3. JAVASCRIPT

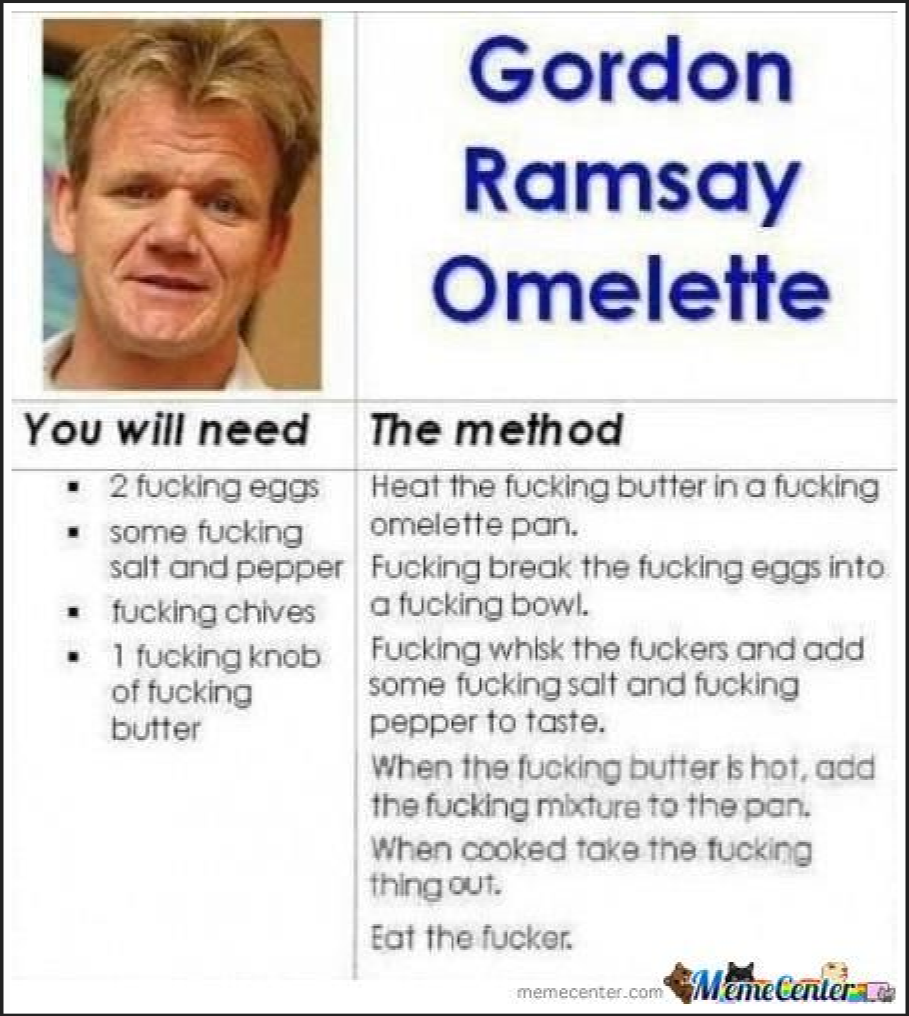
3.1 WHAT IS PROGRAMMING?

Simple, programming is write algorithms in a programming language.

ALGORITHMS

A list of ordered steps whose purpose is do something, and must be understandable for those who will do (run).

