

# Prototypes & Inheritance

# Understanding Prototypes

- JavaScript is Object Oriented
- Functions are very powerful in JavaScript
- JavaScript uses prototypical inheritance instead of classical inheritance



# iPhone Example : Making the Prototype

Suppose you get a new iPhone. Every iPhone is manufactured the same way and come with the same features.

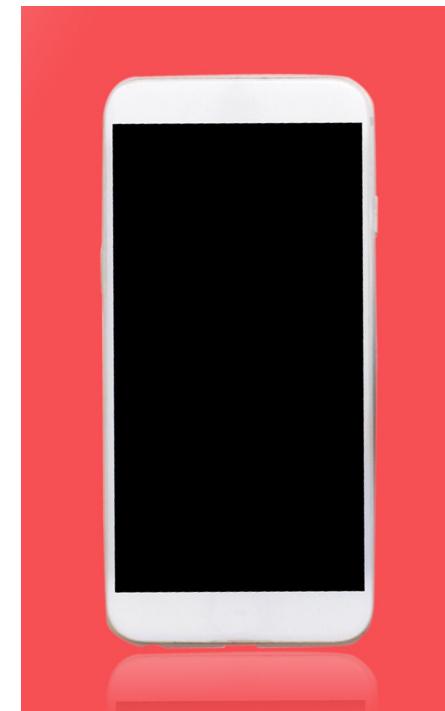
Make a new HTML file, add a script tag and try this:

```
function iPhone(){} // constructor

iPhone.prototype.faceId = function () {
    console.log("unlock my phone with my face!");
}

iPhone.prototype.video = function () {
    console.log("take 4k video with my iPhone");
}

iPhone.prototype.stocksApp = function () {
    console.log("find out what the stock market is doing");
}
```



# iPhone Example : Your Phone

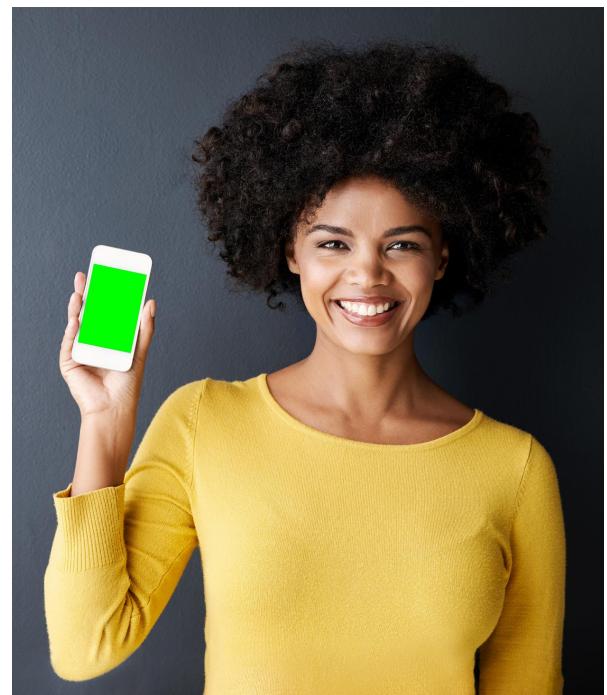
Add this to the script:

```
let myPhone = new iPhone();

myPhone.faceId();
myPhone.video();
myPhone.stocksApp();
```

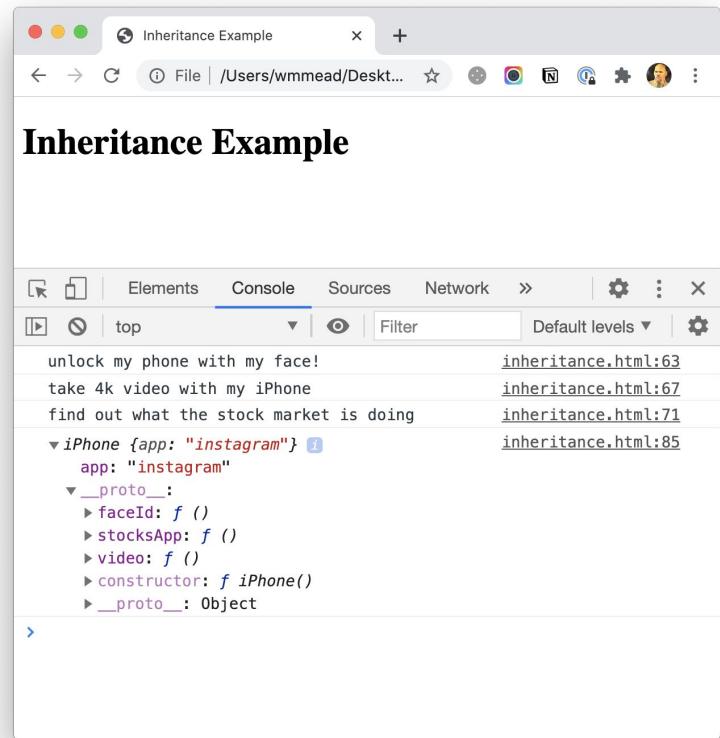
Then customize your phone by adding:

```
myPhone.app = "instagram";
```



