = 'too many'
  }

  return `${name}${strings[1]}${petCount}${strings[2]}`
}

// This yields: Jon has too many pets
const result = pets`${house.human} has ${house.pets} pets`
```

3. arrow functions


// Arrow functions are an alternative to regular functions, written in a more
// syntactically compact way. They don't have their own bindings to the this and
// arguments keywords, but this is an intended feature.
(a, b) => { return a + b }



```
// The basic syntax for an arrow function takes arguments within parentheses,
// and expressions contained in it's body, surrounded by curly braces.

(/* arguments */) => { /* expressions */ }
```



```
// We can write arrow functions in different ways

// When just one argument is passed we don't need the parentheses
a => { return a * 2 }

// When the expression in the body is just used to return a value we don't need
// the curly braces
(a, b) => a + b

// If the expression in the body returns an object literal, we need parentheses
// within the body
(key, value) => ({ key: value })

// If the function takes no arguments, we need to use empty parenthesees
() => console.log(' 🍕 ')
```

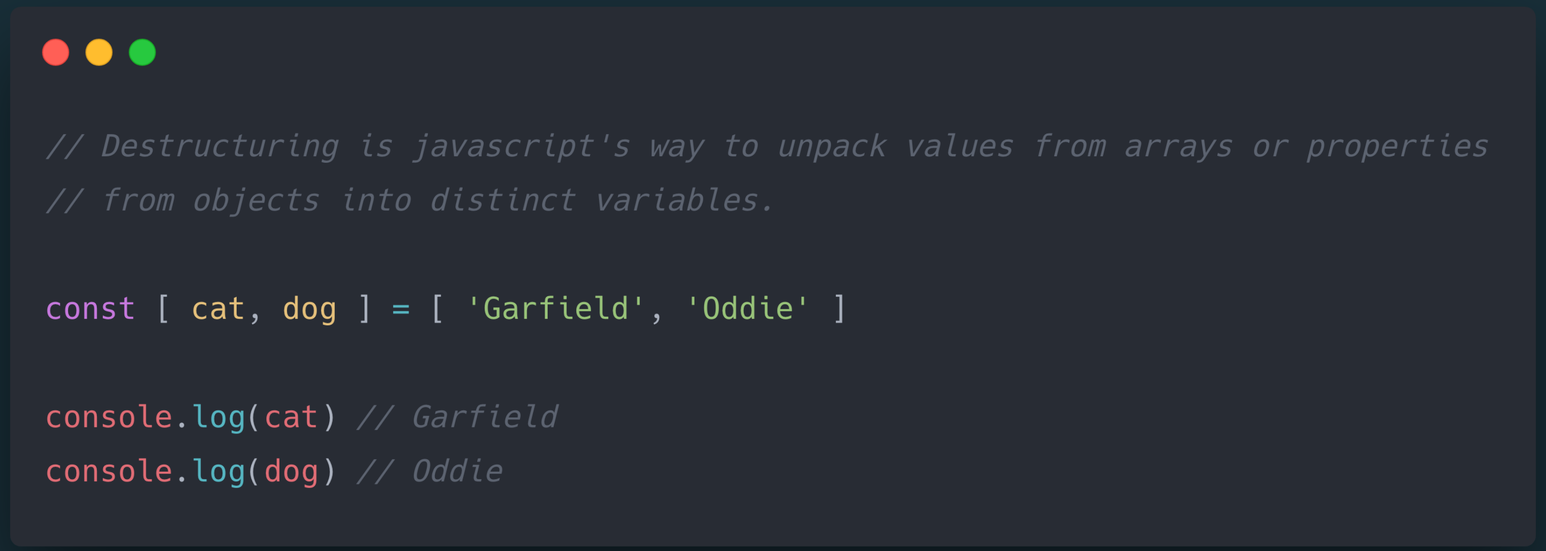
```
// We can store arrow functions in a variable so we can use them anywhere within
// our code

const capitalize = (string) => string.charAt(0).toUpperCase() + string.slice(1)

console.log(capitalize('garfield')) // 'Garfield'
```

```
🤔 // Are these arrow functions well written? What do they return?

// 1 (a === 4, b === 3)
const sum = (a, b) => a + b

// 2 (array === ['a', 'b', 'c'])
const firstElement = array => array[0]

// 3 (object === { a: 5, b: 2 })
const concat = (object) => { return `${object.a} - ${object.b}` }

// 4 (human === 'Jon', cat === 'Garfield')
const makeObject = human, cat => ({ human: human, cat: cat })
```

```
// The most common use for these functions is within methods that take a function
// as an argument, such as map(), reduce(), find(), filter()...

const animals = [{
  name: 'cat',
  legs: 4
}, {
  name: 'dog',
  legs: 4
}, {
  name: 'human',
  legs: 2
}]

const twoLeggedAnimals = animals.filter(animal => animal.legs === 2)

const dog = animals.find(animal => animal.name === 'dog')

const animalNames = animals.map(animal => animal.name)

const totalLegs = animals.reduce((total, current) => total += current.legs, 0)
```

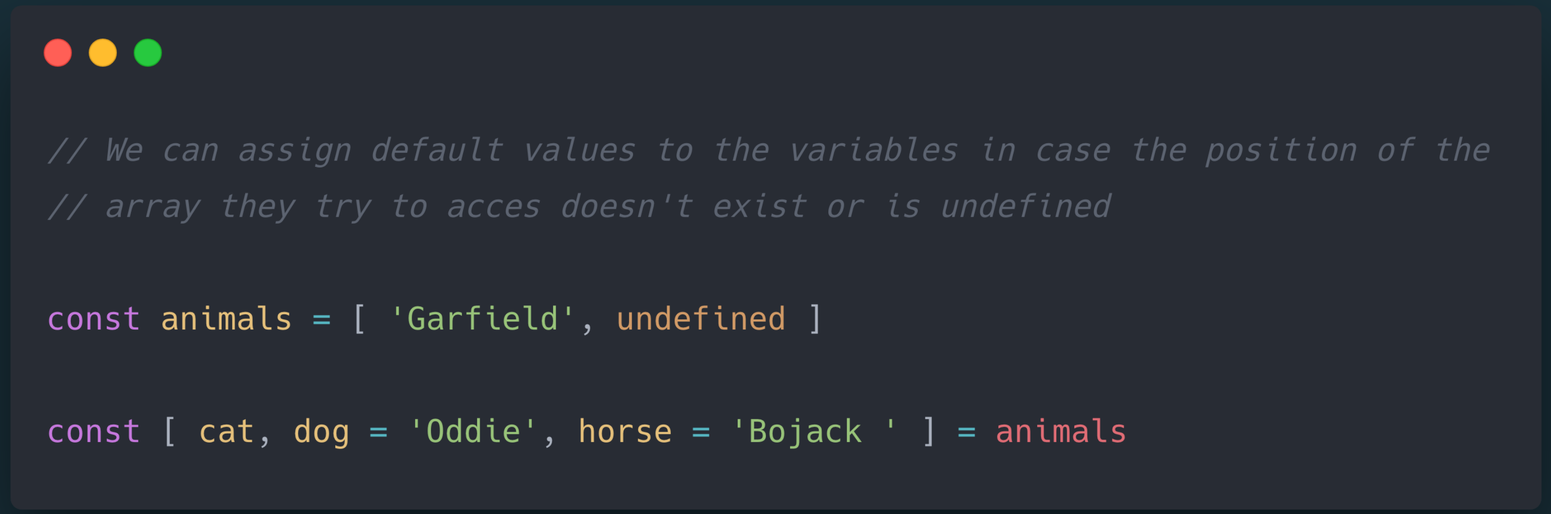
```
// Arrow functions don't create content, which means they don't have their own
// 'this' object. The expression within the arrow function will look up through
// the contexts until it finds a valid 'this' and use it.