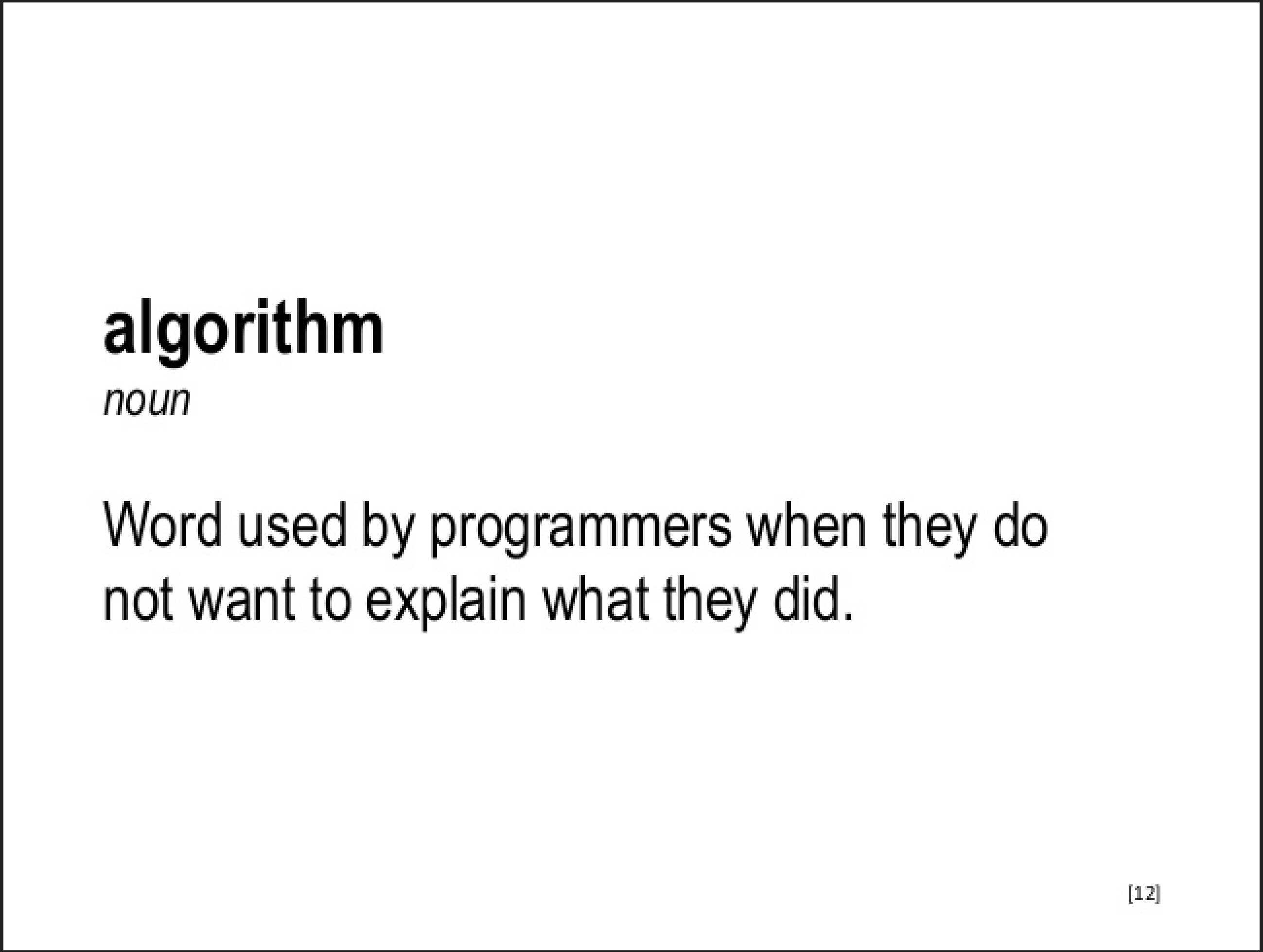
ALGORITHMS



Gordon Ramsay Omelette

You will need	The method
• 2 fucking eggs • some fucking salt and pepper • fucking chives • 1 fucking knob of fucking butter	Heat the fucking butter in a fucking omelette pan. Fucking break the fucking eggs into a fucking bowl. Fucking whisk the fuckers and add some fucking salt and fucking pepper to taste. When the fucking butter is hot, add the fucking mixture to the pan. When cooked take the fucking thing out. Eat the fucker.

ALGORITHMS



algorithm
noun

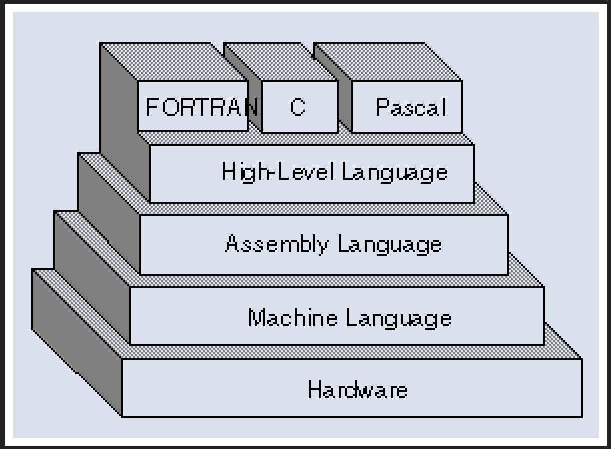
Word used by programmers when they do not want to explain what they did.

[12]

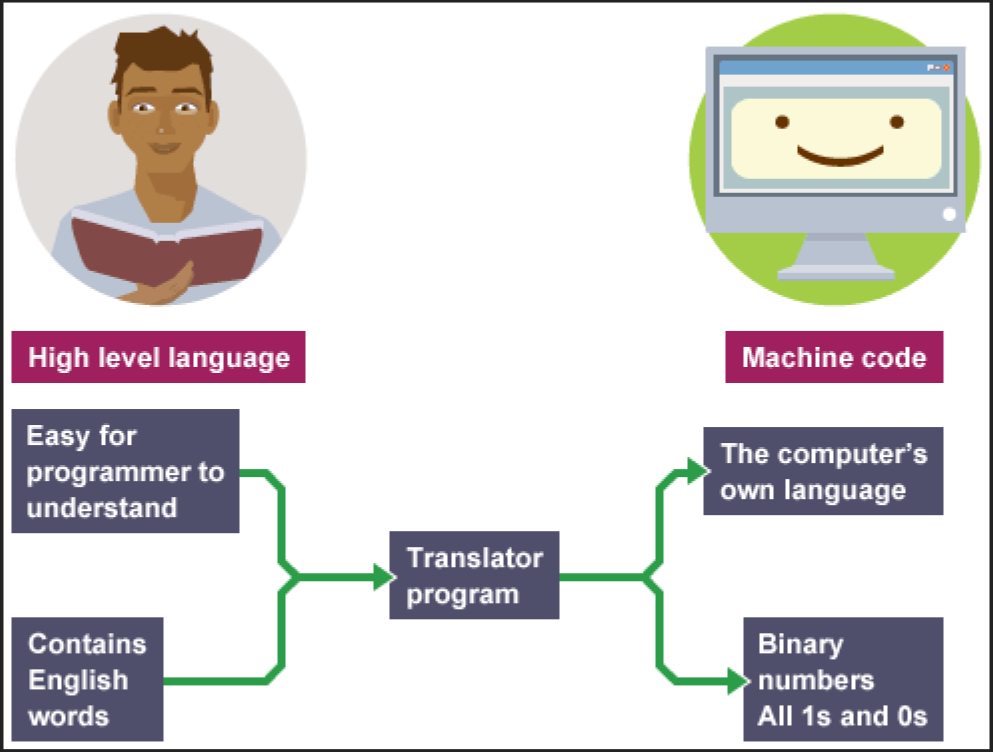
3.2 PROGRAMMING LANGUAGES

A programming language is an artificial language (with syntax and semantic) designed to communicate algorithms to a machine.