# iPhone Example : Seeing the Properties

Type `console.log(myPhone);` in the console, with the page loaded.



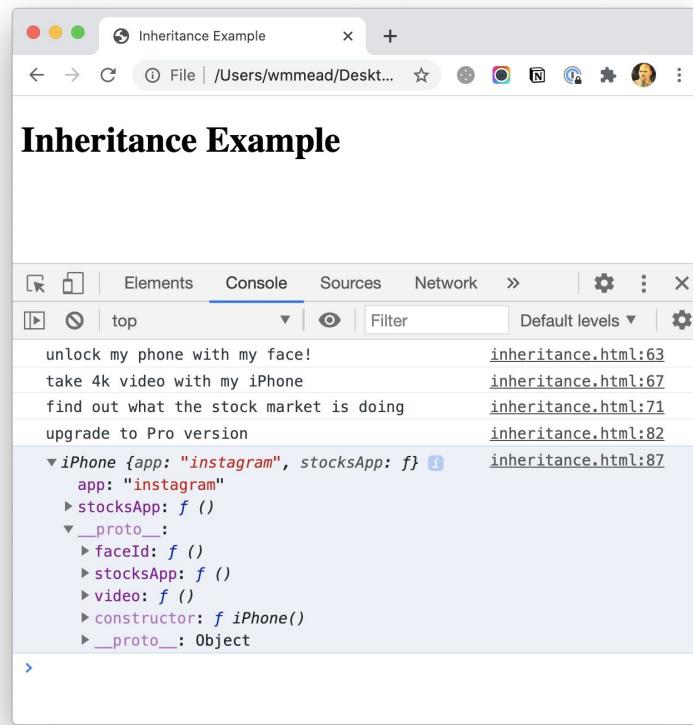
# iPhone Example : Overriding Inheritance

Suppose you have the ability to upgrade the stocks app on your phone to a pro version.

```
myPhone.stocksApp = function () {
    console.log("upgrade to Pro version");
}

myPhone.stocksApp();

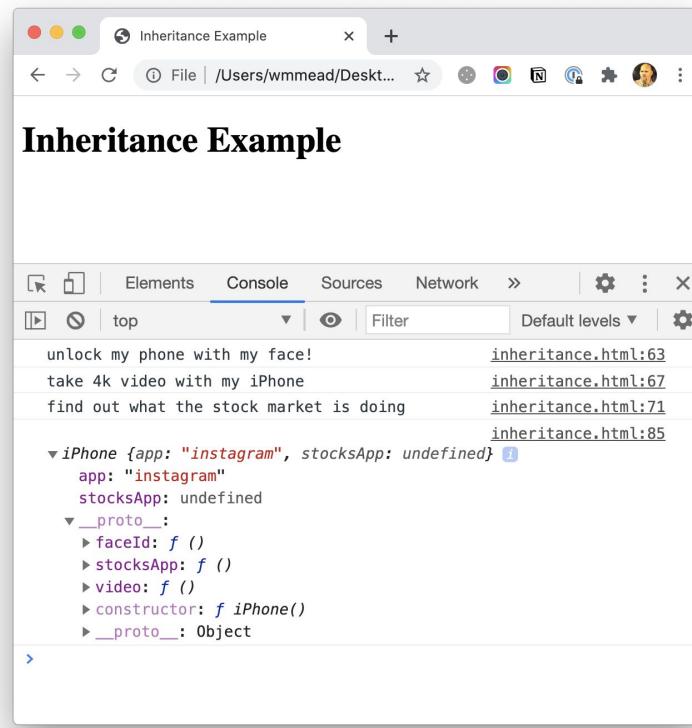
console.log(myPhone);
```



