# The Ultimate JavaScript Master Series

# Part 1

## 01 - Getting Started - 01 Welcome

This will teach the fundamentals of programming and Javascript.

## 01 - Getting Started - 02 What is JavaScript?

What is JavaScript

What can you do with it?

Where does JavaScript code run?

What’s the difference between JavaScript vs ECMAScript?

What is JavaScript?

It is one of the most popular and widely used programming languages in the world. It is growing faster that any other programming languages. (Ah… Java and JavaScript are not the same. Der).



Big companies like Netflix, Walmart, and Paypal build Entire applications around JavaScript. Average salary is $72,000 per year. (According to glassdoor.com?)

You can work as a front end developer, or a back end developer, or a full-stack Developer.

What can you Do with JavaScript? For a long time, javascript was only used in browsers to build interactive webpages. “Some developers refer to javascript as a toy language. But those days are gone because of huge community support and investments by large companies like facebook and google.”

You can build full blow web or mobile apps, as well as real-time networking apps like chats and video streaming services, command-line tools, or even games.

Where does JavaScript Code run? It was originally designed to run only in browsers. Every browser has a “JavaScript Engine” that can execute javascript code. E.g., the javascript engines in firefox and chrome are Spidermonkey and v8. In 2009 an engineer named Ryan daul, took the opensource JavaScript Engine in chrome, and embedded it inside a C++ program. He called the program Node.

Node is a C++ program that includes googles V8 JavaScript engine. Using this, we can run JavaScript code Outside a browser. We can pass our JavaScript code to Node for execution. This means, with JavaScript, we can build the back end for our web and mobile applications.

Javascript code can be run inside a browser or in node. They both provide a ‘runtime?’ environment for our javascript code.

What is the difference between JavaScript and ECMAScript?

ECMAScript is just a Specification. JavaScript is a programming Language that Conforms to this specification.

We have a programming language called ECMA, which is responsible for defining standards. They take care of this ECMAScript Specification.

The first version of ECMAScript was released in 1997. In 2015, ECMA has been working on annual releases of a newer specification. E.g., in 2015, they release ES2015/ES6. This specification defined Many new features for JavaScript.

Every browser has a JS engine, and we can write code here without an other tools. Let’s inspect a chrome window.

Select the Console Tab. This is our JavaScript Console. “We can write any Valid JS code here”.

*console.log('Hello World');*

*console.log('Hello World');*

*VM451:1 Hello World*

*undefined*

We can see the hello world Message on the console. (The VM451:1 is an artifact).

We can also write mathematical expressions here.

*2+2*

*2 +2*

*4*

alert(‘yo’)



## 01 - Getting Started - 03 - Setting Up the Development Environment

VSCode, Sublime Text, and Atom are all code Editors. Mosh prefers VSCode.

We will also install Node, from Nodejs.org. You don’t Need Node to execute JS, because you can execute it inside a browser. But it’s good to have node, because you can use it to install Third Party Libraries.

Create a folder, e.g., js-basics, and drag and drop in VSCode.

Let’s add a new file:



“Now you don’t really need to know html in order to take this course, but if you want to be a front end developer, you should know your html well.”

Make a boilerplate doc !. We’ll use this as a host for our JS code. Save.

Open index.html with live server.

In order to write JS, we need a script element. There are two places where we can add this. In the head section, or the body section.

The best practice is to put the script element at the end of the body section, After all the ‘existing?’ elements.

Why is this a best practice? One reason is that the browser parses this file from top to bottom. If you put the script element in the head, there would be a lot of JS code there, and your browser may get busy parsing and executing that JS code and it won’t be able to render the Content of the page. This will create a bad user experience. The user sees a white or blank webpage while your browser is busy parsing and executing your javascript code.

The second reason is that almost always the code between script elements needs to talk to the elements on this web page. For example we may wish to show or hide some elements. So by adding the code here at the end of the body section we’ll be confident that all these elements will be rendered by the browser.

There are exceptions to this rule. Sometimes you are using third party code that has to be placed in the head section. But these are exceptions. As a best practice, you should add your JavaScript code at the end of the body section.

Let’s write some code:

 <body>

    <h1>Hello World</h1>

    <script>

console.log('Hello World');

    </script>

  </body>

The highlighted code is a statement. A statement is a piece of code that expresses an action to be carried out. In this case, we want to *log* a message *‘Hello World’*, on the *console*.

All statements in JavaScript should be terminated by a semicolon ;

console.log('Hello World');

What we have here in between single “code?” is called a string. A string is a sequence of characters.

In JavaScript we also have this notation: // We can add two slashes and this represents a comment.

<script>

        // Comment

        console.log('Hello World');

    </script>

Here we can add some description to our code and this description is ignored by the JavaScript engine. It is not executed. It is purely for documenting the code when you want to explain to other developers why you have written the code this way. You don’t want to explain what the code does because that should be clear in the code itself. (Mosh highlights the console statement). We want to explain Why’s and Hows.

  <h1>Hello World</h1>

    <script>

      // This is my first JS code.

      console.log("Hello World");

    </script>

Let’s open our console again the browser. alt ctrl i

## 01 - Getting Started - 05 - Separation of Concerns

In real world applications we have thousands or even millions of lines of code. Therefore, writing in the script element is oftentimes not practical. We don’t want to write all the code inline here. We want to extract and separate our JS code from our html code.

Mosh utilizes a metaphor in which we recognize that bedrooms stores your bed and your clothes. We don’t store are clothes in the kitchen. This is what we call the Separation of Concerns. We want to separate HTML--which is all about content--from JavaScrip, which is all about behavior.

How should your webpage behave? What should happen when we hover our mouse over a given element? Maybe something should pop up or be hidden. We’ll use JavaScript to implement behavior.

In VSCode let’s start a new file will call index.js. Let’s cut our JS code from our html file, and paste it in index.js. In this application we have a single file, a single JavaScript file. In a real world application we have hundreds or even thousands of JavaScript files. We’ll eventually learn how to combined these files into a bundle and ‘serve’ that bundle to a ‘client’.

Now that all are JavaScript code is in a separate file, we need to reference that file here.

Let’s add an attribute here (in our HTML document):

<script></script>

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

This tells the browser that are JavaScript code is in index.js.

When we open our browser, we note that the Hello World message is still up, which indicates that our code is still working. Huzzah!

## 01 - Getting Started - 06 - JavaScript in Node

We navigate to our js-basics folder. Then we type (in command prompt… not in node?)

*node index.js*

*C:\Users\Mr. Artifice\Desktop\js-basics>node index.js*

*Hello World*

We get the same messages on the consol. As we can see, node is a program that includes google’s V8 JavaScript engine. We can give it a piece of JavaScript code and it will execute that code for us just like we can in a browser. (This works in both command prompt and the node command prompt). So, node is a runtime environment for executing JavaScript code.

Here’s a tip from Mosh:

VSCode includes an integrated terminal, so you don’t have to open up a separate terminal window. Under view, you’ll find the “Terminal” option. Note that our terminal is pointing to the same folder where we created our files… You don’t have to explicitly navigate to this folder. (Make sure you have the index selected).

Here you can type node index.js and get the same output. (I have a big error message from my previous shell manipulations).



In this course we will no longer work with node. Node is a separate topic for which mosh has devoted a course with 14 hours of content.

## 02 - Basics - 01 - Variables - 5.36

Variables are one of the most fundamental concepts in JavaScript or any other programming language.

In programming we use a variable to store data temporarily in a computer’s memory.

We store our data somewhere, and give that memory location a name:

Memory

|  |  |  |  |
| --- | --- | --- | --- |
| Variable |  |  |  |

Variable Name.

With this Name, we can read the data at the given location in the future.

Metaphor!!!

Imagine putting items in various boxes, and labeling each box. Now, you can readily find your stuff. A variable is like this box. What we put inside this box is the value we assign to a variable; that’s the data. And the label that we put on the box is the Name of our Variable.

In index.js let’s declare a variable. In the old days before ES6 we used the *var* keyword to declare a variable.



However, there are issues with VAR as we will discover later in the course.

After ES6, the best practice is to use the *let* keyword to declare a variable.

let

Let’s give this variable a name or an identifier. This is like the label we put on a box. We’ll call it *name* and terminate it with a semicolon.

let name;

Let’s add this on the console and see what happens.

*console.log(name);*

let name;

console.log(name);

In the console, we see *undefined.* (I also have loads of error messages, for whatever reason).



By default variables that we define in JavaScript… Their value is undefined.

We can optionally initialize this variable:

let name;

console.log(name);

= a string, which is a sequence of characters.

let name = 'Mosh';

console.log(name);

We can use single or double quotes. It is more common to use single quotes for declaring strings in JavaScript.



Now we see Mosh on the console.

let name = 'Mosh';

console.log(name);

We have declared a variable called *name* and we have set it to this (‘Mosh’) value, to this string.

There are a few rules for naming the variables.

They cannot be a reserved keyword. For example we can’t use the keyword *let*. If we tried to use one of these names, we will get an error.

Note this red underline:



This is indicating that this is not a valid identifier.

Our second rule is that the name should be meaningful. The name should give some clue as to what the purpose of the variables are. What kind of data are we storing at that memory location. Always use meaningful and descriptive names.

The third rule is that they cannot start with a number.

The fourth rule is that they cannot contain a space or a hyphen.

For example, *let firstName .* Mosh is using camel notation, so the first letter of the first word is lowercase, and the first letter of every word after should be uppercase.

Camel notation is the convention used in JavaScript to name are variables.

The fifth rule for variable names is that they are case sensitive. E.g., the following variables are different:

*let firstName;*

*let FirstName;*

The sixth rule is that if you want to declare multiple variables there are two ways to do this. You can declare them on one line and separate them using a comma… e.g.,

*let firstName, lastName;* (In this case Mosh has not initialized either of these variables. They are both undefined).

We can optionally initialize one or both of them. E.g.,

*let firstName = ‘Mosh’, lastName;* (lastName is undefined) or… Up

*let firstName =’Mosh’, lastName = ‘Hamedani’;*

But the modern, best practice is to declare each variable on a single line. Like so:

*let firstName =’Mosh’;*

*let lastName = ‘Hamedani’;*

## 02 - Basics - 02 - Constants

Let’s make a variable called interest rate:

*let interestRate = 0.3.;*

This is the initial value; we can always change it later.

let interestRate = 0.3;

interestRate = 1;

If we log this on the console, we’ll see the new value… right?



There it is. 1 on the console.

However, there are real world situations in which we don’t want the value of that variable to change… Because otherwise it’s going to cause all kinds of bugs in the application. So, we use a Constant instead of a variable.

The value of the variable changes, but the value of a constant.

So, let’s change *let*, to *const*:

const interestRate = 0.3;

interestRate = 1;

console.log(interestRate);

When we save these changes, we’ll see an error in the console on line two.



If we click the error circled above:



We can see the line in code where this error occurred. So… we cannot reassign a constant.

The best practice is that if you don’t need to reassign, constant is your best choice. If you need to reassign a variable, use let.

## 02 - Basics - 03 - Primitive Types

What are the kind of values we can and assigned to a variable? We have seen strings… but we have more types.

In JavaScript we have two categories of types:

1. Primitives AKA Value Types
2. Reference Types.

For Primitives, we have:

* Strings
* Number
* Boolean
* undefined
* null

E.g.,

let name = 'Mosh';

We have a variable called name, which is set to a string. This: “*‘Mosh’*” is what we call a String literal. This is a fancy name for a string.

Let’s declare a variable and set it to a number.

let age = 30;

This is what we call a number literal.

Let’s declare a Boolean. A Boolean can be either true or false.

Let is approved to be true:

let isApproved = true;

We use Boolean in situations where we want to have some logic. E.g., If the order is approved, it needs to be shipped. So, the value of Boolean variable can be true or false. (Both true and false are reserved keywords, so they cannot be variable names.)

(Are undefined variables ones that aren’t initialized? What is initialized?).

Ah, yes. If we do not initialize a variable, then by default it is undefined.

let firstName;

We can also explicitly set the variable to undefined:

let firstName = undefined;

However, that is not very common. In contrast, we have another key word, *null*.

let lastNames = null;

We use *null* in all situations that we want to Explicitly clear the value of a variable. E.g., We might want to present the user with a list of colors. If the user has no selection, we want to set the:

*selectedColor* variable to null:

let selectedColor = null;

In the future… if the user selects a color, we will reassign this variable to a color like ‘red’.

let selectedColor = 'red'

But then, if the user clicks red again, we want to remove the selection and set this back to null. We use null in situations where we want to clear the value of a variable.

These are the examples of primitives/value types.

let name = 'Mosh';  //This is a String Literal

let age = 30;  //Number Literal

let isApproved = true;  // Boolean Literal

let firstNames = undefined;  //undefined

let lastNames = null; //null

## 02 - Basics - 07 - Functions

In the category of reference types we’ve learned about objects and arrays.

A function is a set of statements that performs a task or calculates a value.

Let’s declare function using the *function* key word. Let’s give function name, *greet*. Add parenthesis… that’s part of the syntax for declaring functions. () Then {}. What’s inside the curly braces is referred to as the body of the function. This is where we had all the statements to define some kind of logic in our application.

E.g., the logic in this function should be to display a message on the console.

function greet () {

    console.log('Hello World');

}

Note that we terminate our statement with a ;. But when we are declaring a function, we do not need to add a ; at the end, because we’re not declaring it like a variable like this: *let number = 1;*

function greet () {

    console.log('Hello World');

}; this semicolon is unnecessary.

We can call a function like so:

greet();

function greet() {

    console.log('jimbob');

}

greet();

We add the name of the function *greet* with parenthesis *()* and a semicolon to indicate that this is a statement.

**So, in my terms… the function *greet ()* is all one unit, both the word and the parenthesis. Inside {}, we execute the log command. So… all you have to do is add a *greet()* [[with a semicolon]] and you are executing the function by making a statement. So… empty parenthesis are part of the function, along with the name.**

function greet () {

    console.log('Hello World');

}

greet();

((Also, we are mere executing a console log here. Copying and pasting the console log outside the function would give the same value)).

Our function can have inputs, and these inputs can change how the function behaves.

Let’s say we’d like to display the name of a person instead of hello world. We can add a variable in between parentheses. We refer to this variable as a parameter. ^^

function greet(name) {

    console.log('Hello World');

}

greet();

Thus, our greet function has one parameter called name. “essentially name is like a variable that is only meaningful inside of this function. So inside of this function we can work with this name variable but it will not be accessible outside of this function”

[[[I.e., this variable will not contaminate data other code outside the function]]]

Name is an input to this function. So, instead of displaying hello world, we can delete world and add a plus to concatenate two strings… e.g., name:

function greet(name) {

    console.log('Hello' + name);

}

greet();

“When calling the greet function, we need to pass a value for the name variable, or name parameter more accurately”.

[[[When I don’t pass a value for name, the variable is undefined. See below:]]]



So, we can pass John between the brackets. We refer to this as an argument.

function ***greet (name)*** {

    console.log('Hello' + **name**);

}

greet('John');

“So, John is an argument *to* the greet function. And, name is a parameter *of* the greet function.” ^^ “That’s one of the things that a lot of programmers don’t know. They don’t know the difference between a parameter and an argument.”

[[[I explain function thusly: John is an argument that defines the name variable/parameter. Newly defined name variable/parameter equals **undefined name variable**, which is inside the body of the function]]]

“So a parameter is what we have here at the time of ***declaration***. The argument is the actual value we supply for that parameter.

function ***greet (name) {***

    console.log('Hello' + name);

}

greet('John');



Why does Mosh have a space?



Ah haha. Add a space after hello.

We can reuse this function, with a different input. We can copy the argument line, paste it, and add a name.

function greet (name) {

    console.log('Hello ' + name);

}

greet('John');

greet('Mary');

Now we have two different messages on the console.



A function can have multiple parameters. We can add more parameters by using a comma. E.g., lastName.

function greet (name, lastName) {

    console.log('Hello ' + name);

}

greet('John');

greet('Mary');

Now we can add this new parameter to console.log. Note that we added an extra space in the quotes. Also, note that parameters aren’t put into quotes. Presumably only the strings? Also, we can easily add spaces to strings, but we cannot do that with parameters. We had to add empty quotes to incorporate spaces.

function greet (name, lastName) {

    console.log('Hello ' + name + ' ' + lastName);

}

greet('John');

greet('Mary');

“when calling this greet function, we should pass another argument for the last name.” Let’s see what happens if we don’t do this.

((I got a different error message previously because last name was not capitalized. Remember that this stuff is case sensitive))



The default value of variables in JavaScript is undefined which is why hello john and hello Mary are undefined. “so because we did not pass a value for the last name, by default it’s undefined.”

For greet, let’s pass another argument. We’ll add a comma, and a last name in quotes. “we don’t need the second call to the greet function”. We’re deleting the second call to the greet to function, which is Mary. ((apparently values are assigned two parameters in consecutive order))

/\*

function greet () {

    console.log('Hello World');

}

greet();

function greet (name) {

    console.log('Hello World');

}

greet();

Here we concatenated two strings (hello and name) with a plus, and provided an arguement/function Name

function greet (name) {

    console.log('Hello ' + name);

}

greet('John');

Here we copied our function, and put in a different argument.

function greet (name) {

    console.log('Hello ' + name);

}

greet('John');

greet('Mary');

Here we add a last name, parameter, but we did not pass an argument (assign a value) to it, which is why it is (and displays as) literally 'undefined' in the console.

function greet(name, lastName) {

    console.log('Hello ' + name + ' ' + lastName);

}

greet('John');

greet('Mary');

Lastly, below, we have passed another argument, "Smith", which is assigned to the parameter lastName

\*/

function greet(name, lastName) {

    console.log('Hello ' + name + ' ' + lastName);

}

greet('John', 'Smith');

## 02 - Basics - 04 - Dynamic Typing

Something that separates JavaScript from other programming languages is that java script is a dynamic the language.

There are two types of languages:

* Static (statically-typed)
* Dynamic (Dynamically-typed).

In static languages, when we declare a variable, the Type of that variable is set and it cannot be changed in the future: *string name = ‘John’;*

Whereas in a dynamic language, the type of a variable can change at runtime: *let name = ‘John’;*

Let’s examine our code:

let name = 'Mosh';  //This is a String Literal

let age = 30;  //Number Literal

let isApproved = true;  // Boolean Literal

let firstName = undefined;  //undefined

let lastNames = null; //null

At the top, we have declared (let?) this name variable, and we have “set that to a string”. So, the type of name is currently a string, but it can change in the future.

Let’s go to our console, and execute some JavaScript code. We have a typeof operator, which we can use to check the type of variable.

So, we type *typeof* followed by our name variable *name*

*typeof name*



If we reassign name to a different value, like a number (*name = 1;*) and check it’s type:



The type is now changed to number. *‘number’*

This is what we call a dynamic language. Unlike static languages, the type of these variables will be determined at run time, based on the values we assign to them.

Let’s look at some more examples of the typeof operator. (typeof using other reserve key word).

(Command^^) To clear the console press ctrl L.

*typeof age*

‘number’

Type of age is a number.

Let’s change age to a floating point number in the console:

*age = 30.1*

*30.1*

Note that when we look at typeof, age is still a number.



In JavaScript, unlike other programming languages, we don’t have two types of numbers: we don’t have floating point numbers and integers. All numbers are *oftype* number.

*typeof isApproved*

*‘boolean’*

*typeof firstName*

*‘undefined’*

“That’s funny, because the value of this variable (highlights the word undefined) is undefined, but its type is Also undefined”:

let firstName = undefined;

[Now it seems to me that the typeof is *not* undefined. Surely this is part of the following list of types?   
  
**JavaScript types**

* Boolean type.
* Null type.
* Undefined type.
* Number type.
* BigInt type.
* String type.
* Symbol type.

So then, why is this type undefined?]

“What does this mean? Well, earlier I told you that we have two categories of types. Primitives/Value Types, and Reference Types.

In the Primitive/Value Types we have:

* String
* Number
* Boolean
* undefined
* null

So… undefined is actually a Type… but it is also a Value.

let firstName = undefined;

“In this example, *because* we have set *firstName* to *undefined* as a value, it’s type is also undefined.”

((If we renamed firstName to the string ‘icecream’, string would be the type, but icecream the value… I think)).

How about *selectedColor*?

let selectedColor = null;

key Variable type

word

*typeof selectedColor*

*'object'*

The type of this Variable, is an Object.

## 02 - Basics - 05 - Objects

Reference Types

* Object
* Array
* Functions

An object in JavaScript and other programming languages is like an object in real life. For example, a person has a name, age, address, etc. These are the Properties of a person. The same concept exists and JavaScript.

When we’re dealing with multiple related variables, we can put these variables inside an object.

E.g., here we have two variables: name and age.

let name = 'Mosh';

let age = 30;

They are highly related; they are part of the representation of a person. So instead of declaring two variables, we can declare a person Object. Then instead of referencing these two variables, we can simply reference the person object. It makes for cleaner code.

[[[https://www.freecodecamp.org/news/javascript-object-keys-tutorial-how-to-use-a-js-key-value-pair/

*const desk = {*

*height: "4 feet",*

*weight: "30 pounds",*

*color: "brown",*

*material: "wood",*

*};*

*An object contains properties, or key-value pairs. The desk object above has four properties. Each property has a name,* ***which is also called a key,*** *and a corresponding value.*

*For instance, the key height**has the value "4 feet".* ***Together, the key and value make up a single property.***

*height: "4 feet",]]]*

Let person = an object literal, i.e., curly braces.

*let person =* {};

The curly braces above are what we call an object literal.

'Between these curly braces, we add one or more key value pairs. The keys are what we call the properties of this object. In this case, we want the person object to have two properties, or two keys: name and age.

let name = 'Mosh';

let age = 30;

let person = {

};

Name [this is the key]: [after that, we set the value] ‘Mosh’ [add a comma], [another key value pair] [the key ‘age’] age: [the value] 30

“So we add name here… that’s the key. Then we add a colon, and then after that we set the value… Mosh.”

let name = 'Mosh';

let age = 30;

let person = {

    name: 'Mosh',

    age: 30

};

  name: 'Mosh',

Key Value

“Now we have a person object with two **properties**, or two **keyvalue pairs** ((Highlights name: ‘Mosh’)): name and age.” “And with that, we don’t need those two variables”

let name = 'Mosh';

let age = 30;

let person = [{

**name: 'Mosh',**

**age: 30**

};

Now, let’s log person on the console.

let person = {

    name: 'Mosh',

    age: 30

};

console.log(person);



We see our person object {name: “Mosh”, age: 30}. “Note the object literal syntax” - ((He means the curly braces)).

We have a couple key value pairs. ((Mosh wave his mouse over both age and its value, and name and its value)) They ((the key value pairs?)) are the Properties of the person object.

*age:30 Name: ‘mosh’*

Key:value Key: Value

Key Value Pair Key Value Pair

Property Propery

“There are two ways to work with these properties. Let’s say we want to change the name of this person. We’ll need to access the name property.” One way is to utilize Dot Notation. We add the name of our object (person), by typing *person dot*. … and now its properties are displayed in the popup list: It shows the age and the name properties.



Once we see the property that we wish to alter, we can enter it and do the following:

//Dot Notation

person.name = 'John';

let person = {

    name: 'Mosh',

    age: 30

}

person.name = 'John';

console.log(person);

“We can also use the dot notation to read the value of a property.” “Instead of logging the person object we can log it’s name property.” Now, in the console, it just says “John”.

let person = {

    name: 'Mosh',

    age: 30

}

person.name = 'John';

console.log(person.name);

((In other words, we can reference or display specific properties-key:values in an object)).

The other way to access a property is bracket notation. So instead of dot, we use square brackets… and we pass a string that determines the name of the target property. The name of the target property is name. So… we can change that to, say, Mary”

let person = {

    name: 'Mosh',

    age: 30

}

person.name = 'John';

person['name'] = 'Mary';

console.log(person.name);

“When reading that, we can use the dot notation, or the bracket notation. If we save the changes, now we get Mary”



Which notation is better? Dot notation or bracket notation?

“Dot notation is more concise, so that should be your default choice.

*[[So… person is the object, with a couple of properties. Dot notation allows us to select one (or more?) of those properties, and display (probably) or alter it]]*

“…However, bracket notation has its own uses. Sometimes you don’t know the name of the target property until the runtime. E.g., in our user interface, the user might be selecting the name of the target property. In that case, at the time of writing code, we don’t know what property we are going to access. That is going to be selected at runtime by the user.”

“So, we might have another variable somewhere else like “let selection = ‘name’;”. *Let selection*  =’name’ and that can change at runtime.”

let person = {

    name: 'Mosh',

    age: 30

}

person.name = 'John';

let selection = 'name';

person['name'] = 'Mary';

console.log(person.name);

“With this [[person [] = ‘Mary’;]] we can access that property using the bracket notation in a dynamic way. We pass selection here… and we get the same result. [[[Mary on the console]]]

let person = {

    name: 'Mosh',

    age: 30

}

person.name = 'John';

let selection = 'name';

person[selection] = 'Mary';

console.log(person.name);

/\* let name = 'Mosh';

let age = 30;

The Object below allows us to eliminate the two variables above

let person = {

    name: 'Mosh',

    age: 30

};

then add

console.log(person);

Now both of the person object properties display in the console.

//Dot Notation

person.name = 'John';

console.log(person);

This displays just John in the Console window, as we have defined the person object (displayed by the console) as merely the name property (using dot notation), which we also redefine.

Next, we also employ bracket notation to define the properties that will be displayed by the console, and its altered values.

let person = {

    name: 'Mosh',

    age: 30

};

//Bracket Notation

person ['name'] = 'Mary';

console.log(person.name);

So... the object is person.

let person = {

    name: 'Mosh',

    age: 30};

Object has a name property.

name: 'Mosh',

The the variable Selection is created, with a value of name.

let selection = 'name';

The console will open the person object's name propery.

console.log(person.name);

The person object is defined with bracket notation as selection, with selection being set with the value of Mary.

The object Person = the value Name,

The variable Selection = the value Name,

The object Person = Selection,

Selection = Mary

The Object display's the name Mary in the console.

\*/

let person = {

    name: 'Mosh',

    age: 30

};

//Bracket Notation

let selection = 'name';

person [selection] = 'Mary';

console.log(person.name);

## 02 - Basics - 06 - Arrays - 4.18

Sometimes in your applications you might be dealing with a list of objects. For example, the list of products in a shopping cart. Or, the list of colors the user is selected. We utilize arrays to store such lists.

*let selectedColors*  Note that we aren’t using an indecipherable abbreviation like SC. We have a meaningful name. Let’s initialize this:

*let selectedColors =*

We’ll set this to an empty array. The square brackets are what we call *array literal*. They indicate an empty array.

*let selecteColors = [];*

We can initialize this array and add a couple of items.

let selectedColors = ['red', 'blue'];

Now, let’s log this on the console:

console.log(selectedColors)

let selectedColors = ['red', 'blue'];

console.log(selectedColors)



Note that our array has two elements. Also note that each element has an index, and that determines the position of that element in the array.

To access an element in an array, we use that index…

For example, suppose we want to display the first element in the array. We can use the square brackets, and then specify the index. Observe:

let selectedColors = ['red', 'blue'];

console.log(selectedColors[0])



Now, only the first item in the index displays.