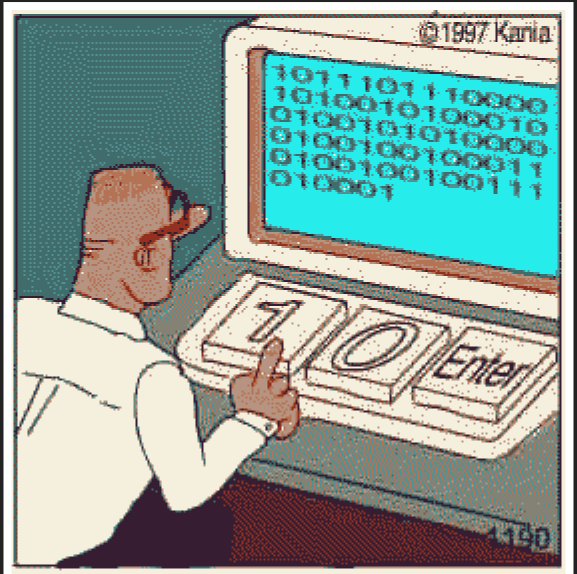
ABSTRACT LEVELS



ABSTRACT LEVELS


High level language
Machine code
Easy for programmer to understand
Contains English words
Translator program
The computer's own language
Binary numbers All 1s and 0s

ABSTRACT LEVELS



Real programmers code in binary.

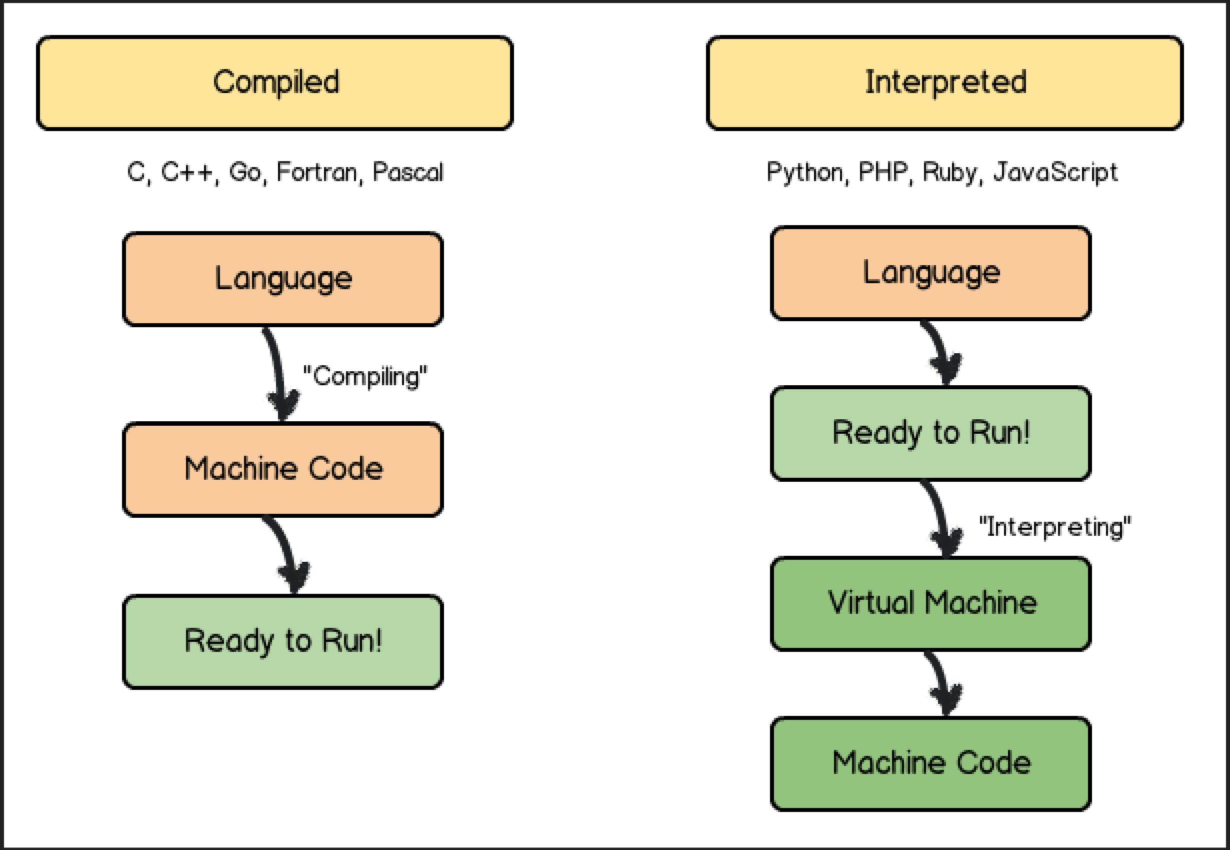
COMPILED VS. INTERPRETED

Since the computer only "speak" machine code, we need to get a way to translate top level programming language into low level machine code. There are two ways:

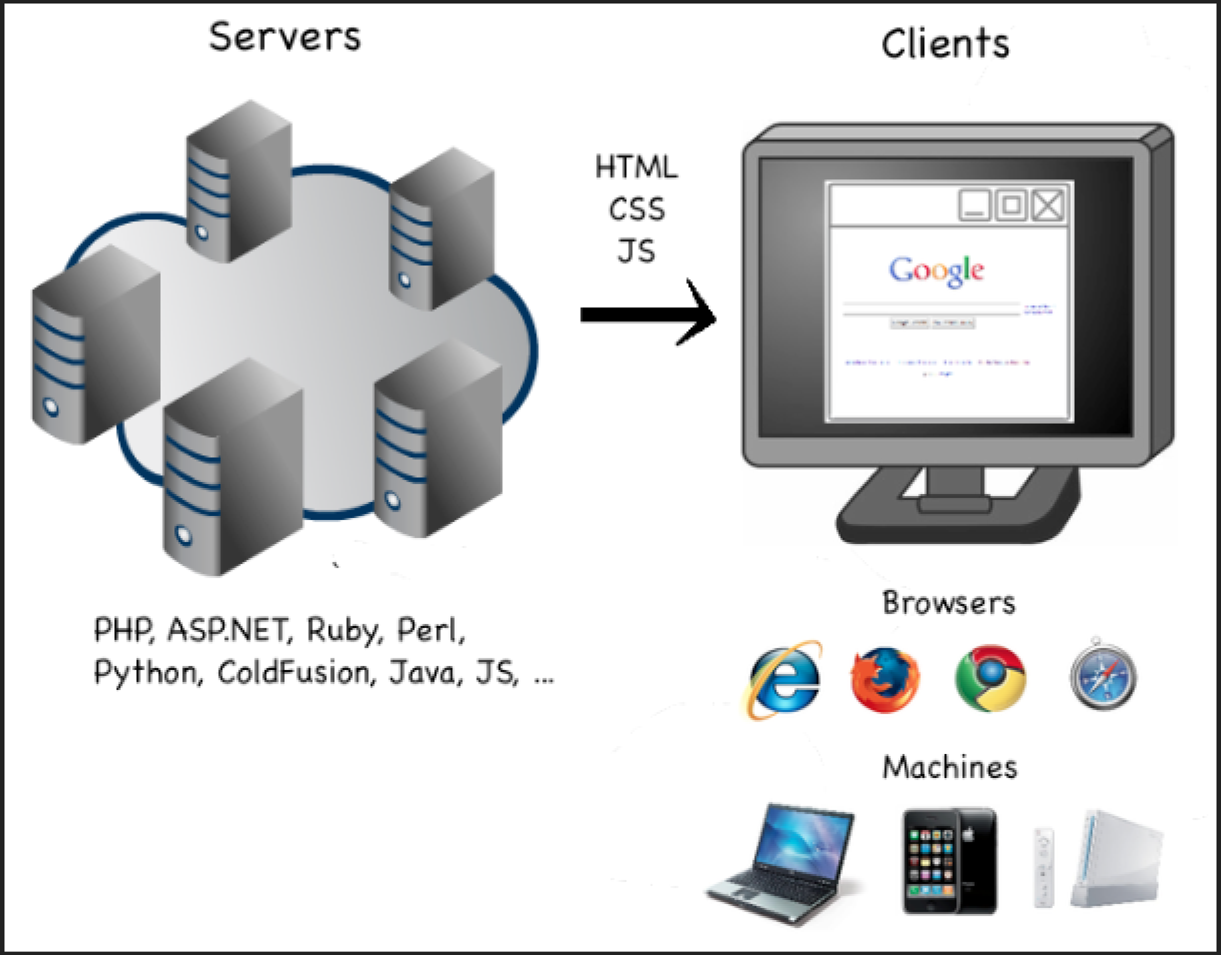
- **Compile**. It translate *source code* into *machine code* through another program (compiler). The result is called *object code* or simply *binary*

- **Interpret**. Use another program (interpreter) that directly executes, i.e. performs, the code of the *source code* without previously compiling it.

COMPILED VS. INTERPRETED



3.3 JAVASCRIPT: THE PROGRAMMING LANGUAGE OF THE WEB



JAVASCRIPT: THE PROGRAMMING LANGUAGE OF THE WEB

Javascript is an interpreted language, and its commonly abbreviated JS.
Each browser has its own Javascript interpreter, also called engine.

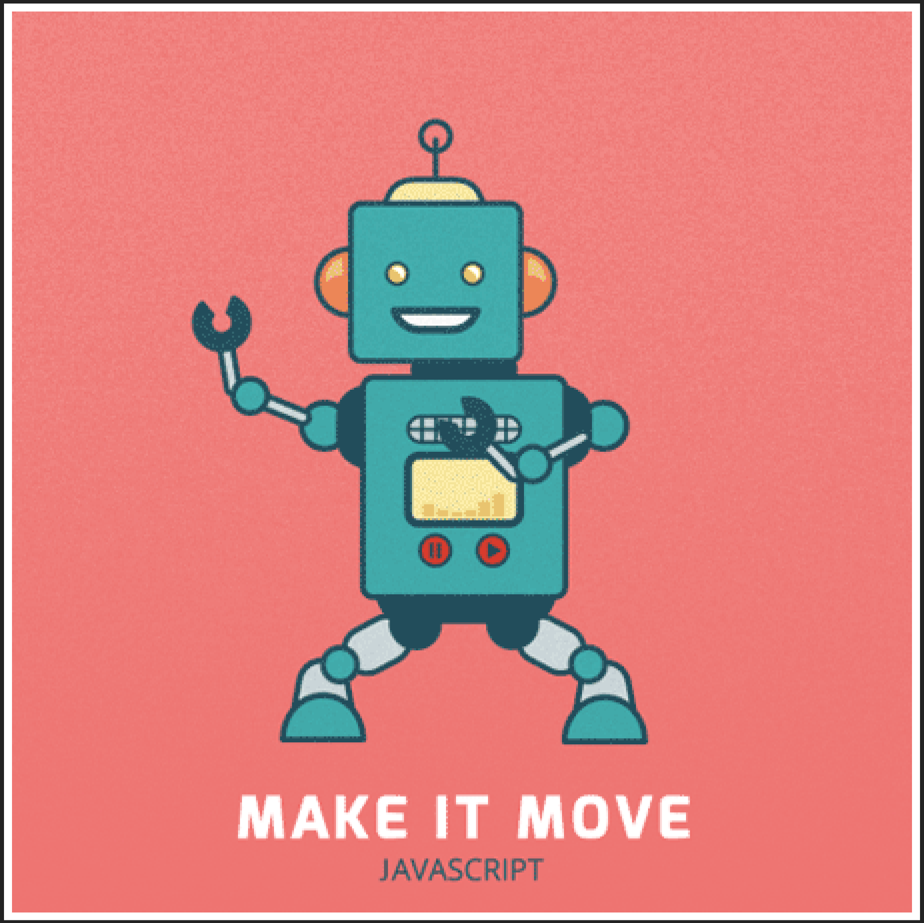
Programs writed in Javascript are called scripts.