# iPhone Example : Deleting a Feature

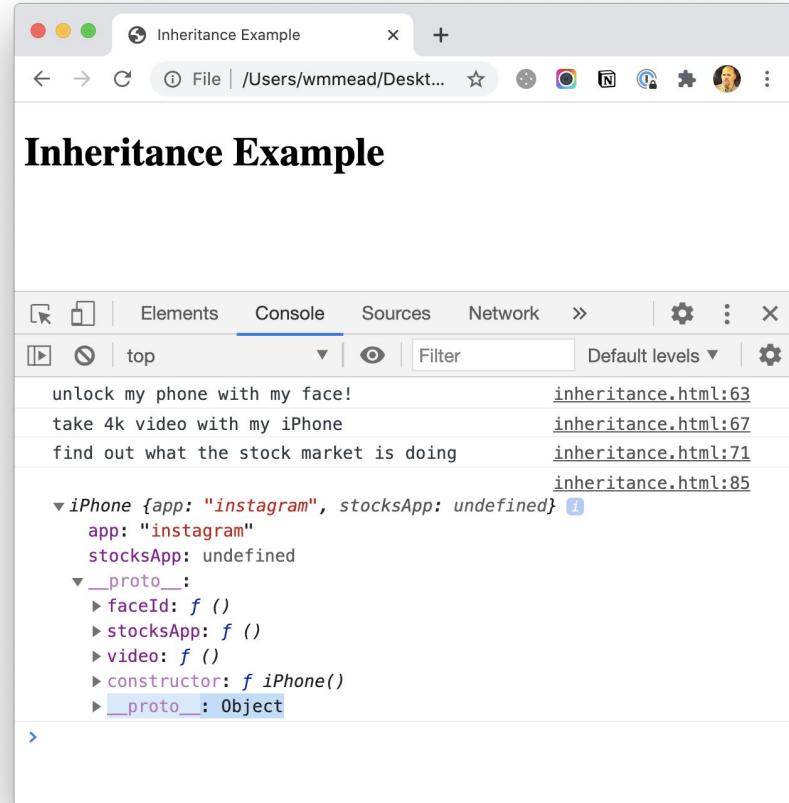
Delete the stocksApp...

```
myPhone.stocksApp = undefined;  
  
myPhone.stocksApp;  
  
console.log(myPhone);
```



# What is `__proto__`?

It is essentially this instance's pointer to the object it inherited from.



The screenshot shows a browser window titled "Inheritance Example". The address bar indicates the file is located at "/Users/wmmead/Desktop...". The developer tools console tab is selected, showing the output of a JavaScript object's properties. The object has properties: `app: "instagram"`, `stocksApp: undefined`, and `__proto__`. The `__proto__` property points to another object with methods: `faceId: f ()`, `stocksApp: f ()`, `video: f ()`, `constructor: f iPhone()`, and `__proto__: Object`.