The lengths of our arrays and the type of objects in them are dynamic, they can change. For example, we can add other elements besides red and blue and expand our array.

let selectedColors = ['red', 'blue'];

selectedColors[2] = 'green';

console.log(selectedColors)



Now we have an array with three elements. Thus, the length is dynamic. It is changeable. Also, the type of objects in this array is also dynamic. Most programming languages do not support mixing different types of objects in the same array.

Here, we will change one of the elements in the array from a colour to a number.

let selectedColors = ['red', 'blue'];

selectedColors[2] = 1;

console.log(selectedColors)



Now we have two strings, and a number.

So, the element type in the array as well as the size of the array is dynamic.

Technically an array is an object. Just like the personal object we previously defined, the array has a bunch of key value pairs or Properties that we can access using the dot notation.

If we examined the already in the console with the typeof function, this is our output:

*typeof selectedColors*

*‘object’*

Note, that this array is indeed an object.

In VS code, we can examine the properties of this array/object using the dot notation. VSCode displays a number of properties to choose from for an array in JavaScript.

“Every time we declare an array using square brackets that array will automatically receive these properties. That we did not explicitly define them… they are simply magically inherited from somewhere else.” (We will learn about this later when we examine prototypes.)



Let’s examine the length property.

let selectedColors = ['red', 'blue'];

selectedColors[2] = '1';

console.log(selectedColors.length);

This property returns the number of items or elements in an array. See below.



An array is a data structure that we used to represent a list of items.

/\*

02 - Basics - 06 - Arrays

let selectedColor = []

The above Square brackets are called a literal array

let selectedColors = ['red', 'blue'];

console.log(selectedColors)

This displays both elements

let selectedColors = ['red', 'blue'];

console.log(selectedColors[0])

This displays the First element.

let selectedColors = ['red', 'blue'];

selectedColors[2] = 'green';

console.log(selectedColors)

This displays a Third element in the array.

\*/

let selectedColors = ['red', 'blue'];

selectedColors[2] = '1';

console.log(selectedColors.length);

## 02 - Basics - 08 - Types of Functions

Mosh disapproves of all the concatenations listed below. But he says we’ll worry about fixing them later with template literals.

console.log('Hello ' + name + ' ' + lastName);

The function below is performing a task. “It’s task is to display something on the console”.

function greet(name, lastName) {

    console.log('Hello ' + name + ' ' + lastName);

}

greet('John', 'Smith');

Let’s do a function that calculates a value. “Let’s call this function square. This function should take a parameter. We’ll call it number”.

function square(number) {

}

“We need to calculate the square that number. That is number \* number”.

function square(number) {

number \* number;

}

“we need to *return* this **value** to whoever is calling this function. For that we use the return key word” We cannot have another variable called return because it is another reserved key word.

function **greet**(name, lastName) {

    console.log('Hello ' + name + ' ' + lastName);

}

function square(number) {

    return **number \* number**;

“Instead of calling to **greet** function, let’s call the **square** function. Square… and we pass 2. This returns a Value… so we can use that value to initialize a variable.”

function square(number) {

    return *number* \* *number*;

}

square(2);

*[[[No, 2 is an argument to the Square function. It Defines the variable, of the function named Square. Number is a variable/parameter of the Square function. It defines the undefined number variable, in the body]]]*

“E.g., we can declare another variable called number, and set it to square of 2.

let number = square(2);

function square(number) {

    return number \* number;

}

let number = square(2);

Now we can display this on the console.

console.log(number);

function square(number) {

    return number \* number;

}

//We were calling the greet function.  Now we are calling the square function.

let number = square(2);

console.log(number);

[[[Sooo. Console.log log will display Number. But what is Number? Number equals the output of the square function. And the Square Function receives an argument, or we “declare” (*let number*) “a variable” and we “pass a Value” to the Square function. That value is then executed inside the body of the function. I just don’t know if the variable we declare is passing a value, or an argument to the function. ]]]

Soo... we'll call the function Square.  Square has a number parameter.  We will return number times number.

Our variable says that number will equal square function (N times N), with the number parameter being 2.



“In this particular example we don’t necessarily have to declare a second variable, if all we want to do is display the square of two (square(2)) on the console. We can exclude this variable declaration…”

function square(number) {

    return number \* number;

}

let number = square(2);

“…and simply pass square of two to console.log”

function square(number) {

    return number \* number;

}

console.log(square(2));

**((Here, the log function square has an argument value of 2, which it will pass to the function square with a parameter value of two, which undergoes the function 2X2, and this value will be passed to console.log))**

“So, when the java script engine executes this code, first it will call this function [[square(2)]], it will get a value, and then pass that value to console.log.”



“How many function calls do we have in this code?”

function square(number) {

    return number \* number;

}

console.log(square(2));

“We have two function calls”. (((What is a function call? Duuuur. It’s the thing that Activates the function))). “Square of two is one function call.

function square(number) {

    return number \* number;

}

console.log(square(2));

“But console dot log is also Another function call, because here we have parenthesis”.

function square(number) {

    return number \* number;

}

console.log();

“We are calling the log function which is defined somewhere, and passing an argument ((between the brackets)).

function square(number) {

    return number \* number;

}

console.log()

“We could pass a simple string like hello:”

function square(number) {

    return number \* number;

}

console.log('Hello');

“Or we can pass an expression. That expression can be a call to Another function… like square of 2”

function square(number) {

    return number \* number;

}

console.log(square(2))

“For now, all I want you to take away is that a function is a set of statements that either performs a task for calculates and returns a value.”

/\*

This function is Performing a task.

function greet(name, lastName) {

    console.log('Hello ' + name + ' ' + lastName);

}

greet('John', 'Smith');

function square(number) {

    return number \* number;

}

//We were calling the greet function.  Now we are calling the square function.

let number = square(2);

console.log(number);

Soo... we'll call the function Square.  Square has a number parameter.  We will return number times number.

Our variable says that number will equal square function (N times N), with the number parameter being 2.  There is an order of operations aspect.  The same term can have different values on the page... because sometimes that term is being acted upon, and other... things are receiving that finished output

function square(number) {

    return number \* number;

}

let number = square(2);

console.log(number);

\*/

//Performing a task

function greet(name, lastName) {

    console.log('Hello ' + name + ' ' + lastName);

}

function square(number) {

    return number \* number;

}

console.log(square(2));

## 03 - Operators - 01 - JavaScript Operators - .40

We utilize operators along with variables and constants to create expressions. With expressions we can implement logic and algorithms.

Kinds of operators:

* Arithmetic operators
* Assignment operators
* Comparison operators
* Logical operators
* Bitwise operators

## 03 - Operators - 02 - Arithmetic Operators

We use arithmetic operators for performing calculations, just like in mathematics. Let’s examine some of them.

We use them for performing calculations, just like in mathematics.   
  
Here’s an example of the addition operator:

let x = 10;

let y = 3;

console.log(x + Y);

Arithmetic operators usually take two operands (like x & y) and then produce a new value.

An expression is something that produces a value. E.g., X + Y.

Comment out - Mosh - 03 - Arithmetic Operators - Highlight a group of text in VSCode and control and slash. It turns text into this:

More Operators:

* // console.log(x + Y);
* // console.log(x - Y);
* // console.log(x \* Y);
* // console.log(x / Y);
* // console.log(x % Y); Remainer of division
* // console.log(x \*\* Y); Exponential? X to the power of Y
* // console.log(x + Y);
* // console.log(x + Y);

Increment operators are indicated by two plus signs (++). Depending on where we put the plus signs this operator will behave differently.

Console.log(x) ((log of X)). “X is initialized to 10” ((Highlights 10 above)).

10 displays on console.

let x = 10;

let y = 3;

console.log(++x);

Displays 11.

This is where things get Weird. If we put this operator After X like so:

let x = 10;

let y = 3;

console.log(x++);

The value of X displays first. And Then the value of X will be incremented by one. So, if we do a Second log:

let x = 10;

let y = 3;

console.log(x++);

console.log(x)

10, Then 11 displays on the console.

/\*

let x = 10;

let y = 3;

console.log(x);

Outputs 10

let x = 10;

let y = 3;

console.log(++x);

Outputs 11

let x = 10;

let y = 3;

console.log(x++);

Outputs 10 for the First console, but X Has been incremented by one.

let x = 10;

let y = 3;

console.log(x++);

console.log(x)

Displays 10, and 11 on console, because x is incremented by one after first console.log

Decrement works in the same manner.

\*/

let x = 10;

let y = 3;

console.log(x++);

console.log(x)

// console.log(x + Y);

// console.log(x - Y);

// console.log(x \* Y);

// console.log(x / Y);

// console.log(x % Y);  Remainer of division

// console.log(x \*\* Y);  Exponential?  X to the power of Y

// Increment (++)

// Decrement (--)

## 03 - Operators - 03 - Comparison Operators - 2.01

We use comparison operators to compare the value of a variable with something else.

Here we have the x set to 1.

*let x = 1;*

Let’s look at the first comparison operator that is greater than. *console.log(x > 0);*

“So we want to check of X’s greater than zero”

let x = 1;

console.log(x > 0);

The console displays this as true.

“So the result of an expression that includes a comparison operator is a Boolean… It’s true or false”.

console.log(x >= 1);



We also have less than, and less than or equal to:

let x = 1;

console.log(x > 0);

console.log(x >= 1);

console.log(x < 1);

console.log(x <= 1);



We refer to the above operators as relational operators.

We also have equality operators. We can check and see if X is equal to one:

console.log(x === 1);

If we want to see if x is not equal to a given value, replace the equal sign with an exclamation mark.

((From [MDN](https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Operators/Strict_inequality) - This is a Strict Inequality Operator. “The strict inequality operator ( !== ) **checks whether its two operands are not equal, returning a Boolean result**. Unlike the inequality operator, the strict inequality operator always considers operands of different types to be different.”))

console.log(x !== 1);



These are all the comparison operators in JavaScript.

let x = 1;

//Relational

console.log(x > 0);

console.log(x >= 1);

console.log(x < 1);

console.log(x <= 1);

//Equality

console.log(x === 1); Is x equal to 1.

console.log(x !== 1); Is x Not equal to 1.

## 03 - Operators - 05 - Equality Operators

Previously we learned about the equality operator. E.g.,

// Strict Equality Operator (Type + Value)

console.log(1 === 1);

In JavaScript we have another equality operator that is indicated by two equals signs.

// Lose Eqaulity Operator

console.log(1 == 1);

The strict equality operator ensures that the values on either side of this operator have the same type and value.

For example on both sides of this operator there are two numbers. Both their type and their value are equal.

console.log(1 === 1);

Suppose we change one of the numbers to a string, like so:

console.log('1' === 1);

This expression is going to evaluate to false. We are comparing a string to a number. The types do not match.

Whereas if we compare a lose equality operator that features a number and a string like so:

// Lose Eqaulity Operator

console.log(1 == 1);

console.log('1' == 1);

The result is still true.

In this case, the operator ((the two equals signs)) looks at the value on the left side, observes that it is a string, and converts the numeral on the right to a string as well.

What if on the left side we have a Boolean?

console.log(true == 1);

The operator will automatically convert the value on the right side to a Boolean.

The console will also read this as true.

“Here’s what you need to take away: the strict equality operator ensures that both values have the same type and the same value. The lose equality operator does not care about the types matching; if the types don’t match it will convert that type on the right side to match the type on the left side. Then, it will only check if the values are equal”

Generally, you will use the strict equality operator because it is more precise and accurate.

/\*

// Strict Equality Operator (Type + Value)

console.log(1 === 1);

console.log('1' === 1);

// Lose Eqaulity Operator

console.log(1 == 1);

\*/

// Lose Eqaulity Operator

console.log(1 == 1);

console.log('1' == 1);

console.log(true == 1);

## 03 - Operators - 06 - Ternary Operator

Let’s examine the Ternary or conditional operator, which is incidentally one of Mosh’s favorites.

Consider the following problem:

// If a customer has more than 100 points,

// they are a 'gold' customer, otherwise,

// they are a 'silver' customer.

Let’s start by declaring a variable to keep track of the number of points.

let points = 110;

Now let’s declare another variable called type, that will represent the type of customer.

let points = 110;

let type =

Let’s start with a condition. We want to compare the number of points with 100.

So, we use the comparative operator here:

let points = 110;

let type = points > 100

This expression produces a Boolean. The result of this expression is either true or false.

Depending on the result, we’ll set the type variable to a different value. Let’s add a question mark:

*let type = points > 100 ?*

If this expression evaluates to true, that means this is a gold customer… So we want to set type to gold.

let points = 110;

let type = points > 100 ? 'gold' :

If the expression evaluates to false up, we want to set the type to:

let points = 110;

let type = points > 100 ? 'gold' : 'silver';

Let’s log type on the console.

let points = 110;

let type = points > 100 ? 'gold' : 'silver';

console.log(type);

The console displays gold.

let points = 90;

let type = points > 100 ? 'gold' : 'silver';

console.log(type);

Now the console displays silver.

let points = 110;

let type = points > 100 ? 'gold' : 'silver';

console.log(type);

Start with a condition ((using a conditional operator)). If that condition evaluates to true, then the type will receive the value gold. If false, silver.

/\*

let points = 110;

let type = points > 100 ? 'gold' : 'silver';

console.log(type);

\*/

// If a customer has more than 100 points,

// they are a 'gold' customer, otherwise,

// they are a 'silver' customer.

let points = 90;

let type = points > 100 ? 'gold' : 'silver';

console.log(type);

## 03 - Operators - 07 - Logical Operators - 5.30

We use logical operators to make decisions based on multiple conditions. In JavaScript we have three kinds of logical operators:

* Logical and
* Logical or
* Not

We’ll start with *Logical AND*, which is indicated with two ampersands: &&.

Here is the basic rule of thumb: logical and returns TRUE if both operands are TRUE. Let’s see an example.

console.log(true && true)

We have two operands, and they are both true. So, the result of evaluating this expression will be true.

If either of these are false, the result will be false.

console.log(false && true)

The console outputs false. The console output false if one or both are false.

What is a real world to use case for this operator? Suppose we want to build an application for approving loans. We want to see if the applicant has high income and a good credit score.

Let’s declare a couple variables:

let highincome = true;

let goodCreditScore = true;

Here we are dealing with two conditions. We need to know that the applicant is true for both high income and credit score. That’s where we use the logical And.

Let’s declare another variable:

let eligibleForLoan =

This is where we use the logical and operator:

let eligibleForLoan = highIncome && goodCreditScore;

Now let’s log this on the console:

let eligibleForLoan = highIncome && goodCreditScore;

let highIncome = true;

let goodCreditScore = true;

let eligibleForLoan = highIncome && goodCreditScore;

console.log(eligibleForLoan);

The console outputs true.

Now let’s examine the logical or.

Logical OR is indicated by two vertical lines. This returns true if one or both of the operands are TRUE.

Let’s edit the logical and, and turn it into a logical or, and change one of the operands to false.

let highIncome = false;

let goodCreditScore = true;

let eligibleForLoan = highIncome || goodCreditScore;

console.log(eligibleForLoan);

Lastly, let’s look at the NOT operator. The not operator is indicated by an exclamation mark.

If the applicant is not eligible for loan, we want to consider their application as refused.

Let’s declare another variable:

*let applicationRefused*

Let’s use the NOT operator:

*let applicationRefused = !*

We apply it on eligibleForLoan:

let applicationRefused = !eligibleForLoan;

let highIncome = false;

let goodCreditScore = true;

let eligibleForLoan = highIncome || goodCreditScore;

//NOT (!)

let applicationRefused = !eligibleForLoan;

console.log(eligibleForLoan);

If the eligibleForLoan is true, the not operator will convert that to false. So, whatever we give it, it will give us the opposite. So if eligibleForLoan is true, this will be converted to False, which means applicationRefused will Also be false.

In this scenario, applicationRefused is always the opposite of eligibleForLoan. That’s where we use the not operator.

So… let’s try changing both conditions to False:

let highIncome = false;

let goodCreditScore = false;

let eligibleForLoan = highIncome || goodCreditScore;

console.log(eligibleForLoan);

//NOT (!)

let applicationRefused = !eligibleForLoan;

And… let’s add a label to console.log:

console.log('Eligible', eligibleForLoan);

((When I test this in the console, it gives the result “Eligible false”, instead of just false.))

Let’s do another console.log, and add another label:

//NOT (!)

let applicationRefused = !eligibleForLoan;

console.log('Application Refused')

And we log the applicationRefused variable:

//NOT (!)

let applicationRefused = !eligibleForLoan;

console.log('Application Refused', applicationRefused);

let highIncome = false;

let goodCreditScore = false;

let eligibleForLoan = highIncome || goodCreditScore;

console.log('Eligible', eligibleForLoan);

//NOT (!)

let applicationRefused = !eligibleForLoan;

c



/\*

//Logical AND (&&)

//Returns TRUE if both operands are TRUE

console.log(true && true)

We have two operands, and they are both true.  So, the result of evaluating this expression will be true.

console.log(false && true)

The console outputs false.  The console output false if one or both are false.

let highIncome = true;

let goodCreditScore = true;

let eligibleForLoan = highIncome && goodCreditScore;

console.log(eligibleForLoan);

This outputs as true.

// Logical OR (||)

// Returns TRUE if one or both of the operands is TRUE

let highIncome = false;

let goodCreditScore = true;

let eligibleForLoan = highIncome || goodCreditScore;

console.log(eligibleForLoan);

let highIncome = false;

let goodCreditScore = true;

let eligibleForLoan = highIncome || goodCreditScore;

//NOT (!)

let applicationRefused = !eligibleForLoan;

console.log(eligibleForLoan);

This will return the opposite value it receives.  In the above case, the applicant Is eligible for the loan, which means eligibleForLoan returns false, which means applicationRefused is Also false.

\*/

// Logical OR (||)

// Returns TRUE if one or both of the operands is TRUE

let highIncome = false;

let goodCreditScore = false;

let eligibleForLoan = highIncome || goodCreditScore;

console.log('Eligible', eligibleForLoan);

//NOT (!)

let applicationRefused = !eligibleForLoan;

console.log('Application Refused', applicationRefused);

/\* Basically, when highIncome and goodCreditScore are false, then eligibleForLOad is false.

And the console.log will display the value, along with a label.

If !eligibleforloan has a false input value, it will flip it to true, and applicationRefused will be true.

Console.log will show the label string, and that applicationRefused is True. \*/

## 03 - Operators - 08 - Logical Operators with Non-booleans - 5.53

In JavaScript unlike many other programming languages we can use logical operators with Non-booleans values.

false or true, aka

false || true

The above is a true expression.

How about:

false || ‘Mosh’



How about:

false || 1

We get an output of 1.

What we realize is that the result of a logical expression is not necessarily true or false. That depends on the value of the operands we have.

In the first example our second operands is true, which is why we get true back.

In our second example, our second Operand is a string, which is why we get a string back.

In the third example our second Operand is a number which is why we get a number back.

So when our JavaScript engine tries to evaluate this expression it looks at each operand. If that operand is not a Boolean true or false, it will try to interpret it as what we call truthy or falsy.

Falsy is not the same as Boolean false.

The values of falsy are:

* Undefined
* Null
* The number zero 0
* Boolean false
* Empty string ‘’
* Not a number NaN groups

Not a number is a special value in JavaScript. Mathematical calculations that do not produce a valid number, this value, not the number, is returned.

If we use any of these Falsy values in a logical expression, they will be treated as Falsy, which is kinda like a Boolean false, but it is not exactly the same.

Anything that is not Falsy, is truthy.

In our second example, our second operand is a string with four characters. ((‘Mosh’)). It’s not an empty string. It’s not falsely. So it’s truthy. Because with the logical/or operator, the result will be true if One of the operands is true. The first operands is false (false || ‘Mosh’), and so the JavaScript engine examines the second operand, which it finds to be not falsy, and therefore truthy.

The same goes for the third example. (false || 1) The 1 is not a Boolean true… It’s truthy. That’s why the value of that operands is returned.

What if we have a triple expression?

false || 1 || 2

The console outputs 1.

With the logical/or operator, it will return a result as soon as it finds an operand that is truthy. The first truthy operand discovered is the one the console will output. You could have a dozen more operands… it will only return the first truthy operand it encounters. This is called Short-Circuiting.

When do we actually use non-Boolean operators?

Suppose we are building an application, and somewhere the user has to pick a color, or were going to use a default color. E.g., the color of the T-shirt they want to buy.

Let’s declare a few variables:

let userColor = 'red';

let defaultColor = 'blue';

let currentColor = userColor || defaultColor;

Let’s log this on the console:

let userColor = 'red';

let defaultColor = 'blue';

let currentColor = userColor || defaultColor;

console.log(currentColor);

The console output is “red”. Because, our user has selected a color.

If the user has not selected a color, then you get the obvious result:

let userColor = undefined;

let defaultColor = 'blue';

let currentColor = userColor || defaultColor;

console.log(currentColor);

Console output is ‘blue’.

“This is the power of using the logical or operator between non-Boolean’s. With this technique we can provide default values.”

/\*

Falsy (false) :

Undefined

null

0

boolean false

empty string ''

Not a Number NaN

Anything that is not Falsy -> Truthy

E.g.:

 false || ‘Mosh’

returns: 'Mosh'

false || 1

We get an output of 1.

false || 1 || 2

The console outputs 1.

With the logical/or operator, it will return a result as soon as it finds an operand that is truthy.

You could have a dozen more operands… it will only return the first truthy operand it encounters.  This is called Short-Circuiting.

let userColor = 'red';

let defaultColor = 'blue';

let currentColor = userColor || defaultColor;

console.log(currentColor);

The output is Red, because user color is selected

\*/

let userColor = undefined;

let defaultColor = 'blue';

let currentColor = userColor || defaultColor;

console.log(currentColor);

## 03 - Operators - 09 - Bitwise Operator

These operators are more on the theoretical side and not something we'd use on a daily basis. This section of the lecture is for the enthusiasts, a.k.a. autists. ((Mosh encourages us to skip this lesson if we like)).

We humans use the decimal system to represent numbers. “12345”. In computers these numbers are stored in the binary format.

E.g., the number one in the decimal system is represented by seven zeros “00000001”. We have eight digits, each digit is what we call a bit. Above we have eight bits which represent one byte of information.

Number two equals six zeros and then one zero. “00000010”.

“There are mathematical formulas behind these for converting numbers between decimal and binary systems”. If you don’t want to learn the mathematics, simply Google decimal to binary converters.

“Bitwise operators in JavaScript or any other programming languages are similar to logical operators but they work on the individual bits of a number.”

E.g.:

console.log(1 | 2);

Note that we have a single vertical line, that represents a bitwise or. ((1 or 2, 1 | 2)) ((Logical ors have double vertical lines)).

“When we apply the bitwise or between one and two, this is what’s going to happen…”

“I add R as the result here (R =). Now, this operator here is going to look at each of these bits in a vertical way. ((Like adding sums?)). If either of these bits is one, the result will be one. Otherwise it will be zero”

1 = 0000001

2 = 0000010

R = 0000011

“If you convert this binary number (00000011, aka the sum of 0000001 and 00000010) to a decimal number, the result will be three”.

The console displays 3.

Bitwise and is similar. We use a single ampersand instead of a vertical line.

If both numbers are one, one will be returned, otherwise the result will be zero.

1 = 0000001

2 = 0000010

3 = 0000011

R = 0000000

console.log(1 | 2); // Bitwise Or

console.log(1 & 2); // Bitwise And

The console outputs 3 and 0.

Suppose you want to implement an access control system. The user can have the following permissions “Read, Write, Execute”.

We can use one byte of information (or eight bits) to determine the kind permission of a user can have.

E.g., we can use five zeros 00000 (the first 5 bits are irrelevant), for the last three bits, if the user has permission we will use 1, otherwise we will use 0.

E.g., read only permission would look like this: 00000100.

00000100 Read

00000010 Write

00000001 Execute

This is where we use bitwise operators.

Let’s implement an access control system using bitwise operators.

Let’s define a constant called read permission, and set it to a decimal number that is equivalent to a binary number 00000100, i.e. 4.

00000100 Read

00000010 Write

00000001 Execute

const readPermission = 4;

const writePermission = 2;

const executePermission = 1;

Let’s declare a variable like my permission and initially set that to 0.

const readPermission = 4;

const writePermission = 2;

const executePermission = 1;

let myPermission = 0;

Now let’s give ourselves extra permissions.

const readPermission = 4;

const writePermission = 2;

const executePermission = 1;

let myPermission = 0;

myPermission = myPermission | readPermission | writePermission;

((Ah ha. So, my permission equals 0, **OR** it equals readPermission, aka 4, or writePermission, aka 2.

But… what is the point of adding the numbers together? I don’t get it. Ah, if it’s six, that means read and write?))

Let’s log this:

const readPermission = 4;

const writePermission = 2;

const executePermission = 1;

let myPermission = 0;

myPermission = myPermission | readPermission | writePermission;

console.log(myPermission);

6 is our output.

“Technically we don’t care about this decimal number. We can use the bitwise and operator to see if I have a given permission.”

For example:

Let’s declare a variable message.

const readPermission = 4;

const writePermission = 2;

const executePermission = 1;

let myPermission = 0;

myPermission = myPermission | readPermission | writePermission;

let message =

And use the ternary/conditional operator.   
  
*For refreshers:*

let type = points > 100 ? 'gold' :

“We start with a condition”: = **()** ((When working with ternary/conditional operators above, no parenthesis were used. We had a greater than > ))

const readPermission = 4;

const writePermission = 2;

const executePermission = 1;

let myPermission = 0;

myPermission = myPermission | readPermission | writePermission;

let message = ()

“We take myPermission”

*Let message = (myPermission)*

const readPermission = 4;

const writePermission = 2;

const executePermission = 1;

let myPermission = 0;

myPermission = myPermission | readPermission | writePermission;

let message = (myPermission)

“And use the bitwise & operator”

const readPermission = 4;

const writePermission = 2;

const executePermission = 1;

let myPermission = 0;

myPermission = myPermission | readPermission | writePermission;

let message = (myPermission &)

“Along with the readPermission”

const readPermission = 4;

const writePermission = 2;

const executePermission = 1;

let myPermission = 0;

myPermission = myPermission | readPermission | writePermission;

let message = (myPermission & readPermission)

“If this evaluates to true” *let message = (****myPermission & readPermission****)* “that means I have the read permission.”  
  
***((How does any of this evaluate as true or false? If they just aren’t zero? Ah. So, my permission is zero, and read permission can be 0 or 4. If four, then true, and the message displays?))***

“Let’s say we want to display a message like yes:

const readPermission = 4;

const writePermission = 2;

const executePermission = 1;

let myPermission = 0;

myPermission = myPermission | readPermission | writePermission;

let message = (myPermission & readPermission) ? 'yes'

“Otherwise, we want to display no”

const readPermission = 4;

const writePermission = 2;

const executePermission = 1;

let myPermission = 0;

myPermission = myPermission | readPermission | writePermission;

let message = (myPermission & readPermission) ? 'yes': 'no';

“Let me break this up into multiple lines so we can see clearly”

const readPermission = 4;

const writePermission = 2;

const executePermission = 1;

let myPermission = 0;

myPermission = myPermission | readPermission | writePermission;

let message =

(myPermission & readPermission) ? 'yes': 'no';

“Here’s our Ternary Operator” Referring to the bottom half I believe. “We have a condition; if that evaluates to true, this value will be used. Otherwise, this other value will be used”.

“Finally, let’s log this message on the console.

