JavaScript: Arrays & Objects

The Complete Web Developer in 2018

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Zero to Mastery
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Data Structures: Arrays

Array of strings

```
> var animalList = ["tiger", "cat", "bear", "bird"]
```

```
> animalList
◂ ▾ (4) ["tiger", "cat", "bear", "bird"]
      0: "tiger"
      1: "cat"
      2: "bear"
      3: "bird"
      length: 4
    ▸ __proto__: Array(0)
```

```
> animalList[0]
◂ "tiger"
> animalList[2]
◂ "bear"
```

Arrays can hold anything..

Arrays can hold:
strings
numbers
booleans
functions
other arrays
etc.

Arrays can have mixed types too, although not advised

Array of functions

```
> var functionList = [checkDriverAge, checkDriverAge2]
< undefined
> functionList
< ▼ (2) [f, f] i
    ▶ 0: f checkDriverAge(age)
    ▶ 1: f ()
      length: 2
    ▶ __proto__: Array(0)
```

```
> functionList[0]
< f checkDriverAge(age) {
      if (age < 18) {
          return "too young";
      } else if (age > 18) {
          return "you may drive";
      } else if (age === 18) {
          return "happy 18th bday";
      }
  }
```

Can even declare a function within an array

```
> var functionList = [function apple() {
  console.log("apple");
  }]
< undefined
> functionList
< ▼ [f] i
    ▼ 0: f apple()
        arguments: null
        caller: null
        length: 0
        name: "apple"
      ▶ prototype: {constructor: f}
      ▶ __proto__: f ()
        [[FunctionLocation]]: VM9521:1
```

Can have multiple types within one array (not advised, can lead to performance issues)

```
> var mixedList = ["apples", 3, undefined, true, function
  apple() {
  console.log("apples")
  }];
<- undefined
> mixedList
<- ▼ (5) ["apples", 3, undefined, true, f]
    0: "apples"
    1: 3
    2: undefined
    3: true
  ▶ 4: f apple()
    length: 5
  ▶ __proto__: Array(0)
```

Array containing arrays

```
> var animalList = [["tiger", "cat"], ["bear", "bird"]];
```

```
> animalList
<- ▶ (2) [Array(2), Array(2)]
> animalList[1]
<- ▶ (2) ["bear", "bird"]
```

To reach item [0] of array [1] in animalList

```
> animalList[1][0]
<- "bear"
```

Array Methods

Javascript has predefined methods to use with arrays - we can think of them as functions we use on arrays

```
> var animalList = ["tiger", "cat", "bear", "bird"];
< undefined
> animalList
< ▶ (4) ["tiger", "cat", "bear", "bird"]
```

.shift( ) - delete first item of array
.pop( ) - delete last item of array

```
> animalList.shift()
< "tiger"
> animalList
< ▶ (3) ["cat", "bear", "bird"]
```

.push( ) - add item to end of array

```
> animalList.pop()
< "bird"
> animalList
< ▶ (2) ["cat", "bear"]
```

```
> animalList.push("elephant")
< 3
> animalList
< ▶ (3) ["cat", "bear", "elephant"]
```

.concat( ) - returns multiple arrays joined together (does not change original arrays)

```
> animalList
◂ ▸ (3) ["cat", "bear", "elephant"]
> animalList.concat(["bee", "deer"])
◂ ▸ (5) ["cat", "bear", "elephant", "bee", "deer"]
> animalList
◂ ▸ (3) ["cat", "bear", "elephant"]
```

can save concatenated array:

```
> animalList
◂ ▸ (3) ["cat", "bear", "elephant"]
> newAnimalList = animalList.concat(["bee", "deer"])
◂ ▸ (5) ["cat", "bear", "elephant", "bee", "deer"]
> newAnimalList
◂ ▸ (5) ["cat", "bear", "elephant", "bee", "deer"]
> animalList
◂ ▸ (3) ["cat", "bear", "elephant"]
```

.sort( ) - sorts array

```
> animalList
◂ ▸ (3) ["cat", "bear", "elephant"]
```

```
> animalList.sort()
◂ ▸ (3) ["bear", "cat", "elephant"]
> animalList
◂ ▸ (3) ["bear", "cat", "elephant"]
```