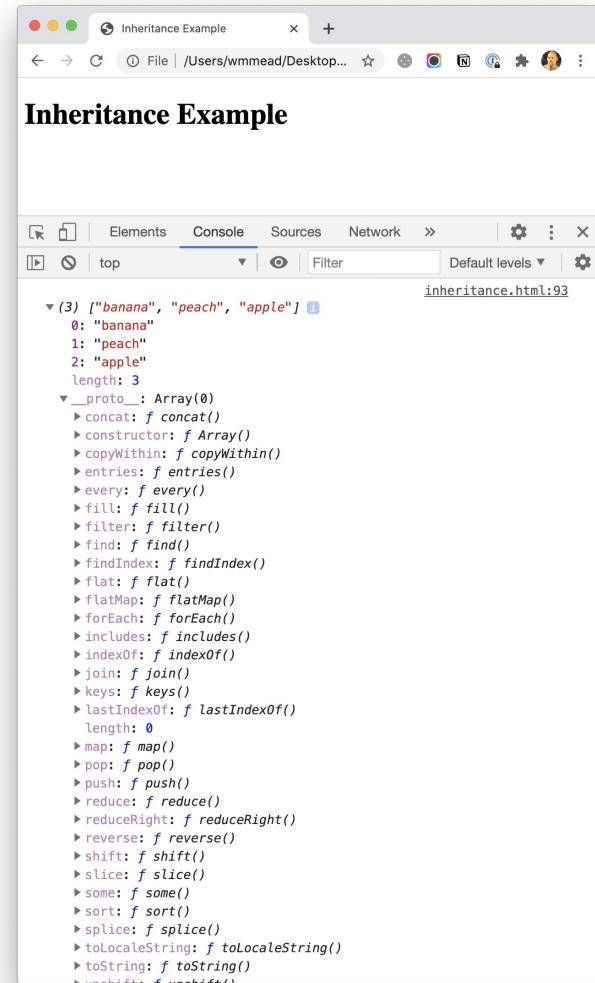
```
unlock my phone with my face! inheritance.html:63
take 4k video with my iPhone inheritance.html:67
find out what the stock market is doing inheritance.html:71
inheritance.html:85
▼ iPhone {app: "instagram", stocksApp: undefined} ⓘ
  app: "instagram"
  stocksApp: undefined
  ▼ __proto__:
    ► faceId: f ()
    ► stocksApp: f ()
    ► video: f ()
    ► constructor: f iPhone()
    ► __proto__: Object
>
```

# A Closer Look at an Array

Add this to the script, so you can see more about how prototypical inheritance works in JavaScript.

```
const myArray = ["banana", "peach", "apple"];

console.log(myArray);
```



# Another Inheritance Example

```
const carManufacturer = {  
  name: "Honda",  
  model: "Accord",  
  trimLevel: "ex",  
  baseFeatures: ["wheels", "engine", "seats"],  
  entertainment: "crappy audio system"  
}  
  
const dealership = Object.create(carManufacturer);
```



# Adding to the Base



```
dealership.equipment = "roof rack";
dealership.warranty = "extended";
dealership.branding = "license plate frame";

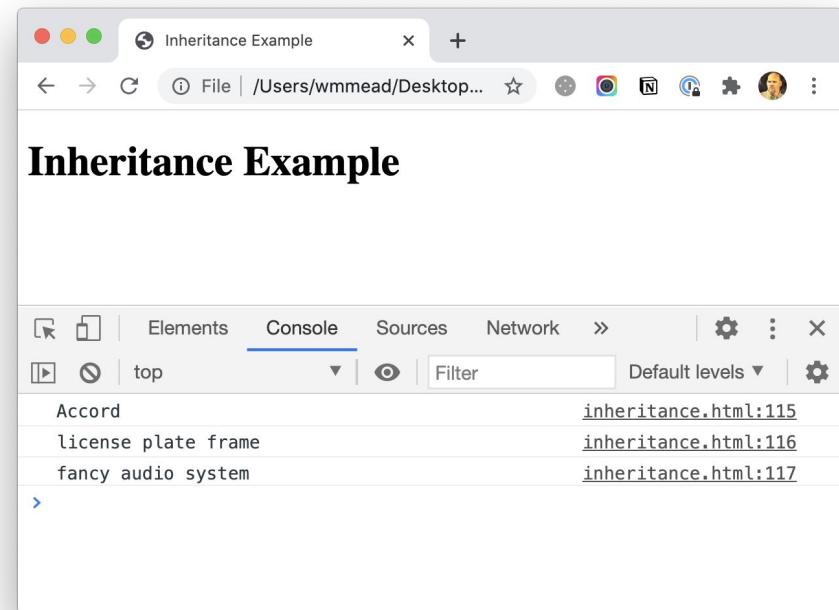
const myCar = Object.create(dealership);

myCar.custom = "after market trailer hitch";
myCar.bumperSticker = "Save the Llamas!";
myCar.entertainment = "fancy audio system";
```

# Accessing the Members of myCar

You can see that you can access members of the object from up and down the prototypical chain.