Console.log(message);

const readPermission = 4;

const writePermission = 2;

const executePermission = 1;

let myPermission = 0;

myPermission = myPermission | readPermission | writePermission;

let message =

 (myPermission & readPermission) ? 'yes': 'no';

 console.log(message);

Console outputs: yes

((Interesting. When you remove the yes: no, the console outputs 4. But, when you add that “?” and the yes: no [[gold: silver in the example way above]], it now hinges on the truth of the condition. If it evaluates to true, the first value (yes) will be used. So, perhaps the ? : make it a conditional/ternary… thing))

((If we remove readPermission from the myPermission variable, then the *let message* variable will output as false, and therefore no)).

const readPermission = 4;

const writePermission = 2;

const executePermission = 1;

let myPermission = 0;

myPermission = myPermission | writePermission;

let message =

 (myPermission & readPermission) ? 'yes': 'no';

 console.log(message);

“So, here’s what I want you to take away. With the bitwise or operator we can add permissions. And with the bitwise & operator we can check to see if we have a given permission.”

const readPermission = 4;

const writePermission = 2;

const executePermission = 1;

let myPermission = 0;

myPermission = myPermission | writePermission;

let message =

 (myPermission & readPermission) ? 'yes': 'no';

 console.log(message);

“Of course this is just one real world use case for using the bitwise operators. There are other use cases, but as I told you before they are really not that common. So if this lecture was confusing, don’t worry about it.”

/\*

Example of a bitwise or with a single vertical line: console.log(1 | 2);

(Logical ors have double vertical lines ||)

// Bitwise Or  If Either of the bits are 1, the result will be 1.

console.log(1 | 2);

1 = 0000001

2 = 0000010

R = 0000011

// Bitwise And - If both numbers are one, one will be returned.  Otherwise, the result will be zero:

console.log(1 & 2);

1 = 0000001

2 = 0000010

3 = 0000011

R = 0000000

console.log(1 | 2);

console.log(1 & 2);

The console outputs 3 and 0.

These are the fundamentals.

//Read, Write, Exectute  (User features)

//00000 (the first five bits are irrelevant).  The remaining bits indicate that the user has permission if the value is one.

00000100 Read

00000010 Write

00000001

const readPermission = 4;

const writePermission = 2;

const executePermission = 1;

let myPermission =0;

myPermission = myPermission | readPermission | writePermission;

console.log(myPermission);

((console displays 6))

const readPermission = 4;

const writePermission = 2;

const executePermission = 1;

let myPermission = 0;

myPermission = myPermission | readPermission | writePermission;

let message =

 (myPermission & readPermission) ? 'yes': 'no';

 console.log(message);

Outputs to yes

\*/

const readPermission = 4;

const writePermission = 2;

const executePermission = 1;

let myPermission = 0;

myPermission = myPermission | writePermission;

let message =

 (myPermission & readPermission) ? 'yes': 'no';

 console.log(message);

## 03 - Operators - 10 - Operators Precedence

Complex expressions require you to consider the precedence of the operators.

E.g.,

let x = 2 + 3 \* 4;

Let’s ask the console for the answer:

console.log(x);

14

Of course, the multiplication expression is evaluated before the addition expression.

It is hard to memorize which operators have higher or lower precedence. So when working with complex expressions, you can use parenthesis to determine how these operators are applied. E.g.,

let x = (2 + 3) \* 4;

console.log(x);

Now our output is 20.

/\*

let x = 2 + 3 \* 4;

console.log(x);

The output is 14

let x = (2 + 3) \* 4;

console.log(x);

This output is 20.

\*/

let x = (2 + 3) \* 4;

console.log(x);

## 03 - Operators - 11 - Drill

1 - What is the result of “true && false”?

This statement uses the double ampersand, logical and operator, where the statement is true if both operands are true. Boolean?

Statement is therefore False.

2 - What is the result of “(true && false) || true”?

The Logical and statement is false, and is considered first because it is in parentheses, according to the order of operations. The double vertical lines indicate logical or, where only one of the operands need to be true. The statement is therefore true.

3 - What is the value of y?

Let x = 10;

Let y = (x > 10) ? 1 : 0;

Using the comparison operator, we find that 10 is not greater than 10. The ternary, or conditional operator is indicated by the question mark. If true, I believe the value is 1. If false, 0.

Y = 0.

4 - What is the value of x?  
  
let x = (2 + 3) \* (4 + 5);

X = 5\*9

X = 45

5 - Which expression returns true?

A - ‘1’ === 1;

B - 1 == 1

C - 1 === 1

The above involve Equality operators. Strict equality operators are indicated by triple equal’s signs ===, and require both the Value And the type to be the same. **A** evaluates as false, as ‘1’ is a string, and a different type.

The Lose Equality Operator requires that the value, but not the type must be the same. It will convert the type on the right to match the left, and then evaluate. **B** evaluates as true, with either operator.

**C** evaluates as true, as both the type and value are the same for a Strict Equality Operator.

6 - What is the value of x?

Let x = (1 == true);

With the Lose Equality Operator, the type on the left is converted to the type on the right, and only then evaluated. Mind you… What numeral is it converted to? Seems to be 1.

So, 1 == true turns into 1 == 1. Which is a True statement. Therefore, x = true.

7 - What is the value of y?

Let x = 10

Let y = (x > 5) && (x < 15);

Let y = (10 > 5) && (10 < 15);

Let y = true && true

Let y = true.

&& indicates Logical &, where the value is true if both operands are true.

8 - What is the value of x?

Let x = 5;

X += 3;

This was not covered in the course. This is an Addition Assignment Operator. It adds the value of the Right operand to a variable, and “assigns the result (of the addition?) to the variable”.

5 += 3 or 5+3=8

X = 8  
  
  
10 - What is the value of y?

Let x = 10;

Let y = x++;

Incremental operators are indicated by two plus signs ++ raise the value of a number by one when assessed Before the number.

When displayed After a number, the increment is only counted when logged a Second time.

So, if this were a double log console.log(x++) and console.log(x), the x would be 11. Instead, it is only 11 in potentia.

X = 10

10 - What is the value of y?

Let x = 1;

Let y = x !==2;

This is not a pairing of the Loose Equality operator and the Logical Not as I thought. This is the Strict Inequality Operator. It checks to see if the operands are not equal, and returns a Boolean. It considers operands of different types to be different.

Y = 1 !==2;

1 is unequal to 2. True.

Y is True

## 03 - Operators - 12 - Swapping Variables

Let’s do a simple programming exercise. Let’s declare two variables:

let a = 'red';

let b = 'blue';

console.log(a)

console.log(b)

We are supposed to add some code to make A post red, and B post blue. I tried this:

let a = 'red';

let b = 'blue';

a = 'blue';

b = 'red';

console.log(a)

console.log(b)

Which works, but is apparently the wrong answer.

Mosh is talking about a 3rd variable. Can we employ logical not?

Huh. We use a third variable as a ‘backup’. Probably, because you’d have a circle if you just tried to make a and b equal each other.

C is assigned the value of A.

A is overwritten by b.

B is overwritten by C.

But the A that is overwritten by b, is Not the b overwritten by C.

let a = 'red';

let b = 'blue';

let c = a;

a = b; //A is overwritten by b

b = c; //C, which has A's value, is overwriting b

console.log(a)

console.log(b)

## 04 - Control Flow - If…else

We’re going to learn how to use expressions and operators along with conditional statements to implement interactivity in our applications.

JavaScript has two kinds of conditional statements:

* if and else - If…else
* switch and case - Switch…case

Suppose we want to get the current hour and depending on its value, we’ll greet the user with a different message.

So if the hour is between 6 AM and 12 PM, we’ll display a “good morning!” message.

If between 12 PM and 6 PM we’ll display good afternoon.

Otherwise we will display good evening.

If our *condition* evaluates to true, the following *statement* will be executed.

if (a **Condition**, which executes statement if true)

statement

(If we have multiple statements put them between curly braces. This creates a block of code).

if (condition) {

    statement

}

We can also have Another condition. If this condition is true, the other statement will be executed.

if (condition) {

    statement

}

else if (anotherCondition)

statement

We can add more curly braces if we want to add more statements.

if (condition) {

    statement

}

else if (anotherCondition) {

    statement

}

As a convention, when we want to define a block of code we put the first curly brace on the same line as displayed above.

if (condition) {

    statement

}

else if (anotherCondition) { //Goes on this line not below

    statement

}

else if (yetAnotherCondition)

statement

If none of the above statements evaluate to true (note we’ve added more else ifs) we can use else to execute one or more other statements.

if (condition) {

    statement

}

else if (anotherCondition) {

    statement

}

else if (yetAnotherCondition)

statement

else

statement

The first statement we want to execute is good morning. We will declare a variable to simulate the time.

let hour = 10;

if (condition) {

    statement

}

else if (anotherCondition) {

    statement

}

else if (yetAnotherCondition)

statement

else

statement

Let’s use 24 hour time format to keep things simple for ourselves.

We are using two comparison operators and two **Expressions**, and applying logical and && in between them. If both of these expressions evaluate to true, then the result of the *full expression* will also be true.

let hour = 10;

if *(****hour >= 6*** *&&* ***hour <  12*** *)* {

    statement

}

else if (anotherCondition) {

    statement

}

else if (yetAnotherCondition)

statement

else

statement

Let’s add the good morning statement, using console.log.

let hour = 10;

if (hour >= 6 && hour <  12 ) {

    console.log('Good morning');

}

else if (anotherCondition) {

    statement

}

else if (yetAnotherCondition)

statement

else

statement

Mosh suggested finishing on our own. So, I came up with two solutions to the problem of 6PM to 12AM, and 12 AM to 6 AM being in the same statement. So, I could either use a Logical Or ||, or just make two consoles. Let’s test it.

let hour =  22;

if (hour >= 6 && hour < 12 ) {

    console.log('Good morning');

}

else if (hour >= 12 && hour < 18) {

    console.log('Good Afternoon!');

}

else if ((hour >= 18 && hour < 24) || (hour > 0 && hour < 6)) {

console.log('Good Evening!');

}

Works fine.

Let’s try splitting up the statement. This also works:

let hour =  4;

if (hour >= 6 && hour < 12 ) {

    console.log('Good morning');

}

else if (hour >= 12 && hour < 18) {

    console.log('Good Afternoon!');

}

else if (hour >= 18 && hour < 24) {

console.log('Good Evening!');

}

else if (hour > 0 && hour < 6) {

    console.log('Good Evening!');

    }

But Both are wrong!

Apparently else covers everything else.

let hour = 4;

if (hour >= 6 && hour < 12 ) {

    console.log('Good morning');

}

else if (hour >= 12 && hour < 18) {

    console.log('Good Afternoon!');

else

console.log('Good evening');

Mosh says to get rid of the brackets, because there aren’t Multiple statements inside the brackets.

let hour =  4;

if (hour >= 6 && hour < 12 )

    console.log('Good morning');

else if (hour >= 12 && hour < 18)

    console.log('Good Afternoon!');

else

console.log('Good evening');

/\*

Ff the hour is between 6 AM and 12 PM, we’ll display a “Good morning!” message.

If between 12 PM and 6 PM we’ll display Good afternoon!

Otherwise we will display Good evening!

let hour =  22;

if (hour >= 6 && hour < 12 ) {

    console.log('Good morning');

}

else if (hour >= 12 && hour < 18) {

    console.log('Good Afternoon!');

}

else if ((hour >= 18 && hour < 24) || (hour > 0 && hour < 6)) {

console.log('Good Evening!');

}

Works fine.  Let’s try splitting up the statement.

This also works:

let hour =  4;

if (hour >= 6 && hour < 12 ) {

    console.log('Good morning');

}

else if (hour >= 12 && hour < 18) {

    console.log('Good Afternoon!');

}

else if (hour >= 18 && hour < 24) {

console.log('Good Evening!');

}

else if (hour > 0 && hour < 6) {

    console.log('Good Evening!');

    }

let hour =  4;

if (hour >= 6 && hour < 12 ) {

    console.log('Good morning');

}

else if (hour >= 12 && hour < 18) {

    console.log('Good Afternoon!');

}

else

console.log('Good evening');

\*/

//Mosh says get rid of ugly brackets.

let hour =  4;

if (hour >= 6 && hour < 12 )

    console.log('Good morning');

else if (hour >= 12 && hour < 18)

    console.log('Good Afternoon!');

else

console.log('Good evening');

## 04 - Control Flow - 02 Switch…Case

Let’s declare a variable called role. We’ll imagine that this represents the role of the current user

let role;

Suppose we want to determine the role of the current user i.e. guest, moderator, or an admin. We could implement this logic using *if and else* statements, but there’s another way. Switch and case.

Start with a switch statement:

switch

Now let’s add a variable (role) instead of condition:

switch (role) {

}

Now let’s add one or more **case statements**. Case statements compare the value of the variable with ‘something’.

Here’s our first case. [[I.e., case (in switch in case) means, “Switch means X. In that case, do Y”]]

let role;

switch (role) {

case

}

If this role equals guest:

let role;

switch (role) {

case 'guest'

}

(We are comparing the value of role with guest).

Then we add a colon and one or more statements.

let role;

switch (role) {

case 'guest':

    console.log('Guest');

}

Now we need to add the break statement, to jump us out of this switch block… Otherwise the other statements ‘below’ will be executed.

let role;

switch (role) {

case 'guest':

    console.log('Guest');

break;

}

E.g. let’s add another case statement. If this user is a moderator, we want to display on console.log ‘moderator user’. Then add a break.

let role;

switch (role) {

case 'guest':

    console.log('Guest');

break;

case 'moderator':

    console.log('Moderator User');

    break;

}

So, if we don’t add the first break statement above, and the role equals guest, both the console.log statements will be executed. Adding a break allows us to jump out of the switch block.

let role;

switch (role) {

case 'guest':

    console.log('Guest');

break;

case 'moderator':

    console.log('Moderator User');

    break;

    default:

        console.log('Unknown User');

}

If none of these cases are matched, we can have a default statement. We can use it to execute one or more statements. Like console.log unknown user.

We don’t need a break for the default statement “because at this point the control would automatically get out of the switch block”.

The console is outputting unknown user because we have not initialized *role* and its default value is undefined, and it doesn’t match any of our case statements.

let role;

switch (role) {

case 'guest':

    console.log('Guest User');

break;

case 'moderator':

    console.log('Moderator User');

    break;

    default:

        console.log('Unknown User');

}

Whereas, if we define role, we will output guest.

let role; ‘guest’;

switch (role) {

case 'guest':

    console.log('Guest User');

break;

case 'moderator':

    console.log('Moderator User');

    break;

    default:

        console.log('Unknown User');

}

With switch in case, we can compare the value of a variable against multiple other values. They don’t have to be strings, they can be numbers or even Boolean’s… though using Boolean’s here is less common… Because if you want to compare the value of a variable with true and false it makes more sense to use an if statement.

We can also implement this exact logic using if and else statements.

if (role === 'guest') console.log('Guest User');

else if (role === 'moderator') console.log('Moderator User');

else console.log('Unknown User');

Note that the if and else implementation is cleaner and shorter. We don’t have the break statements or default or the curly braces. Some people still use switch and case though they are somewhat outdated. “And look a little bit ugly in my personal opinion.” However, sometimes they are more explicit and it comes down to your own personal preference.

/\*

Suppose we want to determine the role of the current user i.e. guest, moderator, or an admin.

let role;

switch (role) {

case 'guest':

    console.log('Guest');

break;

case 'moderator':

    console.log('Moderator User');

    break;

    default:

        console.log('Unknown User');

The console is outputting unknown user because we have not initialized role and its default value is undefined, and it doesn’t match any of our case statements.

\*/

let role = 'guest';

switch (role) {

case 'guest':

    console.log('Guest User');

break;

case 'moderator':

    console.log('Moderator User');

    break;

    default:

        console.log('Unknown User');

}

//We can also implement this exact logic using if and else statements.

if (role === 'guest') console.log('Guest User');

else if (role === 'moderator') console.log('Moderator User');

else console.log('Unknown User');

## 04 - Control Flow - 03 - For

Suppose we wanted to repeat an action a number of times. For example, we might wish to say hello world five times. Don’t do it like this:

console.log('Hello World');

console.log('Hello World');

console.log('Hello World');

console.log('Hello World');

console.log('Hello World');

To achieve a better result, use loops. Loops repeat an action a number of times.

Loops:

* For
* While
* Do…while
* For…in
* For…of

These loops all do basically the same thing. But there are subtle differences between how they start and end.

Let’s examine the for loop first.

Now we need three statements. The first statement is the initialExpression.

for (initialExpression)

Here we declare and initialize a variable. We use *let* to declare the variable *i*, and set it to *zero*.

for (let i = 0)

I is short for index and is a common convention to use in for loops. This is what we call the loop variable.

After initializing this to zero, we terminate the statement with a semicolon.

for (let i = 0;)

The second part of the for loop is what we call a **condition**.

for (let i = 0; condition)

Here we want to add a condition and compare the value of i with something else. This loop will run as long as is condition evaluates to true.

So, if we want the loop to run five times, we’d compare I with five.

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

The third part is what we call incrementExpression. Often times will use the increment operator like so, to increment the value of I with one.

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

After this *for* statement, we can add one or more statements. (If you have multiple statements you need to put them in a curly braces code block).

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

    console.log ('Hello World');

}



So, how does this all work?

As mentioned before, this is what we call an Initial Expression. We are initializing I to 0. ((I has a value of zero)).

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

    console.log ('Hello World');

}

This loop will execute

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

    console.log ('Hello World');

}

so long as this condition is true:

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

    console.log ('Hello World');

}

As long as I is less than five, the log statements will be executed.

After the first iteration, i is incremented by one. Then the i < 5 condition is evaluated again, and one is less than five.

After the second iteration, i is incremented by one, and now were in the third iteration.

To see this in action, let’s output on the console:



At the end of the fifth iteration, i will four, and when we increment that by one I will be five, and the condition will evaluate to false.

So, there are two ways to repeat an action using the for loop. We can initialize I to zero and check to see if it’s less than five.

Alternately, I to 1, and see if it is less than or equal to five.

for (let i = 1; i <= 5; i++) {

    console.log ('Hello World', i);

}

((Note that we are displaying 1 to 5 instead of 0 to 4))



Suppose we only wanted to display the odd numbers between 1 to 5.

We can make an *if* statement check the remainder of the division of I by two.

for (let i = 1; i <= 5; i++) {

if (i % 2 !== 0)

}

((Even numbers Don’t have remainders… i.e., they equal zero)).

So, if the remainder of the division of I by two is not zero, that means I is an odd number.

Let’s displayed on the console.

for (let i = 1; i <= 5; i++) {

if (i % 2 !== 0)

}



We can also work backwards; instead of going from 1 to 5, we can go from 5 to 1.

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

   if (i % 2 !== 0) console.log(i);

}

This outputs odd number in the reverse order.

The previous form is more common… initializing I to zero or 1. But for certain problems, you want to use the for loop in the reverse order.

/\*

console.log('Hello World');

console.log('Hello World');

console.log('Hello World');

console.log('Hello World');

console.log('Hello World');

Don't be dumb.

this is how you do it.

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

    console.log ('Hello World');

}

note the value of the statement displayed on conosole

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

    console.log ('Hello World', i);

}

We can start i witha value of 1

for (let i = 1; i <= 5; i++) {

    console.log ('Hello World', i);

}

\*/

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

   if (i % 2 !== 0) console.log(i);

}

## 04 - Flow Control - 04 - While

Loops:

* For
* While
* Do…while
* For…in
* For…of

In the previous lecture we wrote this for loop to display all odd numbers between zero and five.

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

    if (i % 2 !== 0) console.log(i);

}

Let’s do the same thing with the while loop.

In for loops, the loop variable is part of the loop itself.

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

    if (i % 2 !== 0) console.log(i);

}

In while loops, we have to declare this variable externally.

Let’s declare a variable like i, and set it to zero:

*//for (let i = 0; i <= 5; i++) {*

*//    if (i % 2 !== 0) console.log(i);*

*//}*

let i = 0;

With the for loop, the variable was only meaningful and accessible inside the for loop. It’s called **scope**. “These two variables are completely different, even though they are named the same.”

//for (let i = 0; i <= 5; i++) {

//    if (i % 2 !== 0) console.log(i);

}

let i = 0;

Now let’s add a while statement, and in parenthesis will add our condition. Our condition is that I is less than or equal to five.

let i = 0;

while (i <= 5)

Next will add our statements.

let i = 0;

while (i <= 5) {

if (i % 2 !== 0) console.log(i);

}

Lastly, at the end of our while block we need to increment i.

let i = 0;

while (i <= 5) {

if (i % 2 !== 0) console.log(i);

i++;

}

This is a direct translation from a for loop into a while loop.

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

    if (i % 2 !== 0) console.log(i);

}

let i = 0;

while (i <= 5) {

if (i % 2 !== 0) console.log(i);

i++;

}

Let’s review the code below. Initially, I is zero.

In the why loop, first this condition is evaluated. If this condition is true, then the body of the while loop will be executed.

In the next iteration the condition is evaluated again. If true, the statements in the while block will be executed, otherwise the while block will terminate.

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

    if (i % 2 !== 0) console.log(i);

}

let i = 0;

while (i <= 5) {

if (i % 2 !== 0) console.log(i);

i++;

}

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

    if (i % 2 !== 0) console.log(i);

}

let i = 0;

while (i <= 5) {

if (i % 2 !== 0) console.log(i);

i++;

}

((Also, This does not work. Not sure why:

let i = 0;

while (i <= 5; i++;) {

if (i % 2 !== 0) console.log(i);

}

))

## 04 - Control Flow - 05 - Do…While

Loops:

* For
* While
* Do…while
* For…in
* For…of

Let’s rewrite this as a do…while loop.

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

    if (i % 2 !== 0) console.log(i);

}

let i = 0;

while (i <= 5) {

if (i % 2 !== 0) console.log(i);

i++;

}

let i = 0;

Mosh points out that i has already been declared in this document as part of the while loop. It is *not* incompatible with i in the for loop as that is… contained.

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

    if (i % 2 !== 0) console.log(i);

}

let i = 0;

while (i <= 5) {

if (i % 2 !== 0) console.log(i);

i++;

}

let i = 0;

So we comment out those lines pressing control/.

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

    if (i % 2 !== 0) console.log(i);

}

//let i = 0;

//while (i <= 5) {

//if (i % 2 !== 0) console.log(i);

//i++;

//}

let i = 0;

Let’s rewrite the logic above.

Like while loops, we have to declare our loop variable externally. We declare i and initialize it to zero.

Now we add the “do statement” and a code block.

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

    if (i % 2 !== 0) console.log(i);

}

//let i = 0;

//while (i <= 5) {

//if (i % 2 !== 0) console.log(i);

//i++;

//}

let i = 0;

do {

}

In this block we should have our statements. Let’s copy them from the while loop.

*for (let i = 0; i <= 5; i++) {*

*if (i % 2 !== 0) console.log(i);*

*}*

*//let i = 0;*

*//while (i <= 5) {*

*//if (i % 2 !== 0) console.log(i);*

*//i++;*

*//}*

let i = 0;

do {

    if (i % 2 !== 0) console.log(i);

     i++;

}

At the end of this block, we add the while statement, along with our condition in parentheses. That’s I less than or equal to five.

*for (let i = 0; i <= 5; i++) {*

*if (i % 2 !== 0) console.log(i);*

*}*

*//let i = 0;*

*//while (i <= 5) {*

*//if (i % 2 !== 0) console.log(i);*

*//i++;*

*//}*

let i = 0;

do {

    if (i % 2 !== 0) console.log(i);

     i++;

} while (i <= 5);

What is the difference between a while loop and a do while loop?

let i = 0;

while (i <= 5) {

if (i % 2 !== 0) console.log(i);

i++;

}

let i = 0;

do {

    if (i % 2 !== 0) console.log(i);

     i++;

} while **(i <= 5)**;

Do while loops are always executed at least once even if this **condition** is evaluated to false.

Let’s examine our old while loop.

let i = 0;

while (i <= 5) {

if (i % 2 !== 0) console.log(i);

i++;

}



If we were to let i equal nine, with the old while loop…

let i = 9;

while (i <= 5) {

if (i % 2 !== 0) console.log(i);

i++;

}

the console will display nothing. Because the first time we try to execute the while loop, this condition evaluates to false. The following statements are never executed. So, in while loops this condition is evaluated before the following code block, at the beginning of *every iteration*.

Whereas in do while loops

let i = 0;

do {

    if (i % 2 !== 0) console.log(i);

     i++;

} while (i <= 5);

this condition is evaluated at the end. Thus, the middle statements are always executed at least once, even if the while condition is false.

So, if we set this while loop to nine, we get nine on the console.



“Realistically you’re not going to use this do while a lot in programming. There are situations in which you may want to use this, but in practical terms most of the time you’ll be using a four or a while loop. Just be aware of the difference between a while loop and a do while loop. ”

The// for (let i = 0; i <= 5; i++) {

//     if (i % 2 !== 0) console.log(i);

// }

// let i = 9;

// while (i <= 5) {

// if (i % 2 !== 0) console.log(i);

// i++;

// }

let i = 9;

do {

    if (i % 2 !== 0) console.log(i);

     i++;

} while (i <= 5);

## 04 - Control Flow - 06 - Infinite Loops

Loops:

* For
* While
* Do…while
* For…in
* For…of

An infinite loop executes infinitely. If you create one of these loops, you will crash your browser or your computer.

Let’s declare a variable and set it to zero. We’ll put it in a while loop, where I is less than five, and then console.log.

let i = 0;

while(i < 5) {

    console.log(i);

}

If we forget the increment I (i++), we end up creating an infinite loop.

In the first iteration by zero and is less than five, so we will display i on the console. In all the subsequent iterations I will still be zero.

This log ran up on the console the 6500 times before freezing.

Another example of an infinite loop:

while (true) {

}

You can also create an infinite do while loop.

do {

} while (true);

Or another, where we fail to increment x:

let x = 0;

do {

***// x++;***

} while (x < 5);

We can also create an infinite for loop.

for (let i = 0; i > 0: i++)

or

for (let i = 0; i < 10; )

## 04 - Control Flow - 07 - For…in

Loops:

* For
* While
* Do…while
* For…in
* For…of

With the first three loops we can repeat an action a number of times. We use the other kind of loops to “iterate over the properties of an object or elements of an array”.

Iterate: perform or utter repeatedly. "the bird's call is a monotonously iterated single note"

Suppose we have an object called person with two properties: name and age:

const person = {

    name: 'Mosh',

age: 30

};

Suppose we want to display all the properties of this person object. That’s when we use the *for-in* loop.

Unlike the *for loop*, we **don’t** have an initial expression; a condition; and in increment)

*for (initialExpression; condition; increment)*

const person = {

    name: 'Mosh',

age: 30

};

for (initialExpression; condition; increment)

let key in person:

const person = {

    name: 'Mosh',

age: 30

};

for (let key in person)

So, in every iteration the key variable in the loop will hold the name of one of the properties in this person object. [[[I.e., the key variable will ***represent***one of the properties of the object. So, in the first iteration it displays name, in the second iteration, it displays the age, etc. Note, that person is the ‘variable’? that key is connected to]]]

Let’s add a console.log of the key variable.

const person = {

    name: 'Mosh',

age: 30

};

for (let key in person)

console.log(key);



In the first iteration key is name, in the second-generation key is age.