.reverse( ) - reverses array

```
> animalList
◂ ▸ (3) ["bear", "cat", "elephant"]
```

```
> animalList.reverse()
◂ ▸ (3) ["elephant", "cat", "bear"]
> animalList
◂ ▸ (3) ["elephant", "cat", "bear"]
```

.splice( ) - add/removes elements from array

```
> fruitArray = ["Apples", "Blueberries", "Oranges", "Kiwi"]
◂ ▸ (4) ["Apples", "Blueberries", "Oranges", "Kiwi"]
```

Remove 1 element from array at index 2

```
> fruitArray.splice(2,1)
◂ ▸ ["Oranges"]
> fruitArray
◂ ▸ (3) ["Apples", "Blueberries", "Kiwi"]
```

Add element at index 2

```
> fruitArray.splice(2,0,"Pineapple")
◂ ▸ []
> fruitArray
◂ ▸ (4) ["Apples", "Blueberries", "Pineapple", "Kiwi"]
```

Delete 2 elements at index 1, add 3 elements at index 1

```
> fruitArray.splice(1,2,"Mango", "Lemon", "Lime")
◂ ▸ (2) ["Blueberries", "Pineapple"]
> fruitArray
◂ ▸ (5) ["Apples", "Mango", "Lemon", "Lime", "Kiwi"]
```

JavaScript Array Reference

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Array Object

The Array object is used to store multiple values in a single variable:

```
var cars = ["Saab", "Volvo", "BMW"];
```

Try it Yourself »

Array indexes are zero-based: The first element in the array is 0, the second is 1, and so on.

For a tutorial about Arrays, read our JavaScript Array Tutorial.

Array Properties

Property	Description
constructor	Returns the function that created the Array object's prototype
length	Sets or returns the number of elements in an array
prototype	Allows you to add properties and methods to an Array object

Array Methods

Method	Description
concat()	Joins two or more arrays, and returns a copy of the joined arrays
copyWithin()	Copies array elements within the array, to and from specified positions
entries()	Returns a key/value pair Array Iteration Object
every()	Checks if every element in an array pass a test
fill()	Fill the elements in an array with a static value

filter()	Creates a new array with every element in an array that pass a test
find()	Returns the value of the first element in an array that pass a test
findIndex()	Returns the index of the first element in an array that pass a test
forEach()	Calls a function for each array element
from()	Creates an array from an object
includes()	Check if an array contains the specified element
indexOf()	Search the array for an element and returns its position
isArray()	Checks whether an object is an array
join()	Joins all elements of an array into a string
keys()	Returns a Array Iteration Object, containing the keys of the original array
lastIndexOf()	Search the array for an element, starting at the end, and returns its position
map()	Creates a new array with the result of calling a function for each array element
pop()	Removes the last element of an array, and returns that element
push()	Adds new elements to the end of an array, and returns the new length
reduce()	Reduce the values of an array to a single value (going left-to-right)
reduceRight()	Reduce the values of an array to a single value (going right-to-left)
reverse()	Reverses the order of the elements in an array
shift()	Removes the first element of an array, and returns that element
slice()	Selects a part of an array, and returns the new array
some()	Checks if any of the elements in an array pass a test
sort()	Sorts the elements of an array
splice()	Adds/Removes elements from an array
toString()	Converts an array to a string, and returns the result
unshift()	Adds new elements to the beginning of an array, and returns the new length
valueOf()	Returns the primitive value of an array

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// Exercise 6
// var array = ["Banana", "Apples", "Oranges", “Blueberries"];

```
> var array = ["Banana", "Apples", "Oranges",
  "Blueberries"];
<- undefined
```

// 1. Remove the Banana from the array.

```
> array.shift()
<- "Banana"
> array
<- ▶ (3) ["Apples", "Oranges", "Blueberries"]
```

// 2. Sort the array in order.

```
> array.sort()
<- ▶ (3) ["Apples", "Blueberries", "Oranges"]
> array
<- ▶ (3) ["Apples", "Blueberries", "Oranges"]
```

// 3. Put "Kiwi" at the end of the array.

```
> array.push("Kiwi")
<- 4
> array
<- ▶ (4) ["Apples", "Blueberries", "Oranges", "Kiwi"]
```