function updateThis () {

  this.value = 0

  const addOneToThis = () => {
    this.value ++
  }

  console.log(this.value) // 0
  addOneToThis()
  console.log(this.value) // 1

}
```

4. destructuring

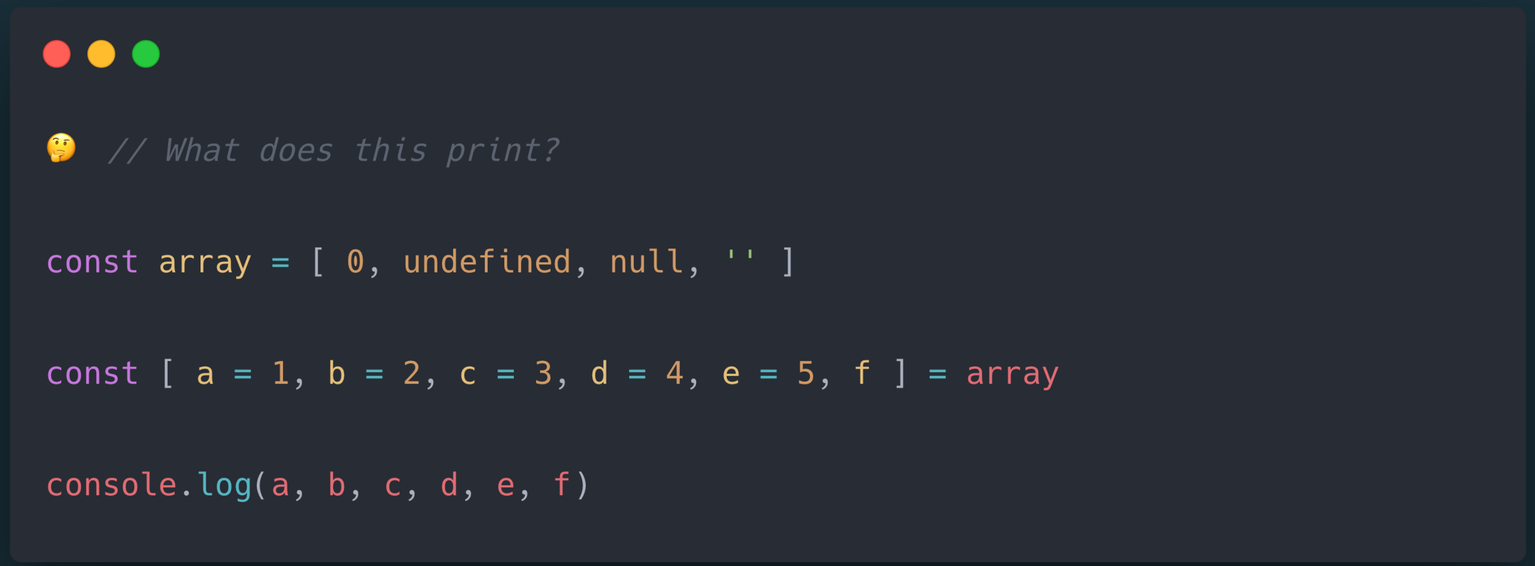


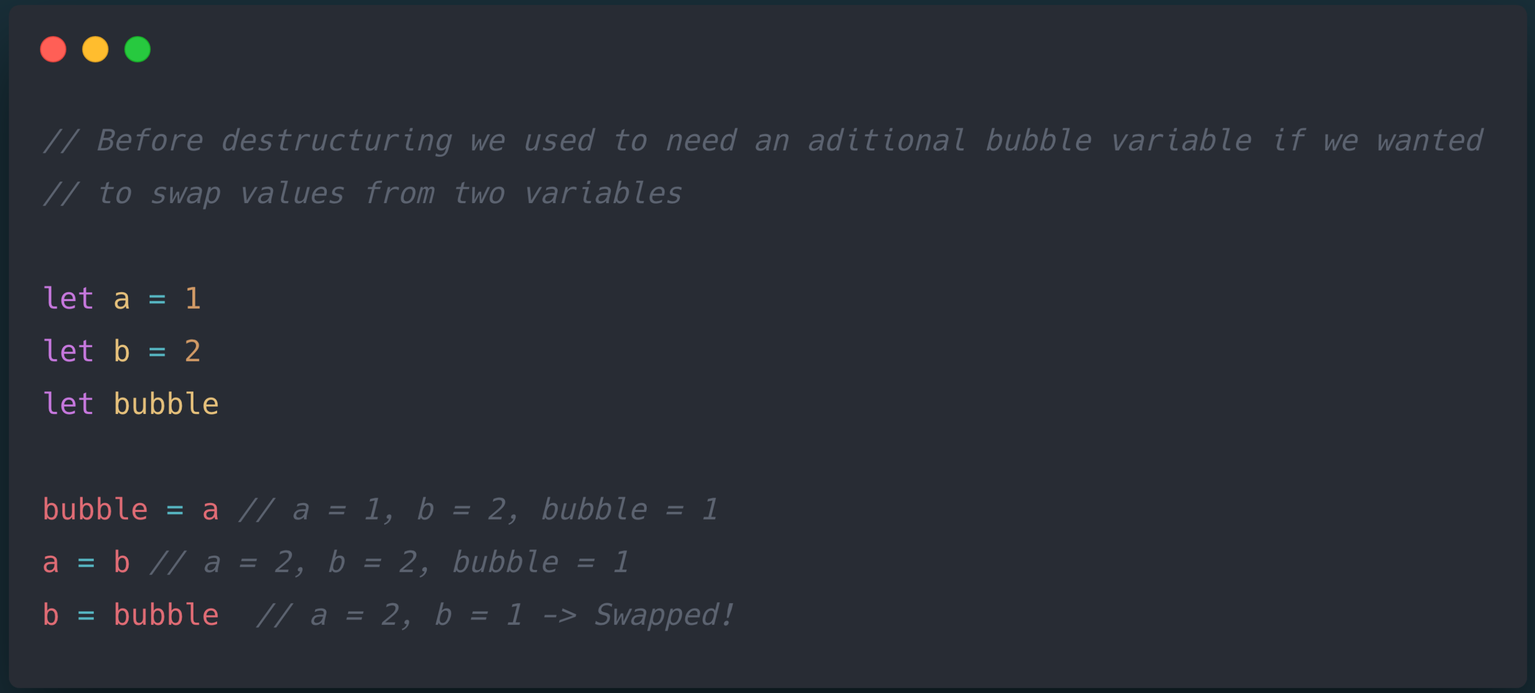
```
// Destructuring is javascript's way to unpack values from arrays or properties
// from objects into distinct variables.