Suppose we wanted to display the value of each property next to it?

const person = {

    name: 'Mosh',

age: 30

};

for (let key in person)

console.log(key);

To access the properties of an object we could use dot notation:

person.name

const person = {

    name: 'Mosh',

age: 30

};

for (let key in person)

console.log(key);

person.name

Or, we could utilize bracket notation. Person, square brackets, and the name of the target property as a string.

const person = {

    name: 'Mosh',

age: 30

};

for (let key in person)

console.log(key);

person.name

person ['name']

We use the bracket notation when we don’t know ahead of time at the time of writing code what property we are going to access. The name of the target property might be calculated at run time. [[Does this mean with multiple iterations, you don’t know Which property of the object will be retrieved?]]]

E.g. “When we **iterate over** [[iterate *through*, one after another,might be a better way of putting it]] the properties of the person object, in each **iteration**, the value of key is going to be different.”

const person = {

    name: 'Mosh',

age: 30

};

**for (let key in person)**

console.log(key);

person.name

person ['name']

So here we can’t ((I think Mosh says *can’t*)) use the dot notation to display the value of this property. I.e., “we can’t do something like this”:

const person = {

    name: 'Mosh',

age: 30

};

for (let key in person)

console.log(key, person.key);

person.name

person ['name']

“because we don’t have a property called key in the person object”. [[Key refers to the Object person, not to the Properties of person.]]

So that’s when we use the bracket notation. So, we add square brackets and pass key as the name of the target property (as a ‘string’). [[So, instead of saying Name or Age, we use ‘pass’ or pretend that Key is the target property]]

const person = {

    name: 'Mosh',

age: 30

};

for (let key in person)

console.log(key, person[key]);



This is the for in loop. We use it to iterate over [[through]] the properties of an object. We can also use these to iterate over [[through]] an array, but it’s not the ideal way. Let’s see an example anyway.

Let’s define an array called colors.

const colors = ['red', 'green', 'blue'];

const person = {

    name: 'Mosh',

age: 30

};

for (let key in person)

console.log(key, person[key]);

const colors = ['red', 'green', 'blue'];

Now let’s use the for..in loop to iterate over [[go through]] this array.

for (let index in colors)

const person = {

    name: 'Mosh',

age: 30

};

for (let key in person)

console.log(key, person[key]);

const colors = ['red', **'green'**, **'blue'**];

for (let index in colors)

We named the loop variable *index* because in each iteration, the index variable will be set to the index to one of the elements in this array. So, it’s going to be zero, **one** and **two**.

Let’s have a look, using console.log:

console.log(index);

const person = {

    name: 'Mosh',

age: 30

};

for (let key in person)

console.log(key, person[key]);

const colors = ['red', 'green', 'blue'];

for (let index in colors)

console.log(index);



If you want the ***element*** at the given index, once again, we use the square bracket notation. Colors of index:

console.log(index, colors[index]);

const person = {

    name: 'Mosh',

age: 30

};

for (let key in person)

console.log(key, person[key]);

const colors = ['red', 'green', 'blue'];

for (let index in colors)

console.log(index, colors[index]);



Now we can see each element of our colors array.

Starting from ecma script 6, or es6, which is the modern version of javascript, we have a new kind of loop, called for-of loop. This is the ideal way to iterate over [[through]] arrays.

/\*

const person = {

    name: 'Mosh',

age: 30

};

for (let key in person)

console.log(key);

//this displays "name" and then "age" in the second iteration

const person = {

    name: 'Mosh',

age: 30

};

for (let key in person)

console.log(key, person.key);

//dot notation ((e.g., person.key)) does not work.  There is no property called key in //the person object.

const person = {

    name: 'Mosh',

age: 30

};

for (let key in person)

console.log(key, person[key]);

//this 'passes' key as the name of the target property.  I think this means key stands in for or pretends to be the property of the person object, and it runs/iterates through them.  Now both the property, And the property's value is displayed.

\*/

const person = {

    name: 'Mosh',

age: 30

};

for (let key in person)

console.log(key, person[key]);

const colors = ['red', 'green', 'blue'];

for (let index in colors)

console.log(index, colors[index]);

//with console.log(index), the numerical values, i.e., the index varialbe is set to the index of one of the elements in the array... will be displayed.  Whereas, when colors[index] is included, the Element at a given index will be displayed

## 04 - Control Flow - 08 - For…of

“Starting from ecma script 6, or es6, we have a new way to iterate over arrays. And that is using the *for…of* loop.”

This is the ideal way to iterate over [[through]] arrays.

“The for-of is very similar to the for-in loop but instead of the in keyword, we use the *of* keyword.”

E.g.,

for (let color of colors);

*const person = {*

*name: 'Mosh',*

*age: 30*

*};*

*for (let key in person)*

*console.log(key, person[key]);*

const colors = ['red', 'green', 'blue'];

*for (let index in colors)*

*console.log(index, colors[index]);*

for (let color of colors);

Now we can simply log this color on the console:

console.log(color);

*const person = {*

*name: 'Mosh',*

*age: 30*

*};*

*for (let key in person)*

*console.log(key, person[key]);*

const colors = ['red', 'green', 'blue'];

*for (let index in colors)*

*console.log(index,* ***colors[index])****;*

for (let color of colors)

console.log(color);

“With this new four-loop, we don’t have to deal with this (above) index. And we don’t have to access the element at the **given index.**  So in each iteration, this color, which is our loop variable will hold one of the items in this array.”

((Zack. Hence, we are utilizing the color variable, rather than the value of the key/index.))



To summarize:

We use the for-in loop to iterate over the properties of an object.

And the for-of loop to iterate over the elements, or items in an array.

//for-in

const person = {

    name: 'Mosh',

age: 30

};

for (let key in person)

console.log(key, person[key]);

//for-of

const colors = ['red', 'green', 'blue'];

for (let color of colors)

console.log(color);

/\*

const person = {

    name: 'Mosh',

age: 30

};

for (let key in person)

console.log(key, person[key]);

const colors = ['red', 'green', 'blue'];

for (let index in colors)

console.log(index, colors[index]);

for (let color of colors)

console.log(color);

//with the for of loop, the color variable will 'hold' an item in the array as it iterates through.  It won't also display the index number, like with you use a for-in loop.

\*/

//for-in

const person = {

    name: 'Mosh',

age: 30

};

for (let key in person)

console.log(key, person[key]);

//for-of

const colors = ['red', 'green', 'blue'];

for (let color of colors)

console.log(color);

//We use the for-in loop to iterate over the properties of an object.

//And the for-of loop to iterate over the elements, or items in an array.

## 04 - Control Flow - 09 - Break and Continue

With all the loops we’ve learned about in this section, the two keywords break and continue they can change how the loop behaves.

Let’s use a while loop as an example.

Let’s declare a variable:

let

We’ll call it i:

let i

And *initialize* to zero:

let i *= 0;*

Now will put this in a while loop:

while (i <= 10)

let i = 0;

while (i <= 10)

And display I on the console:

console.log(i);

let i = 0;

while (i <= 10) {

    console.log(i);  
}

And increment it:

 i++;

let i = 0;

while (i <= 10) {

    console.log(i);

    i++;

}



Sometimes, you want to jump out of a loop for some reason that may happen at runtime.

E.g., an *if* condition

if

let i = 0;

while (i <= 10) {

    if

    console.log(i);

    i++;

}

And an if statement ()

  if ()

let i = 0;

while (i <= 10) {

    if ()

    console.log(i);

    i++;

}

If i = 5…

 if (i === 5)

let i = 0;

while (i <= 10) {

    if (i === 5)

    console.log(i);

    i++;

}

…we want to jump out of the loop.

This is where we use the *break* keyword.

 if (i === 5) break

let i = 0;

while (i <= 10) {

    if (i === 5) break

    console.log(i);

    i++;

}



Now let’s examine the continue keyword. Let’s write a new *if* statement.

If i is an even number. i, modulus 2 equals zero. (Modulus is another term for Absolute Value).

If (i % 2 === 0)

 if (i % 2 === 0)

let i = 0;

while (i <= 10) {

   // if (i === 5) break

   if (i % 2 === 0)

    console.log(i);

    i++;

}

If so, increment I, and continue:

if (i % 2 === 0) {

    i++;

    continue;

let i = 0;

while (i <= 10) {

   // if (i === 5) break

   if (i % 2 === 0) {

    i++;

    continue;

   }

    console.log(i);

    i++;

}



E.g., when i is 2, it is an even number, and then we increment i… so i will be 3. When the javascript engine sees the keyword continue… it will jump to the beginning of the loop…

while (i <= 10) {

…and continue execution of the next iteration.

At this point, i is 3, and the if statement is not executed. That is why we see i logged on the console as 3. [[[In other words, if the *if* statement conditions are met, then it continues to the beginning, and does not reach the console.log]]]

Mosh does not use continue that often… it is old, legacy code. But you may see it in projects that you are working on. “It is an ugly way of writing code.”

With the break keyword we jump out of a loop, and with the continue keyword, jump to the next iteration [[[at the top]]].

## 04 - Control Flow - Exercise - 10 - Max of Two Numbers

“I want you to write a function that takes two numbers and returns the maximum of the two.

Call that function, give a different argument, and make sure it is working properly”.

OK, first attempt, while yielding the correct answer, is Not a function. Mosh does indeed want a function.

if (10>20) {console.log(10)}

else

console.log(20)

I see this much from his lesson, so maybe I can finish:

*function maximum (number1, )*

This is a fail:

function maximum (number1, number2) {

    if (number1 > number2) {console.log(number1)

    else

console.log(number2)}

}

let number1 = 10

let number2 = 20

Well, let’s play with our if…else just for fun:

if (number1 > number2) {console.log(number1)}

else

console.log(number2)

let number1 = 10

let number2 = 20



Ah… need to input the values Before executing the code.

let number1 = 10

let number2 = 20

if (number1 > number2) {console.log(number1)}

else

console.log(number2)

Ah, that works.

This does not:

let number1 = 10

let number2 = 20

function maximum(number1, number2) {

    if (number1 > number2) {console.log(number1)}

    else

console.log(number2)}

}

This does not work:

function maximum(1, 5) {

    if (1 > 5) {console.log(1)}

    else

console.log(5) }

Well, this doesn’t throw an error message:

function maximum(number1, number2) {

    return number1 > number2;

}

Nor does this… I thought I saw that it did… hmm.

function maximum(number1, number2) {

    return number1 > number2;

    return number1 < number2;

}

This just returns False:

function maximum(number1, number2) {

    return number1 > number2;

    return number1 < number2;

}

console.log(maximum(10, 20));

This returns true:

function maximum(number1, number2) {

    return number1 > number2;

    return number1 < number2;

}

console.log(maximum(10, 5));

Well… I can’t just log the output of maximum, because I have two outputs.

Ok, well this worked:

function maximum(number1, number2) {

    if (number1 > number2) return number1

    else return number2

}

console.log(maximum(10, 20));

So did this:

function maximum(number1, number2) {

    if (number1 > number2) {return number1}

    else return number2

}

console.log(maximum(50, 20));

Perhaps this is better?

function maximum(number1, number2) {

    if (number1 > number2) {return number1;}

    else return number2;

}

console.log(maximum(50, 20));

Well… it may all be nonsense.  
  
  
Hmmm, better still?

function maximum(number1, number2) {

    if (number1 > number2) {return number1;

    }

    else return number2;

}

console.log(maximum(50, 20));

Now, let’s follow along with Mosh:

Let’s start by defining a function, will call it Max. We will add two parameters: number one, and number two.

function max(number1, number2)

Or we can use shorter names like a and B. Mosh says A and B are kind of self-explanatory in this case, so we can go ahead and use these undefined names which he normally warned against.

“We want to have some logic, we want to compare the value of a with B, so were going to use an if statement”

If a is greater than be, we want to return a.

if (a > b) return a;

Else, we want to return b.

function max(a, b) {

if (a > b) return a;

else return b;

}

“This is the simplest implementation, it’s not the best”.

Let’s declare a variable called number, and set it to max of one and two.

let number = max(1, 2);

let number = max(1, 2);

function max(a, b) {

if (a > b) return a;

else return b;

}

Now we’ll display the number on the console.

let number = max(1, 2);

console.log(number);

function max(a, b) {

if (a > b) return a;

else return b;

}

(Mosh notes that we “called this function, with different arguments. Different test cases” I.e., different numbers.

Let’s clean up this code. Let’s remove the *else* keyword. Mosh says that if a is true, we will return A and jump out of the function, and the subsequent code won’t be executed. If A is untrue, we should just return b.

return b;

let number = max(1, 2);

console.log(number);

function max(a, b) {

if (a > b) return a;

return b;

}

We can use the conditional operator to make this even simpler. We have a (condition) in parenthesis, a ?, and if this condition evaluates to true, we use one value, otherwise we use the other.

(condition) ? a : b.

Jumping out of the lesson. Hmmm. How can I implement this?

This comes back as undefined:

let number = max(1, 2);

console.log(number);

function max(a, b) {

(a > b) ? a : b

}

Ah, this did it:

return (a > b) ? a : b

let number = max(1, 2);

console.log(number);

function max(a, b) {

return (a > b) ? a : b

}

Back to Mosh:

We use the conditional operator. For the condition, is A > B. If this condition is true ? return A. Otherwise return B.

a > b) ? a : b

let number = max(1, 2);

console.log(number);

function max(a, b) {

(a > b) ? a : b

}

All we need is a return statement, and to terminate with a semicolon.

return (a > b) ? a : b;

let number = max(1, 2);

console.log(number);

function max(a, b) {

return (a > b) ? a : b;

}

## 04 - Control Flow - Exercise - 11 - Landscape or Portrait

function isLandscape(width, height) {

}

Implement this function. Function, isLandscape, and it takes two parameters. Width, and height of an image.

Returns true if the image is landscape, meaning width is greater than height. Otherwise, it returns false. This is similar to the previous exercise, but Mosh has a tip.

So, we want to return a Boolean instead of a numerical value, I guess. I think I did that accidentally earlier…

OK, this did not work… wait, it did. I just had to reload the browser

let boolean = isLandscape(5, 2);

console.log(boolean)

function isLandscape(width, height) {

    if (width > height) return true

   return false

}

We could pare this down:

let boolean = isLandscape(5, 2);

console.log(boolean)

function isLandscape(w, h) {

    if (w > h) return true

    return false

}

Let’s see if we can do the same thing with our conditional operator.

Well, this didn’t work.

let boolean = isLandscape(5, 2);

console.log(boolean)

function isLanscape(w, h) {

    (w > h) ? true : false

}

Nor did this, when we added return:

let boolean = isLandscape(5, 2);

console.log(boolean)

function isLanscape(w, h) {

return (w > h) ? true : false

}

Ah ha… this Does work. The one above had a Typo in isLandscape. Duuuur.

let boolean = isLandscape(1, 2);

console.log(boolean);

function isLandscape(w, h) {

    return (w > h) ? true : false;

}

Interestingly enough, this did not work… when I capitalized False:

let boolean = isLandscape(1, 2);

console.log(boolean);

function isLandscape(w, h) {

    return (w > h) ? true : False;

}

Though it did work when I turned it into a string:

let boolean = isLandscape(1, 2);

console.log(boolean);

function isLandscape(w, h) {

    return (w > h) ? 'true' : 'False';

}

Now, we do it Mosh’s way.

function isLandscape(width, height) {

    if (width > height) return true;

    return false;

}

Using the conditional operator:

function isLandscape(width, height) {

    return (width > height) ? true : false;

}

However, the code above “looks very amateurish. You don’t want to return true or false explicitly. This is very ugly”.

The reason being that we can delete the conditional operator, “and simply return the value of this expression”.

function isLandscape(width, height) {

    return (width > height) ? true : false;

}

If width is greater than height, the expression will be evaluated to true. If width is less than height, this expression will evaluate to false. “So there is no need to explicitly return true and false here. That’s a poor way of writing code”.

Let’s do a console.log. “Simply call this function here, isLandscape”

console.log(isLandscape)

function isLandscape(width, height) {

    return (width > height)

}

Let’s pass the dimensions 800 x 600:

console.log(isLandscape(800, 600));

function isLandscape(width, height) {

    return (width > height)

}

let boolean = isLandscape(5, 2);

console.log(boolean)

function isLandscape(w, h) {

    if (w > h) return true

     return false

}

let boolean = isLandscape(1, 2);

console.log(boolean);

function isLandscape(w, h) {

    return (w > h) ? true : false;

}

function isLandscape(width, height) {

    if (width > height) return true;

    return false;

}

function isLandscape(width, height) {

    return (width > height) ? true : false;

}

function isLandscape(width, height) {

    return (width > height)

}

\*/

console.log(isLandscape(300, 600));

function isLandscape(width, height) {

    return (width > height)

}

## 04 - Control Flow - Exercise - 12 - FizzBuzz

This question is a popular interview question called the fizz buzz algorithm.

So, we have this function called fizzBuzz. We give it an input, and it returns a string.

function fizzBuzz(input) {

}

Let’s declare a constant called output… here we *call* fizzBuzz, and pass an input, like 3

const output = fizzBuzz(3);

function fizzBuzz(input) {

}

Now, log the output:

const output = fizzBuzz(3);

console.log(output);

function fizzBuzz(input) {

}

Mosh’s console outputs Fizz. Mine does not. It just says undefined. I tried switching from edge to chrome, no difference.



“So if the number that we pass is divisible by three, we get Fizz.”

If the number that we pass is divisible by 5, we get Buzz.

If the number we pass is divisible by 3 and 5, like 15, we get fizzBuzz

If the number is not divisible by either 3 or 5, we get the same number… e.g., 7.

if (hour >= 6 && hour < 12 )

    console.log('Good morning');

else if (hour >= 12 && hour < 18)

    console.log('Good Afternoon!');

else

console.log('Good evening');

Let’s aim for outputting just one variable. Switch and case seems another way.

Hmmm. Looks like Mosh used if. We’ll try switch and case too.

const output = fizzBuzz(3);

console.log(output);

function fizzBuzz(input) {if 10 > 1 return true; }

So my problem is, I’m not sure how to output anything.

Ah. Had to put this in parenthesis.

const output = fizzBuzz(3);

console.log(output);

function fizzBuzz(input) {if (10 > 1)

    return true; }

This outputs an error.

const output = fizzBuzz(6);

console.log(output);

function fizzBuzz(input) {if (i % 3 !== 0)

    return true; }

This outputs true

const output = fizzBuzz(6);

console.log(output);

function fizzBuzz(input) {if (fizzBuzz % 3 !== 0)

    return true; }

returns fizz

const output = fizzBuzz(6);

console.log(output);

function fizzBuzz(input) {if (fizzBuzz % 3 !== 0)

    return 'fizz'; }

ah… returns true, even if the number Isn’t divisible by 3.

const output = fizzBuzz(2);

console.log(output);

function fizzBuzz(input) {if (fizzBuzz % 3 !== 0)

    return 'fizz'; }

Ahhh. The !== means Not divisible? === outputs false

const output = fizzBuzz(2);

console.log(output);

function fizzBuzz(input) {if (fizzBuzz % 3 %== 0)

    return 'fizz';

else return false }

Changing fizzbuzz to 5 yields the same result:

const output = fizzBuzz(5);

console.log(output);

function fizzBuzz(input) {if (5 % 2 !== 0)

    return 'fizz';

else return false }

Ah… this needed to be changed to input… durr.

const output = fizzBuzz(4);

console.log(output);

function fizzBuzz(input) {if (input % 2 !== 0)

    return 'fizz';

else return false }

Ok, so this works for 3:

const output = fizzBuzz(3);

console.log(output);

function fizzBuzz(input) {if (input % 3 === 0)

    return 'fizz';

else return false }

Logical And && washed out…

const output = fizzBuzz(15);

console.log(output);

function fizzBuzz(input) {if (input % 3 === 0 && input % 5 === 0)

    return fizzBuzz

    (input % 3 === 0)

    return 'fizz';

else return false }

So did this:

function fizzBuzz(input) {if ((input % 3 === 0) && (input % 5 === 0))

    return fizzBuzz

    (input % 3 === 0)

    return 'fizz';

else return false }

Removing the 3 code produces a weird error:

const output = fizzBuzz(15);

console.log(output);

function fizzBuzz(input) {if ((input % 3 === 0) && (input % 5 === 0))

    return fizzBuzz

else return false }



This gives us a regular error:

const output = fizzBuzz(15);

console.log(output);

function fizzBuzz(input) {if ((input % 3 === 0) && (input % 5 === 0));

    return fizzBuzz

else return false }

Hey dummy… did you remember to pass a string? This works:

const output = fizzBuzz(30);

console.log(output);

function fizzBuzz(input) {if (input % 3 === 0 && input % 5 === 0)

    {return 'fizzBuzz';}

else return false }

We can pare this back down… I had tried a few things:

const output = fizzBuzz(30);

console.log(output);

function fizzBuzz(input) {if (input % 3 === 0 && input % 5 === 0)

    return 'fizzBuzz'

else return false }

Ok… now to try not divisible by either:

const output = fizzBuzz(9);

console.log(output);

function fizzBuzz(input) {if (input % 3 === 0 && input % 5 === 0)

    return 'fizzBuzz'

    else if (input % 3 === 0)

    return 'fizz'

    else if (input % 3 !== 0 && input % 5 !==)

    return (input)

else return false }

This kinda works

const output = fizzBuzz(11);

console.log(output);

function fizzBuzz(input) {if (input % 3 === 0 && input % 5 === 0)

    return 'fizzBuzz'

    else if (input % 3 === 0)

    return 'fizz'

    else if (input % 3 !== 0)

    return (input)

else return false }

Hmmm. 10 returns false… maybe I need to write up something for 5 now:

const output = fizzBuzz(10);

console.log(output);

function fizzBuzz(input) {if (input % 3 === 0 && input % 5 === 0)

    return 'fizzBuzz'

    else if (input % 3 === 0)

    return 'fizz'

    else if (input % 3 !== 0  && input % 5 !== 0)

    return (input)

else return false }

Ok, this works great:

const output = fizzBuzz(101);

console.log(output);

function fizzBuzz(input) {if (input % 3 === 0 && input % 5 === 0)

    return 'fizzBuzz'

    else if (input % 3 === 0)

    return 'fizz'

    else if (input % 5 === 0)

    return 'Buzz'

    else if (input % 3 !== 0  && input % 5 !== 0)

    return (input)

else return 'false' }

This doesn’t work. Error message.

const output = fizzBuzz(dog);

console.log(output);

function fizzBuzz(input) {if (input % 3 === 0 && input % 5 === 0)

    return 'fizzBuzz'

    else if (input % 3 === 0)

    return 'fizz'

    else if (input % 5 === 0)

    return 'Buzz'

    else if (input % 3 !== 0  && input % 5 !== 0)

    return (input)

else return 'Not a number' }

If we input the string, we get back the string… instead of not a number.

const output = fizzBuzz('dog');

console.log(output);

function fizzBuzz(input) {if (input % 3 === 0 && input % 5 === 0)

    return 'fizzBuzz'

    else if (input % 3 === 0)

    return 'fizz'

    else if (input % 5 === 0)

    return 'Buzz'

    else if (input % 3 !== 0  && input % 5 !== 0)

    return (input)

else return 'Not a number' }

Hmmm. How do we get the return input to exclude non numbers? I tried making input divisible by 1… also tried input plus 1

const output = fizzBuzz('dog');

console.log(output);

function fizzBuzz(input) {if (input % 3 === 0 && input % 5 === 0)

    return 'fizzBuzz'

    else if (input % 3 === 0)

    return 'fizz'

    else if (input % 5 === 0)

    return 'Buzz'

    else if

    else if (input % 3 !== 0  && input % 5 !== 0)

    return (input % 1 === 0)

else return 'Not a number' }

Haha. Input plus zero is thus: (outputted dog0)

const output = fizzBuzz('dog');

console.log(output);

function fizzBuzz(input) {if (input % 3 === 0 && input % 5 === 0)

    return 'fizzBuzz'

    else if (input % 3 === 0)

    return 'fizz'

    else if (input % 5 === 0)

    return 'Buzz'

    else if (input % 3 !== 0  && input % 5 !== 0)

    return (input + 0)

else return 'Not a number' }

Ok, dog input % 1 is false.

const output = fizzBuzz('dog');

console.log(output);

function fizzBuzz(input) {if (input % 3 === 0 && input % 5 === 0)

    return 'fizzBuzz'

    else if (input % 3 === 0)

    return 'fizz'

    else if (input % 5 === 0)

    return 'Buzz'

    else if (input % 3 !== 0  && input % 5 !== 0)

    return (input % 1 === 0)

else return 'Not a number' }

Non 3, 5 and either numbers output to true. Strings output to ‘Not a number’. False, outputs to fizzbuzz. True, outputs to true.

const output = fizzBuzz(17);

console.log(output);

function fizzBuzz(input) {if (input % 3 === 0 && input % 5 === 0)

    return 'fizzBuzz'

    else if (input % 3 === 0)

    return 'fizz'

    else if (input % 5 === 0)

    return 'Buzz'

    else if (input % 1 !== 0)

    return 'Not a number'

    else if (input % 3 !== 0  && input % 5 !== 0)

    return (input % 1 === 0)

}

Ok, so instead of input % 1, we did input/1. Plus some rearranging. Everything seems to work.

const output = fizzBuzz(14);

console.log(output);

function fizzBuzz(input) {if (input === true)

    return 'Not a number'

    else if (input === false)

    return 'Not a number'

    else if (input % 1 !== 0)

    return 'Not a number'

    else if (input % 3 === 0 && input % 5 === 0)

    return 'fizzBuzz'

    else if (input % 3 === 0)

    return 'fizz'

    else if (input % 5 === 0)

    return 'Buzz'

    else if (input % 3 !== 0  && input % 5 !== 0)

    return (input/1)

}

Wait… why would we need input/1? Just input. Must have been bad formatting before:

const output = fizzBuzz(false);

console.log(output);

function fizzBuzz(input) {if (input === true)

    return 'Not a number'

    else if (input === false)

    return 'Not a number'

    else if (input % 1 !== 0)

    return 'Not a number'

    else if (input % 3 === 0 && input % 5 === 0)

    return 'fizzBuzz'

    else if (input % 3 === 0)

    return 'fizz'

    else if (input % 5 === 0)

    return 'Buzz'

    else if (input % 3 !== 0 && input % 5 !== 0)

    return (input)

Let’s see Mosh’s solution. Ahh. Here is what we wanted.

const output = fizzBuzz(false);

console.log(output);

function fizzBuzz(input) {

    if (typeof input !== 'number')

   return 'Not a number'

}

“Here we’re dealing with a complex expression. To make this code more readable, I would like to put each expression in parenthesis.”

const output = fizzBuzz(false);

console.log(output);

function fizzBuzz(input) {

    if (typeof input !== 'number')

   return 'Not a number';

   if (input % 3 === 0)

   return 'Fizz';

   if (input % 5 === 0)

   return 'Buzz';

   if (input % 3 === 0 && input % 5 === 0)

}

Select the parenthesis, type ( and it will automatically enclose it ^^ tips and tricks.

const output = fizzBuzz(false);

console.log(output);

function fizzBuzz(input) {

    if (typeof input !== 'number')

   return 'Not a number';

   if (input % 3 === 0)

   return 'Fizz';

   if (input % 5 === 0)

   return 'Buzz';

   if ((input % 3 === 0) && (input % 5 === 0))

}

Ah, ha. Mosh pulled a fast one on us. He is showing that order of operation matters. Also, to move code, select it, push the alt key, and the arrows ^^. Tips and tricks.

console.log(output);

function fizzBuzz(input) {

    if (typeof input !== 'number')

   return 'Not a number';

   if ((input % 3 === 0) && (input % 5 === 0))

   return 'FizzBuzz';

   if (input % 3 === 0)

   return 'Fizz';

   if (input % 5 === 0)

   return 'Buzz';

   return input;

}

In JS, there is a special value called Not A Number. NaN

const output = fizzBuzz(dog);

console.log(output);

function fizzBuzz(input) {

    if (typeof input !== 'number')

   return NaN;

   if ((input % 3 === 0) && (input % 5 === 0))

   return 'FizzBuzz';

   if (input % 3 === 0)

   return 'Fizz';

   if (input % 5 === 0)

   return 'Buzz';

   return input;

}



NaN returns as a number. Weird. But it isn’t a valid mathematical number.

/\*

divisible by 3, => Fizz

divisibile by 5 => Buzz

divisible by both 3 and 5 => FizzBuzz

Not divisible by 3 or 5 => input

not a number => 'Not a number"

 (input % 3 === 0)

    return 'fizz';

    const output = fizzBuzz(false);

console.log(output);

function fizzBuzz(input) {

const output = fizzBuzz(7);

console.log(output);

function fizzBuzz(input) {if (input === true)

    return 'Not a number'

    else if (input === false)

    return 'Not a number'

    else if (input % 1 !== 0)

    return 'Not a number'

    else if (input % 3 === 0 && input % 5 === 0)

    return 'fizzBuzz'

    else if (input % 3 === 0)

    return 'fizz'

    else if (input % 5 === 0)

    return 'Buzz'

    else if (input % 3 !== 0 && input % 5 !== 0)

    return (input)

}

\*/

const output = fizzBuzz(false);

console.log(output);

function fizzBuzz(input) {

    if (typeof input !== 'number')

   return NaN;

   if ((input % 3 === 0) && (input % 5 === 0))

   return 'FizzBuzz';

   if (input % 3 === 0)

   return 'Fizz';

   if (input % 5 === 0)

   return 'Buzz';

   return input;

}

## 04 - Control Flow - Exercise - 13 - Demerit Points

Mosh says this is more difficult than the earlier exercises.

checkSpeed(50);

function checkspeed(speed) {

}

This function takes a parameter that’s the speed of a car. Speed Limit is 70 kph.

So, if a car is driving under or at the speed limit, output OK.

For every 5 above the speed limit, they get 1 point.



If you are at 72… still output to OK.

“As part of calculating the point here, you’ll have to use one of the built in functions in JS. Math.floor.

Math.floor

checkSpeed(50);

function checkspeed(speed) {

}

We can give this function a floating point number like 1.3… or 1.3 points… and this will convert that to the greatest integer.

Math.floor(1.3)

checkSpeed(50);

function checkspeed(speed) {

}

If we pass 80, we get 2 points. If we do 180, it outputs License suspended. So… if a driver gets more than 12 points, license suspended.

Same trouble as usual. How do I get this out output anything?

Math.floor(1.3)

checkSpeed(50);

function checkspeed(speed) {console.log(checkspeed)

}

Math.floor(1.3)

checkSpeed(50);

function checkspeed(speed) {console.log(speed)

}

Math.floor(1.3)

checkSpeed(50);

function checkspeed(speed) {return console.log(speed)

}

Ah ha… we first discover a Typo! Now we are outputting. Displays 50.

checkSpeed(50);

function checkSpeed(speed) {console.log(speed);

}

Trying to log checkSpeed, does this recursive thing, displaying the entire function:

checkSpeed(50);

function checkSpeed(speed) {console.log(checkSpeed);

}



Ok, now we’ll add a condition. And over 75, we don’t display.

checkSpeed(50);

function checkSpeed(speed) { if (speed < 75) console.log(speed);

}

Now, we try to output the string OK, and we fail… oh, duh, because we are over 75.

checkSpeed(90);

function checkSpeed(speed) { if (speed < 75) console.log('OK');

}

Durrr.

checkSpeed(40);

function checkSpeed(speed) { if (speed < 75) console.log('OK');

}

Ok, if speed is less than or equal to 74… we return OK.

checkSpeed(40);

function checkSpeed(speed) { if (speed <= 75) console.log('OK');

}

So, 12 times 5 is 60. Max speed is 130

So, subtracting 75 from speed, and then dividing by 5 seems like the answer… just need to output it.

checkSpeed(80);

function checkSpeed(speed) { if (speed <= 74) console.log('OK');

else if console.log((speed) - 75)

}

Ah… here we are.

checkSpeed(80);

function checkSpeed(speed) { if (speed <= 74) console.log('OK');

else if (speed >= 75)

console.log(speed -75)

}

OK… better still:

checkSpeed(80);

function checkSpeed(speed) { if (speed <= 74) console.log('OK');

else if (speed >= 75)

console.log((speed -75)/5)

}

Now, here’s the string:

checkSpeed(80);

function checkSpeed(speed) { if (speed <= 74) console.log('OK');

else if (speed >= 75)

console.log('Point: '+ (speed -75)/5)

}

Ah… but 75 is Zero points.

checkSpeed(75);

function checkSpeed(speed) { if (speed <= 74) console.log('OK');

else if (speed >= 75)

console.log('Point: '+ (speed -75)/5)

}

OK… 75 is 1 point now:

checkSpeed(75);

function checkSpeed(speed) { if (speed <= 74) console.log('OK');

else if (speed >= 75)

console.log('Point: '+ ((speed -75)/5 + 1) )

}

Ah ha… 89 comes out to 3.8:

checkSpeed(89);

function checkSpeed(speed) { if (speed <= 74) console.log('OK');

else if (speed >= 75)

console.log('Point: '+ ((speed -75)/5 + 1) )

}

Ah ha… here is Math.floor, changing a 91 to a whole number:

checkSpeed(91);

function checkSpeed(speed) { if (speed <= 74) console.log('OK');

else if (speed >= 75)

console.log('Point: '+ (Math.floor((speed -75)/5 + 1)) )

}

OK… now all we have to do is make sure this only applies to under 130.

checkSpeed(140);

function checkSpeed(speed) { if (speed <= 74) console.log('OK');

else if (speed >= 75  && speed < 130)

console.log('Point: '+ (Math.floor((speed -75)/5 + 1)) )

 return console.log('License Suspended')

}

However, if Under 130, we still get points displaying:

checkSpeed(100);

function checkSpeed(speed) { if (speed <= 74) console.log('OK');

else if (speed >= 75  && speed < 130)

console.log('Point: '+ (Math.floor((speed -75)/5 + 1)) )

 return console.log('License Suspended')

}



Ah… just have to add else

checkSpeed(90);

function checkSpeed(speed) { if (speed <= 74) console.log('OK');

else if (speed >= 75  && speed < 130)

console.log('Point: '+ (Math.floor((speed -75)/5 + 1)) )

else return console.log('License Suspended')

}

OK… problem solved.

Lets see Mosh’s Solution.

“The first thing I want to improve here is to turn this magic number into a constant. Because someone else looking at this code may not know what 70 represents here. So you should avoid using magic numbers in your code. Always use constants to describe them”

function checkSpeed(speed) {

    if (speed < 70)

    console.log('OK');

}

We establish a constant speedLimit, and then change (speed < 70) to (speed < speedLimit).

function checkSpeed(speed) {

**const speedLimit = 70;**

    if (speed < speedLimit)

    console.log('OK');

}

“With this change, now our code is more expressive, and also if we want to use this number somewhere else in this function, we don’t have to repeat it multiple times. We have defined it **here** once, and we can reuse it in multiple places.

If tomorrow, the speed limit changes to, let’s say, 75 or 65, there is only a single place we have to change.”

“Once again, we don’t want to use this magic number here… it’s not descriptive.”

function checkSpeed(speed) {

    const speedLimit = 70;

    if (speed < speedLimit)

    console.log('OK');

    else {

         (speed - speedLimit) / 5

    }

}

Instead, we define another constant. Kilometer per point:

function checkSpeed(speed) {

    const speedLimit = 70;

    const kmPerPoint = 5;

    if (speed < speedLimit)

    console.log('OK');

    else {

         (speed - speedLimit) / kmPerPoint

    }

}

“With this we get the number of points”. And Mosh changes this to: *let points = (speed - speedLimit) / kmPerPoint;*

function checkSpeed(speed) {

    const speedLimit = 70;

    const kmPerPoint = 5;

    if (speed < speedLimit)

    console.log('OK');

    else {

         let points = (speed - speedLimit) / kmPerPoint;

    }

}

The result of this expression can be a floating point number.

function checkSpeed(speed) {

    const speedLimit = 70;

    const kmPerPoint = 5;

    if (speed < speedLimit)

    console.log('OK');

    else {

         let points = (speed - speedLimit) / kmPerPoint;

    }

}

So, let’s call Math.floor… and as an argument, we pass the highlighted expression:

function checkSpeed(speed) {

    const speedLimit = 70;

    const kmPerPoint = 5;

    if (speed < speedLimit)

    console.log('OK');

    else {

         let points = Math.floor((speed - speedLimit) / kmPerPoint);

    }

}

“Now we should check to see if the driver gets more than 12 points. So, we need another if statement. If points is greater than or equal to 12, we want to suspend their license.”

[[[I’d note that this is basically a *let* *if* statement. Interesting. ]]]

function checkSpeed(speed) {

    const speedLimit = 70;

    const kmPerPoint = 5;

    if (speed < speedLimit)

    console.log('OK');

    else {

         let points = Math.floor((speed - speedLimit) / kmPerPoint);

         if (points >= 12)

         console.log('License suspended')

    }

}

“Otherwise, we want to display the number of points on the console… and as a second argument, we pass this points variable” [[[The first is string, the second is a value]]]

   else

         console.log('Points', points);

function checkSpeed(speed) {

    const speedLimit = 70;

    const kmPerPoint = 5;

    if (speed < speedLimit)

    console.log('OK');

    else {

         let points = Math.floor((speed - speedLimit) / kmPerPoint);

         if (points >= 12)

         console.log('License suspended')

         else

         console.log('Points', points);

    }

}

“Now technically here I could also use a constant, and that’s a better practice to make sure I don’t accidentally modify this points here”

function checkSpeed(speed) {

    const speedLimit = 70;

    const kmPerPoint = 5;

    if (speed < speedLimit)

    console.log('OK');

    else {

         let points = Math.floor((speed - speedLimit) / kmPerPoint);

         if (points >= 12)

         console.log('License suspended')

         else

         console.log('Points', points);

    }

}

So, we’ll change this to a constant:

function checkSpeed(speed) {

    const speedLimit = 70;

    const kmPerPoint = 5;

    if (speed < speedLimit)

    console.log('OK');

    else {

         const points = Math.floor((speed - speedLimit) / kmPerPoint);

         if (points >= 12)

         console.log('License suspended')

         else

         console.log('Points', points);

    }

}

And if we try to modify the points like so, we’ll get an error:

function checkSpeed(speed) {

    const speedLimit = 70;

    const kmPerPoint = 5;

    if (speed < speedLimit)

    console.log('OK');

    else {

         const points = Math.floor((speed - speedLimit) / kmPerPoint);

         points++;

         if (points >= 12)

         console.log('License suspended')

         else

         console.log('Points', points);

    }

}

“Const should be your default choice. If you want to reassign a variable, that’s when you use the let keyword.”

“Let’s call this function, *checkSpeed* and pass 50.

checkSpeed(50);

checkSpeed(50);

function checkSpeed(speed) {

    const speedLimit = 70;

    const kmPerPoint = 5;

    if (speed < speedLimit)

    console.log('OK');

    else {

         const points = Math.floor((speed - speedLimit) / kmPerPoint);

         if (points >= 12)

         console.log('License suspended')

         else

         console.log('Points', points);

    }

}

If we drive exactly at the speed limit, we get “Points 0”, instead of the OK message. So there is a bug in our condition here. Let’s change it to less than or equal to. [[[I’m not repasting that small change.]]]

checkSpeed(70);

function checkSpeed(speed) {

    const speedLimit = 70;

    const kmPerPoint = 5;

    if (speed < speedLimit)

    console.log('OK');

    else {

         const points = Math.floor((speed - speedLimit) / kmPerPoint);

         if (points >= 12)

         console.log('License suspended')

         else

         console.log('Points', points);

    }

}

Ok… now if you’re going 71, you get the “Points 0” message instead of OK. So, we still have a bug.

Let’s change

 if (speed <= speedLimit)

to:

    if (speed < speedLimit + kmPerPoint)

[[[kmPerPoint is 5… so it’s basically like adding 5. Then we change it to less than]]]

checkSpeed(70);

function checkSpeed(speed) {

    const speedLimit = 70;

    const kmPerPoint = 5;

    if (speed < speedLimit)

    console.log('OK');

    else {

         const points = Math.floor((speed - speedLimit) / kmPerPoint);

         if (points >= 12)

         console.log('License suspended')

         else

         console.log('Points', points);

    }

}

“So our function is working. I just want to show you one more tip to make our code cleaner.

Here, we have this else block, and this has caused indentation here[[[ here being, say, the space before const]]]. “Now this is not a terribly bad thing, but it is better to avoid indentation if we can. Because otherwise we have to scroll to the left and right to see what’s happening here.”

checkSpeed(70);

function checkSpeed(speed) {

    const speedLimit = 70;

    const kmPerPoint = 5;

    if (speed <= speedLimit + kmPerPoint)

    console.log('OK');

    else {

         const points = Math.floor((speed - speedLimit) / kmPerPoint);

         if (points >= 12)

         console.log('License suspended')

         else

         console.log('Points', points);

    }

}

“So, if this condition is true, we want to display ok on the console. To get rid of this else block…”

checkSpeed(70);

function checkSpeed(speed) {

    const speedLimit = 70;

    const kmPerPoint = 5;

    if (speed <= speedLimit + kmPerPoint)

    console.log('OK');

    else {

         const points = Math.floor((speed - speedLimit) / kmPerPoint);

         if (points >= 12)

         console.log('License suspended')

         else

         console.log('Points', points);

    }

}

“…We can add a block here” and stick console.log inside it. And then add a return after: “With this we will jump out of this function, and none of the code **here** will be executed”

 if (speed <= speedLimit + kmPerPoint) {

        console.log('OK');

        return;

    }

checkSpeed(70);

function checkSpeed(speed) {

    const speedLimit = 70;

    const kmPerPoint = 5;

    if (speed <= speedLimit + kmPerPoint) {

        console.log('OK');

        return;

    }

**else {**

**const points = Math.floor((speed - speedLimit) / kmPerPoint);**

**if (points >= 12)**

**console.log('License suspended')**

**else**

**console.log('Points', points);**

    }

}

Now we can remove the else statement and the code block, and remove the indentation:

checkSpeed(70);

function checkSpeed(speed) {

    const speedLimit = 70;

    const kmPerPoint = 5;

    if (speed <= speedLimit + kmPerPoint) {

        console.log('OK');

        return;

    }

    const points = Math.floor((speed - speedLimit) / kmPerPoint);

    if (points >= 12)

    console.log('License suspended')

    else

    console.log('Points', points);

}

/\*

My solution:

checkSpeed(80);

function checkSpeed(speed) { if (speed <= 74) console.log('OK');

else if (speed >= 75  && speed < 130)

console.log('Point: '+ (Math.floor((speed -75)/5 + 1)) )

else return console.log('License Suspended')

}

\*/

checkSpeed(70);

function checkSpeed(speed) {

    const speedLimit = 70;

    const kmPerPoint = 5;

    if (speed <= speedLimit + kmPerPoint) {

        console.log('OK');

        return;

    }

    const points = Math.floor((speed - speedLimit) / kmPerPoint);

    if (points >= 12)

    console.log('License suspended')

    else

    console.log('Points', points);

}

## 04 - Control Flow - 14 - Exercise 5 - Even and Odd Numbers

Write a function called show numbers that takes a parameter called limit. So, we pass a number here like 10, and when we call this function, we should see all the numbers from zero to the number we supplied as the limit.

showNumbers(10);

function showNumbers(limit) {

}



“Next to each number, if that number is even, you should display the even label. Otherwise, you should display odd”

Mosh says this is easy. Looks like a loop of some kind. Let’s see if we can make something display:

Fail.

showNumbers(10);

function showNumbers(limit) {

    for (let i = 0; i < limit)

    console.log(i)

}

OK… this displays.

showNumbers(10);

function showNumbers(limit) {

    let i = 0;

    console.log(i)

}

But this does Not work:

showNumbers(10);

function showNumbers(limit) {

    (let i = 0;)

    console.log(i)

}

This does:

showNumbers(10);

function showNumbers(limit) {

    let i = 0;

    i <= limit;

    console.log(i)

}

This only iterates once:

showNumbers(10);

function showNumbers(limit) {

    let i = 0;

    i <= limit;

    i++

    console.log(i)

}

Huh. This works… why didn’t the earlier expressions? Maybe they did

showNumbers(10);

function showNumbers(limit) {

    for (let i = 0;

    i <= limit;

    i++)

    console.log(i)

}

Well, no replacing for with let, willy nilly. This didn’t work:

showNumbers(10);

function showNumbers(limit) {

    if (let i = 0;

    i <= limit;

    i++)

    console.log(i)

}

This only displays even numbers, 0 to 10:

showNumbers(10);

function showNumbers(limit) {

    for (let i = 0;

    i <= limit;

    i++)

    {if (i % 2 === 0) console.log(i + ' ' + "EVEN")}

Well… this is no good. Just an error message:

showNumbers(10);

function showNumbers(limit) {

    for (let i = 0;

    i <= limit;

    i++)

    {if (i % 2 === 0) console.log(i + ' ' + "EVEN") || (i % 2 !== 0) console.log}

Hmm. This was an error:

showNumbers(10);

function showNumbers(limit) {

    for (let i = 0;

    i <= limit;

    i++)

    {if (i % 2 === 0) console.log(i + ' ' + "EVEN")}

    {if (i % 2 !== 0) console.log(i + ' ' + "ODD")}

}

Ok… so this works with an *if else*.

showNumbers(10);

function showNumbers(limit) {

    for (let i = 0;

    i <= limit;

    i++)

    {if (i % 2 === 0) console.log(i + ' ' + '"EVEN"')

    else if (i % 2 !== 0) console.log(i + ' ' + '"ODD"')

}

}

I note that inputting true gives me weird results.



What was that return only numbers thing?

function fizzBuzz(input) {

    if (typeof input !== 'number')

   return 'Not a number'

}

Ok… this is my output:

showNumbers('dog');

function showNumbers(limit) {

    if (typeof limit !== 'number')

    return

    for (let i = 0;

    i <= limit;

    i++)

    {if (i % 2 === 0) console.log(i + ' ' + '"EVEN"')

    else if (i % 2 !== 0) console.log(i + ' ' + '"ODD"')

}

}

Ok, I got rid of some Pluses by odd and even:

showNumbers(100);

function showNumbers(limit) {

    if (typeof limit !== 'number')

    return

    for (let i = 0;

    i <= limit;

    i++)

    {if (i % 2 === 0) console.log(i + ' "EVEN"')

    else if (i % 2 !== 0) console.log(i + ' "ODD"')

}

}

So, let’s see Mosh’s solution.

“Here we need a *for* loop. Set our i variable to zero. As long as i is less than or equal to limit, we’re going to run this loop. And in every iteration, we’ll increment i”.

showNumbers(10);

function showNumbers(limit) {

for (let i = 0; i <= limit; i++) {

}

}

“Here we need to check if i is an even number or not. If i modulus 2 equals zero, we display console.log of i, and as a second argument we pass ‘EVEN’.” (((Ah, he used a coma instead of +)))

showNumbers(10);

function showNumbers(limit) {

for (let i = 0; i <= limit; i++) {

    if (i % 2 === 0) console.log(i, 'EVEN');

}

}

“Otherwise, we do a console.log of i and odd.” (((Ah, no need for any conditions))).

showNumbers(10);

function showNumbers(limit) {

for (let i = 0; i <= limit; i++) {

    if (i % 2 === 0) console.log(i, 'EVEN');

    else console.log(i, 'ODD');

}

}

“Instead of having two separate console.log statements, we can declare a constant. Call it Message. And here we can use the conditional operator.”

showNumbers(10);

function showNumbers(limit) {

for (let i = 0; i <= limit; i++) {

const message = (i % 2 === 0) ? 'EVEN' : 'ODD';

console.log(i, message);

}

}

Mosh thinks the turnery operator is cleaner and less noisy, but the first is fine as well.

My solution

showNumbers(100);

function showNumbers(limit) {

    if (typeof limit !== 'number')

    return

    for (let i = 0;

    i <= limit;

    i++)

    {if (i % 2 === 0) console.log(i + ' "EVEN"')

    else if (i % 2 !== 0) console.log(i + ' "ODD"')

}

}

first mosh solution

showNumbers(10);

function showNumbers(limit) {

for (let i = 0; i <= limit; i++) {

    if (i % 2 === 0) console.log(i, 'EVEN');

    else console.log(i, 'ODD')

}

}

\*/

showNumbers(10);

function showNumbers(limit) {

for (let i = 0; i <= limit; i++) {

const message = (i % 2 === 0) ? 'EVEN' : 'ODD';

console.log(i, message);

}

}

## 04 - Control Flow - 15 - Exercise 6 - Count Truthy - 4.33

“Takes an array, and returns the number of truthy elements in this array”.

E.g,. “If we have an if statement, we may pass a Boolean true or false as the condition here:

if ()

function countTruthy(array) {

}

“E.g., we might have a constant called isactive… we set this to true.

const isActive = true;

if ()

function countTruthy(array) {

}

“When we use t his constant as the condition here, we get this hello message on the console”.

const isActive = true;

if (isActive) console.log('Hello');

function countTruthy(array) {

}

“But sometimes what we have in our *if* statement is not necessarily a Boolean value. It could be a string, it could be a number, it could be an object… so the JS engine tries to convert that value to something that is Like a Boolean but is Not a Boolean.”

“Let’s say we have a constant called name, and set it to the string Mosh.”

const isActive = true;

const name = 'Mosh';

if (isActive) console.log('Hello');

function countTruthy(array) {

}

“If I pass name here… obviously name is a string, it’s not a Boolean true or false. So, the JS engine tries to interpret this as truthy or falsy. When we run this, we still see the hello message, because we are still dealing with a string of characters. This is what we call a truthy value. It’s not a Boolean true… its truthy.

const isActive = true;

const name = 'Mosh';

if (name) console.log('Hello');

function countTruthy(array) {

}

“In contrast, if we had an empty string, JS would see this as falsy” “Now when we run this code, we no longer see the hello message.”

const isActive = true;

const name = '';

if (name) console.log('Hello');

function countTruthy(array) {

}

Here’s the list of falsy values in JS. “NaN is something I forgot to mention when I talked about all the falsy values in JS.”

* Undefined
* Null
* Empty string ‘’
* Boolean false
* 0
* NaN

“Your job is to create a function called count truthy that gets an array, and returns the number of truthy values in this array.”

“E.g., if I declare this array ((( const array = []))) and set it to [1, 2, 3]… so here we have 3 truthy values.

const array = [1, 2, 3];

function countTruthy(array) {

}

“We call count truthy, pass this array, and immediately pass this result to console.log” We get 3.

const array = [1, 2, 3];

console.log(countTruthy(array));

function countTruthy(array) {

}

If you add zero, you still get three, because zero is a falsy value.

const array = [0, 1, 2, 3];

console.log(countTruthy(array));

function countTruthy(array) {

}

If you add null, undefined, empty string, you still get 3:

const array = [0, null, undefined, '', 1, 2, 3];

console.log(countTruthy(array));

function countTruthy(array) {

}

Well, this is a tricky one. The console.log is exterior to the function. So, I have to somehow exclude falsy elements inside the array.

This doesn’t work:

const array = [0, null, undefined, '', 1, 2, 3];

console.log(countTruthy(array));

function countTruthy(array) { if (array = truthy)}

I mean… I could just run a number filter, so only numbers displayed? And also exclude 0?

First of all… how do we output anything?

This returns undefined.

const array = [0, null, undefined, '', 1, 2, 3];

console.log(countTruthy(array));

function countTruthy(array) {}

This is no good

const array = [0, null, undefined, '', 1, 2, 3];

console.log(countTruthy(array));

function countTruthy(array) {for (let array = [])

if [] = truthy}

Ok, I googled how to call an array with a function… and I got some strange results that aren’t quite applicable. Let’s see what I can figure out.

const array = [0, null, undefined, '', 1, 2, 3];

console.log(countTruthy(array));

function countTruthy(array) {let i = array

return (i)

}

This is displayed on the console:

(7) [0, null, undefined, '', 1, 2, 3]

This returns false:

const array = [0, null, undefined, '', 1, 2, 3];

console.log(countTruthy(array));

function countTruthy(array) {let i = array

return (i === typeof number)

}

This returns *[Array(7)]*.

const array = [0, null, undefined, '', 1, 2, 3];

console.log(countTruthy(array));

function countTruthy(array) {let i = array

return ([i])

}

Ah… maybe I should be paying more attention to the error messages.  
*Identifier 'i' has already been declared*

const array = [0, null, undefined, '', 1, 2, 3];

console.log(countTruthy(array));

function countTruthy(array) {let i = array

let i = (truthy || falsy;

}

Ok… this returns *[Array(7)]*

const array = [0, null, undefined, '', 1, 2, 3];

console.log(countTruthy(array));

function countTruthy(array) {return([array])

}

Returns *(7) [0, null, undefined, '', 1, 2, 3]*

const array = [0, null, undefined, '', 1, 2, 3];

console.log(countTruthy(array));

function countTruthy(array) {return (array)}

*NaN*

const array = [0, null, undefined, '', 1, 2, 3];

console.log(countTruthy(array));

function countTruthy(array) {return (array - 0)}

Just returns number of elements in the array:

const array = [0, null, undefined, '', 1, 2, 3, 4];

console.log(countTruthy(array));

function countTruthy(array) {

if (typeof array !== 'number')

return array.length

OK, I give up.

Mosh says, *let count = 0;*

const array = [0, null, undefined, '', 1, 2, 3, 4];

console.log(countTruthy(array));

function countTruthy(array) {

    let count = 0;

}

Now we’re supposed to use a *for of* loop, to iterate through the array.

So… I was an idiot… I reviewed Arrays, but did not continue my word search to watch other array videos. Duuuuuuuuuuuurrrrrr. Duuuur.

Ah ha… so, I am pulling from the for of video, as *for in* is outmoded. Here’s is the code I pulled from:

const colors = ['red', 'green', 'blue', 3, 5];

for (let color if colors)

console.log(color);

I have come up with this, so far.

const colors = ['red', 'green', 'blue', 3, 5];

for (let color of colors)

if (typeof color == 'number')

console.log(color.length)

Time travel. OK, something like This is what I was looking for, though Mosh says this is bad. “You don’t want to have five conditions here for every falsy value” Also, I couldn’t make it work.

const array = [0, null, undefined, '', 1, 2, 3, 4];

console.log(countTruthy(array));

function countTruthy(array) { for

    let (count = 0;)

    for (let value of array)

    if (value !== false || value !== undefined)

    count++;

    return count;

“We simply pass that value here. Now that value might be a Boolean or a non Boolean. If it is Not a Boolean, the JS engine tries to interpret it as truthy or falsy. So if the **result** is truthy, then count will be incremented. Simple as that.

const array = [0, null, undefined, '', 1, 2, 3, 4];

console.log(countTruthy(array));

function countTruthy(array) {

    let count = 0;

    for (let value of array)

**if (value)**

    count++;

    return count;

}

Incidentally, I can’t get an output from the ‘wrong’ way:

const array = [0, null, undefined, '', 1, 2, 3, 4];

console.log(countTruthy(array));

function countTruthy(array) {

    let bob = 0;

    for (let value of array)

    if (value === 'number' || value !== false || value !== 0 || value !== null || value !== undefined || value !== '')

    bob++;

    return bob;

}

const array = [0, null, undefined, '', 1, 2, 3];

console.log(countTruthy(array));

function countTruthy(array) {

return (array.length,)

}

const array = [0, null, undefined, '', 1, 2, 3, 4];

console.log(countTruthy(array));

function countTruthy(array) {

    let count = 0;

}

const person = {

    name: 'Mosh',

    age: 30

};

for (let bob in person)

console.log(person[bob]);

const colors = ['red', 'green', 'blue', 3, 5];

for (let dave in colors)

console.log(colors[dave]);

for (let color of colors)

if (typeof color == 'string')

console.log(color)

for (let color if colors)

console.log(color);

I have come up with this, so far.

const colors = ['red', 'green', 'blue', 3, 5];

for (let color of colors)

if (typeof color == 'number')

console.log(color.length)

\*/

const array = [0, null, undefined, '', 1, 2, 3, 4];

console.log(countTruthy(array));

function countTruthy(array) {

    let bob = 0;

    for (let value of array)

    if (value === 'number' || value !== false || value !== 0 || value !== null || value !== undefined || value !== '')

    bob++;

    return bob;

}

## 04 - Control Flow - Exercise 7 - String Properties

Create a function called showProperties. Pass an object here… and this function show display all the properties of this object that are of type string.

function showProperties(obj) {

}

“For example, we define an object like movie, and use the object literal syntax to initialize this [[[curly braces]]]. Here’ we’re going to add a few properties like *title*. We set it to a simple string… that value doesn’t really matter. A is enough. ReleaseYear… we set it to a number, like 2018.

Rating… again, a number. And then director… we set it to another string.

const movie = {

    title: 'a',

    releaseYear: 2018,

    rating: 4.5,

    director: 'b'

};

function showProperties(obj) {

}

“Now if we call this function, and pass this movie object, see what we get… the string properties of our movie object… title is a, and director is b.”

const movie = {

    title: 'a',

    releaseYear: 2018,

    rating: 4.5,

    director: 'b'

};

showProperties(movie);

function showProperties(obj) {

}

OK. Let’s hope we have a better time than last lesson.

We start out with regurgitating code from the object lesson. We predictably output the key value pairs, the properties of the movie object. (Freecodecamp says key and value together make a property).

const movie = {

    title: 'a',

    releaseYear: 2018,

    rating: 4.5,

    director: 'b'

};

showProperties(movie);

function showProperties(obj) { for (let key in movie)

    console.log(key, movie[key])

}

Letting key equal string just gives me the name/key, and undefined values:

const movie = {

    title: 'a',

    releaseYear: 2018,

    rating: 4.5,

    director: 'b'

};

showProperties(movie);

function showProperties(obj) { for (let key in movie)

    console.log(key, movie[key = 'string'])

}



Same result for typeof

const movie = {

    title: 'a',

    releaseYear: 2018,

    rating: 4.5,

    director: 'b'

};

showProperties(movie);

function showProperties(obj) { for (let key in movie)

    console.log(key, movie[key ==  typeof string])

}

This gives us Just the values:

const movie = {

    title: 'a',

    releaseYear: 2018,

    rating: 4.5,

    director: 'b'

};

showProperties(movie);

function showProperties(obj) {

    for (let key in movie)

    if (key, movie[key])

    console.log(movie [key])

}

Ok… so we try dot notation:

const movie = {

    title: 'a',

    releaseYear: 2018,

    rating: 4.5,

    director: 'b'

};

showProperties(movie);

function showProperties(obj) {  movie.title = 'pig';

    console.log(movie.title)

}

Interesting… we try loose equality operator, and the value *a* is displayed. Same thing happens with an empty string.

const movie = {

    title: 'a',

    releaseYear: 2018,

    rating: 4.5,

    director: 'b'

};

showProperties(movie);

function showProperties(obj) {  movie.title == 'pig';

    console.log(movie.title)

}

Ah… the console.log returns the empty string for numbers.

const movie = {

    title: 'a',

    releaseYear: 2018,

    rating: 4.5,

    director: 'b'

};

showProperties(movie);

function showProperties(obj) {  movie.title == '';

movie.releaseYear == ''

movie.rating == ''

movie.director == 'bob'

    console.log(movie.title,

        movie.releaseYear)

}

Ok, I pulled some new code from online… and it did allow me to just display the object values… in an array? Not very useful, but an interesting trick all the same:

const movie = {

    title: 'a',

    releaseYear: 2018,

    rating: 4.5,

    director: 'b'

};

showProperties(movie);

function showProperties(obj) {

    console.log(Object.values(movie))

}



Ok, I give up. Mosh says to use the *for in* loop, to iterate over the properties of the object. So, in each iteration, this key will hold the name of one of **these** properties.

const movie = {

**title**: 'a',

**releaseYear**: 2018,

**rating**: 4.5,

**director**: 'b'

};

showProperties(movie);

function showProperties(obj) {

for (let key in obj)

}

Console.log of key:

const movie = {

    title: 'a',

    releaseYear: 2018,

    rating: 4.5,

    director: 'b'

};

showProperties(movie);

function showProperties(obj) { for (let key in obj)

    console.log(key);

}



“Now we need to get the value of each of these properties, and then check the type of that value. If the type is a string, then we’ll display the property and its value”.

“To get the value of this property, we use the bracket notation. So, object of key”

const movie = {

    title: 'a',

    releaseYear: 2018,

    rating: 4.5,

    director: 'b'

};

showProperties(movie);

function showProperties(obj) {

    for (let key in obj)

    obj[key]

}

To check the type of this value, use the typeof operator…

const movie = {

    title: 'a',

    releaseYear: 2018,

    rating: 4.5,

    director: 'b'

};

showProperties(movie);

function showProperties(obj) {

    for (let key in obj)

    typeof obj[key]

}

“And then put this in an if statement. So, if the type of object of key equals string, then, display the key, as well as object of key”

showProperties(movie);

function showProperties(obj) {

    for (let key in obj)

    if (typeof obj[key] === 'string')

    console.log(key, obj[key]);

}

Mosh says, why not use curly braces after the for statement. That’s because there’s only a single statement, under the for statement. “The console dot log statement is a single statement that belongs to our *if* statement.” But curly braces also work.

const movie = {

    title: 'a',

    releaseYear: 2018,

    rating: 4.5,

    director: 'b'

};

showProperties(movie);

function showProperties(obj) {

    for (let key in obj)

    if (typeof obj[key] === 'string')

    console.log(key, obj[key]);

}

const movie = {

    title: 'a',

    releaseYear: 2018,

    rating: 4.5,

    director: 'b'

};

showProperties(movie);

function showProperties(obj) { for (let key in movie)

   if (typeof key movie[key] === 'string')

   console.log(key, movie[key])

}

Well, I wasn’t super far off. I simply couldn’t get the syntax right. Also, obj can be called movie, and it still works. A couple of my attempts are below… though I think I got closer.

function showProperties(obj) { for (let key in movie) if (key, movie[key == 'string'])

unction showProperties(obj) {

    for (let key in movie) if (key, movie[key == 'string']) return console.log

}

   console.log(key, movie[key ==  typeof string])

## 04 - Control Flow - 17 - Exercise 8 - Sum of Multiples of 3 and 5

Mosh says this is another easy one. Thanks Mosh. You know, that hard one a while back wasn’t so hard. These ‘easy’ lessons kinda suck. You know… maybe you’re just a bad teacher… had you thought about that? Maybe you should incorporate some review lessons, before throwing us into the deep end, and demoralizing the slower members of the class like myself. Maybe… you’re just a Sadist. You came from Iran. I’m thinking… ex intelligence? Interrogator… Teacher. They’re almost the Same thing when you think about it. I’m thinking… you used coercion to extract information like secret codes… and now you’re laughing at all of us… as you still try to extract code from your students… code that aren’t in a position to give you. And you watch us sweat. You know… hell is real, Mosh. It’s full of pirates, and lawyers, and Assholes.

This function will return all the multiples of 3 and 5 from zero up to this limit.

console.log(sum(10));

function sum(limit) {

}

What are the multiples of 3 and 5 between zero and ten? Multiples of 3 are 3, 6 and 9. Multiples of 5, are 5 and 10… including the number that is passed as a limit. If you add all these numbers together… the result will be 33.

Ok, so we have to iterate through a number until we hit the limit… that’s easy enough, I guess. And then we have to do the same for 5. And then add the numbers together.

So… which loop is best to use?

Well… *Do while* loops seem to execute at least Once, not matter what. And *for in* and *for of* may be made specifically for objects and arrays, which we are not ((turn the timer back on!)) using.

The While loop is similar, except that the loop variable is outside the loop.

Alright, my usual outputting woes. Nothing but errors. Ah… first, is unexpected token ‘;’ at the end of the for line.

console.log(sum(10));

function sum(limit) {

for (let i = 0; i <= limit; i++;);

return

}

Ok, now we are undefined.

console.log(sum(10));

function sum(limit) {

for (let i = 0; i <= limit; i++);

}

So… do we avoid using magic numbers? Do we define a couple variables?

Ok… maybe we need an internal console.log, so we can at least see what we are outputting.

So… with an internal console.log, nothing posts, because there is nothing to call our function:

function sum(limit) {

for (let i = 0; i <= limit; i++);

console.log(i)

}

Uncaught ReferenceError: i is not defined

at sum (index.js:126:13)

at index.js:119:1  
So… does this mean that console.logs inside functions don’t work?

sum(10)

function sum(limit) {

for (let i = 0; i <= limit; i++);

console.log(i)

}

Ok, back to original code. Return 5, gives us 5 on the console.

console.log(sum(10));

function sum(limit) {

return 5

}

Ok… finally something on the console:

console.log(sum(10));

function sum(limit) {

    let i = 0;

    while ((i \* 3) <= limit) {console.log(i++)}

}

0

1

2

3

index.js:119 undefined

This is an infinite loop.

console.log(sum(10));

function sum(limit) {

    let i = 0;

    while ((i \* 3) <= limit) {console.log(i)}

Another infinite loop:

console.log(sum(10));

function sum(limit) { let i = 1;

while ((3 \* i) <= limit)

console.log(sum)

i++; }

Ok… defining sum returns sum. Can we make sum the sum of two separate statements?

console.log(sum(10));

function sum(limit) { sum = 22;

    return sum

}

Ok, this returns 27.

function sum(limit) {

    let fiver = 7

    let threes = 20

    let sum = (fiver + threes);

    return sum

}

OK… this takes me up to 99 on the console. But I don’t want to add 1, I want to add the sum of bob and bob.

for (let bob = (5 + 5); bob < 100; bob++)

console.log(bob);

OK. Instead of console.loging i, we logged the (i \*3) expression, and got 3, 6, 9 on the console.

console.log(sum(10));

function sum(limit) {

    for (let i = 1; (i \* 3) <= limit; i++)

    console.log((i \* 3))

}

Ok… added a second for statement, and got interesting results… I think the second i \* 5 statement, truncated the i \* 3 iterations.

console.log(sum(10));

function sum(limit) {

    for (let i = 1; (i \* 3) <= limit; i++)

    for (let i = 1; (i \* 5) <= limit; i++)

    console.log((i \* 3))



OK. This is another interesting result:

console.log(sum(10));

function sum(limit) {

    for (let i = 1; (i \* 3) <= limit; i++)

    for (let b = 1; (b \* 5) <= limit; b++)

    console.log((i \* 3) + (b \* 5))

}

3 and 5 make 8. 8 and 5 make 15. Next loop. 6 & 5 make 11. 11 and 5 make 16. Third loop 9 and 5 make 14. 14 and 5 make 19.



So, if we use logical or, we get 8 and 16 as the output:

console.log(sum(10));

function sum(limit) {

    for (let b = 1; (b \* 3) <= limit && (b \* 5) <= limit; b++)

    console.log((b \* 5) + (b \* 3))

Returning limit gives us:

console.log(sum(10));

function sum(limit) {

    for (let b = 1; (b \* 3) < limit; b++)

   console.log(limit)

}



OK… so I eventually gave up and googled the answer.

https://www.codegrepper.com/code-examples/javascript/For+loop+sum+in+javascript

*sp: output loops into a sum js*

The problem is, we need some kind of Container as we iterate through the numbers. The answer is to define a variable as zero before the *for* statement (the function doesn’t work if you define if after the *for* statement… because it becomes subservient to the *for* statement?), and then after the *for* statement, you redefine the variable as *variable equals variable plus* Second *variable*. Because it is *after* the *for* statement, perhaps the for statement is Acting upon it.

console.log(sum(10));

function sum(limit) {

let threez = 0;

    for (let b = 1; ((b \* 3) <= limit); b++)

   threez = threez + (b \* 3)

I still had some trouble incorporating the Second statement… they kept interacting with each other weirdly, even if I assigned separate variables. But it occurred to me that the same set of rules may apply. So, I defined the next variable, and vola.

console.log(sum(10));

function sum(limit) {

let threez = 0;

    for (let b = 1; ((b \* 3) <= limit); b++)

   threez = threez + (b \* 3)

   let fiver = 0;

   for (let i = 1; ((i \* 5) <= limit); i++)

   fiver = fiver + (i \* 5)

   let sum = (threez + fiver)

    return sum

}

After looking ahead at Mosh’s solution, I see a couple interesting things. If we remove the *x = x + y*, and simply output *x + y*, the console outputs to zero:

console.log(sum(10));

function sum(limit) {

let threez = 0;

    for (let b = 1; ((b \* 3) <= limit); b++)

    threez + (b \* 3)

   let fiver = 0;

   for (let i = 1; ((i \* 5) <= limit); i++)

    fiver + (i \* 5)

   let sum = (threez + fiver)

    return sum

}

But… if we output +=, aka the addition assignment operator (it adds the value of the Right operand to the variable), we can simplify the code.

console.log(sum(10));

function sum(limit) {

let threez = 0;

    for (let b = 1; ((b \* 3) <= limit); b++)

    threez += (b \* 3)

   let fiver = 0;

   for (let i = 1; ((i \* 5) <= limit); i++)

    fiver += (i \* 5)

   let sum = (threez + fiver)

    return sum

}

Let us see Mosh’s fancy solution.

Mosh starts with a for loop. Let i equal zero. So long as i is less than or equal to limit… increment i. Let’s see if we can run with that. Nope.

“Now we need to check to see if i is a multiple of 3 or 5.”

function sum(limit) {

    for (let i = 0; i <= limit; i++)

    if (i % 3 === 0 || i % 5 === 0)

}

“Now we need to take i and add it to our sum. Here we need to declare a variable, let sum, set it to zero”.

console.log(sum(10));

function sum(limit) {

let sum = 0;

    for (let i = 0; i <= limit; i++)

    if (i % 3 === 0 || i % 5 === 0)

}

“if i is a multiple of 3 or 5, we need to add 5 to sum. And finally, return sum”.

console.log(sum(10));

function sum(limit) {

let sum = 0;

    for (let i = 0; i <= limit; i++)

        if (i % 3 === 0 || i % 5 === 0)

            sum += i;

    return sum;

}

“Now pay attention to how I have formatted this code. I have added these extra vertical line breaks to separate the initialization, from the actual logic, from the return value.”

console.log(sum(10));

function sum(limit) {

    let sum = 0;

for (let i = 0; i <= limit; i++)

        if (i % 3 === 0 || i % 5 === 0)

            sum += i;

    return sum;

}

“If we didn’t have these vertical breaks, the code would look a little bit squashed… a little bit hard to read. As a best practice, it is always good to separate the last line… the return statement.”

“In this case, we can have all these lines together, because they are Highly related.”

console.log(sum(10));

function sum(limit) {

let sum = 0;

    for (let i = 0; i <= limit; i++)

        if (i % 3 === 0 || i % 5 === 0)

            sum += i;

    return sum;

}

“But some developers prefer to separate the initialization, so you could add a line break here as well.

“But what I want you to take away is that lines that are highly related should be together, and they should be separate from other lines”

console.log(sum(10));

function sum(limit) {

    let sum = 0;

for (let i = 0; i <= limit; i++)

        if (i % 3 === 0 || i % 5 === 0)

            sum += i;

    return sum;

}

Ah… an elegant solution. He just divided all the numbers under 10 by 3 or 5, and added it to a sum. He didn’t have to perform any multiplications.

## 04 - Control Flow - 18 - Exercise 09 - Grade - 6.32

We want to calculate the grade of a student. We pass the array to this function,

If the average is 1-59: F

60-69: D

70-79: C

80-89: B

90-100: A

“Spend 5 or 10 minutes on this exercise.”

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

}

This seems like a fine place for if else, or some kind of equivalent. Well, first up though, let’s see if we can get a sum.

This returns 210 on the console which is good.

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

    for (let average of marks)

    sum += average

    return sum

}

Ah… the next part Seems simple. Finding the average by counting and dividing does work. But of course, it needs to function automatically. So, we have to count the array, and then divide by it.   
  
Regardless, this does return correctly:

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

    for (let average of marks)

    sum += average

    if (sum / 3 <= 59)

    {return 'D'}

}

This is a bit queer.

We can add sum + marks.length, and get 213 on the console:

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

    marks.length

    for (let average of marks)

    sum += average

    return sum + marks.length

}

But if we try to divide sum by marks.length, it doesn’t work. Maybe because it’s in parenthesis? E.g., let’s add sum plus marks.length… it returns undefined.

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

    marks.length

    for (let average of marks)

    sum += average

    if ((sum + marks.length) <= 59)

    {return 'D'}

}

Huh… I think it was just some kind of syntax issue. Because when we take away the parenthesis, and add the equals back in, it returns just fine. Huh**. Wait, no it doesn’t**. This just returns Failed no matter what the input:

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

    marks.length

    for (let average of marks)

    sum += average

    if (sum += marks.length <= 59)

    {return 'FAILED!!!!!!!!!!!!!!!!!!!!!'}

    else if ((sum += marks.length > 60 )

    {return 'Dumb'}

}

So… this seems to work.

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

    marks.length

    for (let average of marks)

    sum += average

    if (marks.length  <= 2)

    {return 'FAILED!!!!!!!!!!!!!!!!!!!!!'}

    else if (sum += marks.length > 60 )

    {return 'Dumb'}

}

This is getting weird. Ok… so return sum gives me 210:

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

    marks.length

    for (let average of marks)

    sum += average

    {return sum}

}

But adding sum to marks.lenbth gives me 211. What is being added? Ah… if the number is 3 or less… it doesn’t add 1. So, only marks.length is being compared. This must be some order of operations issue.

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

    marks.length

    for (let average of marks)

    sum += average

    if (sum += marks.length <= 59)

    {return sum}

}

Ok… so sum / marks.length Does return 70…

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

    marks.length

    for (let average of marks)

    sum += average

    {return sum / marks.length}

}

OK… so we are getting the same result when we just translate this to number. So, the if statement is the problem:

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

    for (let average of marks)

    sum += average

    if ( (210 / 3) < 50)

    {return sum / marks.length}

}

OK… to activate the if statement, sum must be += to any number… zero. Huh. But then I can’t add numbers to sum inside brackets. This is a pickle.

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

    marks.length

    for (let average of marks)

    sum += average

    if (sum <= 100)

    {return 'Bob'}

}

Ah… this seems to negate that previous statement?

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

    for (let average of marks)

    sum += average

    if (sum < 1000)

{return sum}

}

So… I was wondering of parenthesis acted as some kind of function call or something… regardless, using square brackets works… though I don’t know why. Returns bob, whereas 2 + 999 is undefined. [[[I can no longer repeat this. Devil if I know why]]]

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

    for (let average of marks)

    sum += average

    if ( [2 + 995]  < 1000)

{return 'Bob'}

}

OK… here is the first working solution:

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

    for (let average of marks)

    sum += average

    if ( [sum / marks.length]  < 59)

    {return 'F'}

    else if (   [sum / marks.length] >= 60  && [sum / marks.length] <= 69  )

    {return 'D'}

    else if ( [sum / marks.length] >= 70 && [sum / marks.length] <= 79 )

    {return 'C'}

    else if (  [sum / marks.length] > 80 && [sum / marks.length] <= 89 )

    {return 'B'}

    {return 'A'}

}

Let’s see if we can shorten it, but somehow declaring sum /marks.length. Kitty suggested something like const points = (sum / marks.length). So, that gets us away from a let statement that didn’t work.

I ended up using points = (sum / marks.length). ((I later changed it to a let statement, which I swore didn’t work earlier. Huh)). Works:

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

    for (let average of marks)

    sum += average

     points = (sum / marks.length)

    if ( [sum / marks.length]  < 59)

    {return 'F'}

    else if (   [sum / marks.length] >= 60  && [sum / marks.length] <= 69  )

    {return 'D'}

    else if ( [points] >= 70 && [points] <= 79 )

    {return 'C'}

    else if (  [sum / marks.length] > 80 && [sum / marks.length] <= 89 )

    {return 'B'}

    {return 'A'}

Here is the shortened version:

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

    for (let average of marks)

    sum += average

    let points = (sum / marks.length)

    if ( points  < 59)

    {return 'F'}

    else if (points >= 60  && points <= 69  )

    {return 'D'}

    else if (points >= 70 && points <= 79 )

    {return 'C'}

    else if (points > 80 && points <= 89 )

    {return 'B'}

    {return 'A'}

}

Let’s hear Mosh’s version.

“Here first, we need to calculate the average mark. The calculate the average we need to declare a variable like sum and initialize it to zero”.

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

}

“Then we need to use the for of loop to iterate this array of marks and calculate the sum of all these marks. For… let mark of marks”.

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

    for (let mark of marks)

}

“We get Mark, and add it to sum. So sum plus equals mark. This is the total.”

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

    for (let mark of marks)

        sum += mark;

}

“Now to get the average, we need to divide some by the number of marks. That is marks.length.”

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

    for (let mark of marks)

        sum += mark;

    let average = sum / marks.length;

}

“One way to calculate the grade is like this. If average is greater than or equal to zero and average is less than or equal to 59, we’re going to return F.”

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

    for (let mark of marks)

        sum += mark;

    let average = sum / marks.length;

    if (average >= 0 && average <= 59) return 'F';

}

“But this code is a little bit ugly. There is so much noise in this code. Instead of having to conditioners along with a logical and, we can simplify this expression to something like this: if average is less than 60. Because the range for F is 0 to 59.”

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

    for (let mark of marks)

        sum += mark;

    let average = sum / marks.length;

    if (average < 60) return 'F';

}

“If average is less than 70, return ‘D’. Because if we get to this point that means average is at least 60 or higher. Now I’m just checking the upper limit. So the upper limit should be 69. So if the averages between 60 and 69, we return D”

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

    for (let mark of marks)

        sum += mark;

    let average = sum / marks.length;

    if (average < 60) return 'F';

    if (average < 70) return 'D';

    if (average < 80) return 'C';

    if (average < 90) return 'B';

    return 'A';

}

“We can make this code even better. We can break this function into two smaller functions, each focusing on one thing. That is what we call single responsibility principle. I use a metaphor. Think of a restaurant; people who work in a restaurant have different roles. So the chef is in the kitchen responsible for cooking. The chef doesn’t come out and take orders. So he is responsible only for one thing. The same goes for the manager. The manager is responsible only for one thing; managing the restaurant at a high level.”

“We had the same concept in programming. So we should have functions that are small and are focused only on one thing.”

“In this function we are basically doing two different things. The first part of this function is all about calculating the averages of numbers in an array. In the second part is about mapping that average to a grade. So we can extract these few lines…”

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    let sum = 0;

    for (let mark of marks)

        sum += mark;

    let average = sum / marks.length;

    if (average < 60) return 'F';

    if (average < 70) return 'D';

    if (average < 80) return 'C';

    if (average < 90) return 'B';

    return 'A';

}

“and put them in a separate function. Function calculate average. We give it an array. This array can be anything. It can be an array of marks or it can be an array of temperatures… anything. We can reuse this function in the future whatever we need to calculate the average of a bunch of numbers.”

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    if (average < 60) return 'F';

    if (average < 70) return 'D';

    if (average < 80) return 'C';

    if (average < 90) return 'B';

    return 'A';

}

    function calculateGrade(marks) {

        let sum = 0;

        for (let mark of marks)

            sum += mark;

        let average = sum / marks.length;

}

“Here we’re working with marks, but the parameter of this function is called array. So, put the cursor here and press f2 to rename these two array. Also, we need to rename our loop variable from mark to value”:

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    if (average < 60) return 'F';

    if (average < 70) return 'D';

    if (average < 80) return 'C';

    if (average < 90) return 'B';

    return 'A';

}

 function calculateAverage(array)  {

        let sum = 0;

        for (let value of array)

            sum += value;

        let average = sum / array.length;

}

“So now we have a generic function. It’s not tied to marks. It can be reused in different situations. And finally, we can return the average here.”

Or, we can make this code even simpler. So, instead of storing the average in a variable, and then returning it, we can simply return the result of this expression.”

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    if (average < 60) return 'F';

    if (average < 70) return 'D';

    if (average < 80) return 'C';

    if (average < 90) return 'B';

    return 'A';

}

 function calculateAverage(array)  {

        let sum = 0;

        for (let value of array)

            sum += value;

        let average = sum / array.length;

        return average;

}

“So, return sum divided by array dot length.”

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    if (average < 60) return 'F';

    if (average < 70) return 'D';

    if (average < 80) return 'C';

    if (average < 90) return 'B';

    return 'A';

}

 function calculateAverage(array)  {

        let sum = 0;

        for (let value of array)

            sum += value;

        return sum / array.length;

}

“And finally we can reuse this function here. So, we declare a constant average, and set it to calculate average of marks. With this change we now have two very simple functions. Each function is responsible for only one thing.”

const marks = [80, 80, 50];

console.log(calculateGrade(marks));

function calculateGrade(marks) {

    const average = calculateAverage(marks);

    if (average < 60) return 'F';

    if (average < 70) return 'D';

    if (average < 80) return 'C';

    if (average < 90) return 'B';

    return 'A';

}

 function calculateAverage(array)  {

        let sum = 0;

        for (let value of array)

            sum += value;

        return sum / array.length;

}

## 04 - Control Flow - 19 - Exercise 10 - Stars - 2.33

showStars(10);

function showStars(rows) {

}

OK… so the first thing I try is using the truthy function to return a value. If i, iterate value, then log value.

This returns 10.

showStars(10);

function showStars(rows) {

    let count = 0;

    for (let i = 0; i <= rows; i++)

        if (i)

        count++

        console.log(count)

}

showStars(10);

function showStars(rows) {

    let count = 0;

    for (let i = 0; i <= rows; i++)

        if (i)

        console.log('\*')

        count++

        console.log(count)

}



Ok… this gives us 10 stars on the console:

showStars(10);

function showStars(rows) {

    let count = 0;

    let star = '\*';

    for (let i = 0; i <= rows; i++)

        if (i)

       star += '\*'

        console.log(star)

}



This yields a star for every iteration:

showStars(10);

function showStars(rows) {

    let count = 0;

    let star = '\*';

    for (let i = 0; i <= rows; i++)

        console.log(i, star)

}



Now we’re cooking with bacon!

showStars(10);

function showStars(rows) {

    let count = 0;

    let star = '\*';

    for (let i = 0; i <= rows; i++)

        console.log(i, star = star + '\*')

}



We make star = 0 instead of ‘\*’ and we get the correct star output.

showStars(10);

function showStars(rows) {

    let count = 0;

    let star = 0;

    for (let i = 0; i <= rows; i++)

        console.log(i, star = star + '\*')

}



OK, next we remove *let star = 0;* and just change it to an empty string. And we use the += on console.log instead of *star = star + ‘\*’.*

showStars(10);

function showStars(rows) {

    let star = '';

    for (let i = 0; i <= rows; i++)

        console.log(i, star += '\*')

}



So, the string seems to be coming from down below, not from the star variable.

So… we did it. Here it is. I realized that if you log i, it will log numbers on the console until you reach your set limit. So, instead of posting i, we just piggy back on i’s output, and every time i outputs, we post star on console.log

showStars(20);

function showStars(rows) {

    let star = '';

    for (let i = 1; i <= rows; i++)

       if(i)

       console.log(star += '\*')

}

Ah… there’s an even simpler solution:

showStars(20);

function showStars(rows) {

    let star = '';

    for (let i = 1; i <= rows; i++)

       console.log(star += '\*')

}

Mosh’s solution seems more complicated. It utilized two separate functions. Every time function one iterates, the internal function iterates by counting the external function, and outputs a += to a value… which is then logged on the console.   
  
Perhaps this helps avoid performing complicated behavior in the console itself, or the code remaining intact even if you don’t output console.log.

“What we have here, is what we call a nested loop.” “You may see this pattern in a lot of algorithms.”

showStars(20);

function showStars(rows) {

    for (let row = 1; row <= rows; row++) {

     let pattern = '';

     for (let i = 0; i < row; i++)

        pattern += '\*';

        console.log(pattern);

    }

}

For my edification. Below utilizes a term, instead of some kind of term and operation in the console.log. When I put both *pattern* And *console.log* in parenthesis after the *for* statement, both get executed.

showStars(20);

function showStars(rows) {

     let pattern = '';

     for (let i = 0; i < rows; i++)

        (pattern += '\*',

        console.log(pattern, i));

}



In fact, all we Really need to do, is remove the parenthesis, but keep the comma after pattern statement, it works the same.

showStars(20);

function showStars(rows) {

  let pattern = '';

     for (let i = 0; i < rows; i++)

        pattern += '\*',

        console.log(pattern, i);

}

But… if we add a semicolon (or nothing) instead of the comma, the i is no longer defined at all.

showStars(20);

function showStars(rows) {

     let pattern = '';

     for (let i = 0; i < rows; i++)

        pattern += '\*';

        console.log(pattern, i);

}



Comma gives us this:

showStars(20);

function showStars(rows) {

     let pattern = '';

     for (let i = 0; i < rows; i++)

        pattern += '\*',

        console.log(pattern);

}



No comma gives us this:

showStars(20);

function showStars(rows) {

     let pattern = '';

     for (let i = 0; i < rows; i++)

        pattern += '\*'

        console.log(pattern);

}



## 04 - Control Flow - 20 - Exercise 11 - Prime Numbers - 8.24

Takes a limit, and shows all the prime numbers up to this limit. Prime numbers have a factor of one and itself.

showPrimes(20);

function showPrimes(limit) {

}

Ok, here’s a basic structure. Weird returns:

showPrimes(20);

function showPrimes(limit) {

for (let i = 1; i <= limit; i++)

if (limit % i)

console.log(i)

}



Ok, what do we need to do? We every number between 1 and limit be divided by every number less than or equal to that number.

showStars(20);

function showStars(rows) {

    for (let row = 1; row <= rows; row++) {

     let pattern = '';

     for (let i = 0; i < row; i++)

        pattern += '\*';

        console.log(pattern);

    }

}

This was no good:

showPrimes(20);

function showPrimes(limit) {

for (let i = 1; i <= limit; i++)

{for (let b = 2; b <= limit && b < i; b++)

 console.log(i);

}

}



Well… adding a colon makes sure it only returns once… oh, what happened to my %? Got to add that back in.

showPrimes(20);

function showPrimes(limit) {

for (let i = 1; i <= limit; i++)

{for (let b = 2; b <= limit && b < i; b++);

 console.log(i);

}

}

Ok, so this shows all non primes:

showPrimes(20);

function showPrimes(limit) {

for (let i = 1; i < limit; i++)

{for (let b = 2; b < i; b++)

    if (i % b === 0)

 console.log(i);

}

}

This is dumb… it would only display non primes, and it doesn’t load:

showPrimes(55);

function showPrimes(limit) {

for (let i = 1; i < limit; i++)

    {for (let b = 2; b < i; b++)

{for (let c = 2; c < b; c++)

    if (b \* c = i)

    console.log(i)

}

Maybe we can do this by counting factors.

OK… I gave up. I was correct in all my assumptions. It all boils down to how to say, “Not (i % b === 0)”. And that, turned out to be using a Boolean. You set a variable to true. And then you define false as (i % b === 0).

showPrimes(20);

function showPrimes(limit) {

for (let i = 1; i < limit; i++)

{for (let b = 2; b < i; b++)

    if (i % b === 0)

 console.log(i);

}

}

Mosh’s solution:

showPrimes(15);

function showPrimes(limit) {

    for (let i = 2; i <= limit; i++)

    }

For each number, we need to check to see if this number is prime or not. Check from 2 to the current number, which is i.

Mosh notes that using letters is confusing. So, using more meaningful variable names is helpful. We change i to number, and the other variable to factor. (Highlight i, press f2, change it to number).

showPrimes(15);

function showPrimes(limit) {

    for (let number = 2; number <= limit; number++) {

    }

    }

The inner loop is for finding the factors of the number. “This number has a factor of a number other than one and itself. That’s why I have not included one in this loop, because every number can be divided by one. For the same reason I have not included the number itself in this loop [[[no equals]]], because again we know that each number can be divided by itself evenly.”

“In this **inner loop**, we want to see if we have a factor other than the one and itself. If we do, that number is not a prime number”

showPrimes(15);

function showPrimes(limit) {

    for (let number = 2; number <= limit; number++) {

**for (let factor = 2; factor <** number; factor++)

        if (number % factor === 0)

    }

    }

“What we can do here is declare a variable… we can assume this number is a prime number. But if this condition is true, we need to set isPrime to false.”

showPrimes(15);

function showPrimes(limit) {

    for (let number = 2; number <= limit; number++) {

        let isPrime = true;

        for (let factor = 2; factor < number; factor++) {

        if (number % factor === 0)

        isPrime = false;

        }

    }

    }

“If we find a factor for this number, that means this number is not a prime number for there is really no need to continue running this loop. Because this is just wasting our computer’s processing power”.

“So, here we can add a code block. If we get to this point we can use break to jump out of this loop.”

showPrimes(15);

function showPrimes(limit) {

    for (let number = 2; number <= limit; number++) {

        let isPrime = true;

        for (let factor = 2; factor < number; factor++) {

        if (number % factor === 0) {

        isPrime = false;

        break;

        }

    }

    }

“When we get to this point, is prime is either true or false. If it is true, we log this number on the console”

showPrimes(15);

function showPrimes(limit) {

    for (let number = 2; number <= limit; number++) {

        let isPrime = true;

        for (let factor = 2; factor < number; factor++) {

        if (number % factor === 0) {

          isPrime = false;

          break;

          }

        }

if (isPrime) console.log(number);

    }

    }

Mosh states that the function can easily be split. I was a bit perplexed, so here’s his explanation.

“This logic does not necessarily have to be part of our showPrimes function.

showPrimes(15);

function showPrimes(limit) {

    for (let number = 2; number <= limit; number++) {

        let isPrime = true;

        for (let factor = 2; factor < number; factor++) {

        if (number % factor === 0) {

          isPrime = false;

          break;

          }

        }

if (isPrime) console.log(number);

    }

    }

“We can have a separate function called is prime that takes a number and simply tells us this number is prime or not. Then we can use this function inside of show prime’s function or somewhere else. It’s a reusable function; it’s a reusable piece of code.”

showPrimes(15);

function showPrimes(limit) {

    for (let number = 2; number <= limit; number++) {

        let isPrime = true;

        for (let factor = 2; factor < number; factor++) {

          if (number % factor === 0) {

            isPrime = false;

            break;

          }

        }

 if (isPrime) console.log(number);

    }

    }

    function isPrime(number) {

    }

­

“I’m going to extract all these lines… move them to our new function”.

showPrimes(15);

function showPrimes(limit) {

    for (let number = 2; number <= limit; number++) {

        if (isPrime) console.log(number);

    }

}

function isPrime(number) {

    let isPrime = true;

    for (let factor = 2; factor < number; factor++) {

      if (number % factor === 0) {

        isPrime = false;

        break;

      }

    }

}

“We can make this code cleaner and more elegant. If we get to this point, instead of breaking from the loop, we can simply return false. In other words there is no need to ~~break~~, and then ~~return isPrime;~~ “

showPrimes(15);

function showPrimes(limit) {

    for (let number = 2; number <= limit; number++) {

        if (isPrime) console.log(number);

    }

}

function isPrime(number) {

    let isPrime = true;

    for (let factor = 2; factor < number; factor++) {

      if (number % factor === 0) {

        isPrime = false;

~~break;~~ return false;

      }

    }

~~return isPrime~~

}

“We can do a shortcut here. If we get to this point, we simply return false. That means we don’t need to set ~~isPrime to false~~. We don’t even need to declare ~~is prime~~. We run this loop; we try to find a factor for this number. If we find a factor we immediately return false. Otherwise, if we get to this point, that means we didn’t find any factors for this number, so return true.

showPrimes(15);

function showPrimes(limit) {

    for (let number = 2; number <= limit; number++) {

        if (isPrime) console.log(number);

    }

}

function isPrime(number) {

~~let isPrime = true;~~

    for (let factor = 2; factor < number; factor++) {

      if (number % factor === 0) {

~~isPrime = false;~~

        return false;

      }

    }

    return true;

}

“Also, we can get rid of all these curly braces, because our for statement… our four loop has a single statement, and our if statement also has a single statement. So let’s get rid of all these extra curly braces, getting in the way, annoying me”

showPrimes(15);

function showPrimes(limit) {

    for (let number = 2; number <= limit; number++) {

        if (isPrime) console.log(number);

    }

}

function isPrime(number) {

    for (let factor = 2; factor < number; factor++) {

      if (number % factor === 0) {

        return false;

      }

    }

    return true;

}

“Finally, in showPrimes; here we have only a single loop. We are iterating the numbers from two to this limit. We simply call isPrime function and pass our number. If the number is prime, we log it on the console. This also means we don’t need these curly braces.”

showPrimes(15);

function showPrimes(limit) {

    for (let number = 2; number <= limit; number++) {

        if (isPrime(number)) console.log(number);

    }

}

function isPrime(number) {

    for (let factor = 2; factor < number; factor++)

      if (number % factor === 0)

        return false;

    return true;

}

“With these changes, we have two very simple functions. If you give this function to the dumbest person in the world they will understand it. Also we don’t have nested loops. Generally speaking nested loops are bit hard to understand. So whenever you have a nested loop it’s probably an indication that you can extract the logic in the inner loop and put it somewhere else in a different function.”

showPrimes(15);

function showPrimes(limit) {

    for (let number = 2; number <= limit; number++)

        if (isPrime(number)) console.log(number);

}

function isPrime(number) {

    for (let factor = 2; factor < number; factor++)

      if (number % factor === 0)

        return false;

    return true;

}

­­­­

Haven’t finished taking notes yet, but I thought I’d include this. Splitting this function was confusing to me. The findPrime function was originally isPrime. And value of the isPrime function was originally number. (Clearly, there’s no relation to the isPrime in the let statement. And we can reassign the number value in the second function).

The call to the findPrime function takes place in an *if* statement. In the *if* statement I wondered why the value for the findPrime function call couldn’t be zzz. But, of course, the *(findPrime(number))* is a call to and an argument to the findPrime function… we need to tell the findPrime function that its value is number, so the second function can divide number.

In a previous lesson, the function call was performed as a constant. Here it is performed as an *if* statement.

showPrimes(15);

function showPrimes(limit) {

    for (let number = 2; number <= limit; number++)

 if (findPrime(number)) console.log(number);

    }

    function findPrime(zzz) {let isPrime = true;

        for (let factor = 2; factor < zzz; factor++)

          if (zzz % factor === 0)

            return false;

         return true;

        }

/\*

showPrimes(15);

function showPrimes(limit) {

    for (let number = 2; number <= limit; number++) {

        let isPrime = true;

        for (let factor = 2; factor < number; factor++) {

          if (number % factor === 0) {

            isPrime = false;

            break;

          }

        }

 if (isPrime) console.log(number);

    }

    }

\*/

showPrimes(15);

function showPrimes(limit) {

    for (let number = 2; number <= limit; number++)

        if (isPrime(number)) console.log(number);

}

function isPrime(number) {

    for (let factor = 2; factor < number; factor++)

      if (number % factor === 0)

        return false;

    return true;

}

## 05 - Objects - 01 - Basics - 4.53

“Objects are collections of key value pairs. If we have properties that are highly related, we want to encapsulate them inside an object.”

“Suppose we’re building an application for drawing different kinds of shapes. Like circles, rectangles, and so on. So, we could declare multiple variables around circles… e.g., let radius, we set that to 1. Then x, and y (((equal 1))). We’re defining multiple variables. That all these variables are highly related. They represent a circle.”

let radius = 1;

let x = 1;

let y = 1;

“A better approach is to put these variables inside an object. Now we can send that object anywhere in our program; we can pass that any function. And all these variables will be available in that object.”

“I’ll define an object. We could use let or const. In this case, it doesn’t really matter. Let’s define a circle object using the object literal syntax.”

let radius = 1;

let x = 1;

let y = 1;

const circle = {};

“So, we add these curly braces and inside we add one or more key value pairs. The first key is radius and the value is one. Now this value we have here can be any type in JavaScript. It can be a number, a string, a Boolean, null, undefined; it can even be another object. Or an array, or a function.”

let radius = 1;

let x = 1;

let y = 1;

const circle = {

    radius: 1

};

“E.g. So, instead of defining two other key value pairs as X and Y, I’m going to add a key called location and set its value to another **object**. Now in this object we can have two ***keyvalue pairs, or properties.*** The first one is X and the second one is Y. We can also have another property here like isVisible, and set that to a Boolean, true or false. So, the purpose of an object is to group related variables.”

“But it’s not just grouping related variables. Quite often we have functions that should operate on these variables.”

let radius = 1;

let x = 1;

let y = 1;

const circle = {

    radius: 1,

**location: {**

***x: 1,***

***y: 1***

    },

    isVisible: true

};

“E.g., we can have a function like draw for drawing a circle. Or we could have another function for moving a circle.”  
  
“These functions are highly related to these variables we have defined here. So, instead of defining these functions in a standalone way, it’s better to put these functions inside the circle object. With this, wherever/whenever? We have a circle object inside our program, we have access to all its properties and functions.”

let radius = 1;

let x = 1;

let y = 1;

const circle = {

    radius: 1,

    location: {

        x: 1,

        y: 1

    },

    isVisible: true

};

function draw() {}

function move() {}

Let’s see how we can add this draw function inside the circle object. “We add another key value pair. The key is ‘draw’, and the value is a function. So, I told you the value of a key value pair can be anything in JavaScript. Here the value is a function. For simplicity, we’ll do a console.log here, and log ‘draw’ on the console.”

let radius = 1;

let x = 1;

let y = 1;

const circle = {

    radius: 1,

    location: {

        x: 1,

        y: 1

    },

    isVisible: true,

    draw: function() {

        console.log('draw');

    }

};

function draw() {}

function move() {}

“So, now with this circle object, we no longer need these independent variables and functions. All of these are now part of a circle object.”

~~let radius = 1;~~

~~let x = 1;~~

~~let y = 1;~~

const circle = {

    radius: 1,

    location: {

        x: 1,

        y: 1

    },

    isVisible: true,

    draw: function() {

        console.log('draw');

    }

};

~~function draw() {}~~

~~function move() {}~~

“So, we can access them using the dot notation. Circle. Look, all of them are here.”



“We can simply call the draw function like this. You see the draw message here.” (((Draw is displayed on the console))). “What you see here is what we refer to as object oriented style of programming, also abbreviated as **OOP. Object oriented programming** is basically a style of programming where we see a program as a collection of objects that talk to each other to perform some functionality.”

const circle = {

    radius: 1,

    location: {

        x: 1,

        y: 1

    },

    isVisible: true,

    draw: function() {

        console.log('draw');

    }

};

circle.draw();

“So here we have a circle object, and this object has a few properties, and a function. In object oriented programming terms, if a function is part of an object, we call that function a **method** ^^.”

…

“So, here more accurately, instead of saying were calling the draw function of the circle object, we say were calling the draw method of the circle object. That’s the difference between a function and a method. If a function is part of an object, in object oriented programming terms, we refer to that function as a method.”

const circle = {

    radius: 1,

    location: {

        x: 1,

        y: 1

    },

    isVisible: true,

    draw: function() {

        console.log('draw');

    }

};

circle.draw();

“Using this object literal syntax is an easy way to create an object. But as our applications get more complex, we need a different way to create objects.

const circle = {

    radius: 1,

    location: {

        x: 1,

        y: 1

    },

    isVisible: true,

    draw: function() {

        console.log('draw');

    }

};

circle.draw();

## 05 - Objects - 02 - Factory Functions - 5.45

“In the last lecture we learned how to use the object literal syntax to create an object. But there’s a problem.”

“Imagine we want to create two circle objects. So, let’s copy this code *here* and call this second circle object *circle two*. The problem we have here is that we have duplicated the implementation of the draw method. Right now, it’s a simple method, there’s only a single line of code. But what if we had 10 lines of code **here**. We wouldn’t want to repeat all these lines here, because if we had a bug in this method, then we have to fix it in multiple places.”

“Also take into account that our circle object currently has only a single method. What if we had 10 other methods here? We don’t want to duplicate or repeat all that logic. ***So, if our objects have logic, we need a different way to create objects***. That’s when we use factory or constructor functions.”

*const circle = {*

*radius: 1,*

*location: {*

*x: 1,*

*y: 1*

*},*

*isVisible: true,*

*draw: function() {*

*console.log('draw');*

*}*

*};*

const circle2 = {

    radius: 1,

    location: {

        x: 1,

        y: 1

    },

    isVisible: true,

**draw: function() {**

**console.log('draw');**

    }

};

“Just like a factory produces products, these factory functions produce objects.”

“We define a function and call it create circle. Then we move this definition of the circle object inside of our factory function.”

function createCircle() {

    const circle = {

        radius: 1,

        location: {

            x: 1,

            y: 1

        },

        isVisible: true,

        draw: function() {

            console.log('draw');

        }

    };

}

“So, we have a circle object here. Finally, we need to return this. One way is to return it like this. But we don’t really need this circle constant defined, because we are not going to reference it anywhere. We only want to return it.”

function createCircle() {

    const circle = {

        radius: 1,

        location: {

            x: 1,

            y: 1

        },

        isVisible: true,

        draw: function() {

            console.log('draw');

        }

    };

    return circle;

}

“So, we can make this code shorter by removing the circle constant and simply returning this object. So, whenever we call the create circle function, we’ll get a circle object. However, we have hardcoded these values here, so every circle that is created by this function, its radius will be one. That’s not what we want. Maybe we want to have a circle with a bigger radius. So, we want to pass radius as a parameter here.”

function createCircle(…….) {

    return {

        radius: 1,

        location: {

            x: 1,

            y: 1

        },

        isVisible: true,

        draw: function() {

            console.log('draw');

        }

    };

}

“So radius, and then, instead of hard coding 1, we want to set the value to this ‘radius’ argument that we supply when calling this function.”

function createCircle(radius) {

    return {

        radius: radius,

        location: {

            x: 1,

            y: 1

        },

        isVisible: true,

        draw: function() {

            console.log('draw');

        }

    };

}

“Similarly, we can add another **parameter** here like location. And instead of hard coding this object here, we can simply set location to this location argument.

function createCircle(**radius, location)** {

    return {

        radius: radius,

        location: location, ~~{~~

~~x: 1,~~

~~y: 1~~

~~},~~

        isVisible: true,

        draw: function() {

            console.log('draw');

        }

    };

}

“However, for simplicity, we’re going to remove these two properties, *location* and *isVisible* so we can focus on the core of factory function. We don’t need the location parameter either.”

function createCircle(radius, ~~location~~) {

    return {

        radius: radius,

~~location: location,~~

~~isVisible: true,~~

        draw: function() {

            console.log('draw');

        }

    };

}

“We can make this code a little bit shorter. In modern JavaScript, if our key and value are the same, we can make our code shorter by removing the value and simply adding the key. So that is exactly equivalent to this code” (((radius, = radius: radius,)))"

function createCircle(radius) {

    return {

        radius~~: radius~~,

        draw: function() {

            console.log('draw');

        }

    };

}

“Next, we have our draw method. There is also a shorter syntax to define this method. So, instead of defining it as a key value pair, we can define it like this. Draw parenthesis and code block. This is similar to how we define a function outside of an object”  
…  
“So, if you wanted to define a function, this is how we define it, right? So, we have the function keyword, the name of the *function*, parenthesis, and code block”

…

“Now when we put this inside of an object, basically we are ~~dropping~~ the function keyword, and basically adding this inside of the object. You can see this syntax is a little bit shorter than what we have here.”

function createCircle(radius) {

    return {

        radius,

        draw() {

        }

        draw: function() {

            console.log('draw');

        }

    };

}

~~function~~ *draw*() {

}

“Let’s move our console.log statement into our draw method”

function createCircle(radius) {

    return {

        radius,

        draw() {

            console.log('draw');

        }

~~draw: function() {~~

~~}~~

    };

}

“So now we have a factory function. We can simply call this to create a circle object.”

function createCircle(radius) {

    return {

        radius,

        draw() {

            console.log('draw');

        }

    };

}

“We’ll define this constant, circle1. And call the createCircle function, and pass 1 as the radius. Now, let’s log this circle object on the console… circle1”

function createCircle(radius, location) {

    return {

        radius,

        draw() {

            console.log('draw');

        }

    };

}

const circle1 = createCircle(1);

console.log(circle1);

“Radius is set to 1. We also have this draw method (((points to purple draw line)))”



“We can call circle1.draw(), and here’s our draw message on the console”.



“The beauty of this factory function is that we have defined our logic in one place. So, we can call this function with different values or different arguments, we get different circle objects, but we have defined the draw method only in one place. So, if there is a bug in this method that we need to fix in the future, there is a single place that we need to modify”.

function createCircle(radius) {

    return {

        radius,

        draw() {

            console.log('draw');

        }

    };

}

const circle1 = createCircle(1);

console.log(circle1);

“So, now we’ll create another circle object; circle two, create circle, and pass 2 as the radius. Let’s log this on the console… circle2. Save the changes. Look, we have two different circle objects (((refers to console))) and a single definition of the draw method”

const circle2 = createCircle(2);

console.log(circle1);

function createCircle(radius, location) {

    return {

        radius,

        draw() {

            console.log('draw');

        }

    };

}

const circle1 = createCircle(1);

console.log(circle1);

const circle2 = createCircle(2);

console.log(circle1);



“This is all about factory functions. But factory functions are not the only way to create objects. We can also use constructor functions”.

## 05 - Objects - 03 - Constructor Functions - 5.48

Constructor functions are another pattern for creating objects. “Just like the factory function we’re going to create a function, and the job of this function is to construct or create an object.”

“However, the naming convention we use for constructor functions is different. The naming convention we have for factory functions is what we call camel notation. The first letter of the first word is lowercase. But the first letter of every word after is uppercase. This is what we call camel notation.” oneTwoThreeFour… i.e., camel humps.

“In contrast we have another notation that is called Pascal notation. In this notation the first letter of every word should be uppercase. OneTwoThreeFour. When naming constructor functions we should use Pascal notation by convention. Because that something that other JavaScript developers expect when they read your code”

“Note we don’t call this create circle”

//factory function

function createCircle(radius, location) {

    return {

        radius,

        draw() {

            console.log('draw');

        }

    };

}

function Circle

“Just like our factory function, here we need to add a parameter, radius. However, instead of returning an object, we’re going to use a different approach to initialize an object.”

//factory function

function createCircle(radius) {

    return {

        radius,

        draw() {

            console.log('draw');

        }

    };

}

function Circle(radius) {

}

“In JavaScript we have a keyword called ‘this’. This is a reference to the object that is executing this piece of code. Imagine for now that this references an empty object.

//factory function

function createCircle(radius) {

    return {

        radius,

        draw() {

            console.log('draw');

        }

    };

}

function Circle(radius) {

this

}

“You know that with dot notation we can access properties of an object, we can read a property, or we can set a property. So, on this new empty object, we want to add a property called radius and we set that to this radius argument that we receive here.”  
…  
“So, in JavaScript our objects are dynamic. Once we create them, we can always add additional properties or methods to them. So, here were adding a new property to an empty object.”

//factory function

function createCircle(radius) {

    return {

        radius,

        draw() {

            console.log('draw');

        }

    };

}

function Circle(radius) {

    this.radius = radius;

}

“Similarly, we’re going to use this approach to add a new draw method to this empty object. This, dot draw… we set this to a function. And in the body of this function, we simply do a console.log of ‘draw’”

//factory function

function createCircle(radius) {

    return {

        radius,

        draw() {

            console.log('draw');

        }

    };

}

function Circle(radius) {

    this.radius = radius;

    this.draw = function() {

        console.log('draw');

    }

}

“Finally, in order to create a circle object using this constructor function, we’re going to define a constant called circle and here we’ll use another key word… that is new circle and pass one is the radius.”

//factory function

function createCircle(radius) {

    return {

        radius,

        draw() {

            console.log('draw');

        }

    };

}

// Constructor Function

function Circle(radius) {

    this.radius = radius;

    this.draw = function() {

        console.log('draw');

    }

}

const circle = new Circle(1);

What is happening here? When we use this new operator here, three things happen. This new operator creates an empty JavaScript object. Something like this: constant x set to an empty object *const x = {}*. That is happening under the hood, but you don’t see that. Next it will set this to point to this new ***empty*** object.”

“So, in this code, we have access to this new empty object. And we set this radius property as well as the draw method in this new object. Finally, this new operator will return ***this*** new object from this function. So, it looks like this. Return this. We don’t have to explicitly add this statement here in this function. This will happen under the hood.”

//factory function

function createCircle(radius) {

    return {

        radius,

        draw() {

            console.log('draw');

        }

    };

}

function Circle(radius) {

    this.radius = radius;

    this.draw = function() {

        console.log('draw');

    }

~~return this;~~

}

const circle = new Circle(1);

const x = *{}*

“To recap. When we use the new operator three things happen. This operator first creates an empty object. Then, it will set this to point to this object. And finally, it will return that object from this function”.

“So, what we get ***here*** is that new object, and we simply set circle to point to that object.”

function Circle(radius) {

    this.radius = radius;

    this.draw = function() {

        console.log('draw');

    }

}

const circle = *new Circle(1);*

const x = {}

“Now let’s see the difference between factory and constructor functions. With factory functions, we create an object like this: constant my circle… here we call createCircle, and pass an argument. *const myCircl = createCircle(1);* So, with factory functions, we simply **call a function** and in this function we return a new object.”

“In contrast, with constructor functions we use the new operator, and instead of returning an object, we use the this keyword. Also, in terms of naming convention, with constructor functions we use that the Pascal naming convention but in factory functions we use the camel notation.”

//factory function

function createCircle(radius) {

    return {

        radius,

        draw() {

            console.log('draw');

        }

    };

}

const myCircle = **createCircle(1);**

// Constructor Function

function Circle(radius) {

    this.radius = radius;

    this.draw = function() {

        console.log('draw');

    }

}

const circle = ***new Circle(1);***

Which one should we use to create new objects? Both these patterns are equally good for creating new objects. The construction function pattern is familiar to developers who have some experience programming in languages like C# or Java. So, with *this* pattern, you can see we are creating a new circle.

Now, if you don’t have any experiences in languages like C# or Java, you might want to go for a factory function. There is really no difference between these two patterns. However, there are some discussions on line by some strongly opinionated developers comparing these two patterns. My suggestion to you is do not get hung up on these discussions they are just a waste of time. Pick one pattern and stick to that.

//factory function

function createCircle(radius) {

    return {

        radius,

        draw() {

            console.log('draw');

        }

    };

}

const myCircle = createCircle(1);

// Constructor Function

function Circle(radius) {

    this.radius = radius;

    this.draw = function() {

        console.log('draw');

    }

}

const circle = new Circle(1);

//factory function

function createCircle(radius) {

    return {

        radius,

        draw() {

            console.log('draw');

        }

    };

}

const myCircle = createCircle(1);

// Constructor Function

function Circle(radius) {

    this.radius = radius;

    this.draw = function() {

        console.log('draw');

    }

}

const circle = new Circle(1);

## 05 - Objects - 04 - Dynamic Nature of Objects - 2.03

“Objects in JavaScript are dynamic which means once you create them you can always add new properties or methods, or remove existing ones.”

“So, here we havea circle objectwith a single property that is radius.”

**const circle = {**

**radius: 1**

**};**

console.log(circle);

“We can add another property like color and set it to yellow. circle.color = ‘yellow’; . Now when we log the circle on the console, we can see we have two properties. Color and radius.”

const circle = {

    radius: 1

};

circle.color = 'yellow';

console.log(circle);



“Similarly, we can add a new method here. Circle.draw. Set it to new function. *circle.draw = function() {} .* And now, when we log this on the console, we can see our circle object has three members. Two properties, color and radius. And one method.”

const circle = {

    radius: 1

};

circle.color = 'yellow';

circle.draw = function() {}

console.log(circle);



“We can also delete existing properties or methods. So before logging the circle, we can use the delete operator to delete a member from a circle object. That member can be a property or a method. So, delete *circle.color*. We can also delete the draw method. So, *delete circle.draw*. Now our circle object has only the radius property that we had at the time of creating this object.”

const circle = {

    radius: 1

};

circle.color = 'yellow';

circle.draw = function() {}

delete circle.color;

delete circle.draw;

console.log(circle);



“Now, something that some developers find confusing is that here we’ve use the const keyword to define a new constant. However, we have modified the circle object. We’ve added a property and then removed that property. So, what kind of constant is that?”

const circle = {

    radius: 1

};

circle.color = 'yellow';

circle.draw = function() {}

delete circle.color;

delete circle.draw;

console.log(circle);

“When we use constant here, that means we cannot reassign this variable. So, this variable is more accurately a constant. So, we cannot reset circle to new object.”

const circle = {

    radius: 1

};

circle.color = 'yellow';

circle.draw = function() {}

delete circle.color;

delete circle.draw;

console.log(circle);

“If we do that we get this error. *Assignment two constant variable*. So, we cannot reassign this constant, but we can always change the circle object by adding or removing properties. ”

const circle = {

    radius: 1

};

circle = {};

circle.color = 'yellow';

circle.draw = function() {}

delete circle.color;

delete circle.draw;

console.log(circle);



const circle = {

    radius: 1

};

circle = {};

circle.color = 'yellow';

circle.draw = function() {}

delete circle.color;

delete circle.draw;

console.log(circle);

## 05 - Objects - 05 - Constructor Property - 2.24

“Every object in JavaScript has a property called constructor. And that references the function that was used to construct or create an object.”

“So, here we have two objects: circle and another. Let’s look at their constructor property.”

…

“On the console, another.constructor. (((You have to push enter twice))). As you see, this returns our circle function that we used to create this object.” (((E.g., .constructor shows the function under the hood))).

// Factory Function

function createCircle(radius) {

    return {

        radius,

        draw: function() {

            console.log('draw');

        }

    }

}

const circle = createCircle(1);

// Constructor Function

function Circle(radius) {

    this.radius = radius;

    this.draw = function () {

        console.log('draw');

    }

}

const another = new Circle(1);



“Now let’s look at circle.constructor. What is this? Well, we can tell this is a function because here we have this blue F. As we can see the first letter of this function is uppercase. So, this is a built in constructor function in JavaScript. When we create an object using the object literal syntax, internally the JavaScript engine uses this constructor function.”

*circle.constructor*

*ƒ Object() { [native code] }*



“Let me show you. Let’s temporarily delete all this code. Let’s define an object like this.”

let x = {};

“When we use this syntax, object literal, JavaScript engine will translate that to something like this. Let X equals new object.” (((Looks like the constructor function. Guess that more literally represents the code than factory function))).

let x = {};

// let x = new Object();

“So, the circle object we created and return it from our factory function. And because we use the object literal syntax, internally it was created using this object constructor function.”



***circle.constructor***

***ƒ Object() { [native code] }***

“In JavaScript we have a few other built-in constructors. For example, we have string, for creating strings.”

new String();

“But quite often we use string literals. Single quote or double quote or backtick. Using these literals is cleaner and simpler than using the constructor.

new String();  // '', "", ``

“We also have Boolean… But again we don’t use this. We either use true or false. So, we refer to these as Boolean literals. ”

new String();  // '', "", ``

new Boolean(); // true, false

“We also have number. But instead, we use number literals like 123 whatever.”

new String();  // '', "", ``

new Boolean(); // true, false

new Number(); // 1, 2, 3, ...

“This is what I want you to take away. Every object has a constructor property and that references the function that was used to create that object.”

*another.constructor*

*ƒ Circle(radius) {*

*this.radius = radius;*

*this.draw = function() {*

*console.log('draw');*

*}*

*}*

/\*

new String();  // '', "", ``

new Boolean(); // true, false

new Number(); // 1, 2, 3, ...

\*/

// Factory Function

function createCircle(radius) {

    return {

        radius,

        draw: function() {

            console.log('draw');

        }

    };

}

const circle = createCircle(1);

// Constructor Function

function Circle(radius) {

    this.radius = radius;

    this.draw = function() {

        console.log('draw');

    }

}

const another = new Circle(1);

## 05 - Objects - 06 - Functions are Objects - 4.47

“One of the confusing concepts in JavaScript is that here, functions are objects. So, this circle function we have here is actually an object.”

function Circle(radius) {

    this.radius = raidus;

    this.draw = function() {

        console.log('draw');

    }

}

const another = new Circle(1);

“See? Circle. These are all the members of the circle function or the circle object. The purple icons are methods, like call, bind, apply. And the blue icons are properties. So, let’s take a look at a few of these members on the console.”

function Circle(radius) {

    this.radius = raidus;

    this.draw = function() {

        console.log('draw');

    }

}

Circle.

const another = new Circle(1);



“Here in the console, circle.name . That returns the name of this function. Circle.length returns the number of arguments.”



“Now, earlier in this last lecture I told you that every object in JavaScript as a constructor property and that references the function that was used to create an object. Here’s the interesting part. Who do we think created this object? Let’s have a look.”



“Here, we have another built-in constructor called function. When we declare function using this syntax, internally JavaScript engine will use this function constructor to create this object.”

***Circle.constructor***

***ƒ Function() { [native code] }***

function Circle(radius) {

    this.radius = raidus;

    this.draw = function() {

        console.log('draw');

    }

}

const another = new Circle(1);

“Let me show you. We’ll define a constant called Circle one, to separate from our circle. Set it to new function. Here, our function requires one parameter. Radius. So, we add that here as a string. Now, as a second argument were going to pass the code inside of this function.”

function Circle(radius) {

    this.radius = raidus;

    this.draw = function() {

        console.log('draw');

    }

}

const Circle1 = new Function('radius')

const another = new Circle(1);

“So, to break it up into multiple lines, I’m going to use the backtick character… And simply copy all this code, and put it here.”

function Circle(radius) {

    this.radius = raidus;

    this.draw = function() {

        console.log('draw');

    }

}

const Circle1 = new Function('radius', `

this.radius = raidus;

this.draw = function() {

    console.log('draw');

}

`);

const another = new Circle(1);

“So, when we declare a function, internally it’s represented like this. Now, we can call the circle one, just like calling our circle function”

function Circle(radius) {

    this.radius = raidus;

    this.draw = function() {

        console.log('draw');

    }

}

const Circle1 = new Function('radius', `

this.radius = raidus;

this.draw = function() {

    console.log('draw');

}

`);

const another = new Circle(1);

“We can create a circle object by newing up Circle one, and pass one as the radius”

function Circle(radius) {

    this.radius = raidus;

    this.draw = function() {

        console.log('draw');

    }

}

const Circle1 = new Function('radius', `

this.radius = raidus;

this.draw = function() {

    console.log('draw');

}

`)

const circle = new Circle1(1);

const another = new Circle(1);

“Save the changes, now in the console, lets log circle. Look, it’s a real circle object with these two members. (((Refers to draw and radius))).”



“Now let’s take a look at a couple of methods that are available in our functions. Circle. Here we have this call method.”

function Circle(radius) {

    this.radius = radius;

    this.draw = function() {

        console.log('draw');

    }

}

Circle.call

const another = new Circle(1);

“…And with this, we can call a function. Look at the arguments. The first argument is “this” argument. (((Points to this at the top. I assume this indicates this.radius?))). ”



“Here we need to pass an empty object, and *this* will reference this object that we pass here.”

function Circle(radius) {

    this.radius = radius;

    this.draw = function() {

        console.log('draw');

    }

}

Circle.call({})

const another = new Circle(1);

“After that, we add our arguments explicitly. So, here we have one argument… we pass 1. "If we had multiple arguments, we pass them explicitly like this: 1, 2, 3, 4.”

“So, ***this*** expression is exactly like the expression here. When we use the *new* operator, this *new* operator will internally create an empty object and pass that as the first *argument* to the call method. And this object, will determine the context for this. So, this will reference this object.”

function Circle(radius) {

    this.radius = radius;

    this.draw = function() {

        console.log('draw');

    }

}

***Circle.call({}, 1)***

const another = new Circle(1);

“Earlier I told you if you don’t use the ~~new~~ operator, this by default, will point to the global object, which is window.” (((Word search does not turn up global object))) So, if I want to rewrite this expression in this way…

function Circle(radius) {

    this.radius = radius;

    this.draw = function() {

        console.log('draw');

    }

}

Circle.call({}, 1)

const another = ~~new~~ Circle(1);

“…instead of passing an empty object, I’d pass window. Of course, we don’t want to do this… I’m just explaining what happens under the hood.”

function Circle(radius) {

    this.radius = radius;

    this.draw = function() {

        console.log('draw');

    }

}

Circle.call(window, 1)

const another = new Circle(1);

“So, the first argument here specifies the target of this. Now, we have another method called *apply*. It’s exactly like the call method. With apply we can call a function, but instead of passing all the arguments explicitly (1, 2, 3, 4), we pass them in an array. So, this is useful if you already have an array somewhere else in your application, and you want to pass that array is the second argument to the apply method

function Circle(radius) {

    this.radius = radius;

    this.draw = function() {

        console.log('draw');

    }

}

Circle.call({}, 1);

Circle.apply({}, [1, 2, 3]);

const another = new Circle(1);

“So, this is the take away. In JavaScript, functions are objects.”

function Circle(radius) {

    this.radius = radius;

    this.draw = function() {

        console.log('draw');

    }

}

Circle.call({}, 1);

Circle.apply({}, [1, 2, 3]);

const another = new Circle(1);

## 05 - Objects - 07 - Value vs Reference Types - 5.49

In JavaScript, we have two categories of types. Value types, aka primitives. And reference types.

Primitive or Value Types

* Number
* String
* Boolean
* Symbol (New in es6)
* Undefined
* null

‘Reference Types

* Object
* Function
* Array

“In the last lecture we learned that functions are also objects. The same is true about arrays. In a nutshell, in JavaScript we have primitives and objects. In this lecture were going to see how primitives and objects behave differently, because this is absolutely important for you to understand before we move on to the next section where we talk about prototypes.”

“Let’s define two primitives. X & Y.”

let x = 10;

let y = x;

“Now, I’m going to change the value of x to 20. What I want you to note here is that X and Y are two independent variables. Save, and go back into the console. X is 20, Y is 10. They are independent. So, when we work with primitives, this value is stored inside of this variable. When we copy that variable, that value that is stored in the variable is copied into this new variable. So, they are completely independent of each other.”

let x = 10;

let y = x;

x = 20;



“Now let’s see what happens if we use a reference type or an object here. So, I’m going to change this to an object that has a property called value. And then, instead of setting X to 20, we’ll set X.value to 20”

let x = { value: 10 };

let y = x;

x.value = 20;

When we log x and y on the console, “we can see the value property of Y is also 20.”



“So, this is the take away. When we use an object, that object is not stored in this variable. That object is stored somewhere else in the memory… And the address of that memory location is stored inside that variable.”

let x = { value: 10 };

let y = x;

x.value = 20;



“So, then when we copy X, into Y, it is the address or the reference that is copied. In other words, both X and Y are pointing to the same object in memory. And when we modify that object using either X or Y, the changes are immediately visible to the other variable.”

let x = { value: 10 };

let y = x;

x.value = 20;



“So, here’s the conclusion. Primitives are copied by their value. Objects are copied by their reference.”

“Let’s define a function called increase that takes a number. And here we simply increase the number by one. Let’s declare a number variable and set it to 10. And then call increase and pass this number.”

let number = 10;

function increase(number) {

    number++;

}

increase(number);

“If I log this number on the console, what do we think we’ll see? We see ten. But didn’t we increase the number? Well, when we call increase and pass this number variable, its value is copied into this parameter that is local in this function. So, this number variable here is completely independent of this Other number variable.   
  
“Here in this function, we increment number by one, so it will be 11. But, after this function, this number is going to go out of this scope. So when we log this number on the console, we’re essentially dealing with this first number.”

“So, I told you, primitives are copied by their value. So, here we are dealing with two independent copies. That’s why we see 10 on the console.”

let number = 10;

function increase(number) {

    number++;

}

increase(number);

console.log(number);

“Now, let’s change this to a reference type or an object. So, I’m going to change 10 to an object that has a value property. Let’s rename this variable to object. And similarly, we’ll rename the parameter in this function to obj. And then increment object.value."

“Now, when we log this on the console, we’ll see 11. The reason for this is when we ***call*** increase, and pass this obj, this object is passed by as a reference. So, this local parameter that we have here, will point to the same object that we define here. So, in this case we are not dealing with two independent copies. We have two variables that are pointing to the same object. So, any changes that we make to this object will be visible to the other variable.”  
{value: 11}

let obj = { value: 10 };

function increase(obj) {

    obj.value++;

}

***increase(obj);***

console.log(obj);

“In JavaScript we have value types, also called primitives as well as reference types which are objects. Our primitives are number string Boolean symbol undefined and null. Primitives or value types are copied by their value. Reference types are objects are copied by their reference.

/\*

let x = { value: 10 };

let y = x;

x.value = 20;

let number = 10;

function increase(number) {

    number++;

}

increase(number);

console.log(number);

\*/

let obj = { value: 10 };

function increase(obj) {

    obj.value++;

}

increase(obj);

console.log(obj);

## 05 - Objects - 08 - Enumerating Properties of an Object - 5.09

“So, here we have this circle object with the radius property and the draw method. We’ve learned about the for in and the for of loops to iterate over the properties of an object. In this lecture, we’ll review this one more time”

const circle = {

    radius: 1,

    draw() {

        console.log('draw')

    }

};

“First, let’s take a look at the for in loop. For let key in circle. With this we can iterate over all the properties and methods of an object. Now we can log the key on the console. So, we have radius and draw.”

const circle = {

    radius: 1,

    draw() {

        console.log('draw')

    }

};

for (let key in circle)

    console.log(key);



“If you want to get the value of a property, use the bracket notation here. So, as a second argument here we pass circle of key. So, we’re using the bracket notation to get the value of this key or this property. We can see the value of radius is one and the value of draw is a function. And here is the implementation of our draw function or draw method.”

const circle = {

    radius: 1,

    draw() {

        console.log('draw')

    }

};

for (let key in circle)

    console.log(key, circle[key]);



“We also have this new for of loop. For let key of circle. Simply log it on the console… We see an error. Circle is not iterable. The for of loop can only be used with iterables such as arrays and maps. An object is not iterable. So, we cannot iterate it using a for of loop.”

const circle = {

    radius: 1,

    draw() {

        console.log('draw')

    }

};

for (let key in circle)

    console.log(key, circle[key]);

for (let key of circle)

    console.log(key);



“However, we have this method object.keys of circle. With this, we can get all the keys in our circle object, and this will return an array. And since arrays are iterable, we can use the for of loop to iterate them. Save… we get radius and draw. Now, let’s take a closer look at this method here.”

const circle = {

    radius: 1,

    draw() {

        console.log('draw')

    }

};

for (let key in circle)

    console.log(key, circle[key]);

for (let key of Object.keys(circle))

    console.log(key);



“Earlier, we learned that this object is a built-in constructor function. So, somewhere we have this constructor function like this, and whenever we create an object using the object literal syntax… internally *that* is translated into a call to this constructor function.”

“So, when we create an object using the object literal syntax like this--value is 1--internally, that is translated to a call to this object constructor function. So, that looks like this… new object. Right?” (((Basically. X = { value: 1} really means X = new object() and value: 1 goes inside.)))

const circle = {

    radius: 1,

    draw() {

        console.log('draw')

    }

};

for (let key in circle)

    console.log(key, circle[key]);

for (let key of Object.keys(circle))

    console.log(key);

    function Object() {}

const x = { value: 1 }

    const x = new Object();

“Also, you learned, that all functions in JS are objects. So, they have properties and methods that we can access using the dot notation.”

const circle = {

    radius: 1,

    draw() {

        console.log('draw')

    }

};

for (let key in circle)

    console.log(key, circle[key]);

for (let key of Object.keys(circle))

    console.log(key);

    function Object() {}

“So, when we type object. … we can see all the properties and methods defined in this object.”

   Object.



“So, here we’re using the keys method, and this method returns a string array, which contains all the properties and methods in this object.”

const circle = {

    radius: 1,

    draw() {

        console.log('draw')

    }

};

for (let key in circle)

    console.log(key, circle[key]);

for (let key of Object.keys(circle))

    console.log(key);

   Object.keys()

“We have another similar method to object.keys. That other method is called entries. So, instead of returning the keys as a string array, it returns each key value pair as an array.”

const circle = {

    radius: 1,

    draw() {

        console.log('draw')

    }

};

for (let key in circle)

    console.log(key, circle[key]);

for (let key of Object.keys(circle))

    console.log(key);

for (let key of Object.entries(circle))

    console.log(key);

“Let’s rename key to entry” Use f2 “Save the changes.”

“Each entry is an array. The first element in the array is a key(((radius))), and the second element is the value (((1))). So, that is also another way to get access to all the properties and methods in an object.”

const circle = {

    radius: 1,

    draw() {

        console.log('draw')

    }

};

for (let key in circle)

    console.log(key, circle[key]);

for (let entry of Object.entries(circle))

    console.log(entry);



“Sometimes you want to see if a given object has a given property or method. To do that, you can use the in operator. E.g., if radius as a string in circle, we’ll display a message like yes. With the in operator, we can see if a given property exists in a given object.” We get yes on the console, unless we change radius to something like color. Does not log no, btw.”

const circle = {

    radius: 1,

    draw() {

        console.log('draw')

    }

};

for (let key in circle)

    console.log(key, circle[key]);

for (let entry of Object.keys(circle))

    console.log(entry);

    for (let entry of Object.entries(circle))

    console.log(entry);

    if ('radius' in circle) console.log('yes');



“The simplest way to enumerate the properties of an object is to use the for in loop. But we can also use the for of loop along with object.keys and object.entries. And finally, to see if given property or method exists in an object, we use the in operator.”

const circle = {

    radius: 1,

    draw() {

        console.log('draw')

    }

};

for (let key in circle)

    console.log(key, circle[key]);

for (let entry of Object.keys(circle))

    console.log(entry);

    for (let entry of Object.entries(circle))

    console.log(entry);

    if ('radius' in circle) console.log('yes');

/\*

const circle = {

    radius: 1,

    draw() {

        console.log('draw')

    }

};

for (let key in circle)

    console.log(key, circle[key]);

for (let key of circle)

    console.log(key);

\*/

const circle = {

    radius: 1,

    draw() {

        console.log('draw')

    }

};

for (let key in circle)

    console.log(key, circle[key]);

for (let entry of Object.keys(circle))

    console.log(entry);

    for (let entry of Object.entries(circle))

    console.log(entry);

    if ('radius' in circle) console.log('yes');

## 05 - Objects - 09 - Cloning an Object - 4.21

“In the last lecture we learned how to enumerate the properties of an object. Now, using this technique, we can get all the properties in an object and copy them into another object.”

“So, let’s say we want to create another circle object which is a copy of the circle object here. I’m going to call that another. Const another … initially we’ll set it to an empty object.”

const circle = {

    radius: 1,

    draw() {

        console.log('draw');

    }

};

const another = {};

“Now we can use the for in loop to iterate over all the properties in this object, and copy them into this new object.”

const circle = {

    radius: 1,

    draw() {

        console.log('draw');

    }

};

const another = {};

“For let key in circle.”

const circle = {

    radius: 1,

    draw() {

        console.log('draw');

    }

};

const another = {};

for (let key in circle)

“Now we use the bracket notation to access a property with a given key. So, we set another of key to circle of key. So, basically here in the first iteration, key will be radius, so this code will be equivalent to this: Another of radius. So, we’re sending the radius property of another object, to circle of radius.” (((Basically saying another’s key property… is the same as circle’s key property)))

const circle = {

    radius: 1,

    draw() {

        console.log('draw');

    }

};

const another = {};

for (let key in circle)

    another[key] = circle[key];

another['radius'] = circle['radius']

“Here on the right side of the assignment operator, we are reading the radius property of the circle… the value of this property is one. So, we get one, and put it in the radius property of the another object.”

const circle = {

    radius: 1,

    draw() {

        console.log('draw');

    }

};

const another = {};

for (let key in circle)

    another[key] = circle[key];

another['radius'] = circle['radius']

“Now let’s log another on the console. Our radius property is set to one, and here is our draw method.”

const circle = {

    radius: 1,

    draw() {

        console.log('draw');

    }

};

const another = {};

for (let key in circle)

    another[key] = circle[key];

console.log(another);



“So, if we call another.draw, everything works as we expect. Beautiful.”



“But this approach for copying or cloning an object is a little bit old. In modern JavaScript, we have better ways to achieve the same thing.”

const circle = {

    radius: 1,

    draw() {

        console.log('draw');

    }

};

const another = {};

for (let key in circle)

    another[key] = circle[key];

console.log(another);

“One way is to use the object assign method. We have this object that we’ve seen before. This object has a method called assign. Here as the first argument, we can pass a target object which can be an empty object or an existing object.”

const circle = {

    radius: 1,

    draw() {

        console.log('draw');

    }

};

// const another = {};

// for (let key in circle)

//     another[key] = circle[key];

Object.assign({})

console.log(another);

“Then, we can pass one or more source objects. Let’s say, circle. What this method does, is it takes all the properties and methods in the source object, and then copies them into this new object, and finally returns the result here. (((See next window))).

const another = Object.assign({}, circle);

const circle = {

  radius: 1,

  draw() {

    console.log("draw");

  },

};

// const another = {};

// for (let key in circle)

//     another[key] = circle[key];

Object.assign({}, circle);

console.log(another);

“So, this line of code is exactly equivalent to these three lines.”

const circle = {

  radius: 1,

  draw() {

    console.log("draw");

  },

};

// const another = {};

// for (let key in circle)

//     another[key] = circle[key];

const another = Object.assign({}, circle);

console.log(another);

“If we save the changes, we get the exact same result”.



“Now, this target object that we pass here doesn’t have to be an empty object. It can be an existing object. It can have one or more properties or methods.”

const circle = {

  radius: 1,

  draw() {

    console.log("draw");

  },

};

// const another = {};

// for (let key in circle)

//     another[key] = circle[key];

const another = Object.assign({}, circle);

console.log(another);

“For example, let’s add a color property here. We set that to yellow. Now save the changes. This new object has let color property that we initially had here, as well as the members of the circle object. So, this is the object.assign method.”

const circle = {

  radius: 1,

  draw() {

    console.log("draw");

  },

};

// const another = {};

// for (let key in circle)

//     another[key] = circle[key];

const another = Object.assign({

    color: 'yellow'

}, circle);

console.log(another);



“Let’s see yet another, simpler, and more elegant way to clone an object. We can use the spread operator. So, another. Here we set this to a new object. And then use the spread operator, which is three dots to spread this circle object.”

“Basically what this operator does, is that it takes all the properties and methods in this object and puts them here, in between these curly braces. So, this is the simplest way to clone an object. Save the changes… we get the exact same circle object as before”

const circle = {

  radius: 1,

  draw() {

    console.log("draw");

  },

};

// const another = {};

// for (let key in circle)

//     another[key] = circle[key];

// const another = Object.assign({}, circle);

const another = { ...circle };

console.log(another);



“So, here’s what I want you to take away. Object.assign copies the properties and methods from one or more source objects into a target object. And, we can use that to clone an object or, combine multiple objects into a single object.”

“And, the spread operator is used to spread an object which basically means getting all its properties and methods and putting them into another object.

// const another = {};

// for (let key in circle)

//     another[key] = circle[key];

const another = Object.assign({}, circle);

const another = { ...circle };

console.log(another);

/\*

const circle = {

    radius: 1,

    draw() {

        console.log('draw');

    }

};

const another = {};

for (let key in circle)

    another[key] = circle[key];

another['radius'] = circle['radius']

console.log(another);

const circle = {

  radius: 1,

  draw() {

    console.log("draw");

  },

};

// const another = {};

// for (let key in circle)

//     another[key] = circle[key];

const another = Object.assign({

    color: 'yellow'

}, circle);

console.log(another);

\*/

const circle = {

  radius: 1,

  draw() {

    console.log("draw");

  },

};

// const another = {};

// for (let key in circle)

//     another[key] = circle[key];

// const another = Object.assign({}, circle);

const another = { ...circle };

console.log(another);

## 05 - Objects - 11 - Math - 2.56

“Let’s take a look at a few of the built in objects in JS.