// 4. Remove "Apples" from the array.

```
> array.splice(0,1)
<- ▶ ["Apples"]
> array
<- ▶ (3) ["Blueberries", "Oranges", "Kiwi"]
```

// 5. Sort the array in reverse order. (Not alphabetical, but reverse
// the current Array i.e. ['a', 'c', 'b'] becomes ['b', 'c', 'a'])

```
> array.reverse()
<- ▶ (3) ["Kiwi", "Oranges", "Blueberries"]
```

// using this array,
// var array2 = ["Banana", ["Apples", ["Oranges"], "Blueberries"]];
// access "Oranges".

```
> var array2 = ["Banana", ["Apples", ["Oranges"],
  "Blueberries"]];
<- undefined
> array2[1][1][0]
<- "Oranges"
```

Data Structures: Objects
Also a Javascript Type

Object - collection of properties + values

```
> var userObject = {
      name: "John",
      age: 34,
      hobby: "Crossfit",
      isMarried: false,
  }
```

```
> userObject
<- ▼ {name: "John", age: 34, hobby: "Crossfit", isMarried: fa
  lse} i
      age: 34
      hobby: "Crossfit"
      isMarried: false
      name: "John"
    ▶ __proto__: Object
```

```
> userObject.name
<- "John"
```

Object { } vs array [ ]:

```
> fruitArray
<- ▶ (5) ["Apples", "Mango", "Lemon", "Lime", "Kiwi"]
```

```
> fruitArray[0]
<- "Apples"
```

Object: property “name” holds value “John” at userObject.name
Array: index [0] holds value “Apples” at fruitArray[0]

To add property to object, just declare it

```
> userObject.favoriteFood = "spinach";
<- "spinach"
```

```
> userObject
<- ▼{name: "John", age: 34, hobby: "Crossfit", isMarried: fa
   lse, favoriteFood: "spinach"} i
     age: 34
     favoriteFood: "spinach"
     hobby: "Crossfit"
     isMarried: false
     name: "John"
   ▶ __proto__: Object
```

Change value of a property the same way

```
> userObject.hobby = "soccer"
<- "soccer"
```

```
> userObject
<- ▼{name: "John", age: 34, hobby: "soccer", isMarried: fals
   e, favoriteFood: "spinach"} i
     age: 34
     favoriteFood: "spinach"
     hobby: "soccer"
     isMarried: false
     name: "John"
   ▶ __proto__: Object
```

How come is “object” a javascript type, but “array” isn’t?
An array is a kind of object (uses indices as properties)

Example: **ARRAY [ ] within OBJECT { }**

```
> userObject.quotes = ["its lit", "sup bro", "damn girl"]
```

```
> userObject
< ▼ {name: "John", age: 34, hobby: "soccer", isMarried: fals
    e, favoriteFood: "spinach", …} i
    age: 34
    favoriteFood: "spinach"
    hobby: "soccer"
    isMarried: false
    name: "John"
  ▼ quotes: Array(3)
      0: "its lit"
      1: "sup bro"
      2: "damn girl"
      length: 3
    ▶ __proto__: Array(0)
  ▶ __proto__: Object
```

To access array:

```
> userObject.quotes
< ▼ (3) ["its lit", "sup bro", "damn girl"] i
    0: "its lit"
    1: "sup bro"
    2: "damn girl"
    length: 3
  ▶ __proto__: Array(0)
```

To access value:

```
> userObject.quotes[1]
< "sup bro"
```

Example: **OBJECT { } within ARRAY [ ]**

```
> var listArray = [
      {
          username: "andy",
          password: "secret",
      },
      {
          username: "jess",
          password: "123",
      }
  ];
```

```
> listArray
<- ▼ (2) [{…}, {…}]
    ▼ 0:
        password: "secret"
        username: "andy"
      ▶ __proto__: Object
    ▼ 1:
        password: "123"
        username: "jess"
      ▶ __proto__: Object
      length: 2
    ▶ __proto__: Array(0)
```

To access object:

```
> listArray[0]
<- ▼ {username: "andy", password: "secret"}
      password: "secret"
      username: "andy"
    ▶ __proto__: Object
```