HISTORY

- 1995: At Netscape, Brendan Eich created "JavaScript".
- 1996: Microsoft releases "JScript", a port for IE3.
- 1997: JavaScript was standardized in the "ECMAScript" spec.
- 2005: "AJAX" was coined and the web 2.0 age begins.
- 2010: Node.JS was released.
- 2015: ECMAScript 6 was released.

ANATOMY OF A WEBSITE

HTML (structure) + CSS (style) + JavaScript (logic and behaviour)



EXECUTING JAVASCRIPT

To include JavaScript code in a web page it used the `<script>` HTML tag.

```
<!DOCTYPE html>
<html>
  <head>
    ...
  </head>
  <body>
    ...
    <script>
      // Your JavaScript code begins here
      console.log('Hello World!');
    </script>
  </body>
</html>
```

The script tag can goes into any place of `head` or `body` tags, and multiple scripts are allowed.

EXECUTING JAVASCRIPT

In order to get a better organization of our projects, the JS scripts can be written in separated files and reference them with the `src` attribute.

```
<!DOCTYPE html>
<html>
  <head>
    ...
  </head>
  <body>
    ...
    <script src="path/to/jsScript1.js"></script>
    <script src="path/to/jsScript2.js"></script>
    <script src="path/to/jsScript3.js"></script>
  </body>
</html>
```

The suffix `*.js` is the extension for the JS script files.

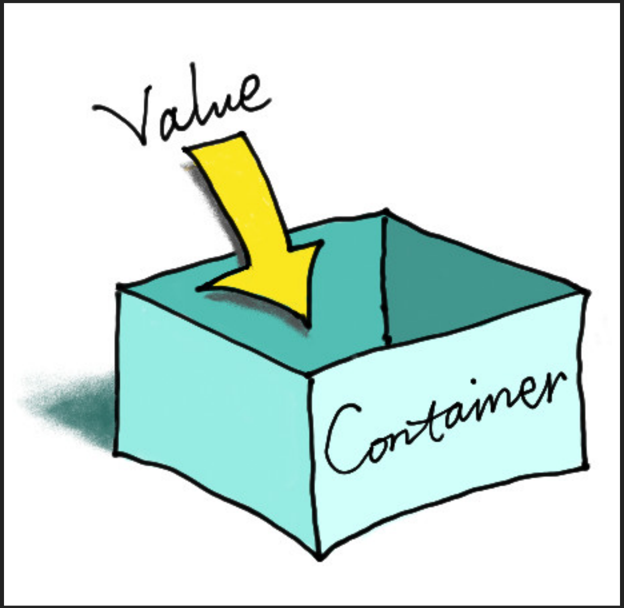
3.4 JS: VARIABLES

WHAT IS A VARIABLE?

We need store data: score in a game, telephone in a contact book, etc.

A variable is a named value (or a value with meaning), that represent data.
The value of a variable can change, but its meaning cannot.

Also, the variables can be seen as value containers.



SYNTAX

To declare and initialize a variable, the following syntax is used:

```
// var name
var x;

// name = value
x = 5;
```

Or all in one statement:

```
// var name = value
var x = 5;
```

Reasign a value (notice the = assignment operator):

```
var x = 5;
x = 1;
```

PRIMITIVE DATA TYPES

String: Sequence of characters.

```
var greeting = 'Hello Diego';
var greatUniversity = "CENTRO";
```

Number: Integers and floating point.

```
var myAge   = 5;
var myDebt = 9.10;
```

Boolean: Represents logical values true or false.

```
var catsAreBest = true;
var isRaining    = false;
```

undefined: Represents a value that hasn't been defined.

```
var absoluteTruth;
```

WEAKLY TYPED (LOOSELY TYPED)

JS is a weakly typed language. It means that you should not specify the data type when a variable is declared.
JS figures out the type based on value, and the type can change.

```
var myName = 'Diego';
myName = 2;
myName = true;
```

3.5 JS: COMMENTS

Comments are statements ignored by computer and is aimed to human can understand not obvious code.

```
// Single line comments
var x = 4;

/*
 Comments in multiple lines (for long descriptions)
*/
```

3.6 JS: FUNCTIONS

Often we want to do a task several times, and is very annoying and confusing write the same piece of code repeatedly.

Functions "encapsulate" a task, that we view as a single line of code. The functions make the code more readable (add abstract layer) and reusable.

FUNCTIONS

- Are "self contained" modules that accomplish a specific task (SINGLE RESPONSABILITY).
- Usually "take in" data, process it, and "return" a result.
- Once is written, it can be used over and over and over again.
- JS provide many built in functions.
- We don't care how a function does what it does, only that it "does it"!

SYNTAX

Definition:

```
function sayHello () {
  console.log('Hello!');
}
```

Call a defined function:

```
sayHello();
```

ARGUMENTS

Functions, could need data to perform the desired task.

These data are called arguments, and works like pre-defined variables in the function.

```
function addNumbers(num1, num2) {
  var result = num1 + num2;
  console.log(result);
}

addNumbers(7, 21);
```

RETURN VALUES

```
function addNumbers(num1, num2) {
  var result = num1 + num2;
  return result; // Anything after this line won't be executed
}

var sum = addNumbers(5, 2);

var biggerSum = addNumbers(2, 5) + addNumbers(3, 2);

var hugeSum = addNumbers(addNumbers(5, 2), addNumbers(3, 7));
```

VARIABLE SCOPE

The JS variables only live in the block of code (or function) where were defined.
It means that they are visible in the function where they're defined.

The parts of code where a variable is visible is called the "variable scope".

Local scope

```
function addNumbers(num1, num2) {
  var result = num1 + num2;
  console.log("The result is: " + result);
}

addNumbers(5, 7);
console.log(result);
```

Global scope

```
var result;
function addNumbers(num1, num2) {
  result = num1 + num2;
  console.log("The result is: " + result);
}

addNumbers(5, 7);
console.log(result);
```

FUNCTIONS AS VARIABLES

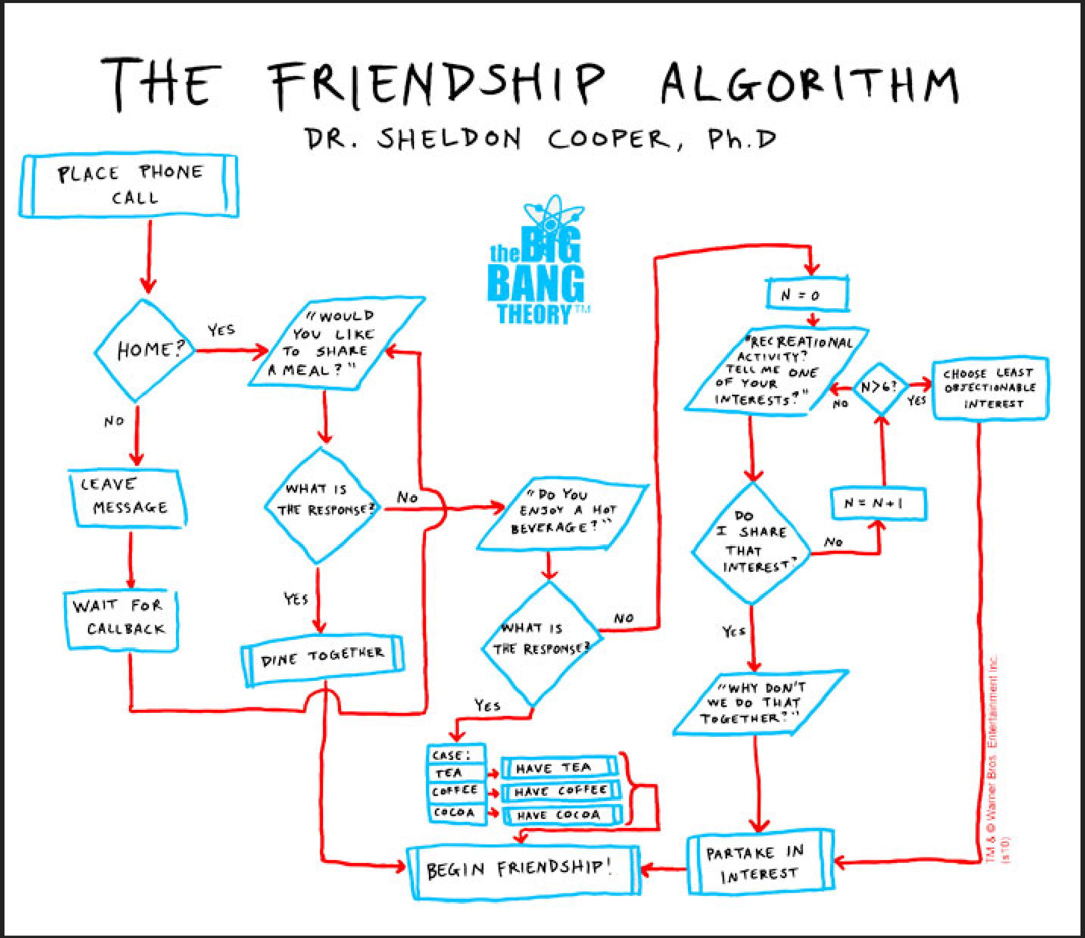
JS is a "first-class" language: support treat the functions like a variable.

```
function mistery(otherFunction, a, b) {
  return otherFunction(a) + otherFunction(b);
};

function g(x) {
  return x * x;
}

var f = function(x) {
  return x + x;
}

mistery(g, 4, 9);
mistery(f, 4, 9);
```

3.7 JS: FLOW CONTROL

The last code bender.

FLOW CONTROL



3.6.1 CONDITIONALS (`if`)

The programs need to take decisions (execute or not a bunch of code).
These decisions are based on a condition.
A condition is a question whose answer only have two values: `true` or `false`.

With the `if` statement JS make a conditional.

```
if (condition) {
  // statements to execute
}
```

Example (if):

```
var x = 5;

if (x > 0) {
  console.log('x is a positive number!');
}

if (isRaining()) {
  useUmbrella();
}
```

COMPARISION OPERATORS

Operator symbol Name Example

```
var n = 28;
```

Operator symbol	Name	Example
===	Strict equality	n == 28 n === '28'
!==	Strict inequality	n !== 28 n !== '28'
>	Greater than	n > 25 n > 30
<	Lower than	n < 31 n < 23
>=	Greater or equal than	n >= 28
<=	Lower or equal than	n <= 28

LOGICAL OPERATORS

Operator symbol Name Example

```
var a = 4;
var b = -2;
```

Operator symbol	Name	Example
&&	AND	a > 0 && b < 0 4 > 0 && -2 < 0
||	OR	a > 0 || b > 0 4 > 0 || -2 > 0
!	NOT	!(a === b) !(a < 0)

Can combining together multiple conditions (be careful with the parenthesis):

```
var myAge = 28;

if ((myAge > 0 && myAge < 5) || (myAge > 70)) {
  console.log('MB free!');
}
```