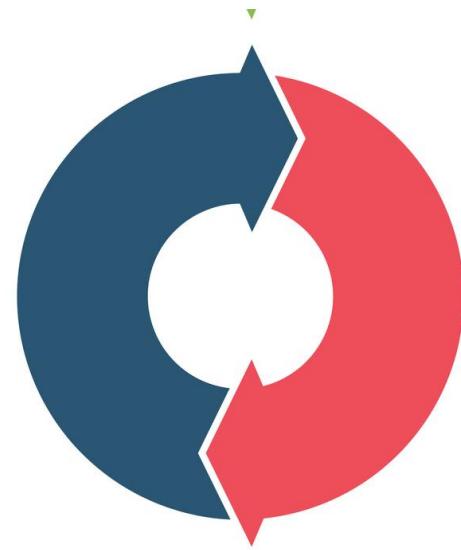
```
console.log(myCar.model);
console.log(myCar.branding);
console.log(myCar.entertainment);
```



# The JavaScript For ... In Loop

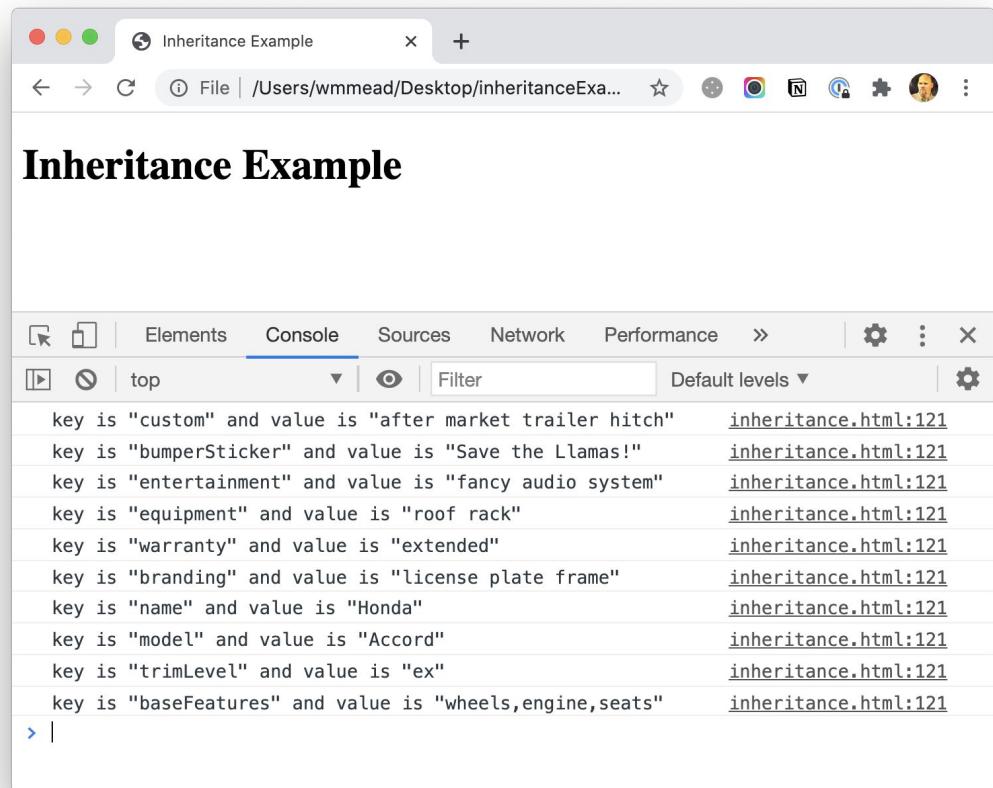
ES2015 (ES6) added a handy for ... in loop that is for iterating over objects. It looks like this:

```
for (const key in myCar) {  
  const val = myCar[key];  
  console.log(`key is "${key}" and value is "${val}"`);  
}
```



# For ... In Results

Here are the results...



The screenshot shows a browser window titled "Inheritance Example". The address bar indicates the file is located at "/Users/wmmead/Desktop/inheritanceExa...". The browser's toolbar includes standard icons for back, forward, search, and refresh.

The main content area displays the title "Inheritance Example". Below it, the browser's developer tools console is open, specifically the "Console" tab. The console output shows the results of a for...in loop, listing various car features and their values:

```
key is "custom" and value is "after market trailer hitch" inheritance.html:121
key is "bumperSticker" and value is "Save the Llamas!" inheritance.html:121
key is "entertainment" and value is "fancy audio system" inheritance.html:121
key is "equipment" and value is "roof rack" inheritance.html:121
key is "warranty" and value is "extended" inheritance.html:121
key is "branding" and value is "license plate frame" inheritance.html:121
key is "name" and value is "Honda" inheritance.html:121
key is "model" and value is "Accord" inheritance.html:121
key is "trimLevel" and value is "ex" inheritance.html:121
key is "baseFeatures" and value is "wheels,engine,seats" inheritance.html:121
```

The console interface includes tabs for Elements, Console, Sources, Network, and Performance, along with various filter and settings options.