const [ cat, dog ] = [ 'Garfield', 'Oddie' ]

console.log(cat) // Garfield
console.log(dog) // Oddie
```

```
// Basic array destructuring works by asigning variables different values that
//  exist within the array using the syntax [ variable, variable...] = array

const address = '28035 - Madrid'

const [ zipCode, city ] = address.split(' - ') // split() returns an array

console.log(zipCode) // 28035
console.log(city) // Madrid
```

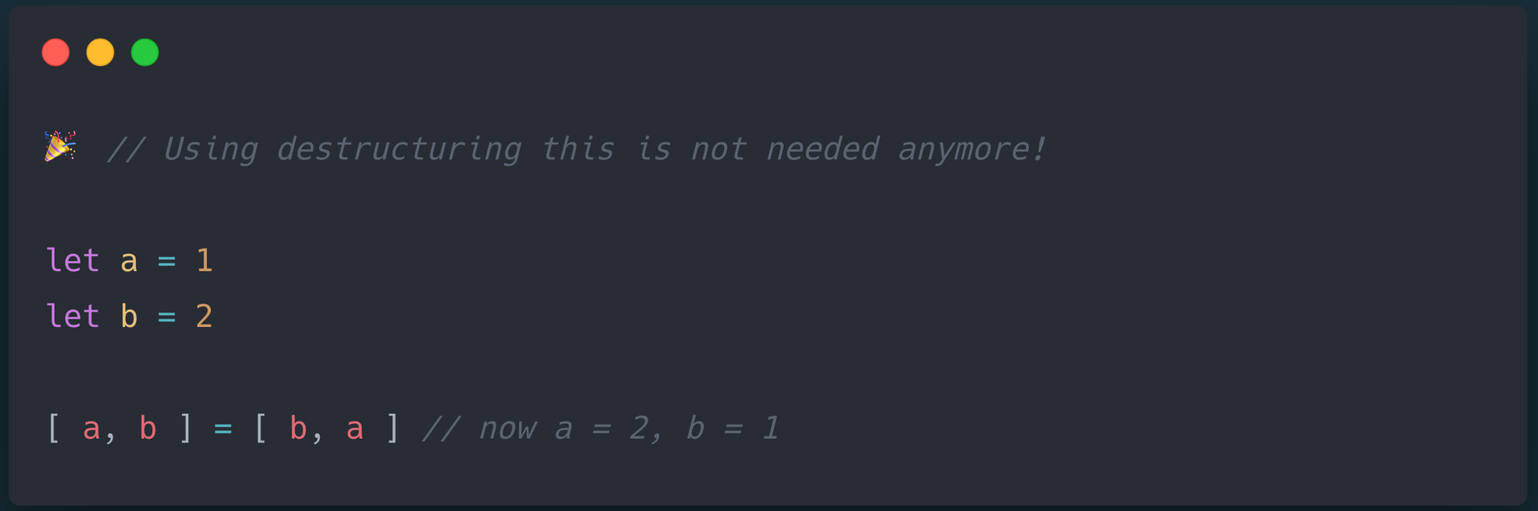


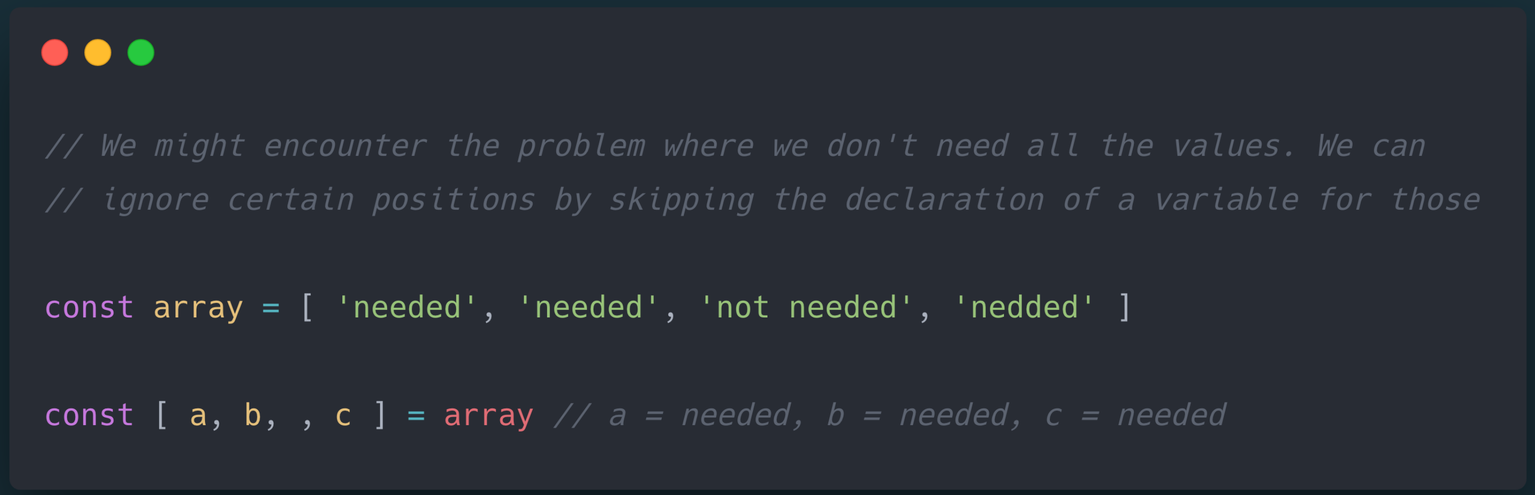
```
// We can assign default values to the variables in case the position of the
// array they try to acces doesn't exist or is undefined

const animals = [ 'Garfield', undefined ]

const [ cat, dog = 'Oddie', horse = 'Bojack ' ] = animals
```


🤔 // What does this print?
const array = [0, undefined, null, '']
const [a = 1, b = 2, c = 3, d = 4, e = 5, f] = array
console.log(a, b, c, d, e, f)



```
// Before destructuring we used to need an aditional bubble variable if we wanted
// to swap values from two variables

let a = 1
let b = 2
let bubble

bubble = a // a = 1, b = 2, bubble = 1
a = b // a = 2, b = 2, bubble = 1
b = bubble  // a = 2, b = 1 -> Swapped!
```


🎉 // Using destructuring this is not needed anymore!
let a = 1
let b = 2
[a, b] = [b, a] // now a = 2, b = 1



```
// We might encounter the problem where we don't need all the values. We can
// ignore certain positions by skipping the declaration of a variable for those

const array = [ 'needed', 'needed', 'not needed', 'nedded' ]

const [ a, b, , c ] = array // a = needed, b = needed, c = needed
```

```
// With objects works similarly, but with basic destructuring variables need
// to be named with the object's keys. This allows us to declare them in any
// order.

const house = { human: 'Jon', cat: 'Garfield', dog: 'Oddie' }

const { human, dog, cat } = house

console.log(human, dog, cat) // Jon Oddie Garfield
```

```
// However, we can change names to better suited ones if needed. We can consider
// the semicolon as the word 'as', so it reads:
// 'store variable 'as' new named variable'

const house = { humanNameIs: 'Jon', catName: 'Garfield' }

const { humanNameIs: human, catName: cat } = house

console.log(human, cat) // Jon Garfield
```

```
// We can also use default values in case the key doesn't exist or is undefined

const house = { human: 'Jon', cat: undefined }

const { human, cat = 'Garfield', dog = 'Oddie' } = house

console.log(human, cat, dog) // Jon Garfield Oddie
```

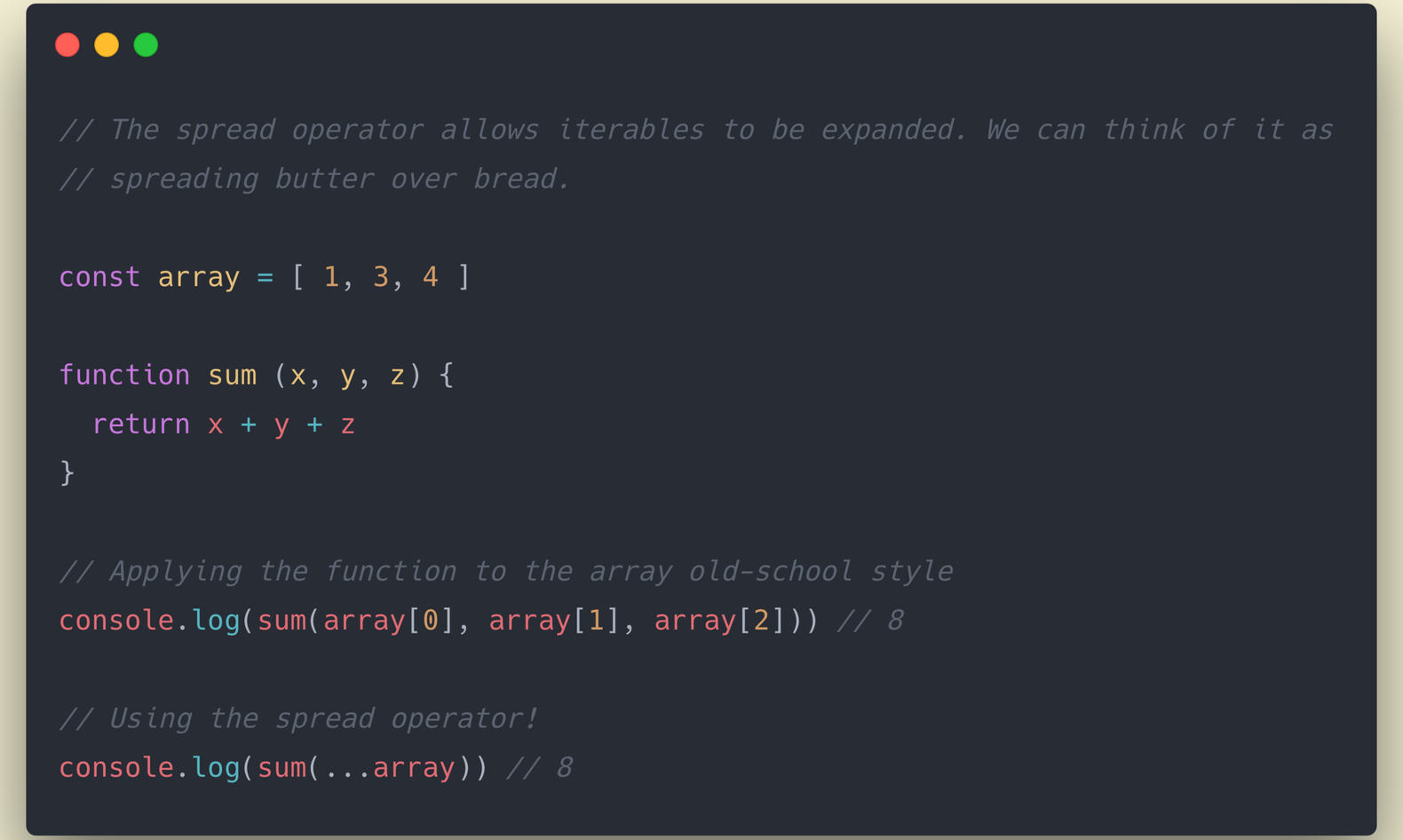
```
🤔 // What does this print?

const house = { nameA: 'Jon', nameB: undefined, dog: 'Tobby' }

const { nameA: human, nameB: cat = 'Garfield', dog: nameC = 'Oddie' } = house

console.log(human, cat, dog)
```

```
// For functions that take objects or arrays as arguments we can use destructuring
// to access each of the values within these data structures directly in the
// arguments.

const person = { name: 'Jon', surname: 'Q. Arbuckle' }

function concatenateName ({ name, surname }) {
  return name + surname
}

const fullName = concatenateName(person)

console.log(fullName) // Jon Q. Arbuckle
```

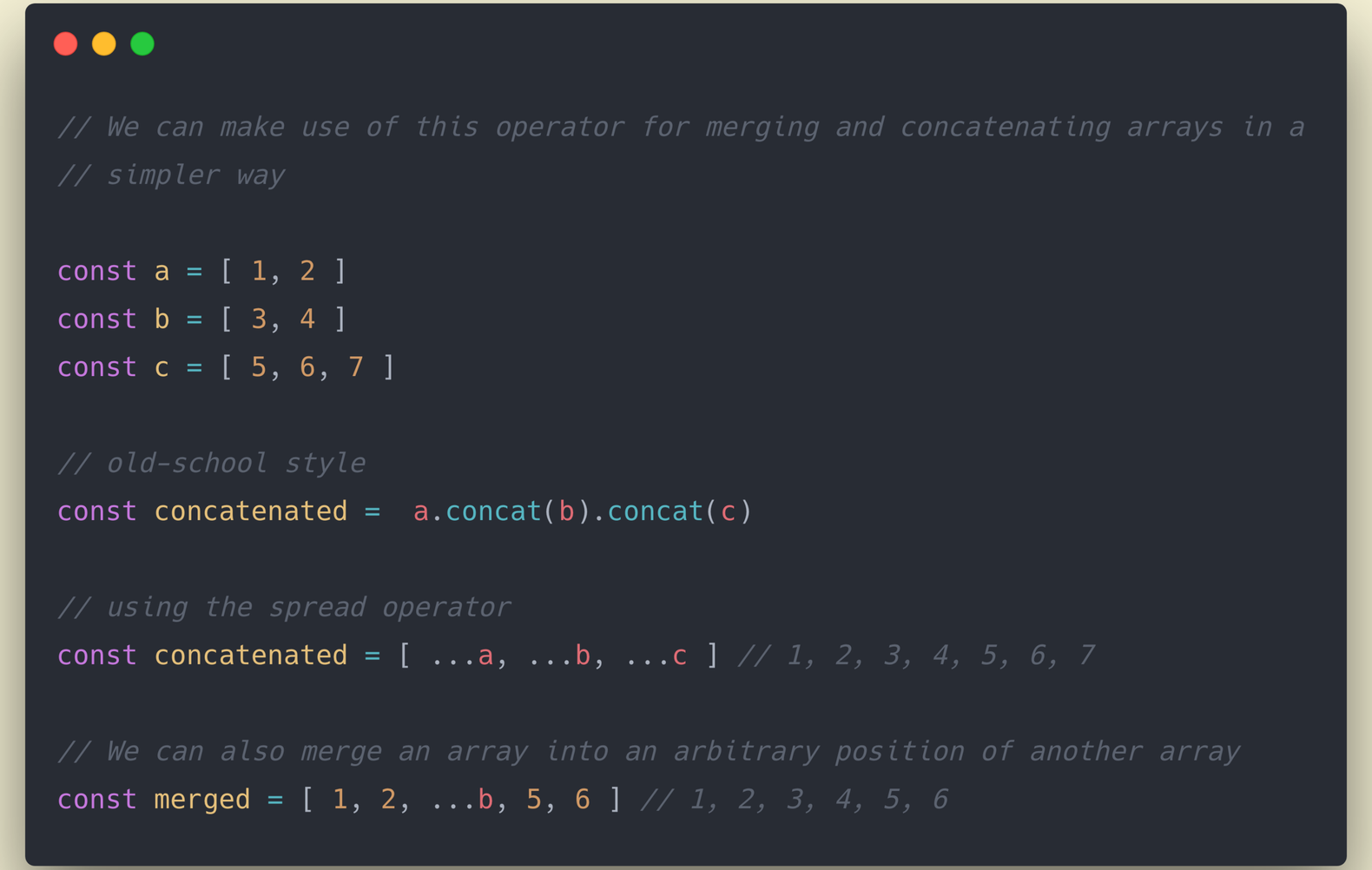
```
🎉 // This is how thigs we have learn help us write better and cleaner code!

// From this:

const person = { name: 'Jon', surname: 'Q. Arbuckle' }

function concatenateName (person) {
  let name = person.name
  let surname = person.surname
  return name + surname
}

const fullName = concatenateName(person)

// To this!

const person = { name: 'Jon', surname: 'Q. Arbuckle' }

const fullName = ({ name, surname }) => `${name} ${surname}`
```

```
// For nested objects the destructuring gets a bit more complicated, but it's
// still possible.

const person = {
  name: 'Jon',
  pets: {
    cat: 'Garfield',
    dog: undefined
  }
}

const { name: human, pets: { cat, dog = 'Oddie' } }  // Same rules apply!

console.log(human, cat, dog) // Jon Garfield Oddie
```

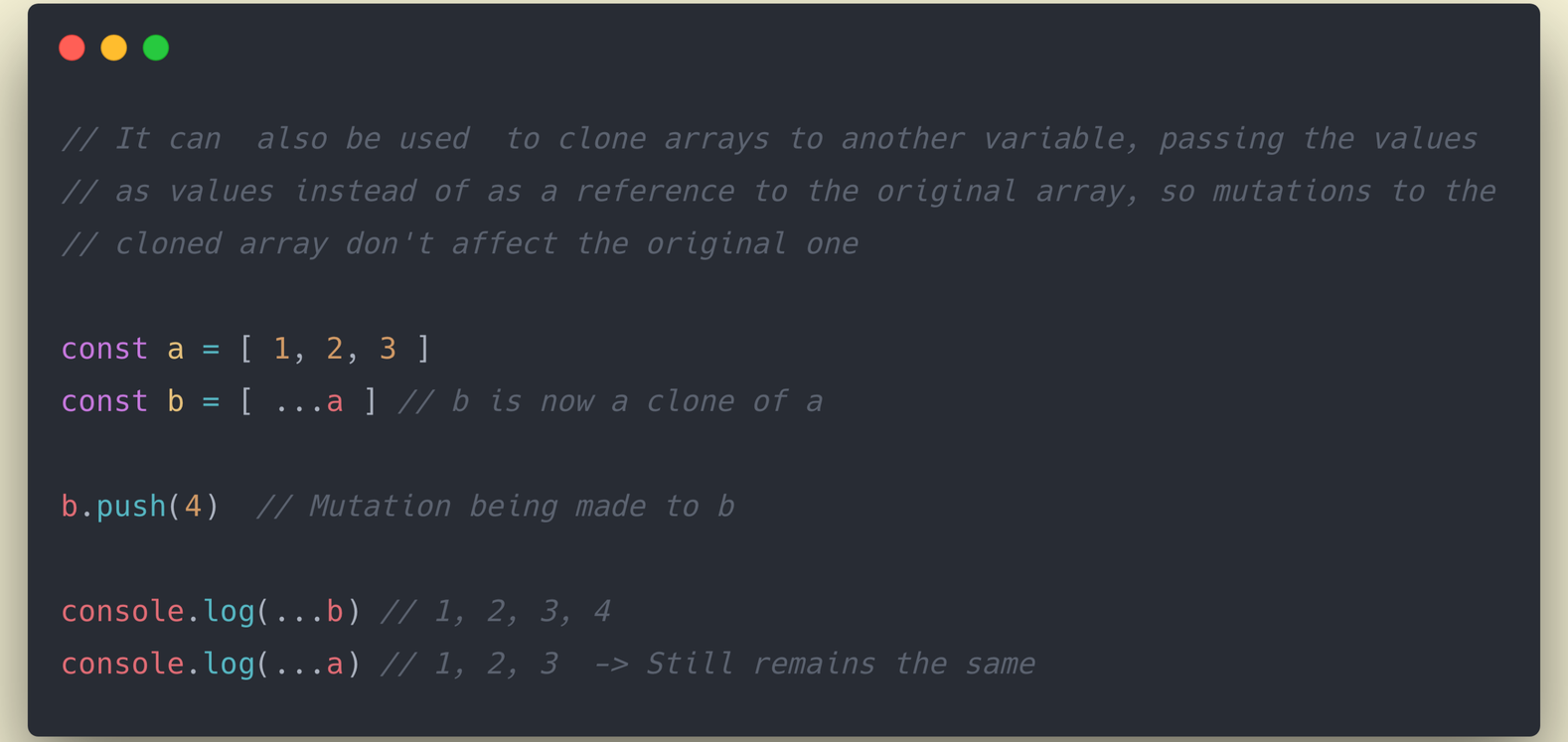
5. spread operator



```
// The spread operator allows iterables to be expanded. We can think of it as
// spreading butter over bread.

const array = [ 1, 3, 4 ]

function sum (x, y, z) {
  return x + y + z
}

// Applying the function to the array old-school style
console.log(sum(array[0], array[1], array[2])) // 8

// Using the spread operator!
console.log(sum(...array)) // 8
```



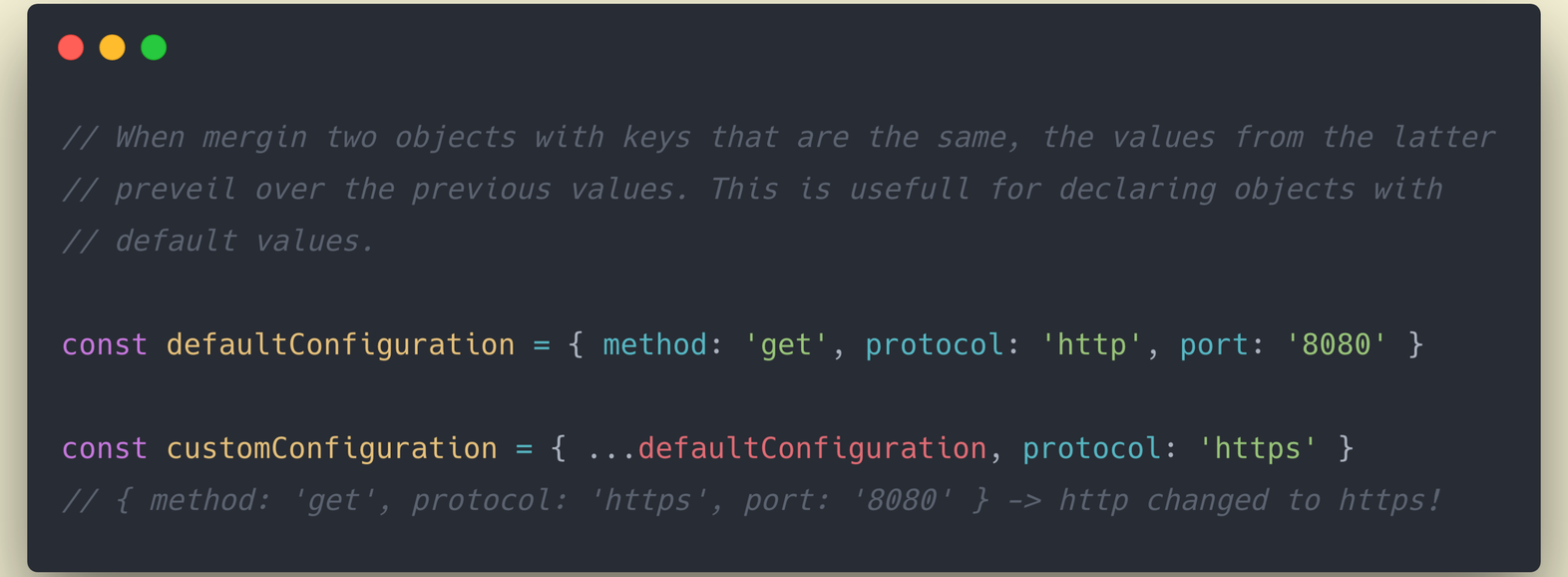
```
// We can make use of this operator for merging and concatenating arrays in a
// simpler way

const a = [ 1, 2 ]
const b = [ 3, 4 ]
const c = [ 5, 6, 7 ]

// old-school style
const concatenated =  a.concat(b).concat(c)

// using the spread operator
const concatenated = [ ...a, ...b, ...c ] // 1, 2, 3, 4, 5, 6, 7

// We can also merge an array into an arbitrary position of another array
const merged = [ 1, 2, ...b, 5, 6 ] // 1, 2, 3, 4, 5, 6
```



```
// It can  also be used  to clone arrays to another variable, passing the values
// as values instead of as a reference to the original array, so mutations to the
// cloned array don't affect the original one

const a = [ 1, 2, 3 ]
const b = [ ...a ] // b is now a clone of a

b.push(4)  // Mutation being made to b

console.log(...b) // 1, 2, 3, 4
console.log(...a) // 1, 2, 3  -> Still remains the same
```

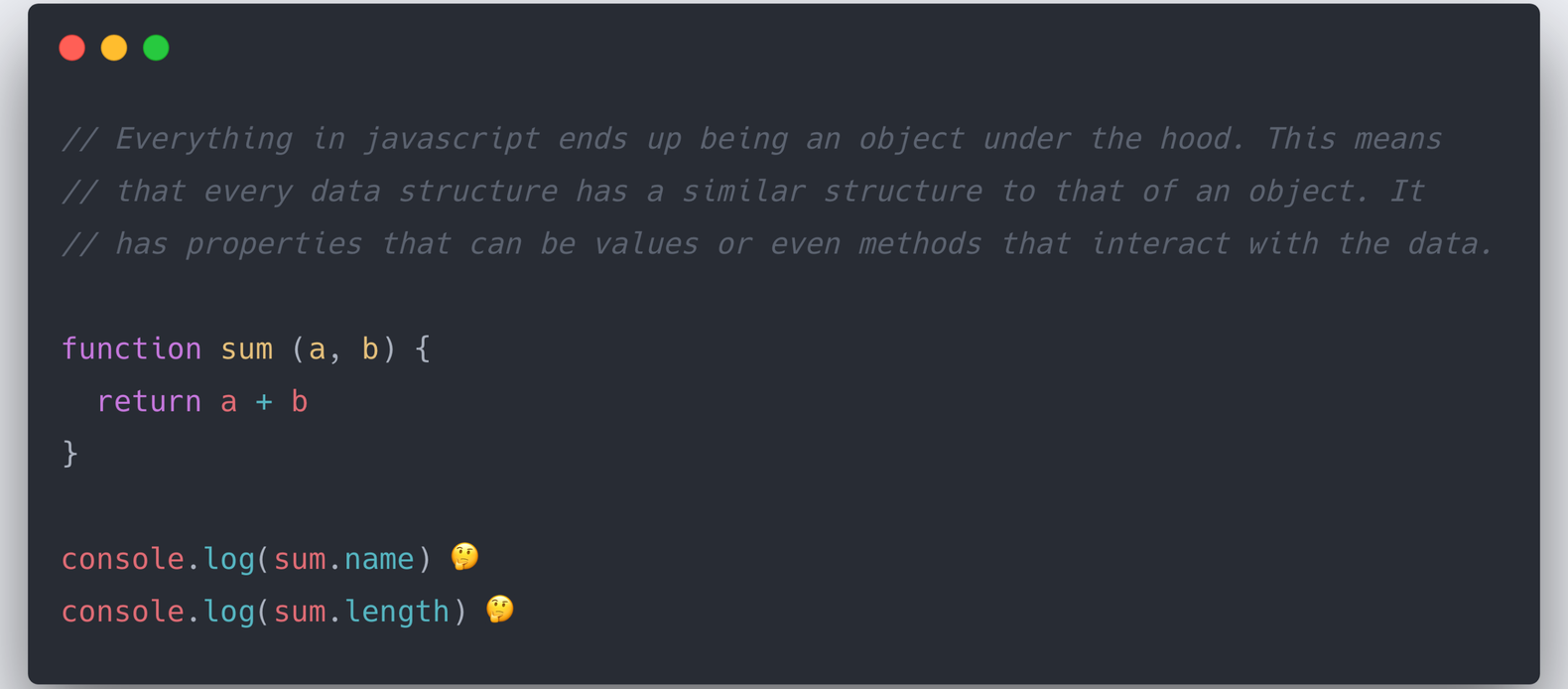
```
// The rest operator works as the spread operator, but used when destructuring,
// so it holds the remaining values that where not destructured

const user = [ 'Jon', 'Q. Arbuckle', '28000', 'Madrid', 'Spain']

function getFullNameAndAddress ([ name, surname, ...rest ]) {
  // rest is now [ '28000', 'Madrid', 'Spain' ]
  return `${name} ${surname}, ${rest.join(' ')}`
}

console.log(getFullNameAndAddress(user)) // Jon Q. Arbuckle, 28000 Madrid Spain
```

```
// Sread also works with objects, spreading the key/value pairs.

const user = { name: 'Jon', surname: 'Q. Arbuckle' }
const address = { zipCode: '28000', city: 'Madrid', country: 'Spain' }

const userInfo = { ...user, ...address }
// { name: 'Jon', surname: 'Q. Arbuckle', zipCode: '28000', city: 'Madrid', ... }
```

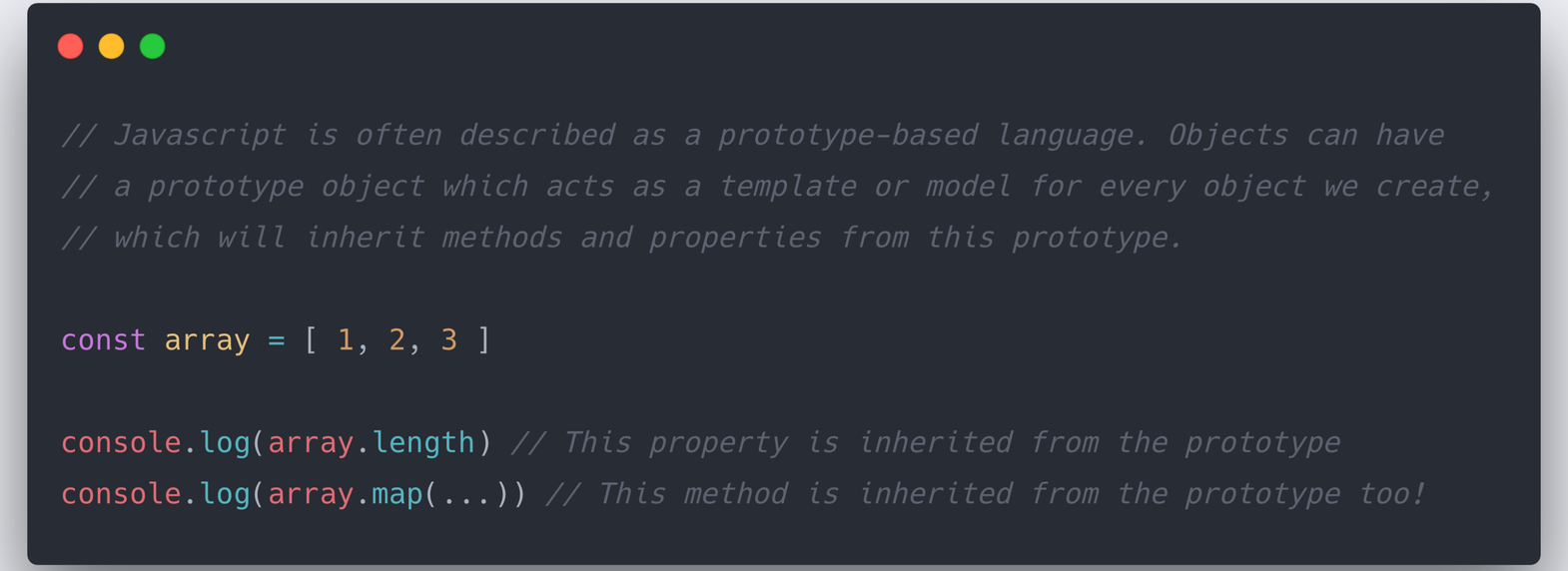


```
// When mergin two objects with keys that are the same, the values from the latter
// preveil over the previous values. This is usefull for declaring objects with
// default values.

const defaultConfiguration = { method: 'get', protocol: 'http', port: '8080' }

const customConfiguration = { ...defaultConfiguration, protocol: 'https' }
// { method: 'get', protocol: 'https', port: '8080' } -> http changed to https!
```

6. prototypes and functions

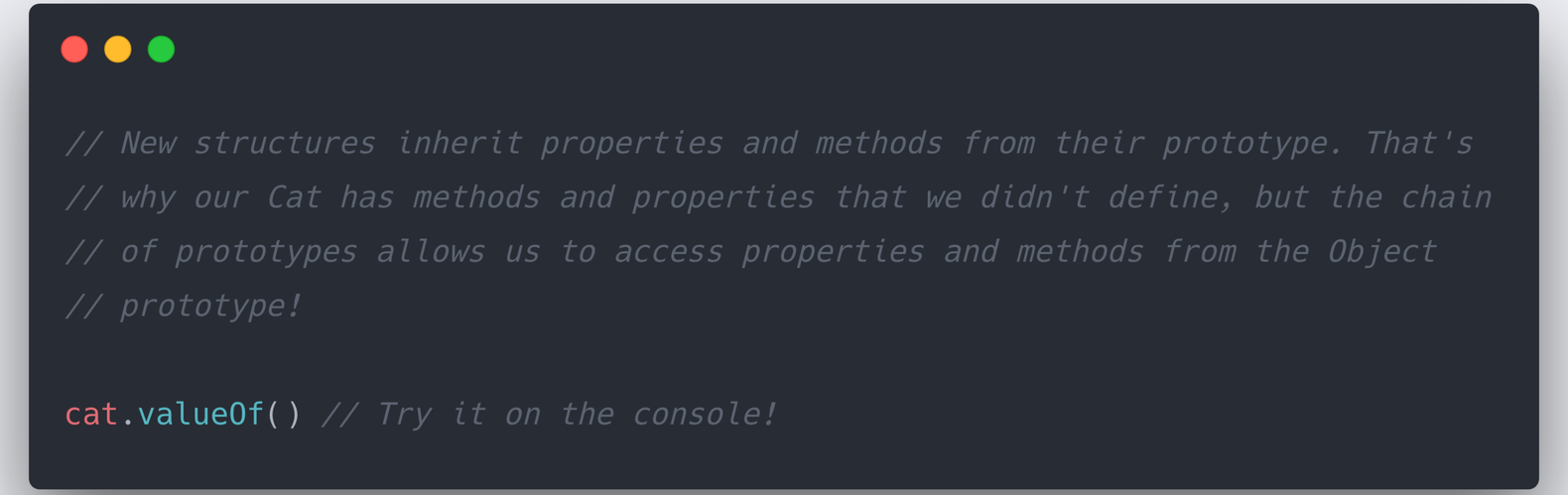


```
// Everything in javascript ends up being an object under the hood. This means
// that every data structure has a similar structure to that of an object. It
// has properties that can be values or even methods that interact with the data.

function sum (a, b) {
  return a + b
}

console.log(sum.name) 🤔
console.log(sum.length) 🤔
```



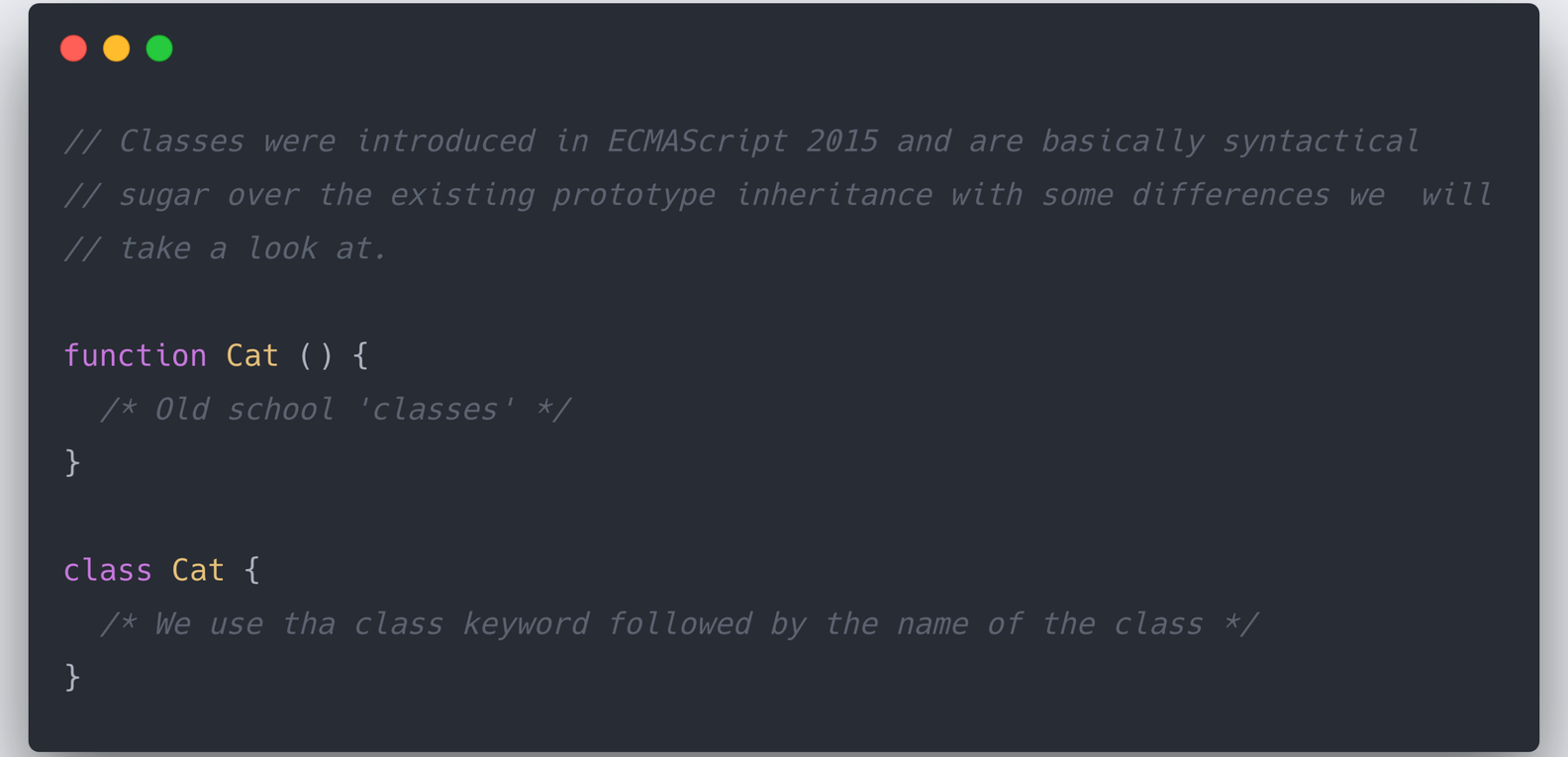
```
// Javascript is often described as a prototype-based language. Objects can have
// a prototype object which acts as a template or model for every object we create,
// which will inherit methods and properties from this prototype.

const array = [ 1, 2, 3 ]

console.log(array.length) // This property is inherited from the prototype
console.log(array.map(...)) // This method is inherited from the prototype too!
```

```
// We can declare a new data structure of our own, with it's own properties and
// methods

function Cat (name, color, age) {

  this.name = name
  this.color = color
  this.age = 0
  this.lifes = 7

  this.isAlive = function () {
    return this.lifes > 0
  }

  this.growOld = function () {
    this.age ++
    if (this.age > 15) {
      this.lifes --
      this.age = 0
    }
  }

}

const cat = new Cat('Garfield', 'orange', 5)

cat.growOld()

console.log(cat.color) // orange
console.log(cat.age) // 1
console.log(cat.isAlive()) // true
```



```
// New structures inherit properties and methods from their prototype. That's
// why our Cat has methods and properties that we didn't define, but the chain
// of prototypes allows us to access properties and methods from the Object
// prototype!

cat.valueOf() // Try it on the console!
```

```
// We can modify existing prototypes for data structures that are 'native' data
// structures in javascript. For instance, we can customize the Array prototype
// and add new methods:

Array.prototype.whatAmI = 'An array, duh...' // Array is the 'native' array!
Array.prototype.rightShift = function () {
  this.unshift(this.pop()) // Shift array
  return this // Return shifted array
}

// Now all arrays will have these methods and properties!

const week = [ 'MONDAY', 'TUESDAY', 'WEDNESDAY', 'THURSDAY', 'SATURDAY', 'SUNDAY' ]

console.log(week.whatAmI) // An array, duh...
console.log(week.rightShift()) // [ 'SUNDAY', 'MONDAY', 'TUESDAY', 'WEDNESDAY', 'THURSDAY',
'SATURDAY' ]
```



```
// Classes were introduced in ECMAScript 2015 and are basically syntactical
// sugar over the existing prototype inheritance with some differences we  will
// take a look at.

function Cat () {
  /* Old school 'classes' */
}

class Cat {
  /* We use tha class keyword followed by the name of the class */
}
```

```
// The constructor is just a method, but one that is special and used for
// creating and initializating an object with a class. Is the method that gets
// called when we use the 'new' keyword for creating an object of said class.

class Cat {

  constructor (name, color, age) {
    this.name = name
    this.color = color
    this.age = age
  }

}

const cat = new Cat('Garfield', 'orange', 5)  // constructor('Garfield', 'orange', 5)
```

```
// As with prototypes we can declare methods within the class body, but we can use
// computed properties that return data based on the instance properties.

class Cat {

  constructor (name, color, age) {
    this.name = name
    this.color = color
    this.age = age
  }

  get description () {
    return `${this.name} is an ${this.color} cat, aged ${this.age}`
  }

  growOld () {
    this.age ++
  }

}

const cat = new Cat('Garfield', 'orange', 5)

cat.growOld

console.log(cat.description) // Garfield is an orange cat, aged 6
```

```
// Classes can extend other classes and inherit their methods and properties by
// using the keyword extends followed by the 'parent' class.

class Kitty extends Cat {

  constructor (name, color, age) {
    super(name, color)
    if (age > 3) throw Error('This is a fully grown cat!')
    this.age = age
  }

  // We can still use growOld and get description because we inherited them!

}
```

```
// While we can overwrite the parent's class methods or properties, we can
// always access them within the class using super.

class Kitty extends Cat {

  constructor (name, color, age) {
    super(name, color)
    if (age > 3) throw Error('This is a fully grown cat!')
    this.age = age
  }

  // We can overwrite growOld but still inherit some functionallity
  growOld () {
    super.growOld() // Invoke the growOld method from the parent class
    if (this.age > 3) throw Error('This kitty is now a full grown cat :(')
  }

}
```

References

MDN web docs:

let
https://developer.mozilla.org/docs/Web/JavaScript/Reference/Statements/let

const
https://developer.mozilla.org/docs/Web/JavaScript/Reference/Statements/const

template strings
https://developer.mozilla.org/docs/Web/JavaScript/Reference/Template_literals

arrow functions
https://developer.mozilla.org/docs/Web/JavaScript/Reference/Functions/Arrow_functions

destructuring
https://developer.mozilla.org/docs/Web/JavaScript/Reference/Operators/Destructuring_assignmen

spread operator
https://developer.mozilla.org/docs/Web/JavaScript/Reference/Operators/Spread_syntax

rest operator
https://developer.mozilla.org/docs/Web/JavaScript/Reference/Functions/rest_parameters

prototypes
https://developer.mozilla.org/en-US/docs/Learn/JavaScript/Objects/Object_prototypes

classes
https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Classes

Github

https://github.com/pedro-rodalia/JS-103

Repl.it

https://repl.it/@pedro_rodalia