To access value:

```
> listArray[0].password
<- "secret"
```

METHOD: FUNCTION within OBJECT (or array)

```
> userObject.shout = function() {
      console.log("AHHHHH!");
  }
< ƒ () {
      console.log("AHHHHH!");
  }
```

```
> userObject
< ▼{name: "John", age: 34, hobby: "soccer", isMarried: fals
  e, favoriteFood: "spinach", …} i
    age: 34
    favoriteFood: "spinach"
    hobby: "soccer"
    isMarried: false
    name: "John"
  ▶ quotes: (3) ["its lit", "sup bro", "damn girl"]
  ▶ shout: ƒ ()
  ▶ __proto__: Object
```

To see function code:

```
> userObject.shout
< ƒ () {
      console.log("AHHHHH!");
  }
```

Use ( ) to call function
We would say shout is a method of userObject

```
> userObject.shout()
```

```
AHHHHH!                                          pathturbo.js:1
```

Earlier we learned about “Array Methods”
We would say that for those, concat, sort, etc are methods of listArray or any array we create

Also, look at console.log( )… console is an object and log is one of many methods

```
> console
< console {debug: ƒ, error: ƒ, info: ƒ, log: ƒ, warn: ƒ, …}
    assert: ƒ assert()
    clear: ƒ clear()
    context: ƒ context()
    count: ƒ count()
    countReset: ƒ countReset()
    debug: ƒ ()
    dir: ƒ dir()
    dirxml: ƒ dirxml()
    error: ƒ ()
    exception: ƒ ()
    group: ƒ group()
    groupCollapsed: ƒ groupCollapsed()
    groupEnd: ƒ groupEnd()
    info: ƒ ()
    log: ƒ ()
    markTimeline: ƒ ()
    profile: ƒ ()
    profileEnd: ƒ ()
    table: ƒ table()
    time: ƒ time()
    timeEnd: ƒ timeEnd()
    timeStamp: ƒ timeStamp()
    trace: ƒ trace()
```

Lets try.. console.info( )

```
> console.info("hello");
  hello                                          pathturbo.js:1
```

console.error( )

```
> console.error("welcome to fail");
✖ ▶welcome to fail                               pathturbo.js:1
```

When we declare a variable and it's empty, it's *undefined*

When we create an empty object or array, it's empty but NOT undefined, although its properties/indices are undefined.

Create empty object

```
> userObject2 = {};
<· ▶ {}
```

```
> userObject2.fakeproperty
<· undefined
```

Create empty array

```
> listArray2 = [];
<· ▶ []
```

```
> listArray2[0]
<· undefined
```

Null is the 5th Javascript Data Type

Null and Undefined are 2 different data types!
Properties are NOT undefined, they return an error!

Create NULL object

```
> nullObject = null;
<· null
```

```
> nullObject.fakeproperty
✕ ▶ Uncaught TypeError: Cannot read property 'fakeproperty' of null
    at <anonymous>:1:12                                    VM273576:1
```

We can add properties to an empty object/array…

```
> userObject2.fakeproperty = "andy"
"andy"
> userObject2
▶ {fakeproperty: "andy"}
```

but cannot add properties to a null object…

```
> nullObject.fakeproperty = "andy"
▶ Uncaught TypeError: Cannot set property 'fakeproperty' of null
    at <anonymous>:1:25                                    VM276207:1
```

// Exercise 7
// Create an object and an array which we will use in our facebook exercise.

// 1. Create an object that has properties "username" and "password". Fill those values in with strings.

```
> var objectFB = {
      username: "stephy",
      password: "abc1"
  }
```

// 2. Create an array which contains the object you have made above and name the array “database".

```
> var databaseArray = [objectFB];
```

