Functions are objects (JavaScript)


```
function sayHello()
{
    console.log("Hey")
}

sayHello.property1 = 'Bye';
```

well if functions are objects we should be able to add properties to it right?

How functions look internally

```
const functionObj = {
  property1 : Bye
  name : sayHello
   () : console.log("Hey")
}
```

So, that basically means, every function is represented as an object. It has all the properties of that function for example property1 that we just defined It also has a name property that is the name of the function. (Optional since function can be anonymous. It has () which is basically used to invoke the function.

Note: This example is just an illustration to understand, the object could look differently It's important to understand this because we say functions can be passed as arguments (They're objects)

Types in JavaScript

* Primitive type
  → number (5, 6 ...)
  → boolean (true, false)
  → undefined (undefined)
  → null
  → Symbol (new in ES6)
  → String ('hi', 'hey'...)

* Non Primitive type
  → object
  → {}
  → [...]
  → function

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What's the difference?

→ Primitive type is directly stored in the memory (var a = 5) a holds the values.
→ Non-primitive type does not directly hold the value, it holds the reference to that value in memory (like pointers)

Built in Objects (come with the language)

we already have primitive types like number, boolean etc

So why are there built-in objects like **Number**, **Boolean** given by the language?

→ Every primitive type (number, string etc) have wrappers around them called Number(), String() etc.

Okay but why complicate?

> false.toString();
→ 'false'

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Wait!! false is a primitive type how can be run toString() on it?

What JS does internally

Boolean(false).toString()

Oh so these built in objects like Number, Boolean etc exist for us to run other methods on the primitive types. Because we cant directly run the method on primitive type.

So not everything in JS is an object, there are primitive types too that are not Objects

Let's now talk about non-primitive types (Objects)

* Arrays are objects
  Umm.... wait what?
  Internally arrays are treated like objects as follows

```
let array = [1,4,5]
```

internally

```
var array = {
  0 : 1
  1 : 4
  2 : 5
}
```

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So if you check
>typeof [1,2,3] @codeWithSimran
>object.

So how do we differentiate and find if its an array if typeof says its an object.

Array.isArray([1,2]) → true

↙

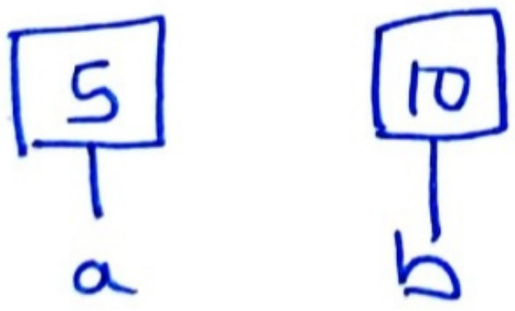
Built in Object
that has isArray property [modern JS]

Pass by value & Pass by reference

* Pass by value

let a = 5; let b = 10

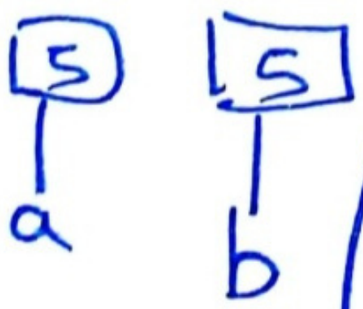
memory



That means a and b actually hold the values we assign them

* when we do

let a=5; let b=a;



a has no contact with b later
a copy of a is assigned to b and
b is now independent.
This is pass by value.

* Pass by reference

Objects are passed by reference

```
Let obj1 = { name: 'John',
             favFood : 'Burger' }
let obj2 = obj1;   @codeWithSim
obj2.favFood = 'pizza';
console.log(obj1, obj2)
```

obj1
↳ { name: 'John', favfood : 'pizza' }

obj2
↳ {name: 'John', favfood: 'pizza'}

Wait, what? obj1 and obj2 are same but we only changed favfood property of obj2 right:
what happens internally

① obj1 → name: John, favfood: 'burger' ← obj2 ← ② obj2 = obj1

memory

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That means obj1 and obj2 have the same data, because they're both pointing to the same memory location.
So changing obj1 or obj2 will change data for both.
So objects are basically references to a some memory location and obj2 = obj1 does not create a new memory space for obj2.
We're saving memory space
But also it's confusing, what if someone wants to keep them separate?

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Also remember, since arrays are objects, that have the same behaviour

Arrays soln	Object soln
let a = [1,2,3] let b = [].concat(a)	let a = {'a':0,'b':1} let b = Object.assign({},a)

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Exercise:

Try doing the same with spread operator.

soln let b = {...a}

What if we have nested objects?

```
let obj1= {
        a : 1
        b : 2
        c : {
            nested : true
            }
    }
```


Try the above methods and do

obj2 = ~~obj1~~ {...obj1}

obj2.c.nested = false;

You'll se the value of nested will change to false in both objects.

Opps... We have a problem. Whatever approach we tried on top does not work with nested object because every object

is passed by reference and we only cloned the top layer

This is called shallow cloning.

But what we need now is deep cloning (all levels)

→ let obj2 = JSON.parse(JSON.stringify(obj1));

This does deep cloning.
However if obj is too large, there will be performance issue as parsing the whole object to all levels can take time.

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