USING VALUES AS `false`

The empty string (''), the number 0, `undefined` and `null` act as `false`.

```
var name = '';
if (name) {
  console.log('Hello, ' + name);
}

var points = 0;
if (points) {
  console.log('You have ' + points + ' points');
}

var firstName;
if (firstName) {
  console.log('Your name is ' + firstName);
}
```

COMPLETE CONDITIONALS: `if-else`

To make a complete conditionals: code that is executed when the condition is satisfied and code when not.

```
var age = 18;
if (age > 16) {
  console.log('Yay, you can drive!');
} else {
  console.log('Sorry, but you have ' + (16 - age) + ' years til you
}
```

MULTIPLE CONDITIONALS: `if-else if-else`

```
var age = 20;
if (age >= 35) {
  console.log('You can vote AND hold any place in government!');
} else if (age >= 25) {
  console.log('You can vote AND run for the Senate!');
} else if (age >= 18) {
  console.log('You can vote!');
} else {
  console.log('You have no voice in government!');
}
```

3.6.2 ITERATIONS (`while`)

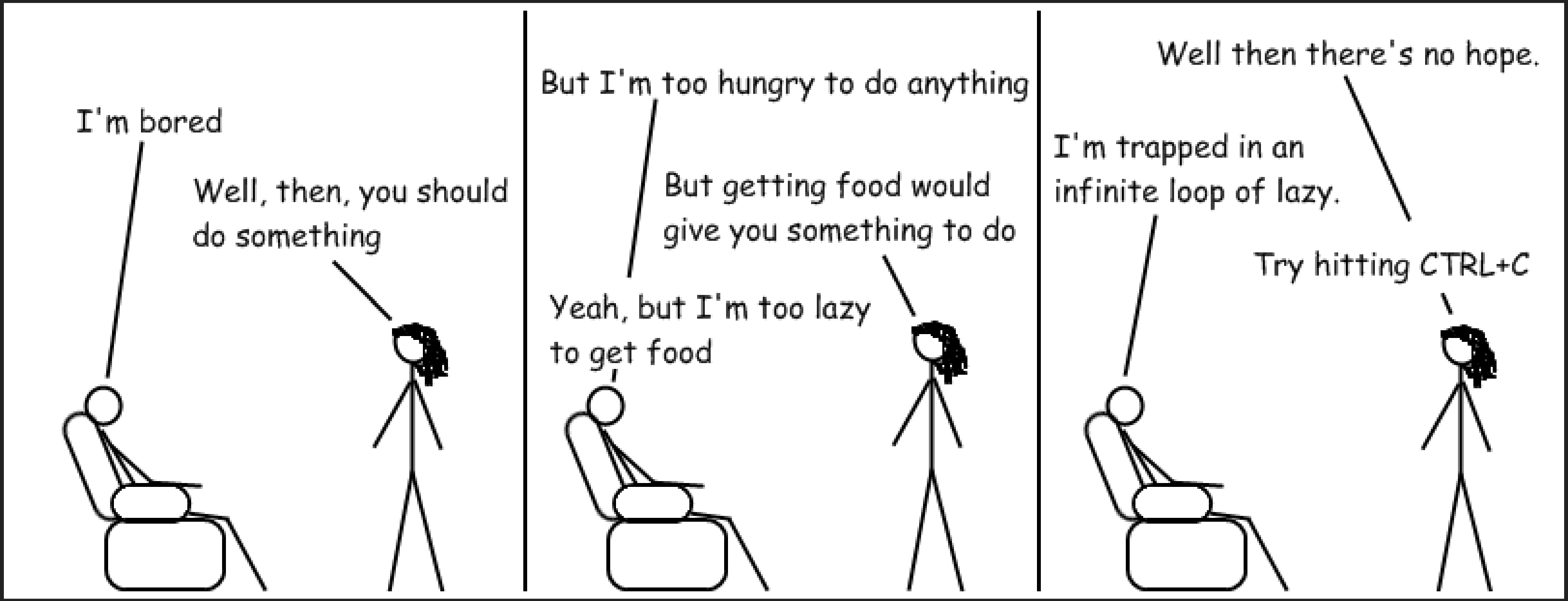
Repeat a task multiple times is make iterations.
Are two ways to view the iterations: until a condition it no longer satisfied or counting.

For the first way, JS use the statement `while`.

```
while (expression) {
  // statements to repeat
}
```

```
var x = 0;
while (x < 5) {
  console.log(x);
  x = x + 1;
}
```

BEWARE INFINITE LOOPS


I'm bored
Well, then, you should do something
But I'm too hungry to do anything
But getting food would give you something to do
Yeah, but I'm too lazy to get food
I'm trapped in an infinite loop of lazy.
Try hitting CTRL+C
Well then there's no hope.

3.6.3 ITERATIONS (`for`)

The other way to make iterations is counting.

```
for (initialize; condition; update) {
  // statements to repeat
}
```

```
for (var i = 0; i < 5; i = i + 1) {
  console.log(i);
}
```

BREAK A LOOP

To prematurely exit a loop, use the `break` statement.

```
for (var current = 100; current < 200; current++) {
  console.log('Testing ' + current);
  if (current % 7 == 0) {
    console.log('Found it! ' + current);
    break;
  }
}
```

3.8 JS: ARRAYS

For hold multiple values in one single variable we can use arrays.
An array is a type of data-type that holds an ordered list of values, of any type.

SYNTAX

```
var arrayName = [element0, element1, ...];
var arrayName = [];
```

```
var rainbowColors = ['Red', 'Orange', 'Yellow', 'Green', 'Blue', 'In
var raceWinners = [33, 72, 64];
var myFavoriteThings = ['Play guitar', 666, 'Web media course'];
```

The `length` property reports the size of the array:

```
console.log(courseStudents.length);
```

ARRAY ACCESS

You can access items with "bracket notation". The index starts at 0.

```
var arrayItem = arrayName[indexNum];
```

```
var rainbowColors = ['Red', 'Orange', 'Yellow', 'Green', 'Blue', 'In
var firstColor = rainbowColors[0];
var lastColor = rainbowColors[6];
```

MODIFICATION

You can also use bracket notation to change the item in an array:

```
var myFavoriteThings = ['Play guitar', 666, 'Web media course'];
myFavoriteThings[0] = 'Drunk beer';
```

```
myFavoriteThings.push('Coding');
```

3.9 JS: OBJECTS

One of the most abstract things of the modern code is the concept of object-oriented programming. An object in programming language can be compared to objects in real life.

OBJECTS IN JAVASCRIPT

JS is designed on a simple object-based paradigm.

An JS object is a collection of properties, and a property is an association between a name (or key) and a value.
A property of an object can be seen as a variable attached to the object.

```
var object = {};

var object = {
  property1 : value1,
  property2 : value2
};
```

Example of objects

```
var aboutMe = {
  hometown: 'CDMX, México',
  hair: 'black',
  wearGlasses: true,
  birthday: { day: 2, month: 'September' }
};

var cat = {};
cat.furColor = 'orange';
```

ACCESS (DOTS AND BRACKETS)

Two ways to retrieve the values of an object: with dot and brackets.

```
var aboutMe = {
  hometown: 'CDMX, México',
  hair: 'black',
  wearGlasses: true,
  birthday: { day: 2, month: 'September' }
};

var myHometown = aboutMe.hometown;

var myHairColor = aboutMe['hair'];
```

CHANGING (DOTS AND BRACKETS)

```
var aboutMe = {
  hometown: 'CDMX, México',
  hair: 'black',
  wearGlasses: true,
  birthday: { day: 2, month: 'September' }
};

aboutMe.wearGlasses = false;

// Add attributes
aboutMe.gender = 'male';

// Remove attributes
delete aboutMe.gender;
```

ARRAY OF OBJECTS

```
var myPets = [
  {
    name: 'Lizzie',
    type: 'dog',
    bathDays: 0,
    age: 6
  },
  {
    name: 'Daemon',
    type: 'cat',
    age: 1
  }
];
```

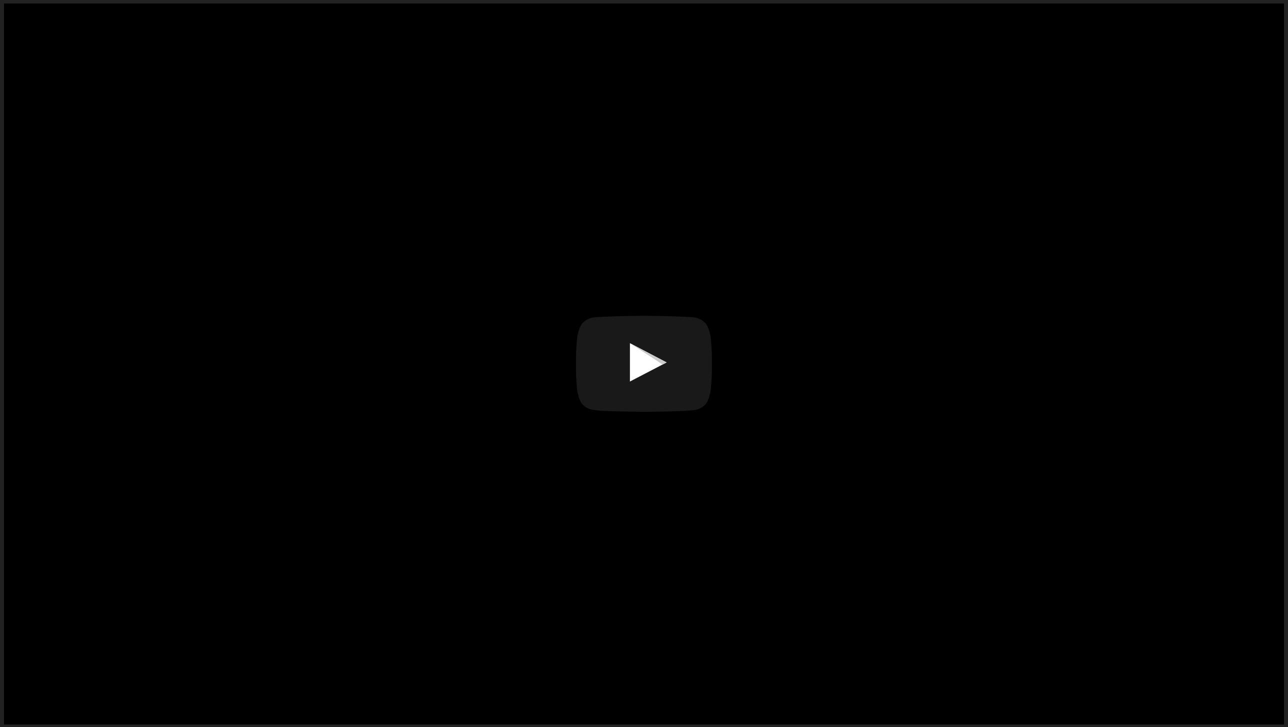
OBJECT METHODS

Since we can put any type of data as a value of attribute, we can put...
FUNCTIONS!!!!!
Object attributes that are functions are called methods.

```
var myCat = {
  name: 'Daemon',
  type: 'cat',
  age: 1,
  furColor: 'grey',
  meow: function() {
    console.log('meowww');
  },
  sleep: function (numMinutes) {
    for (var i = 0; i < numMinutes; i++) {
      console.log('z');
    }
  }
};

myCat.meow();
myCat.sleep(10);
```

OBJECT METHODS

```
myCat.eat = function (food) {
  console.log('Yum, I love ' + food);
};
```



```
myCat.eat('Tia helen');
```