# Object Method: hasOwnProperty()

The object method, hasOwnProperty() can be used to filter out any unwanted properties that might come down the prototype chain.

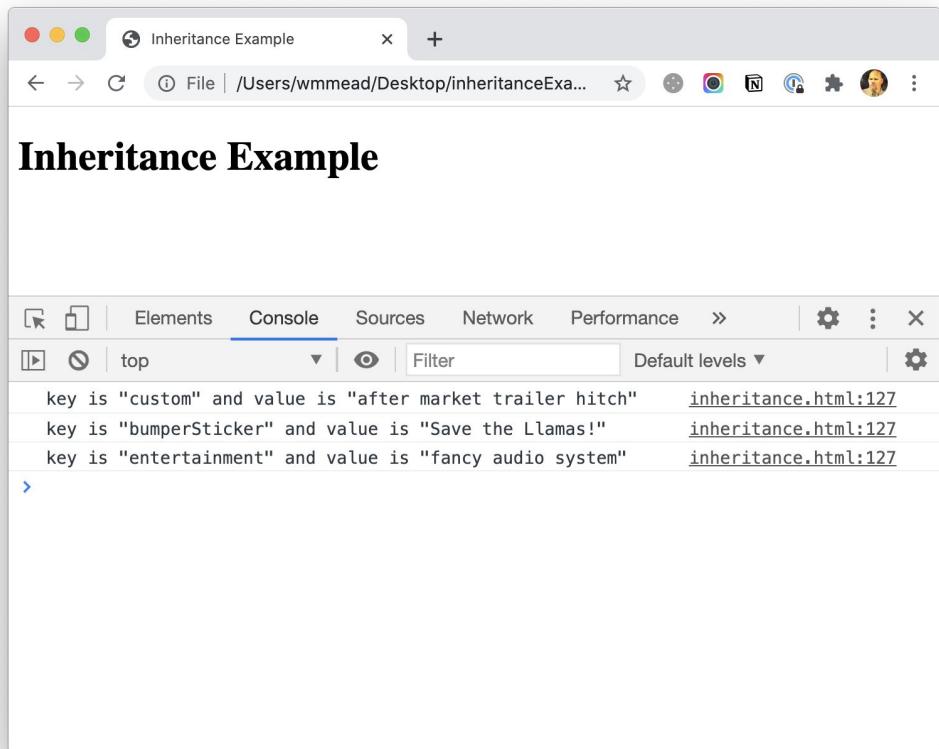
It is considered best practice to use this:

```
for (const key in myCar) {  
  if (myCar.hasOwnProperty(key)) {  
    const val = myCar[key];  
    console.log(`key is "${key}" and value is "${val}"`);  
  }  
}
```

The results are shown on the next slide.

# Final Result

Here is the result with the hasOwnProperty if statement filtering out anything inherited.



The screenshot shows a browser window titled "Inheritance Example". The address bar indicates the file is located at "/Users/wmmead/Desktop/inheritanceExa...". The browser's title bar includes standard Mac OS X controls (red, yellow, green) and a "+" button. Below the title bar is a toolbar with icons for back, forward, refresh, and other browser functions. The main content area displays the heading "Inheritance Example" in bold. Below the heading is a developer tools console tab bar with tabs for Elements, Console, Sources, Network, and Performance. The "Console" tab is active, indicated by a blue underline. The console output area shows three log entries:

```
key is "custom" and value is "after market trailer hitch"    inheritance.html:127
key is "bumperSticker" and value is "Save the Llamas!"      inheritance.html:127
key is "entertainment" and value is "fancy audio system"   inheritance.html:127
```

The console interface includes a "Default levels" dropdown, a "Filter" input field, and various settings and search icons at the top.

# Summary

There is a lot to learn about prototypes and inheritance in JavaScript. It's different from other languages, but if you can get your head around it, it is a very powerful feature of this particular language.