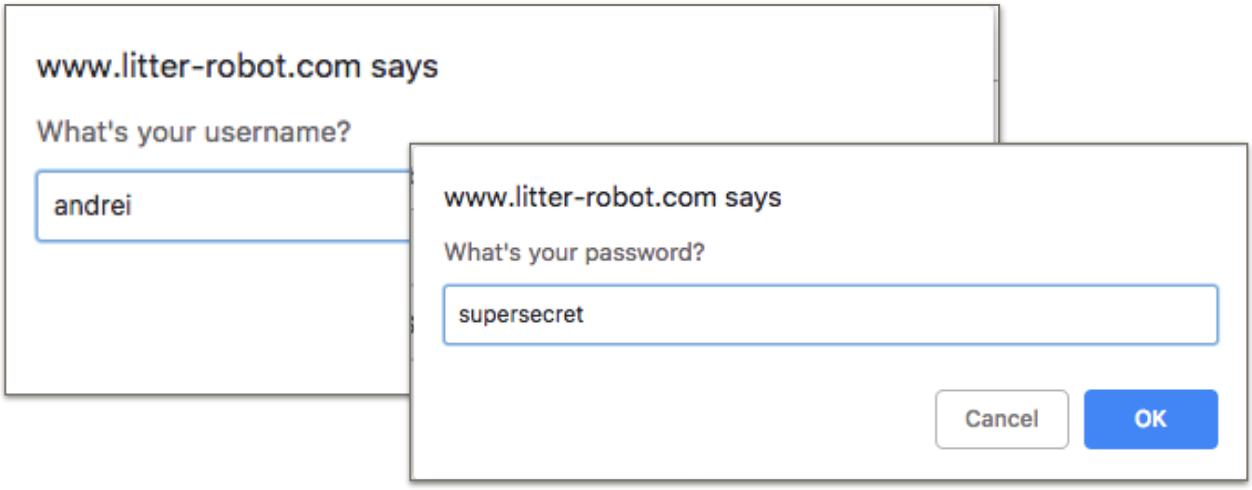
// 3. Create an array called "newsfeed" which contains 3 objects with properties "username" and "timeline".

```
> var newsfeedArray = [
      {
          username: "stephma",
          timeline: "qwerty"
      },
      {
          username: "andylol",
          timeline: "ijk"
      },
      {
          username: "sallyki",
          timeline: "chai latte time!"
      }
  ];
```

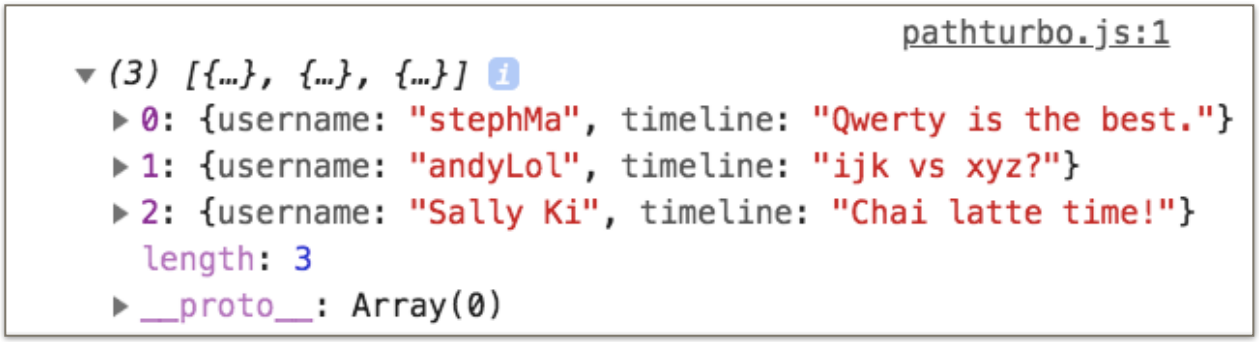
Exercise: Build Facebook

```
> var databaseArray = [
      {
          username: "andrei",
          password: "supersecret"
      }
  ];

  var newsfeedArray = [
      {
          username: "stephMa",
          timeline: "Qwerty is the best."
      },
      {
          username: "andyLol",
          timeline: "ijk vs xyz?"
      },
      {
          username: "Sally Ki",
          timeline: "Chai latte time!"
      }
  ];

  var usernamePrompt = prompt("What's your username?");
  var passwordPrompt = prompt("What's your password?");

  function signInFB(user, pw) {
      if (user === databaseArray[0].username
          && pw === databaseArray[0].password) {
          console.log(newsfeedArray);
      } else {
          alert ("Wrong username/password");
      }
  }

  signInFB(usernamePrompt, passwordPrompt);
```

If you enter correct username and password…



….you get the timeline in the console:



If incorrect, get message: