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THE COMPLETE JAVASCRIPT COURSE

FROM ZERO TO EXPERT!



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SLIDES FOR THEORY LECTURES

(DON'T SKIP THEM, THEY ARE SUPER
IMPORTANT 😎)

JS



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WELCOME, WELCOME,
WELCOME!



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SECTION

WELCOME, WELCOME, WELCOME!

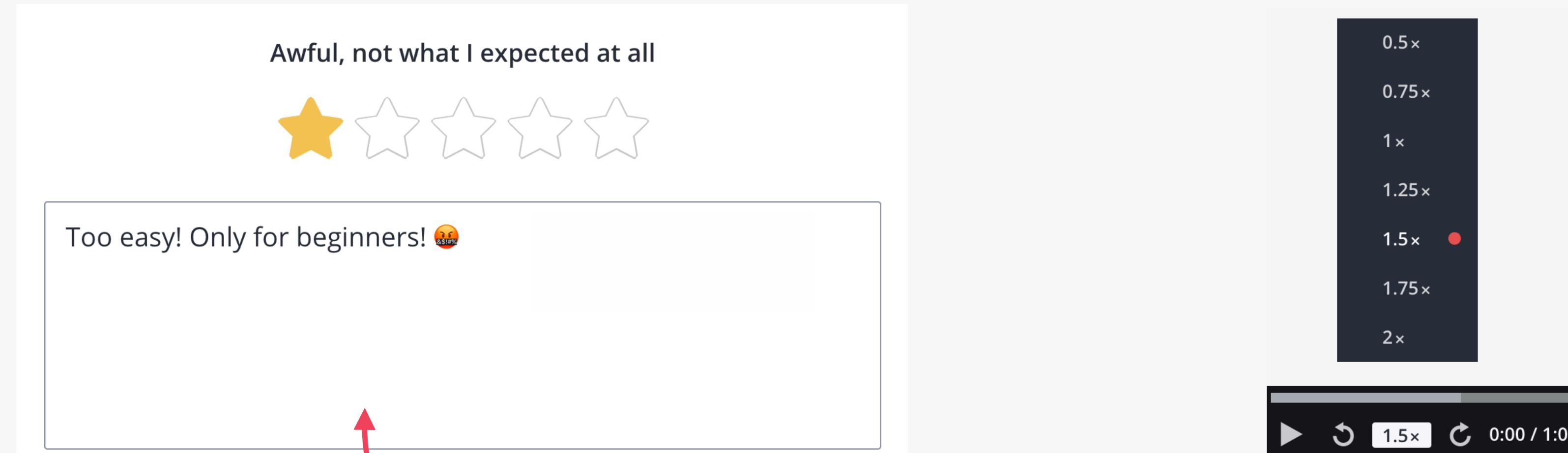
LECTURE

WATCH BEFORE YOU START!

JS

SOME QUICK CONSIDERATIONS BEFORE WE START...

✌️ This course is for all of you! So please don't write a bad review right away if the course is too easy, or too hard, or progressing too slow, or too fast for you. To make it perfect for YOU, you can rewatch lectures, jump to other sections, watch the course with slower or faster playback speed, or ask questions.



Please don't be that person.
Everyone is different...
(Unless the course *itself* is truly terrible)

SOME QUICK CONSIDERATIONS BEFORE WE START...



You need to code along with me! You will learn **ZERO** JavaScript skills by just sitting and watching me code. You have to code **YOURSELF!**



SOME QUICK CONSIDERATIONS BEFORE WE START...



🤓 Try all the coding challenges! Try to do your best, but if you get stuck for too long, watch the solution. Don't beat yourself up if you can't figure it out! Just rewatch the lectures that were covered in the challenge, try to understand them better, and move on.



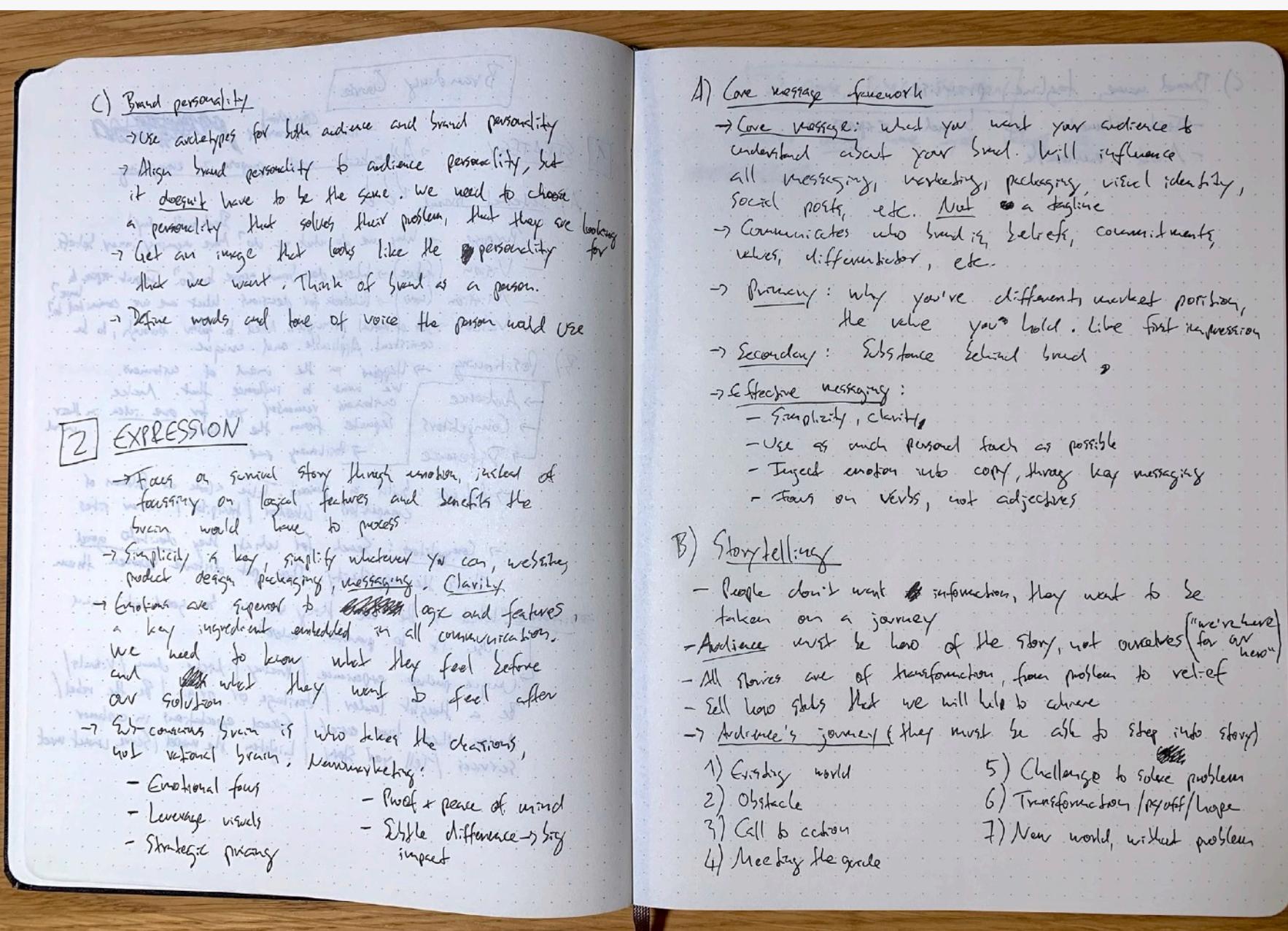
Watch for this sign!

PAUSE THE VIDEO
FOR CHALLENGE

SOME QUICK CONSIDERATIONS BEFORE WE START...



If you want the course material to stick, take notes. Notes on code syntax, notes on theory concepts, notes on everything!



Totally non-coding... Try to understand a single word 😂

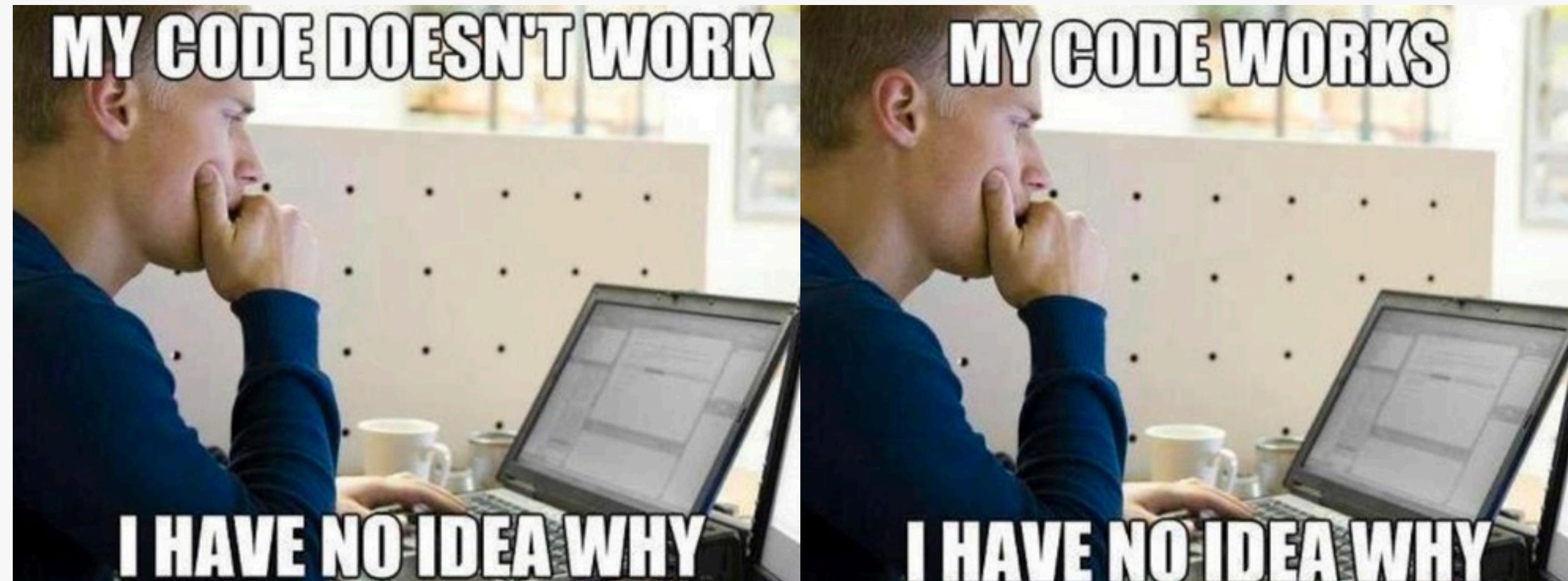
SOME QUICK CONSIDERATIONS BEFORE WE START...

 If this is your first time ever programming, please don't get overwhelmed. It's 100% normal that you will not understand everything at the beginning. *Just don't think "I guess coding is not for me"!*



SOME QUICK CONSIDERATIONS BEFORE WE START...

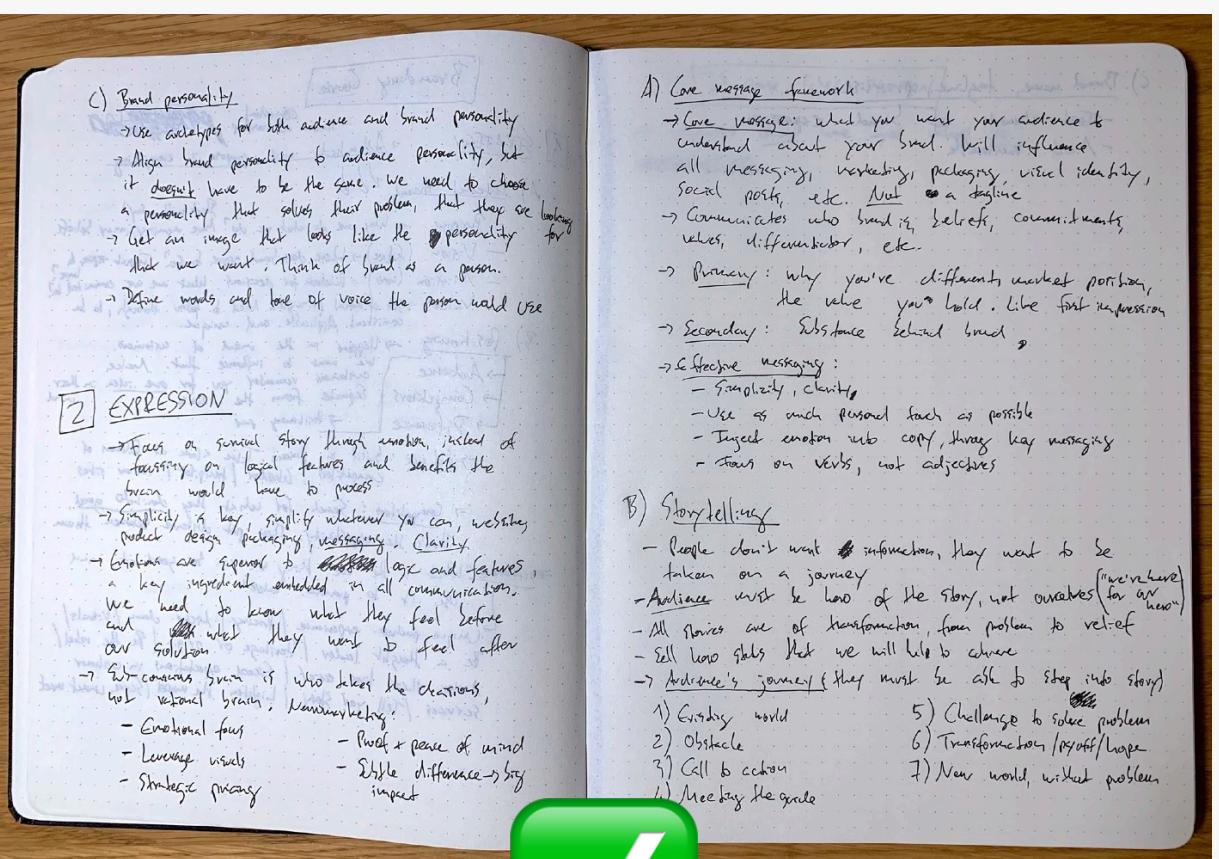
😊 In the first sections of the course, don't bother understanding WHY things work the way they do in JavaScript. Also, don't stress about efficient code, or fast code, or clean code. While learning, we just want to make things WORK. We will understand the WHY later in the course.



SOME QUICK CONSIDERATIONS BEFORE WE START...



Before moving on from a section, make sure that you understand exactly what was covered. Take a break, review the code we wrote, review your notes, review the projects we built, and maybe even write some code yourself.

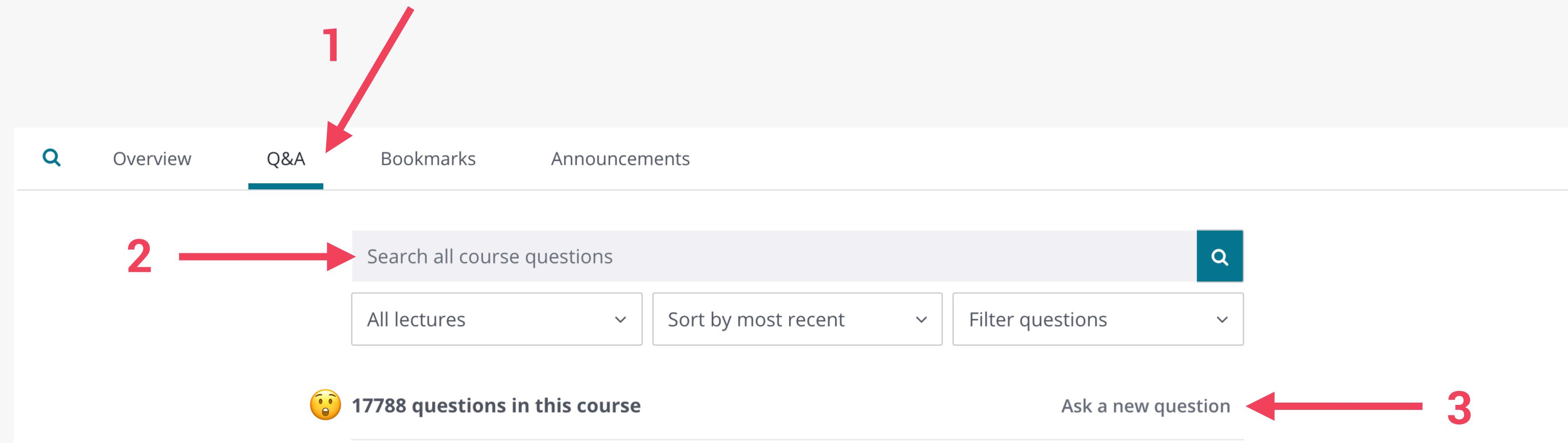


A screenshot of a mobile game titled "Guess My Number!". The title is at the top center in a large, bold, black font. Below it is a horizontal input bar with a white rectangular input field in the center containing the number "3". To the left of the input field is a smaller button also showing "3". At the bottom left is a "Check!" button. On the right side, there are three status indicators: a yellow star icon with "Correct number!", a red score icon with "Score: 18", and a blue highscore icon with "Highscore: 18". A green button with a white checkmark is at the bottom center. In the top right corner, there is a small "(Between 1 and 20)" text.



SOME QUICK CONSIDERATIONS BEFORE WE START...

!? If you have an error or a question, start by trying to solve it yourself! This is essential for your progress. If you can't solve it, check the Q&A section. If that doesn't help, just ask a new question. Use a short description, and post relevant code.

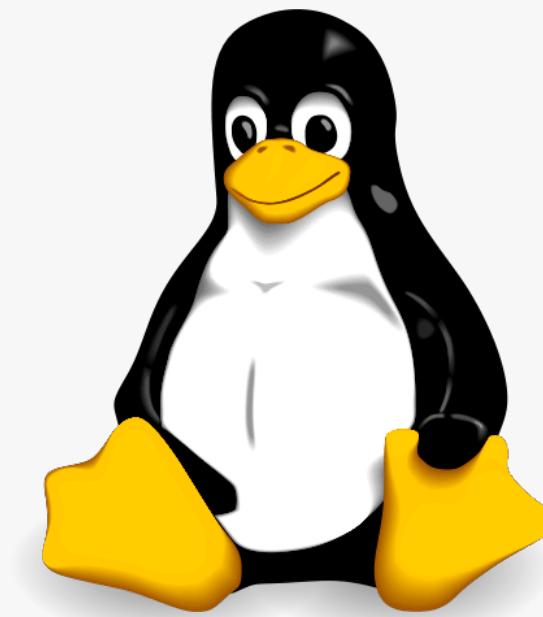
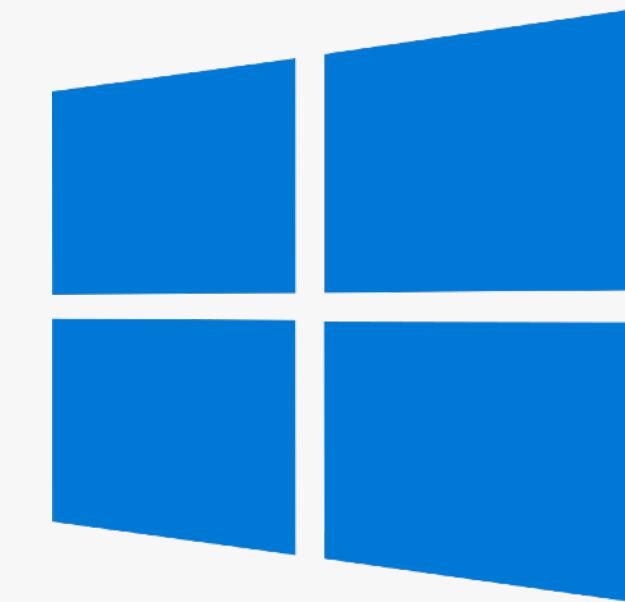


The screenshot shows a user interface for a course's Q&A section. At the top, there is a navigation bar with tabs: Overview, Q&A (which is currently selected and highlighted in blue), Bookmarks, and Announcements. Below the navigation bar is a search bar labeled "Search all course questions" with a magnifying glass icon. Underneath the search bar are three dropdown menus: "All lectures", "Sort by most recent", and "Filter questions". In the bottom left corner, there is a statistic showing "17788 questions in this course" next to a surprised face emoji. In the bottom right corner, there is a button labeled "Ask a new question". Three red numbers (1, 2, 3) are overlaid on the image to guide the user: number 1 points to the "Q&A" tab, number 2 points to the search bar, and number 3 points to the "Ask a new question" button.

SOME QUICK CONSIDERATIONS BEFORE WE START...

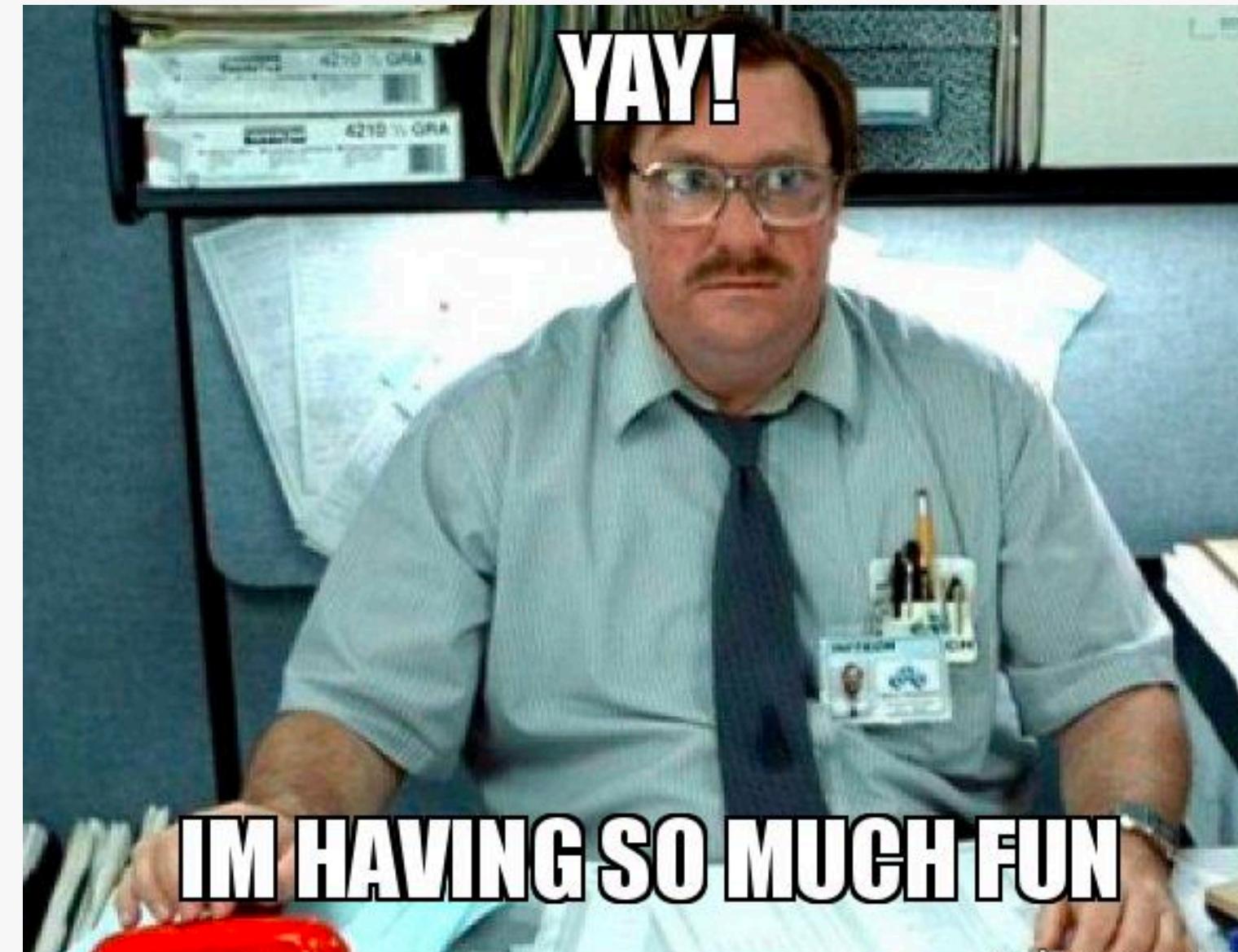


I recorded this course on a Mac, but everything works the exact same way on Windows or Linux. If something doesn't work on your computer, it's NOT because you're using a different OS.



SOME QUICK CONSIDERATIONS BEFORE WE START...

😍 **Most importantly, have fun!** It's so rewarding to see something that **YOU** have built **YOURSELF!** So if you're feeling frustrated, stop whatever you're doing, and come back later!



And I mean **REAL** fun 😊

JAVASCRIPT FUNDAMENTALS – PART 1



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SECTION

JAVASCRIPT FUNDAMENTALS - PART 1

LECTURE

A BRIEF INTRODUCTION TO
JAVASCRIPT

JS

WHAT IS JAVASCRIPT?

JAVASCRIPT

Based on objects, for
storing most kinds of data

JAVASCRIPT IS A HIGH-LEVEL,
OBJECT-ORIENTED, MULTI-PARADIGM
PROGRAMMING LANGUAGE. 😱

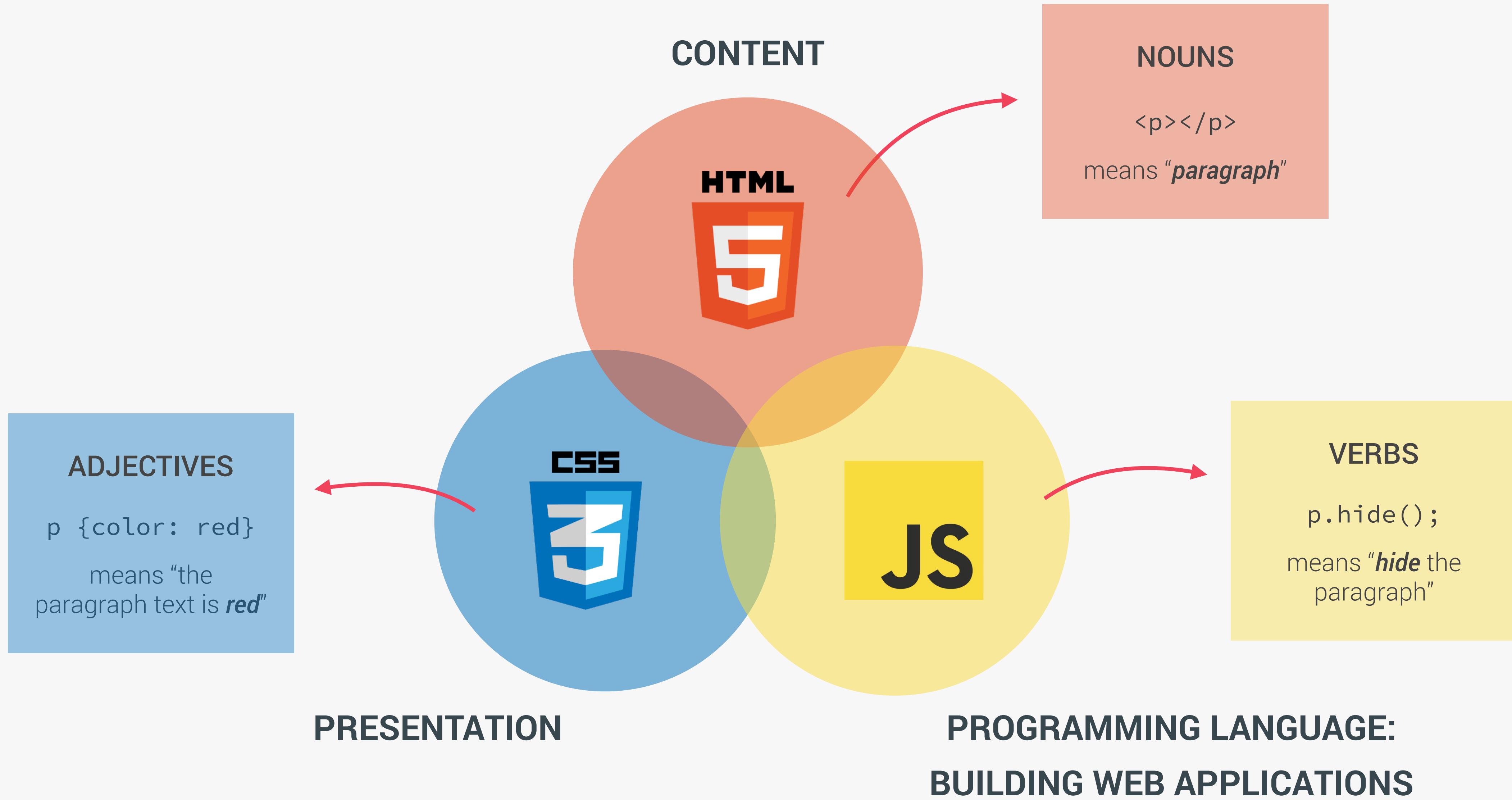
Instruct computer to *do things*

We don't have to worry about complex
stuff like memory management

We can use different styles
of programming



THE ROLE OF JAVASCRIPT IN WEB DEVELOPMENT



EXAMPLE OF DYNAMIC EFFECTS / WEB APPLICATION

The image shows a screenshot of the Twitter mobile application interface. On the left, a sidebar menu includes Home, Explore, Notifications (16), Messages, Bookmarks, Lists, Profile (highlighted in green), and More. A red arrow points from the 'Profile' section to a green 'Tweet' button at the bottom of the sidebar. Another red arrow points from the 'Profile' section to a green circular loading indicator on the main profile page. On the right, the main profile page for 'Jonas Schmedtmann' (@jonasschmedtmann) is displayed. It features a banner for 'CODING COURSES DONE RIGHT.', a profile picture, and a bio: 'Developer. Designer. Online teacher.' Below the bio are statistics: 37 Following and 19.4K Followers. At the bottom of the profile page, there are tabs for Tweets, Tweets & replies, Media, and Likes. A red arrow points from the 'Tweets' tab to a green circular loading indicator. In the background, a search bar shows 'Search Twitter' and a card for 'Node.js, Express, MongoDB & More: The Complete Bootcamp'. Red arrows point from the top of this card to the top of the sidebar and the bottom of the sidebar. At the very bottom of the screen, there are links for Terms, Privacy policy, Cookies, Ads info, and More.

Show spinner + loading data in the background

Show tweet box after clicking

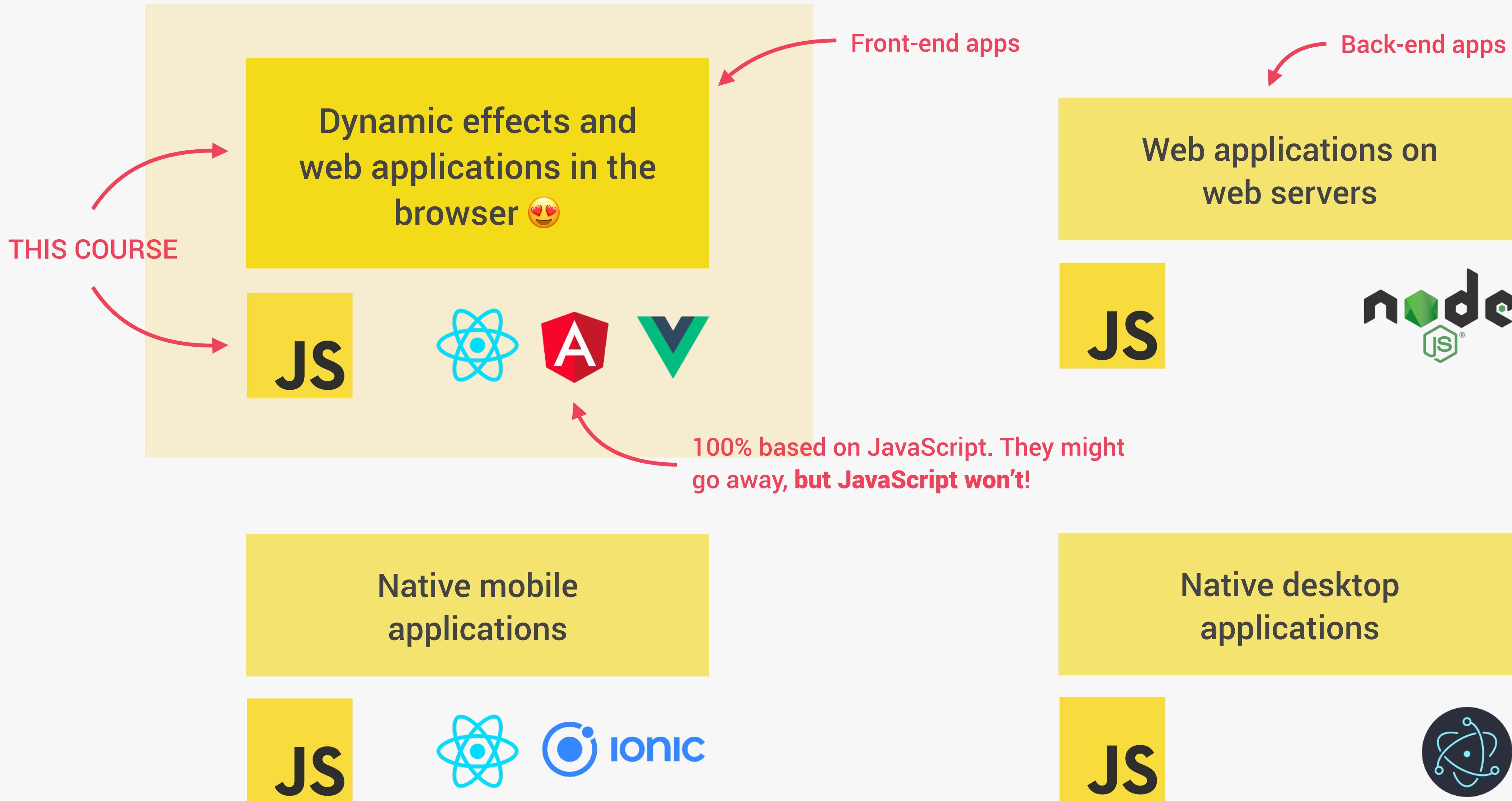
Show tweets after loading data

Display user info on hover

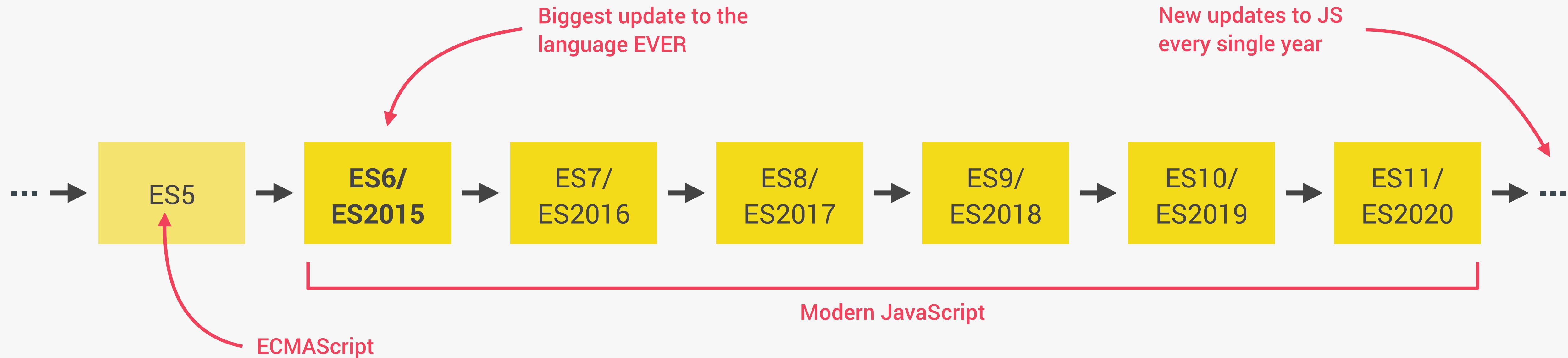
Show spinner + loading data in the background

Show data after loading

THERE IS NOTHING YOU CAN'T DO WITH JAVASCRIPT (WELL, ALMOST...)



JAVASCRIPT RELEASES... (MORE ABOUT THIS LATER)



Learn **modern JavaScript from the beginning**, but without forgetting the older parts!



Let's finally get started!



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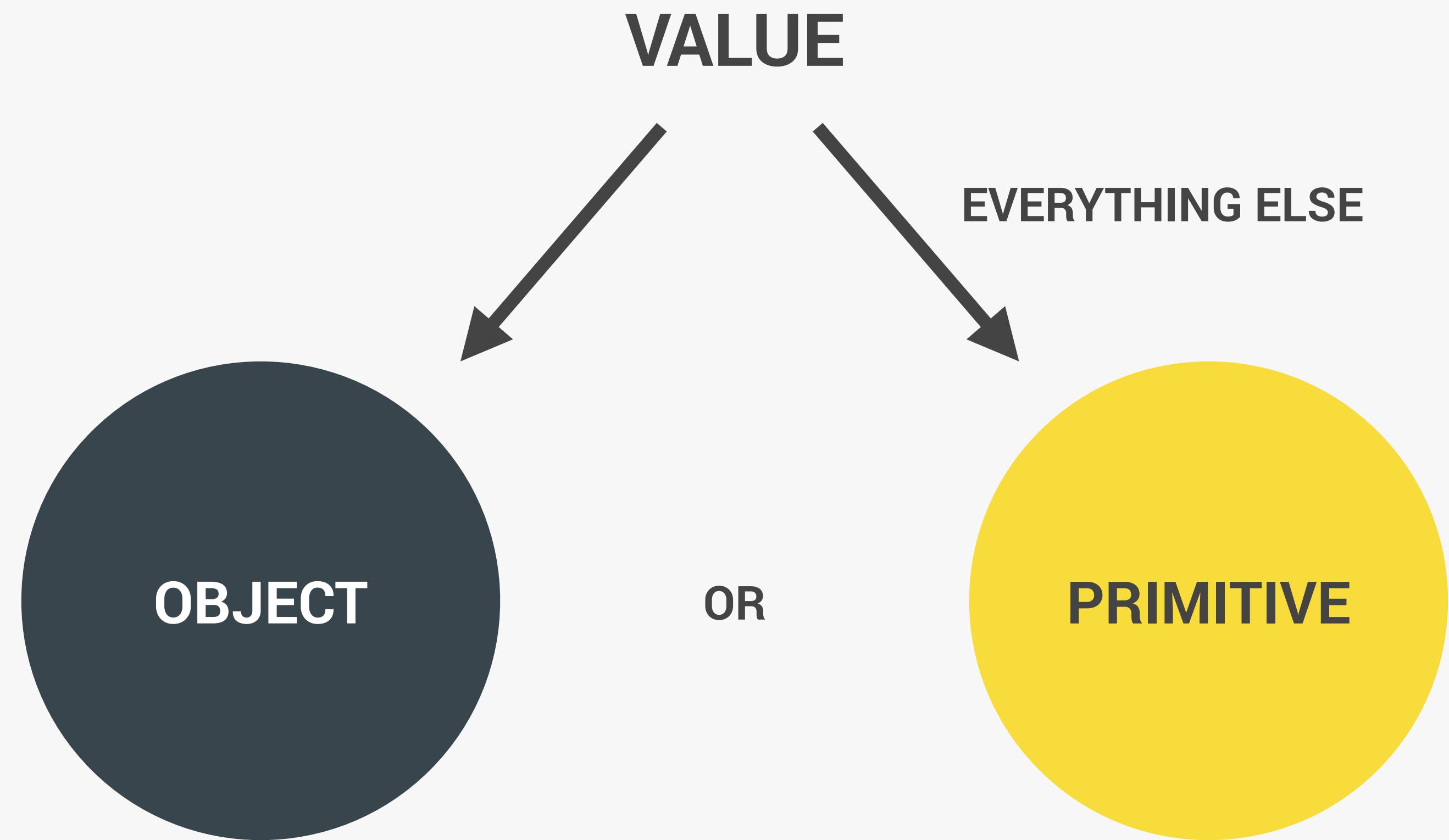
JAVASCRIPT FUNDAMENTALS - PART 1

LECTURE

DATA TYPES

JS

OBJECTS AND PRIMITIVES



```
let me = {  
  name: 'Jonas'  
};
```

```
let firstName = 'Jonas';  
let age = 30;
```

THE 7 PRIMITIVE DATA TYPES

1. **Number:** Floating point numbers ➡ Used for decimals and integers

```
let age = 23;
```

2. **String:** Sequence of characters ➡ Used for text

```
let firstName = 'Jonas';
```

3. **Boolean:** Logical type that can only be true or false ➡ Used for taking decisions

```
let fullAge = true;
```

4. **Undefined:** Value taken by a variable that is not yet defined ('empty value')

```
let children;
```

5. **Null:** Also means 'empty value'

6. **Symbol (ES2015):** Value that is unique and cannot be changed [Not useful for now]

7. **BigInt (ES2020):** Larger integers than the Number type can hold



JavaScript has dynamic typing: We do **not** have to manually define the data type of the value stored in a variable. Instead, data types are determined **automatically**.



Value has type, NOT variable!



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JAVASCRIPT FUNDAMENTALS - PART 1

LECTURE

BOOLEAN LOGIC

JS

BASIC BOOLEAN LOGIC: THE AND, OR & NOT OPERATORS

A AND B

"Sarah has a driver's license
AND good vision"

A OR B

"Sarah has a driver's license
OR good vision"

NOT A, NOT B



Possible values

		A
AND		TRUE FALSE
B	TRUE	TRUE FALSE
	FALSE	FALSE FALSE

Results of operation, depending on 2 variables

true when **ALL** are true

No matter how many variables

A

OR		TRUE FALSE
B	TRUE	TRUE TRUE
	FALSE	TRUE FALSE

true when **ONE** is true

Inverts **true/false** value

👉 EXAMPLE:

A: Sarah has a driver's license

B: Sarah has good vision

Boolean variables that can be either TRUE or FALSE

AN EXAMPLE



BOOLEAN VARIABLES

- 👉 A: Age is greater or equal 20
- 👉 B: Age is less than 30

false

true

age = 16

		A	B	
		AND	TRUE	FALSE
A	TRUE	TRUE	FALSE	
	FALSE	FALSE	FALSE	

LET'S USE OPERATORS!

- 👉 !A

true

false

- 👉 A AND B

false

true

false

- 👉 A OR B

false

true

true

- 👉 !A AND B

true

true

true

- 👉 A OR !B

false

false

false

		A	B	
		OR	TRUE	FALSE
A	TRUE	TRUE	TRUE	
	FALSE	TRUE	FALSE	



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SECTION

JAVASCRIPT FUNDAMENTALS - PART 1

LECTURE

JAVASCRIPT RELEASES: ES5, ES6+
AND ESNEXT

JS

A BRIEF HISTORY OF JAVASCRIPT

1995

👉 Brendan Eich creates the **very first version of JavaScript in just 10 days**. It was called Mocha, but already had many fundamental features of modern JavaScript!



1996

👉 Mocha changes to LiveScript and then to JavaScript, in order to attract Java developers. However, **JavaScript has almost nothing to do with Java** 🤪

👉 Microsoft launches IE, **copying JavaScript from Netscape** and calling it JScript;



1997

👉 With a need to standardize the language, ECMA releases ECMAScript 1 (ES1), the first **official standard for JavaScript** (ECMAScript is the standard, JavaScript the language in practice);



2009

👉 ES5 (ECMAScript 5) is released with lots of great new features;

2015

👉 ES6/ES2015 (ECMAScript 2015) was released: **the biggest update to the language ever!**

👉 ECMAScript changes to an **annual release cycle** in order to ship less features per update 🙏

2016 – ∞

👉 Release of ES2016 / ES2017 / ES2018 / ES2019 / ES2020 / ES2021 / ... / ES2089 😅

BACKWARDS COMPATIBILITY: DON'T BREAK THE WEB!

```
// ES1 Code  
function add(n) {  
  var x = 5 + add.arguments[0];  
  return x;  
}
```

1997



BACKWARDS
COMPATIBLE

Modern JavaScript
Engine

2020

DON'T BREAK THE WEB!

- 👉 Old features are **never** removed;
- 👉 Not really new versions, just **incremental updates** (releases)
- 👉 Websites keep working **forever!**

Modern JavaScript
Engine

2020

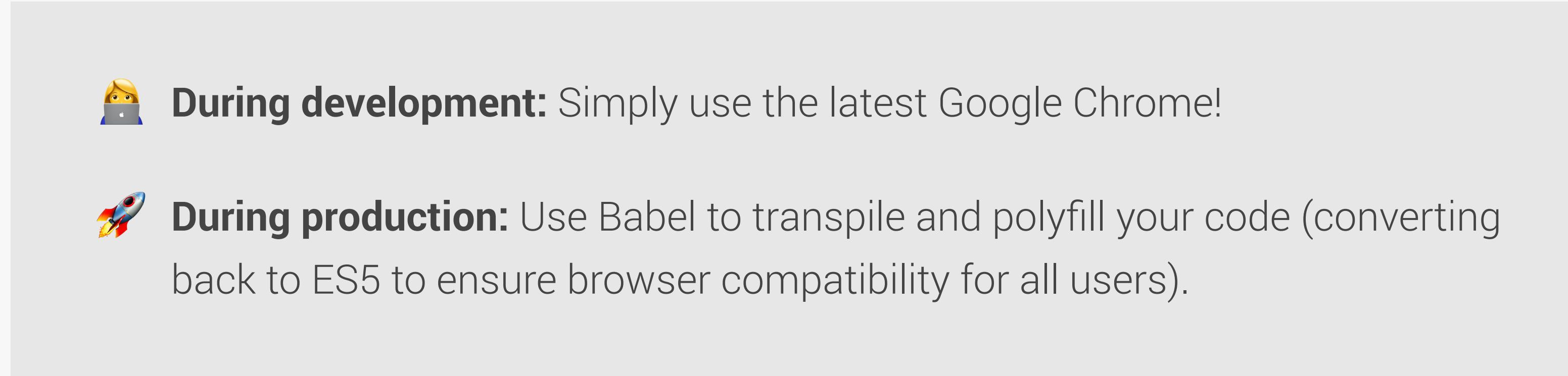
NOT FORWARDS
COMPATIBLE



```
// ES2089 Code 😂  
c int add n <=> int 5 + n
```

2089

HOW TO USE MODERN JAVASCRIPT TODAY


Feature name	Current browser	Trunk	Babel 6.2	Babel 7	Browser	Edge	Firefox ESR	Firefox Dev	IE 11	IE 12	IE 13	IE 14	IE 15	IE 16	IE 17	IE 18	IE 19	IE 20	IE 21	IE 22	IE 23	IE 24	IE 25	IE 26	IE 27	IE 28	IE 29	IE 30	IE 31	IE 32	IE 33	IE 34	IE 35	IE 36	IE 37	IE 38	IE 39	IE 40	IE 41	IE 42	IE 43	IE 44	IE 45	IE 46	IE 47	IE 48	IE 49	IE 50	IE 51	IE 52	IE 53	IE 54	IE 55	IE 56	IE 57	IE 58	IE 59	IE 60	IE 61	IE 62	IE 63	IE 64	IE 65	IE 66	IE 67	IE 68	IE 69	IE 70	IE 71	IE 72	IE 73	IE 74	IE 75	IE 76	IE 77	IE 78	IE 79	IE 80	IE 81	IE 82	IE 83	IE 84	IE 85	IE 86	IE 87	IE 88	IE 89	IE 90	IE 91	IE 92	IE 93	IE 94	IE 95	IE 96	IE 97	IE 98	IE 99	IE 100	IE 101	IE 102	IE 103	IE 104	IE 105	IE 106	IE 107	IE 108	IE 109	IE 110	IE 111	IE 112	IE 113	IE 114	IE 115	IE 116	IE 117	IE 118	IE 119	IE 120	IE 121	IE 122	IE 123	IE 124	IE 125	IE 126	IE 127	IE 128	IE 129	IE 130	IE 131	IE 132	IE 133	IE 134	IE 135	IE 136	IE 137	IE 138	IE 139	IE 140	IE 141	IE 142	IE 143	IE 144	IE 145	IE 146	IE 147	IE 148	IE 149	IE 150	IE 151	IE 152	IE 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582	IE 583	IE 584	IE 585	IE 586	IE 587	IE 588	IE 589	IE 590	IE 591	IE 592	IE 593	IE 594	IE 595	IE 596	IE 597	IE 598	IE 599	IE 600	IE 601	IE 602	IE 603	IE 604	IE 605	IE 606	IE 607	IE 608	IE 609	IE 610	IE 611	IE 612	IE 613	IE 614	IE 615	IE 616	IE 617	IE 618	IE 619	IE 620	IE 621	IE 622	IE 623	IE 624	IE 625	IE 626	IE 627	IE 628	IE 629	IE 630	IE 631	IE 632	IE 633	IE 634	IE 635	IE 636	IE 637	IE 638	IE 639	IE 640	IE 641	IE 642	IE 643	IE 644	IE 645	IE 646	IE 647	IE 648	IE 649	IE 650	IE 651	IE 652	IE 653	IE 654	IE 655	IE 656	IE 657	IE 658	IE 659	IE 660	IE 661	IE 662	IE 663	IE 664	IE 665	IE 666	IE 667	IE 668	IE 669	IE 670	IE 671	IE 672	IE 673	IE 674	IE 675	IE 676	IE 677	IE 678	IE 679	IE 680	IE 681	IE 682	IE 683	IE 684	IE 685	IE 686	IE 687	IE 688	IE 689	IE 690	IE 691	IE 692	IE 693	IE 694	IE 695	IE 696	IE 697	IE 698	IE 699	IE 700	IE 701	IE 702	IE 703	IE 704	IE 705	IE 706	IE 707	IE 708	IE 709	IE 710	IE 711	IE 712	IE 713	IE 714	IE 715	IE 716	IE 717	IE 718	IE 719	IE 720	IE 721	IE 722	IE 723	IE 724	IE 725	IE 726	IE 727	IE 728	IE 729	IE 730	IE 731	IE 732	IE 733	IE 734	IE 735	IE 736	IE 737	IE 738	IE 739	IE 740	IE 741	IE 742	IE 743	IE 744	IE 745	IE 746	IE 747	IE 748	IE 749	IE 750	IE 751	IE 752	IE 753	IE 754	IE 755	IE 756	IE 757	IE 758	IE 759	IE 760	IE 761	IE 762	IE 763	IE 764	IE 765	IE 766	IE 767	IE 768	IE 769	IE 770	IE 771	

MODERN JAVASCRIPT FROM THE BEGINNING



Learn **modern JavaScript from the beginning!**



But, also learn how some things used to be done **before** modern JavaScript (e.g. const & let vs var and function constructors vs ES6 class).

3 reasons why we should not forget the Good Ol' JavaScript:

- 👉 You will better understand how JavaScript actually works;
- 👉 Many tutorials and code you find online today are still in ES5;
- 👉 When working on old codebases, these will be written in ES5.

JAVASCRIPT FUNDAMENTALS – PART 2



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SECTION

JAVASCRIPT FUNDAMENTALS - PART 2

LECTURE

FUNCTIONS CALLING OTHER
FUNCTIONS

JS

CALLING A FUNCTION INSIDE A FUNCTION: DATA FLOW

```
const cutPieces = function (fruit) {  
    return fruit * 4;  
};  
  
const fruitProcessor = function (apples, oranges) {  
    const applePieces = cutPieces(apples);  
    const orangePieces = cutPieces(oranges);  
  
    const juice = `Juice with ${applePieces} pieces of  
apple and ${orangePieces} pieces of orange.`;  
    return juice;  
};  
  
console.log(fruitProcessor(2 [3]));
```

The diagram illustrates the data flow in the `fruitProcessor` function. It starts with two arguments: `apples` (value 8) and `oranges` (value 2). These values are passed to the `cutPieces` function, which returns `applePieces` (value 8) and `orangePieces` (value 2). These intermediate values are then used in the template string for `juice`. Finally, the `juice` string is returned by the `fruitProcessor` function and logged to the console.



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SECTION

JAVASCRIPT FUNDAMENTALS - PART 2

LECTURE

REVIEWING FUNCTIONS

JS

FUNCTIONS REVIEW: 3 DIFFERENT FUNCTION TYPES

👉 Function declaration

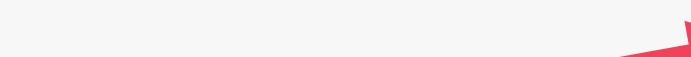
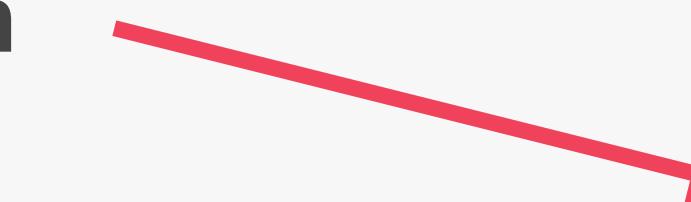
Function that can be used before it's declared

👉 Function expression

Essentially a function value stored in a variable

👉 Arrow function

Great for a quick one-line functions. Has no this keyword (more later...)



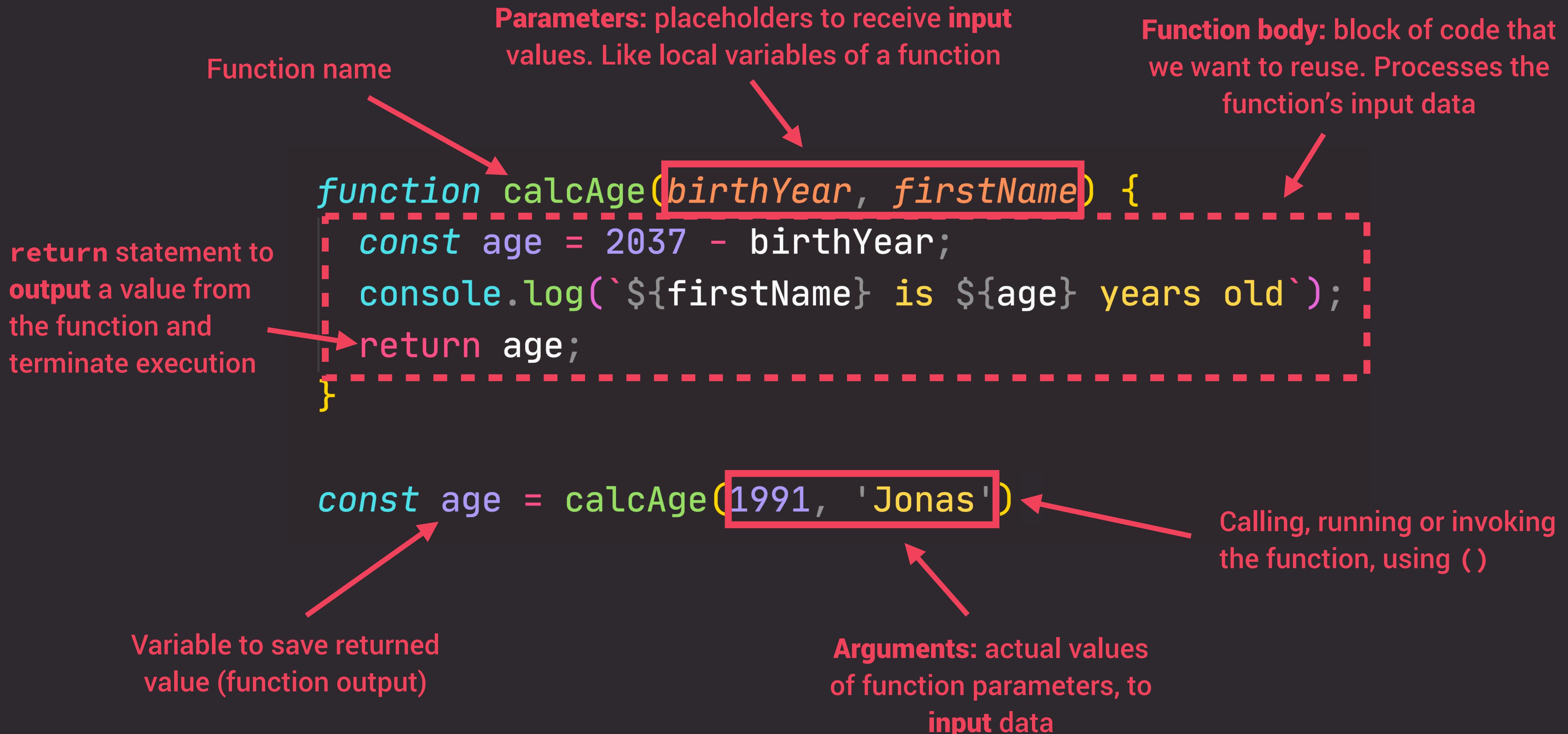
```
function calcAge(birthYear) {  
  return 2037 - birthYear;  
}
```

```
const calcAge = function (birthYear) {  
  return 2037 - birthYear;  
};
```

```
const calcAge = birthYear => 2037 - birthYear;
```

👉 Three different ways of writing functions, but they all work in a similar way: receive **input** data, **transform** data, and then **output** data.

FUNCTIONS REVIEW: ANATOMY OF A FUNCTION



DEVELOPER SKILLS & EDITOR SETUP



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SECTION

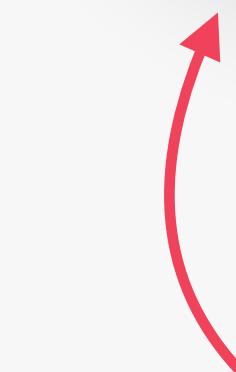
DEVELOPER SKILLS & EDITOR SETUP

LECTURE

LEARNING HOW TO CODE

JS

HOW TO FAIL 🤦 AT LEARNING HOW TO CODE



John
(not actually...)

- 💥 **He didn't have a clear goal** at the beginning of his journey
- 💥 **He started by watching courses and reading tutorials, but he would just copy the code without caring how it works.** Sometimes he would just copy and paste code!
- 💥 **He didn't reinforce** what he was learning by doing small challenges or taking notes
- 💥 **He didn't practice coding,** and didn't come up with his own project ideas
- 💥 **He quickly became frustrated** when his code was not perfectly clean or efficient
- 💥 **He lost motivation** because he thought he could never know everything
- 💥 **He was learning in isolation**
- 💥 After finishing a couple of courses, **he thought he now was a web developer** and could start applying to jobs. But he couldn't even build an app on his own!

HOW TO SUCCEED AT LEARNING HOW TO CODE

💥 He didn't have a **clear goal** at the beginning of his journey

↓ **FIX**

- 👉 Set a **specific, measurable, realistic and time-based** goal
- 👉 Know exactly **why** you are learning to code: Switching careers? Finding a better job?
- 👉 **Imagine a big project** you want to be able to build!
- 👉 Research technologies you need and then learn them

💥 He would just **copy the code without caring how it works**. Sometimes he would just copy and paste code!

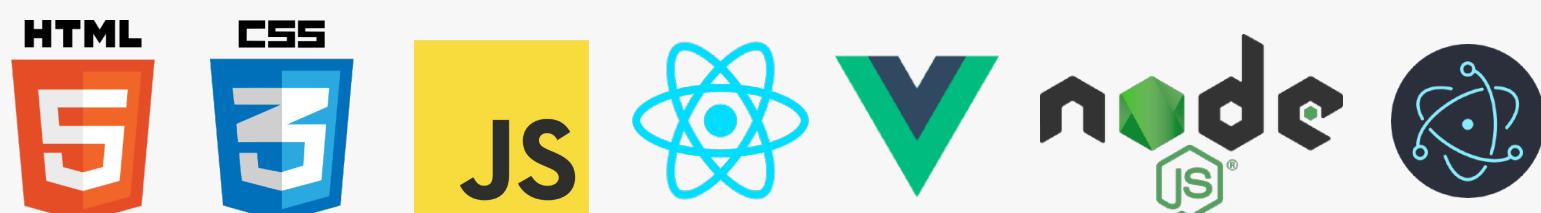
↓ **FIX**

- 👉 Understand the code that you're studying and typing
- 👉 **Always type the code**, don't copy-paste!

💥 He didn't reinforce what he was learning by doing small challenges or taking notes

↓ **FIX**

- 👉 After you learn a new feature or concept, **use it immediately**
- 👉 Take notes
- 👉 **Challenge yourself** and practice with small coding exercises and challenges
- 👉 Don't be in a hurry to complete the course fast!



PAUSE THE VIDEO
FOR CHALLENGE

codewars 

HOW TO SUCCEED AT LEARNING HOW TO CODE

💥 He **didn't practice coding**, and didn't come up with his own project ideas

↓ **FIX**

👍 Practicing on your own is the most important thing to do

👍 **This is NOT optional!** Without **practice outside of courses**, you won't go anywhere!

👍 Come up with your own project ideas or copy popular sites or applications, or just parts of them in the beginning

👍 Don't be stuck in "tutorial hell"

💥 He **quickly became frustrated** when his code was not perfectly clean or efficient

↓ **FIX**

👍 **Don't get stuck** trying to write the perfect code!

👍 Just write tons of code, **no matter the quality!**

👍 Clean and efficient code will come with time

👍 You can always refactor code later

💥 He **lost motivation** because he thought he could never know everything

↓ **FIX**

👍 Embrace the fact that **you will never know everything**

👍 Just focus on what you need to achieve your goal!



getify
@getify

20+ yrs dev exp, 8 books w/ 100k+ copies sold, 300k+ hours watched of my videos, 4k+ taught in person...

And you know what? I still struggle to get my code to work and it's still a tedious slog. And my code still confuses me the next day.

You're not alone in these struggles.

1,601 3:33 PM - Mar 10, 2018



HOW TO SUCCEED AT LEARNING HOW TO CODE

💥 He was **learning in isolation**

↓ FIX

👉 Explain new concepts to other people. If you can explain it, you truly understand it!

👉 Share your goals to make **yourself accountable**

👉 Share your learning progress with the web dev community (#100DaysOfCode,  #CodeNewbie, #webdev, etc.)

💥 After finishing a couple of courses, **he thought he now was a web developer** and could start applying to jobs

↓ FIX

👉 The **biggest misconception** that people have!

👉 Courses are an amazing starting point, but are only the **beginning of your journey!**

NEXT SLIDE 

LEARNING HOW TO CODE IS HARD, BUT YOU CAN DO IT!





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SECTION

DEVELOPER SKILLS & EDITOR SETUP

LECTURE

HOW TO THINK LIKE A DEVELOPER:
BECOME A PROBLEM SOLVER!



HOW TO FAIL 🤦 AT SOLVING PROBLEMS



John can
code now 😊

WHENEVER JOHN ENCOUNTERS A PROBLEM:

- 💥 He jumps at the problem **without much thinking**
- 💥 He implements his solution in an **unstructured way**
- 💥 He **gets stressed out** when things don't work
- 💥 He is **too proud to research** solutions

↓ FIX

- 👍 Stay calm and slow down, don't just jump at a problem without a plan
- 👍 Take a very **logical and rational approach** (programming is just logic, in the end...)
- 👍 Use my **4-step framework** to solve any problem

NEXT SLIDE →

👉 Example: In an array of GPS coordinates, find the two closest points

4 STEPS TO SOLVE ANY PROBLEM

1

Make sure you 100% understand the problem. Ask the right questions to get a clear picture of the problem

EXAMPLE

Project Manager: “We need a function that reverses whatever we pass into it”

1

- 👉 What does “whatever” even mean in this context?
What should be reversed? **Answer:** Only strings, numbers, and arrays make sense to reverse...
- 👉 What to do if something else is passed in?
- 👉 What should be returned? Should it always be a string, or should the type be the same as passed in?
- 👉 How to recognize whether the argument is a number, a string, or an array?
- 👉 How to reverse a number, a string, and an array?

4 STEPS TO SOLVE ANY PROBLEM

1

Make sure you 100% understand the problem. Ask the right questions to get a clear picture of the problem



2

Divide and conquer: Break a big problem into smaller sub-problems.

2

SUB-PROBLEMS:

- 👉 Check if argument is a number, a string, or an array
- 👉 Implement reversing a number
- 👉 Implement reversing a string
- 👉 Implement reversing an array
- 👉 Return reversed value



Looks like a task list that we need to implement

EXAMPLE

Project Manager: “We need a function that reverses whatever we pass into it”

4 STEPS TO SOLVE ANY PROBLEM

1

Make sure you 100% understand the problem. Ask the right questions to get a clear picture of the problem



2

Divide and conquer: Break a big problem into smaller sub-problems.



3

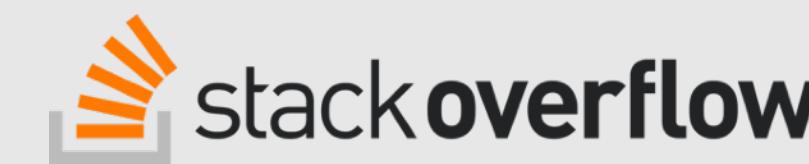
Don't be afraid to do as much research as you have to

EXAMPLE

Project Manager: “*We need a function that reverses whatever we pass into it*”

3

- 👉 How to check if a value is a number in JavaScript?
- 👉 How to check if a value is a string in JavaScript?
- 👉 How to check if a value is an array in JavaScript?
- 👉 How to reverse a number in JavaScript?
- 👉 How to reverse a string in JavaScript?
- 👉 How to reverse an array in JavaScript?



4 STEPS TO SOLVE ANY PROBLEM

1

Make sure you 100% understand the problem. Ask the right questions to get a clear picture of the problem



2

Divide and conquer: Break a big problem into smaller sub-problems.



3

Don't be afraid to do as much research as you have to



4

For bigger problems, write pseudo-code before writing the actual code

EXAMPLE

Project Manager: “We need a function that reverses whatever we pass into it”

4

```
function reverse(value)
  if value type !string && !number && !array
    return value

  if value type == string
    reverse string
  if value type == number
    reverse number
  if value type == array
    reverse array

  return reversed value
```




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SECTION

DEVELOPER SKILLS & EDITOR SETUP

LECTURE

DEBUGGING (FIXING ERRORS)

JS

WHAT IS A SOFTWARE BUG?

- 👉 **Software bug:** Defect or problem in a computer program.
Basically, any **unexpected or unintended behavior** of a computer program is a software bug.

- 👉 Bugs are **completely normal** in software development!

- 👉 Previous example: “We need a function that reverses whatever we pass into it”

```
reverse([1, 3, 5, 7])
```



```
[5, 1, 7, 3]
```



Unexpected result: the array is scrambled, NOT reversed.
So there is a **bug** in the **reverse function** 🐛

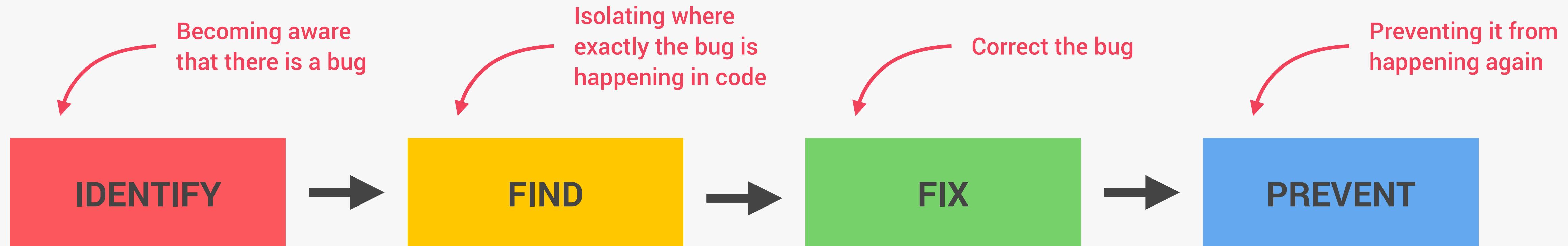
- 👉 Debugging: Process of finding, fixing and preventing bugs.

0800 Autan started
1000 " stopped - autan ✓
13" UC (032) MP - MC { 1.2700 9.037 847 025
033 PRO 2 1.982 647 000 9.037 846 995
2.130 476 415 4.615 925 055
const 2.130 676 415
Relays 6-2 in 033 failed special speed test
in relay " 10.000 test .
Relays changed
1100 Started Cosine Tape (Sine check)
1525 Started Multi Adder Test.
1545 Relay #70 Panel F
(moth) in relay.
First actual case of bug being found.
Autan started.
closed down.



A **real bug** which was causing an error in Harvard's computer in the 1940s

THE DEBUGGING PROCESS



- 👉 During development
- 👉 Testing software
- 👉 User reports during production
- 👉 Context: browsers, users, etc.

- 👉 Developer console (*simple* code)
- 👉 Debugger (*complex* code)

- 👉 Replace wrong solution with new correct solution

- 👉 Searching for the same bug in similar code
- 👉 Writing tests using testing software

JAVASCRIPT IN THE BROWSER: DOM AND EVENTS FUNDAMENTALS



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SECTION

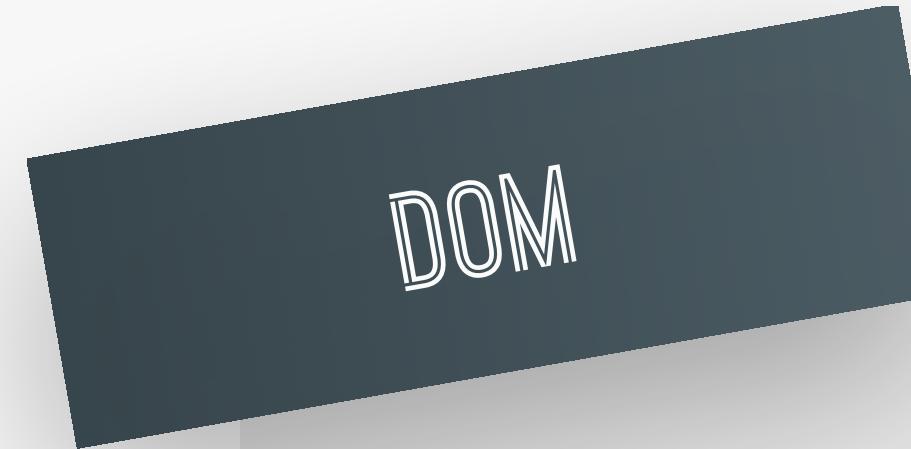
JAVASCRIPT IN THE BROWSER: DOM
AND EVENTS FUNDAMENTALS

LECTURE

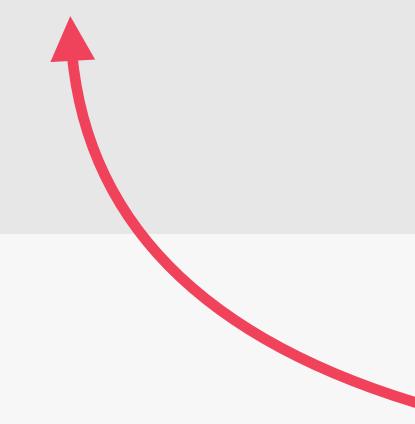
WHAT'S THE DOM AND DOM
MANIPULATION

JS

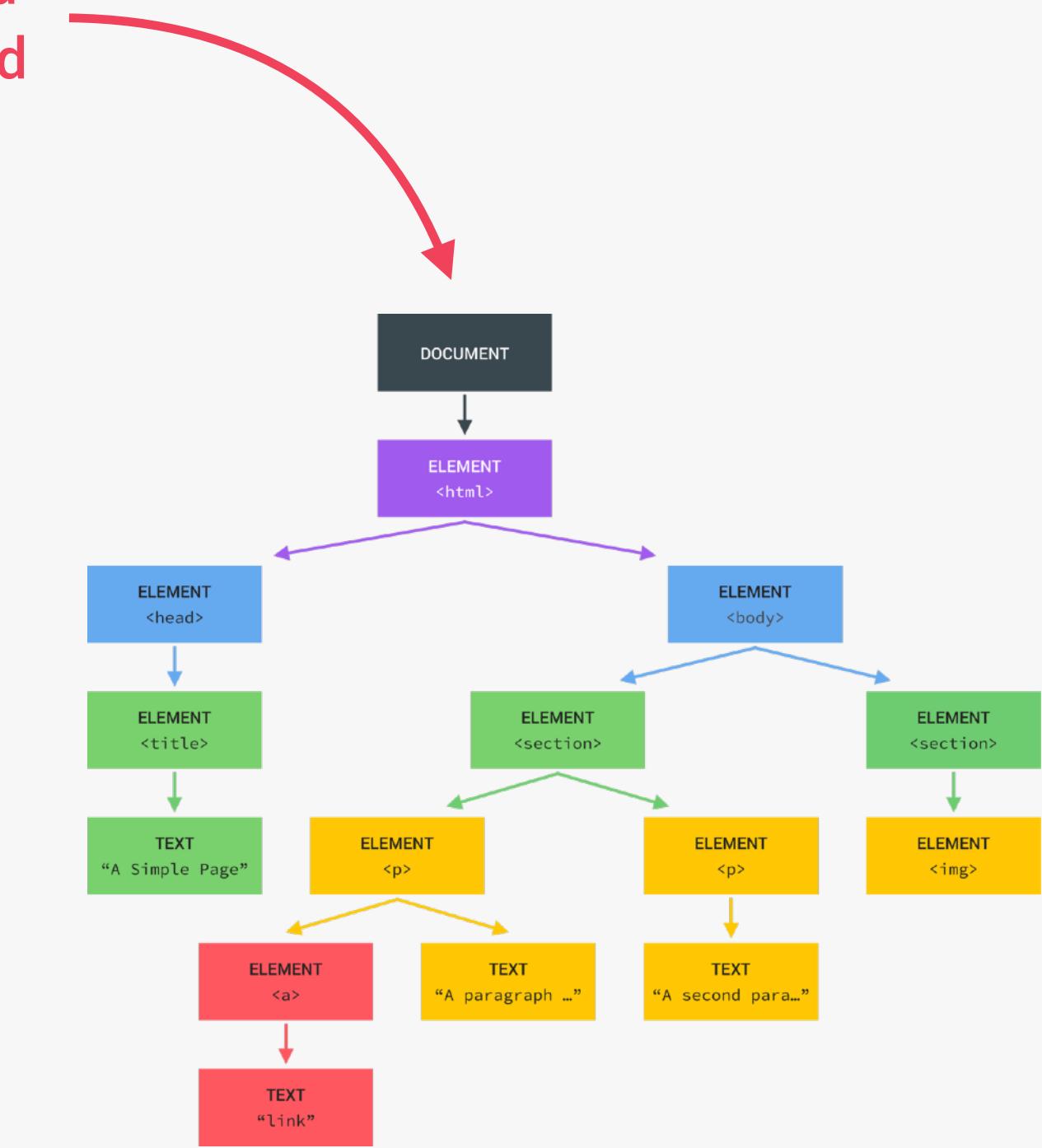
WHAT IS THE DOM?



DOCUMENT OBJECT MODEL: STRUCTURED REPRESENTATION OF HTML DOCUMENTS. ALLOWS JAVASCRIPT TO ACCESS HTML ELEMENTS AND STYLES TO MANIPULATE THEM.

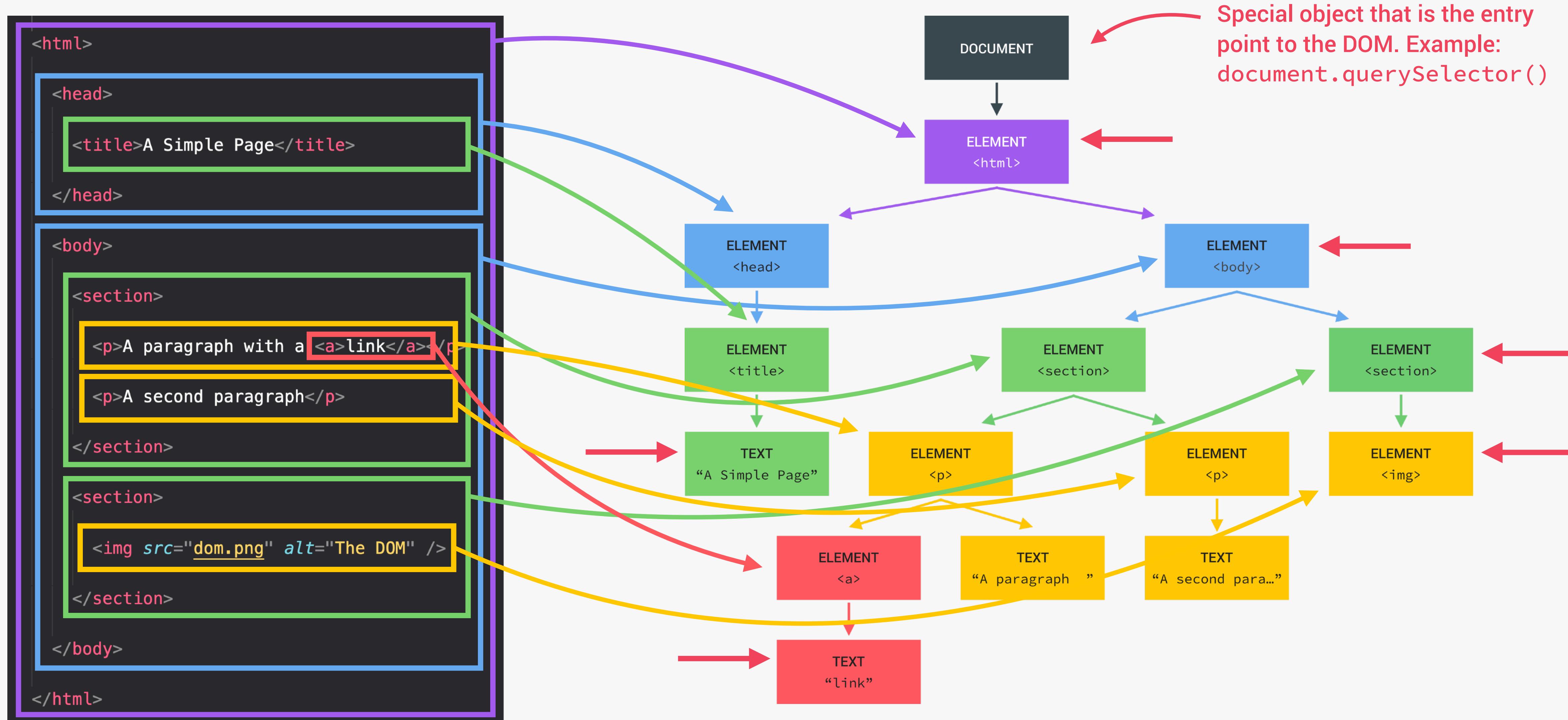


Tree structure, generated by browser on HTML load



Change text, HTML attributes, and even CSS styles

THE DOM TREE STRUCTURE



DOM != JAVASCRIPT



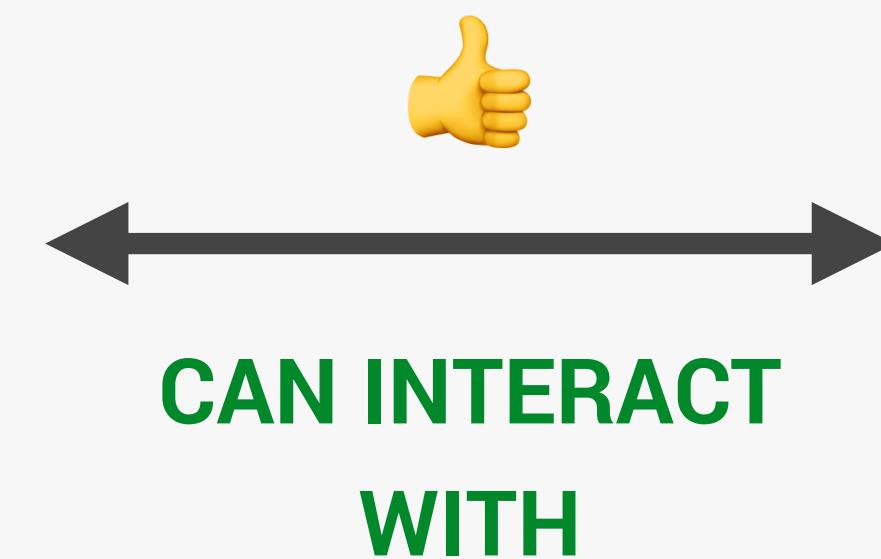
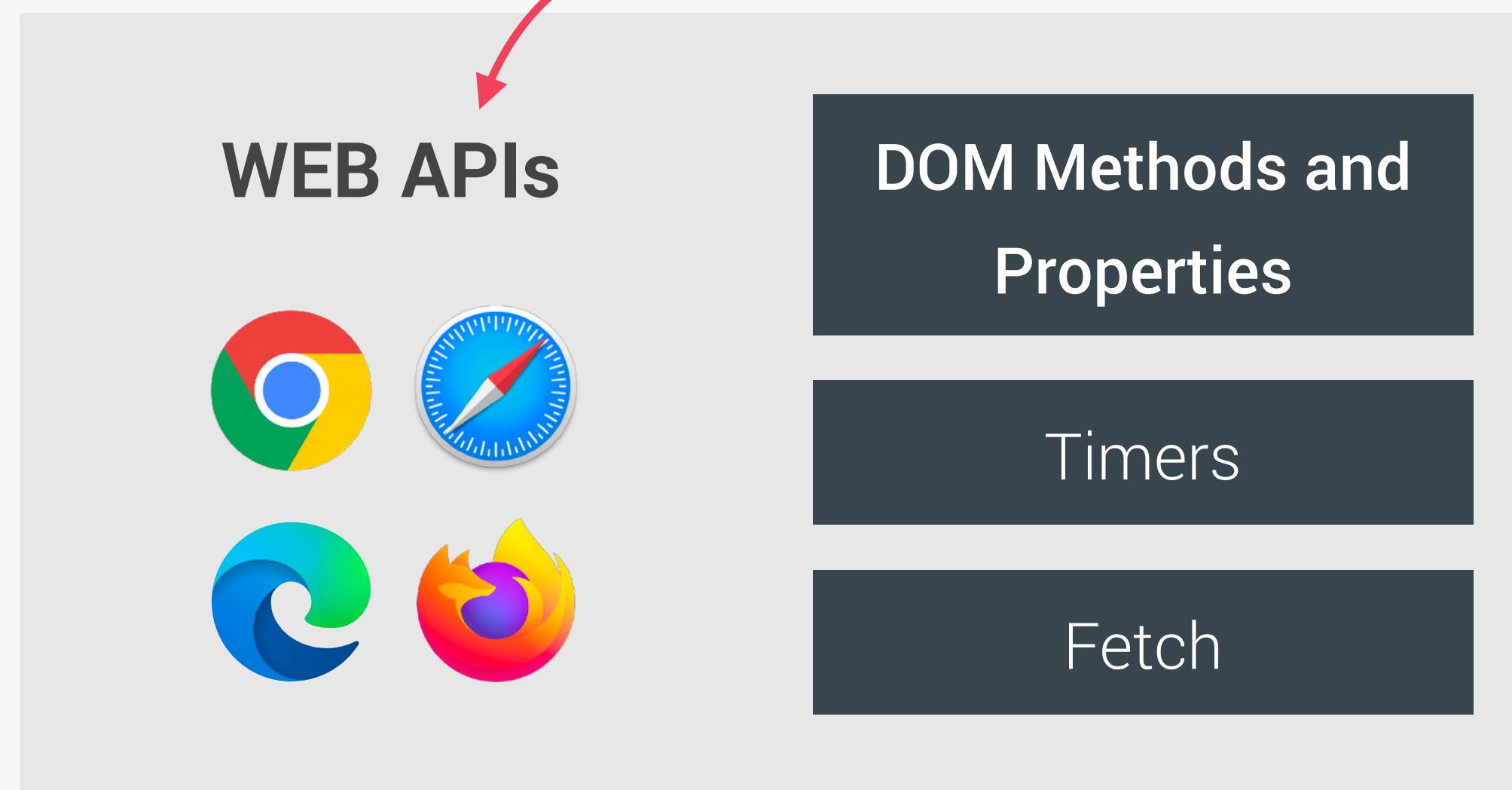
DOM Methods and
Properties for DOM
Manipulation



JS



For example
`document.querySelector()`



JS

HOW JAVASCRIPT
WORKS BEHIND THE
SCENES



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SECTION

HOW JAVASCRIPT WORKS BEHIND THE
SCENES

LECTURE

AN HIGH-LEVEL OVERVIEW OF
JAVASCRIPT

JS

WHAT IS JAVASCRIPT: REVISITED

JAVASCRIPT

JAVASCRIPT IS A HIGH-LEVEL,
OBJECT-ORIENTED, MULTI-PARADIGM
PROGRAMMING LANGUAGE.

JS

WHAT IS JAVASCRIPT: REVISITED

JAVASCRIPT

JAVASCRIPT IS A HIGH-LEVEL PROTOTYPE-BASED OBJECT-ORIENTED
MULTI-PARADIGM INTERPRETED OR JUST-IN-TIME COMPILED
DYNAMIC SINGLE-THREADED GARBAGE-COLLECTED PROGRAMMING
LANGUAGE WITH FIRST-CLASS FUNCTIONS AND A NON-BLOCKING
EVENT LOOP CONCURRENCY MODEL.



JS

DECONSTRUCTING THE MONSTER DEFINITION

High-level

Garbage-collected

Interpreted or just-in-time compiled

Multi-paradigm

Prototype-based object-oriented

First-class functions

Dynamic

Single-threaded

Non-blocking event loop

DECONSTRUCTING THE MONSTER DEFINITION

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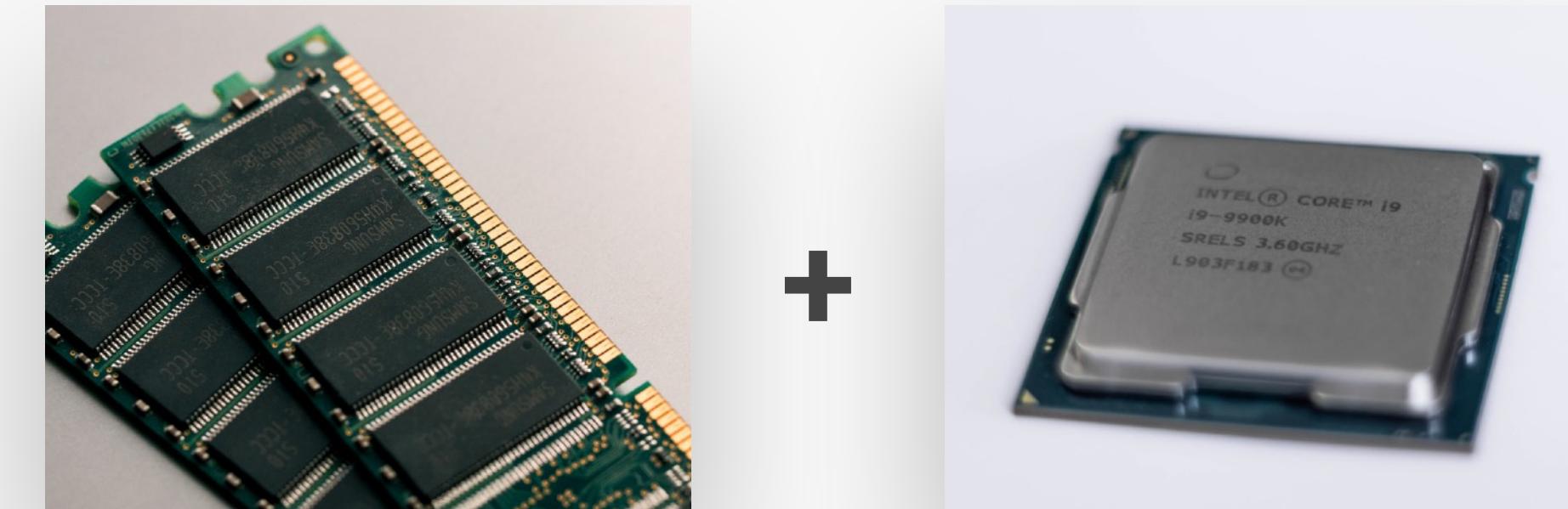
First-class functions

Dynamic

Single-threaded

Non-blocking event loop

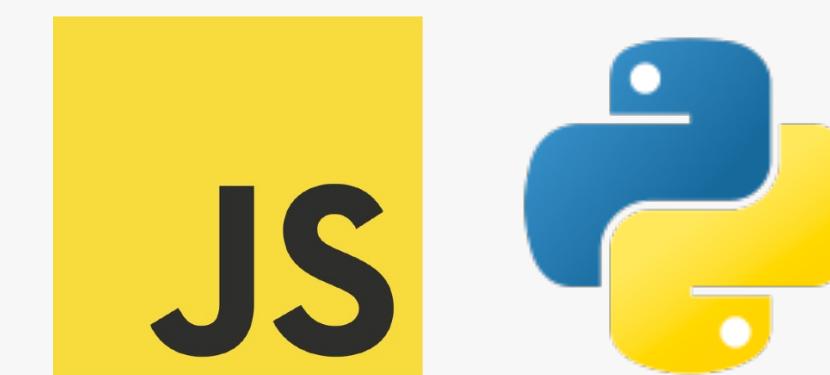
👉 Any computer program needs resources:



LOW-LEVEL



Developer has to manage
resources manually



HIGH-LEVEL



Developer does NOT have
to worry, everything
happens automatically

DECONSTRUCTING THE MONSTER DEFINITION

High-level

Garbage-collected

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Multi-paradigm

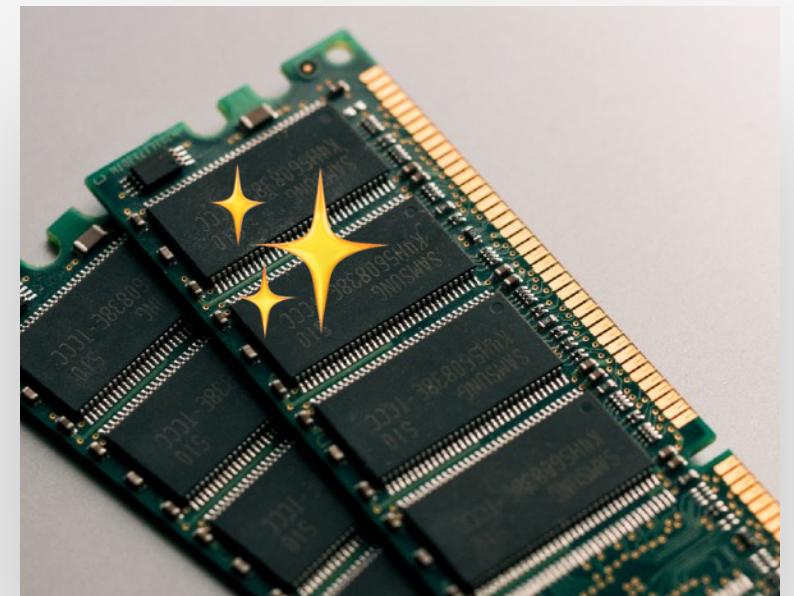
Prototype-based object-oriented

First-class functions

Dynamic

Single-threaded

Non-blocking event loop



Cleaning the memory
so we don't have to

DECONSTRUCTING THE MONSTER DEFINITION

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```
document.querySelector(".again").addEventListener("click", () => {
  document.querySelector(".message").textContent = "Start guessing...";
  document.querySelector(".number").textContent = "?";
  document.querySelector(".guess").value = "";
  score = 20;
  document.querySelector(".score").textContent = score;
  number = Math.floor(Math.random() * 20) + 1;
});
```

Abstraction over
0s and 1s

CONVERT TO MACHINE CODE = COMPILED

```
11010110101110101011101101100101110101010111101010
01111010101110101001001110101110101011100010101100010
1010010011101110111100111000001110101011110111010
110100100001010010111010101101010111010101101010010
00001110100100100111101010111010101110010101111010
100101010010011110100111010010101010010101001011010100
100101010010001111010000101011100010100010101110101101
1110010001000111101000101011100010100010101110101101
010100101010001010100011101001001011101010010001010110
11101010010111010100010101110101010101010101010101001
1110101001011101010001010111010101010101010101010101001
011101010111010101000101011101010101010101011100111010
1110101001110101000111010101010101010101010101010101010
```

Happens inside the
JavaScript engine

More about this **Later in this Section** 

DECONSTRUCTING THE MONSTER DEFINITION

High-level

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Non-blocking event loop

👉 **Paradigm:** An approach and mindset of structuring code, which will direct your coding style and technique.

The one we've been
using so far

1

Procedural programming

2

Object-oriented programming (OOP)

3

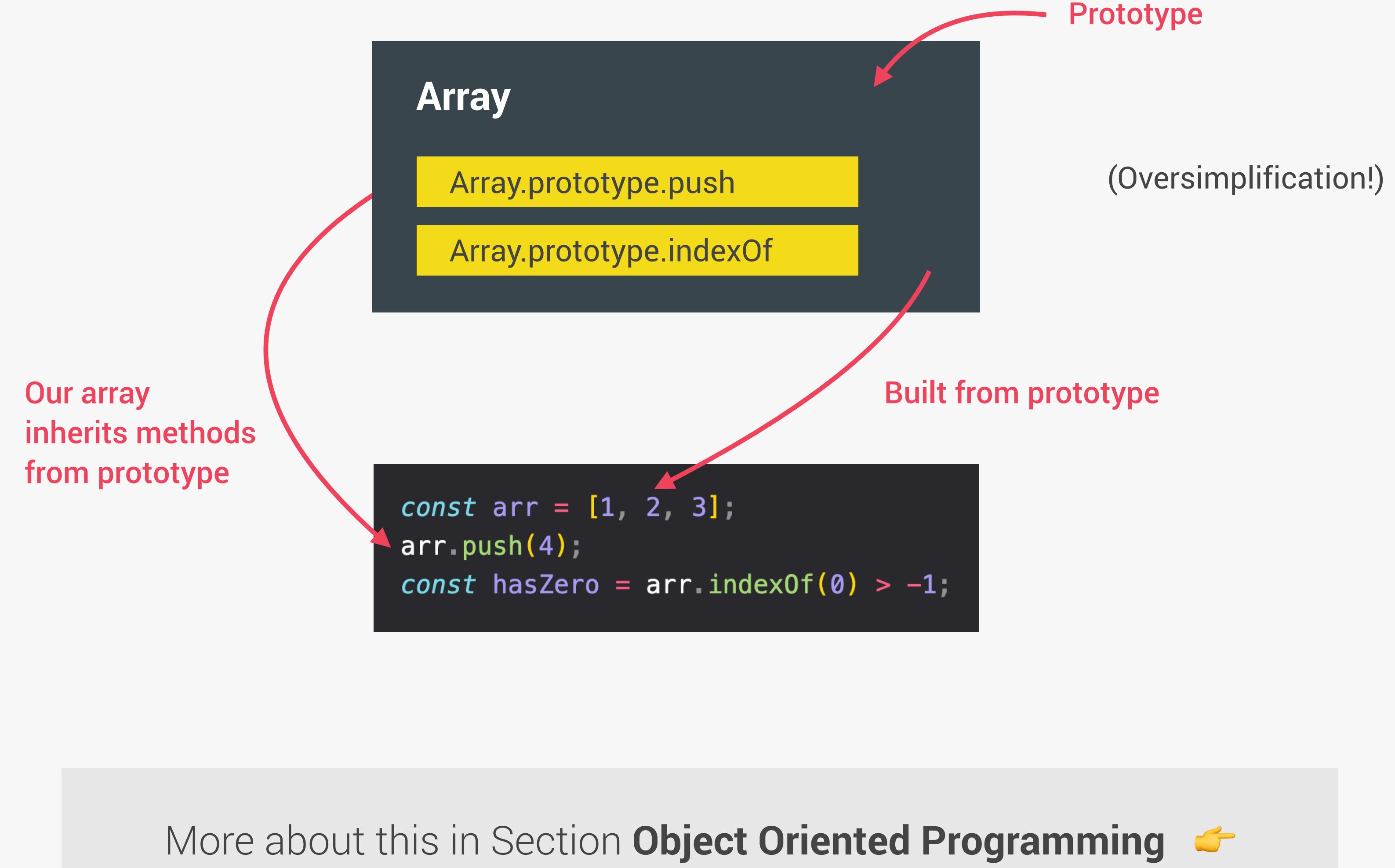
Functional programming (FP)

👉 Imperative vs.
👉 Declarative

More about this later in **Multiple Sections** 👉

DECONSTRUCTING THE MONSTER DEFINITION

- High-level
- Garbage-collected
- Interpreted or just-in-time compiled
- Multi-paradigm
- Prototype-based object-oriented
- First-class functions
- Dynamic
- Single-threaded
- Non-blocking event loop



DECONSTRUCTING THE MONSTER DEFINITION

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Non-blocking event loop

👉 In a language with **first-class functions**, functions are simply **treated as variables**. We can pass them into other functions, and return them from functions.

```
const closeModal = () => {  
  modal.classList.add("hidden");  
  overlay.classList.add("hidden");  
};  
  
overlay.addEventListener("click", closeModal);
```

Passing a function into another function as an argument:
First-class functions!

More about this in Section **A Closer Look at Functions** 👉

DECONSTRUCTING THE MONSTER DEFINITION

High-level

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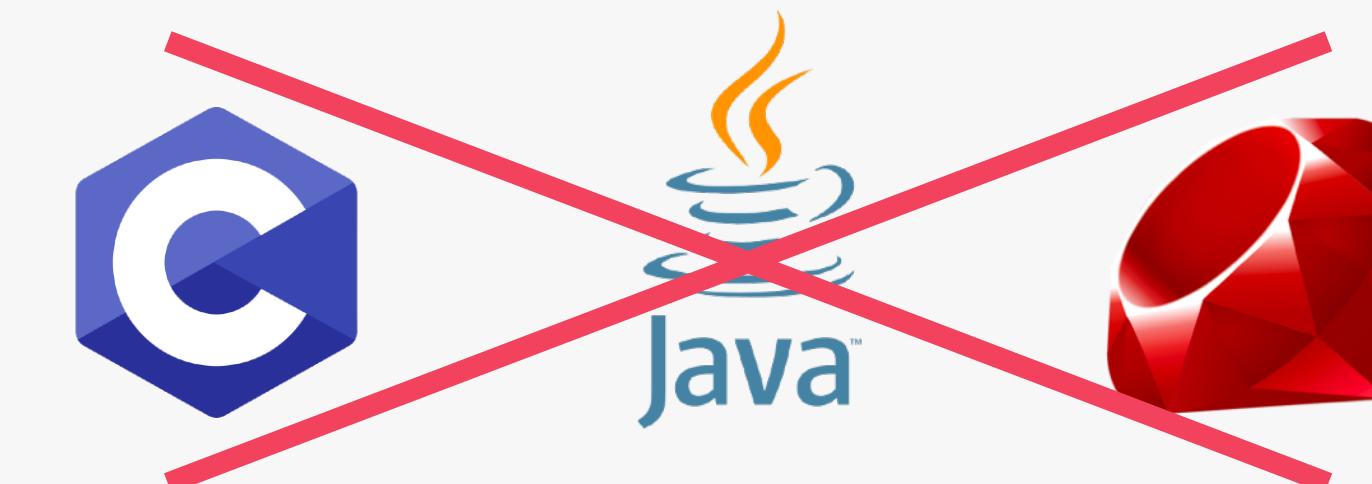
Non-blocking event loop

👉 **Dynamically-typed language:**

No data type definitions. Types becomes known at runtime

Data type of variable is automatically changed

```
let x = 23;  
let y = 19;  
x = "Jonas";
```



TS

DECONSTRUCTING THE MONSTER DEFINITION

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Non-blocking event loop

- 👉 **Concurrency model:** how the JavaScript engine handles multiple tasks happening at the same time.

↓ **Why do we need that?**

- 👉 JavaScript runs in one **single thread**, so it can only do one thing at a time.

↓ **So what about a long-running task?**

- 👉 Sounds like it would block the single thread. However, we want non-blocking behavior!

↓ **How do we achieve that?**

(Oversimplification!)

- 👉 By using an **event loop**: takes long running tasks, executes them in the “background”, and puts them back in the main thread once they are finished.

More about this **Later in this Section** ↗



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HOW JAVASCRIPT WORKS BEHIND THE
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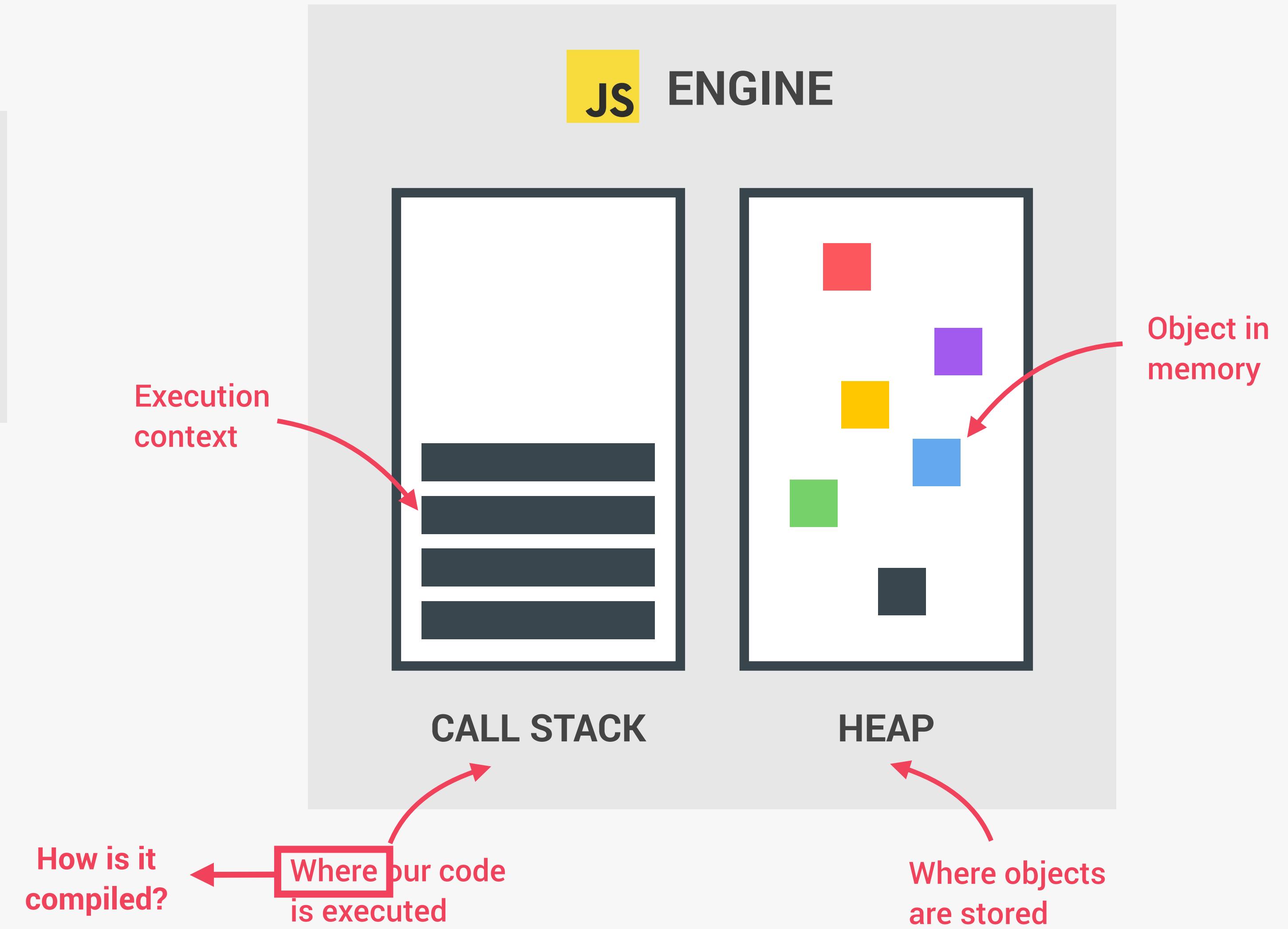
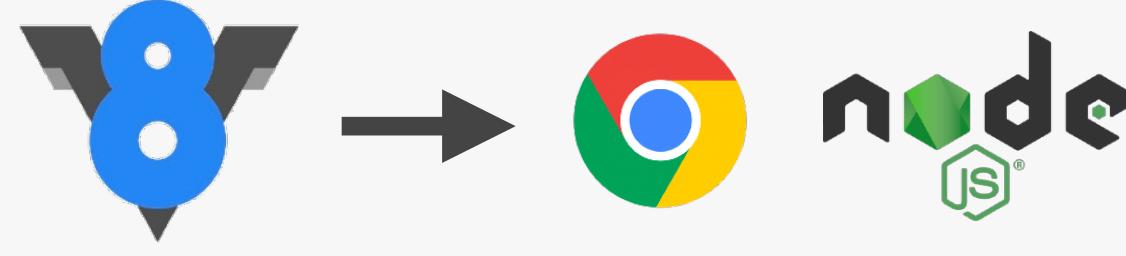
THE JAVASCRIPT ENGINE AND
RUNTIME

JS

WHAT IS A JAVASCRIPT ENGINE?



👉 Example: V8 Engine



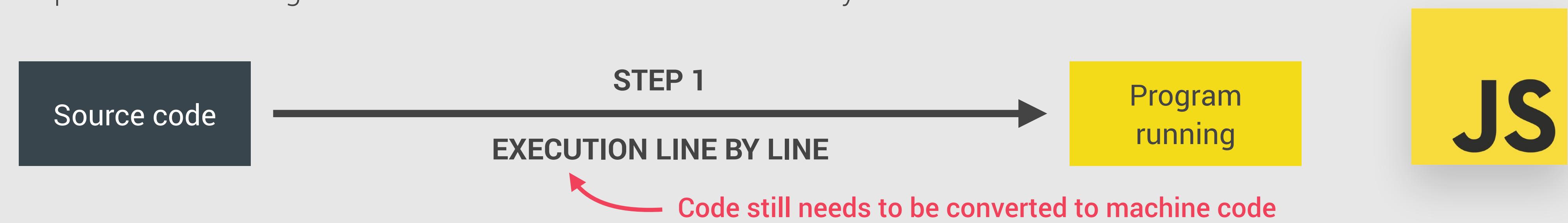
COMPUTER SCIENCE SIDENOTE: COMPIRATION VS. INTERPRETATION



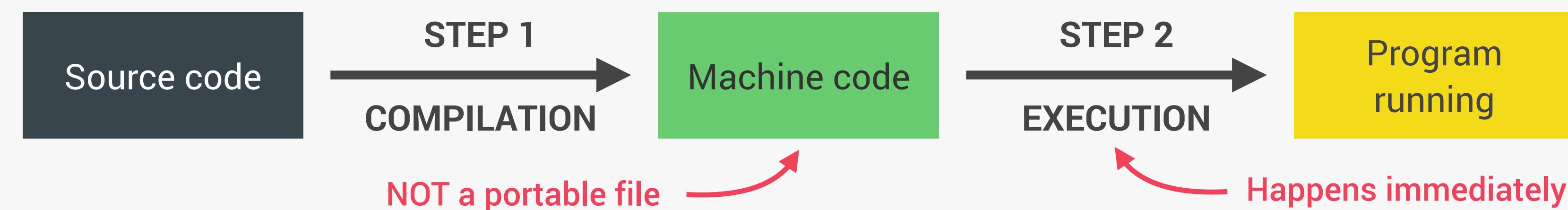
- 👉 **Compilation:** Entire code is converted into machine code at once, and written to a binary file that can be executed by a computer.



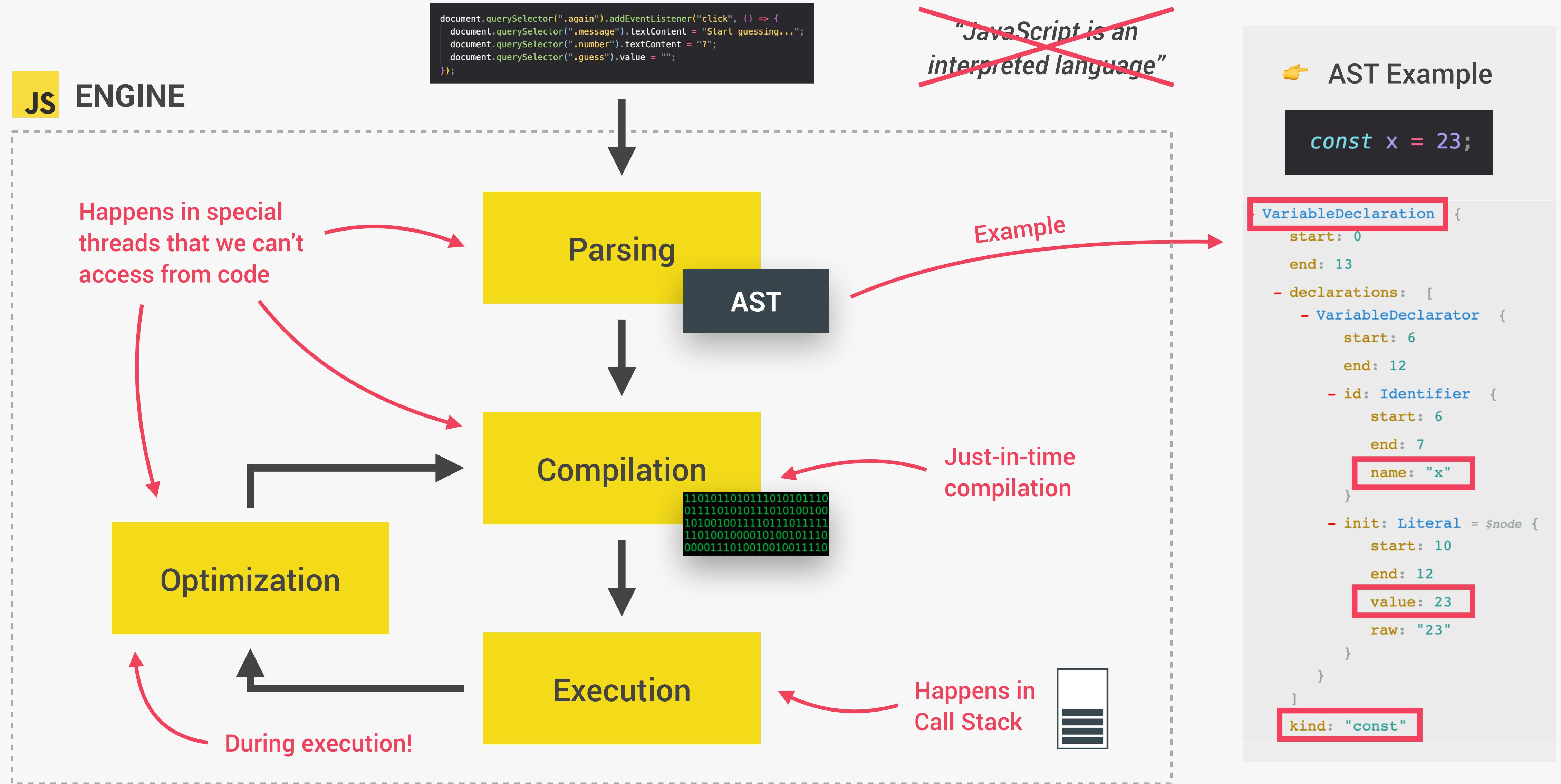
- 👉 **Interpretation:** Interpreter runs through the source code and executes it line by line.



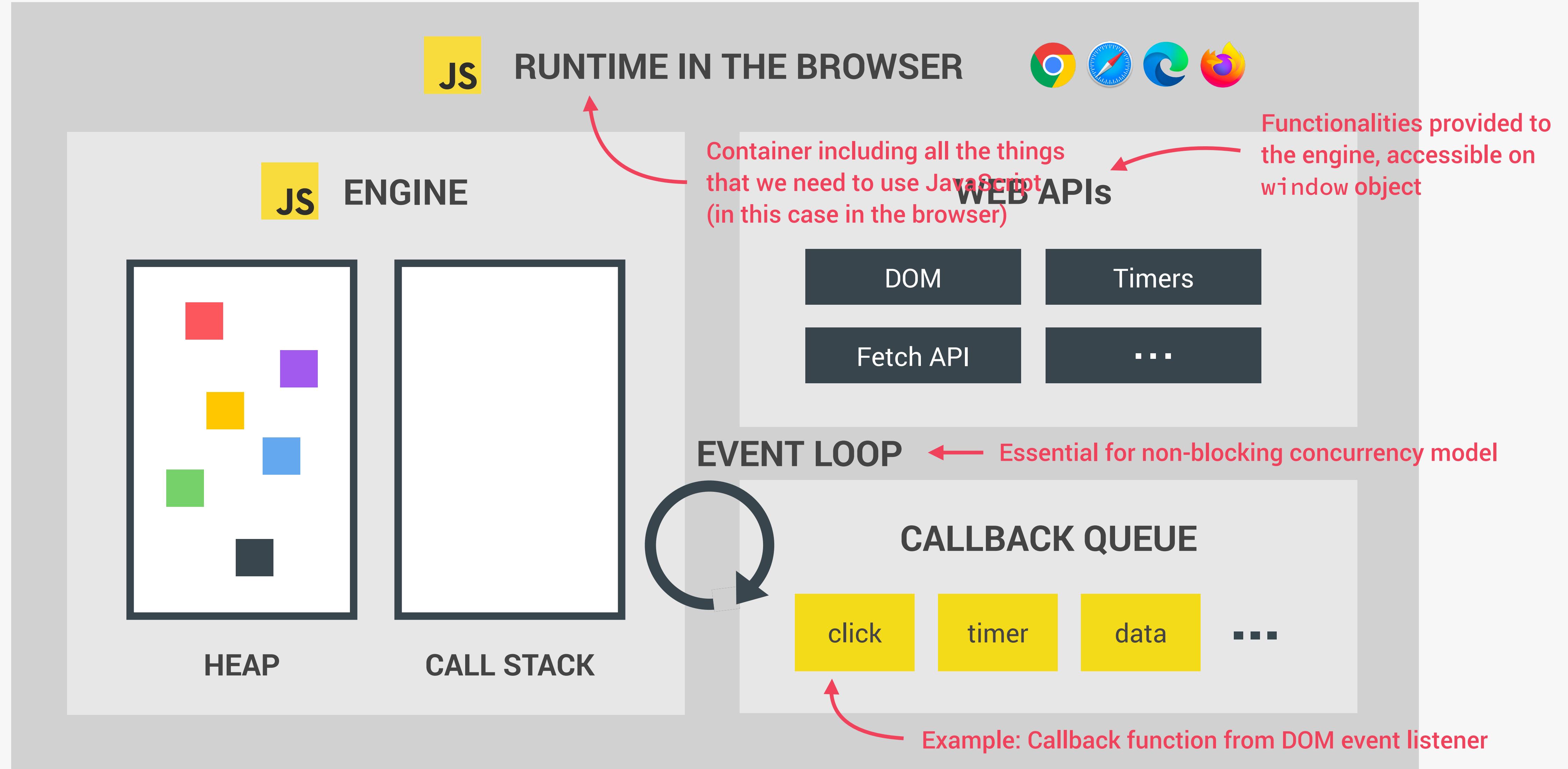
- 👉 **Just-in-time (JIT) compilation:** Entire code is converted into machine code at once, then executed immediately.



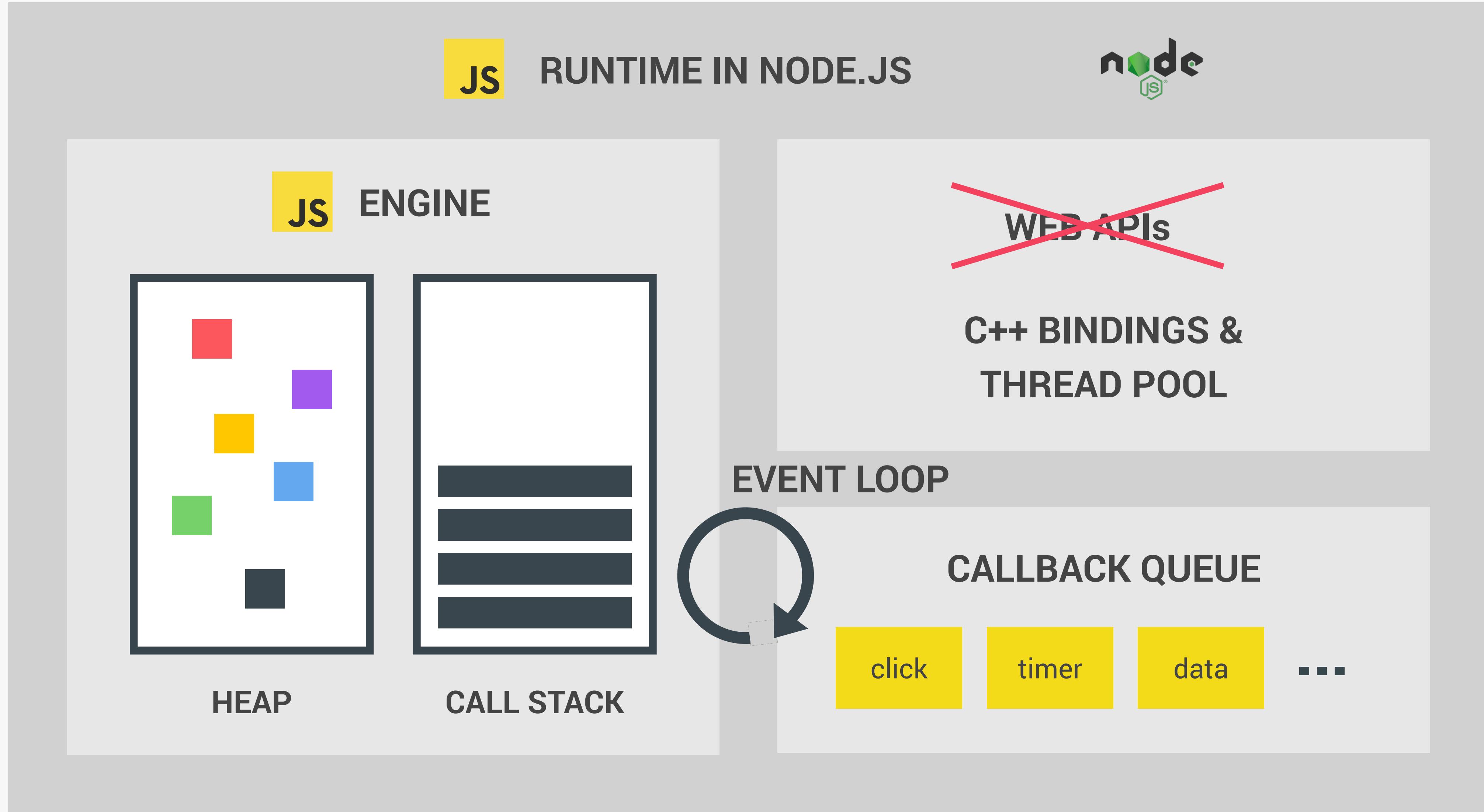
MODERN JUST-IN-TIME COMPIRATION OF JAVASCRIPT



THE BIGGER PICTURE: JAVASCRIPT RUNTIME



THE BIGGER PICTURE: JAVASCRIPT RUNTIME





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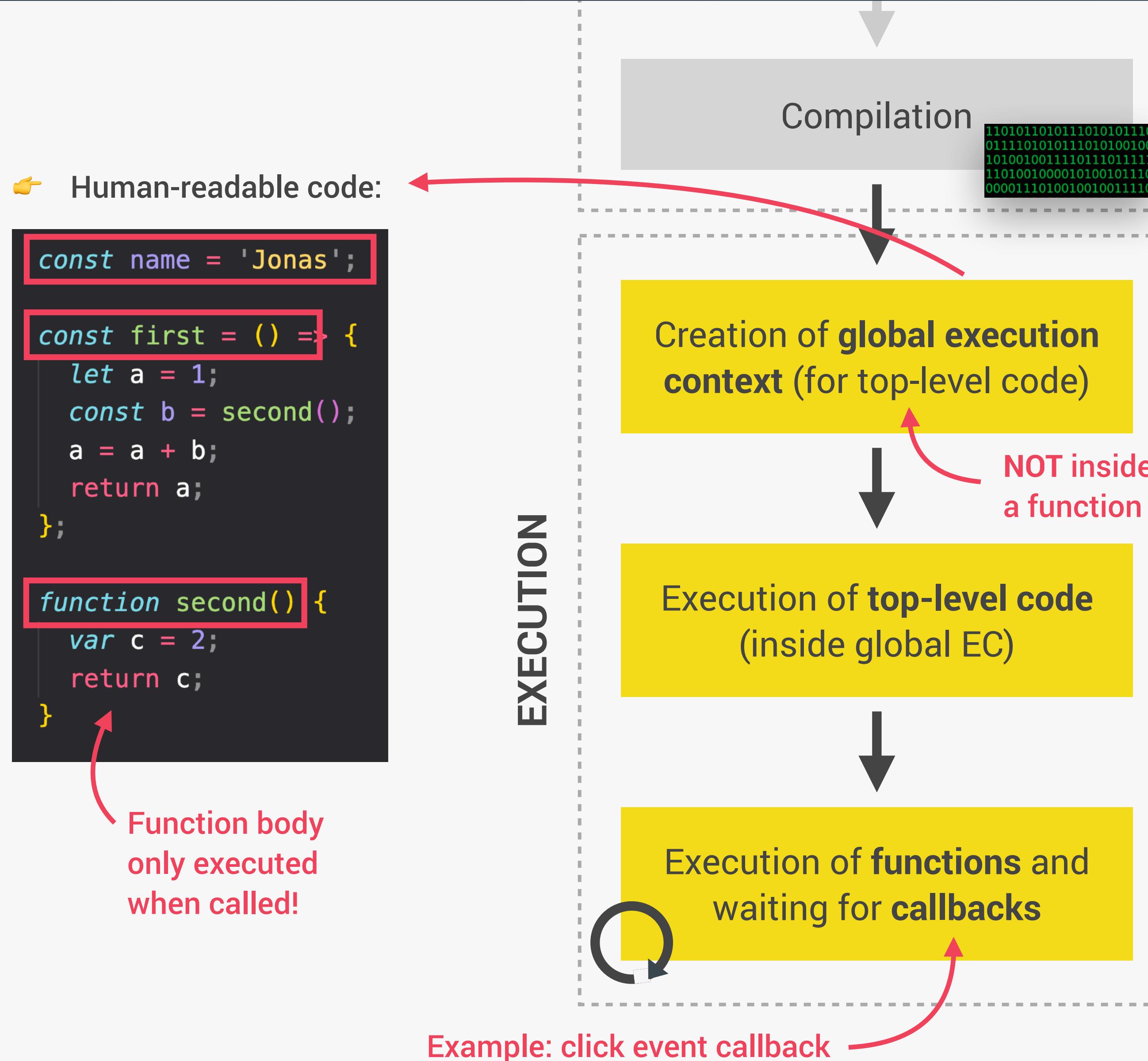
HOW JAVASCRIPT WORKS BEHIND THE
SCENES

LECTURE

EXECUTION CONTEXTS AND THE
CALL STACK

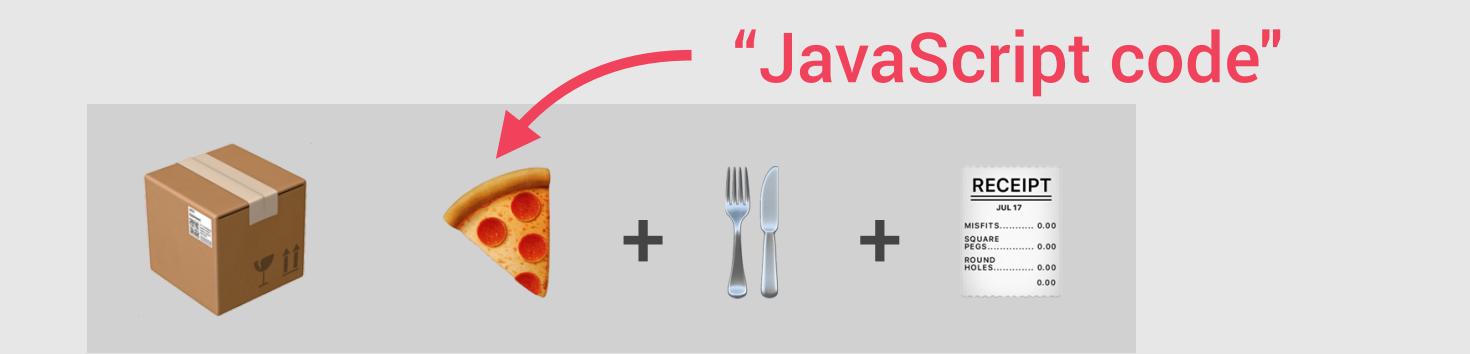
JS

WHAT IS AN EXECUTION CONTEXT?



EXECUTION CONTEXT

Environment in which a piece of JavaScript is executed. Stores all the necessary information for some code to be executed.



- 👉 Exactly one global execution context (EC): Default context, created for code that is not inside any function (top-level).
 - 👉 One execution context per function: For each function call, a new execution context is created.
- All together make the call stack

EXECUTION CONTEXT IN DETAIL

WHAT'S INSIDE EXECUTION CONTEXT?

1 Variable Environment

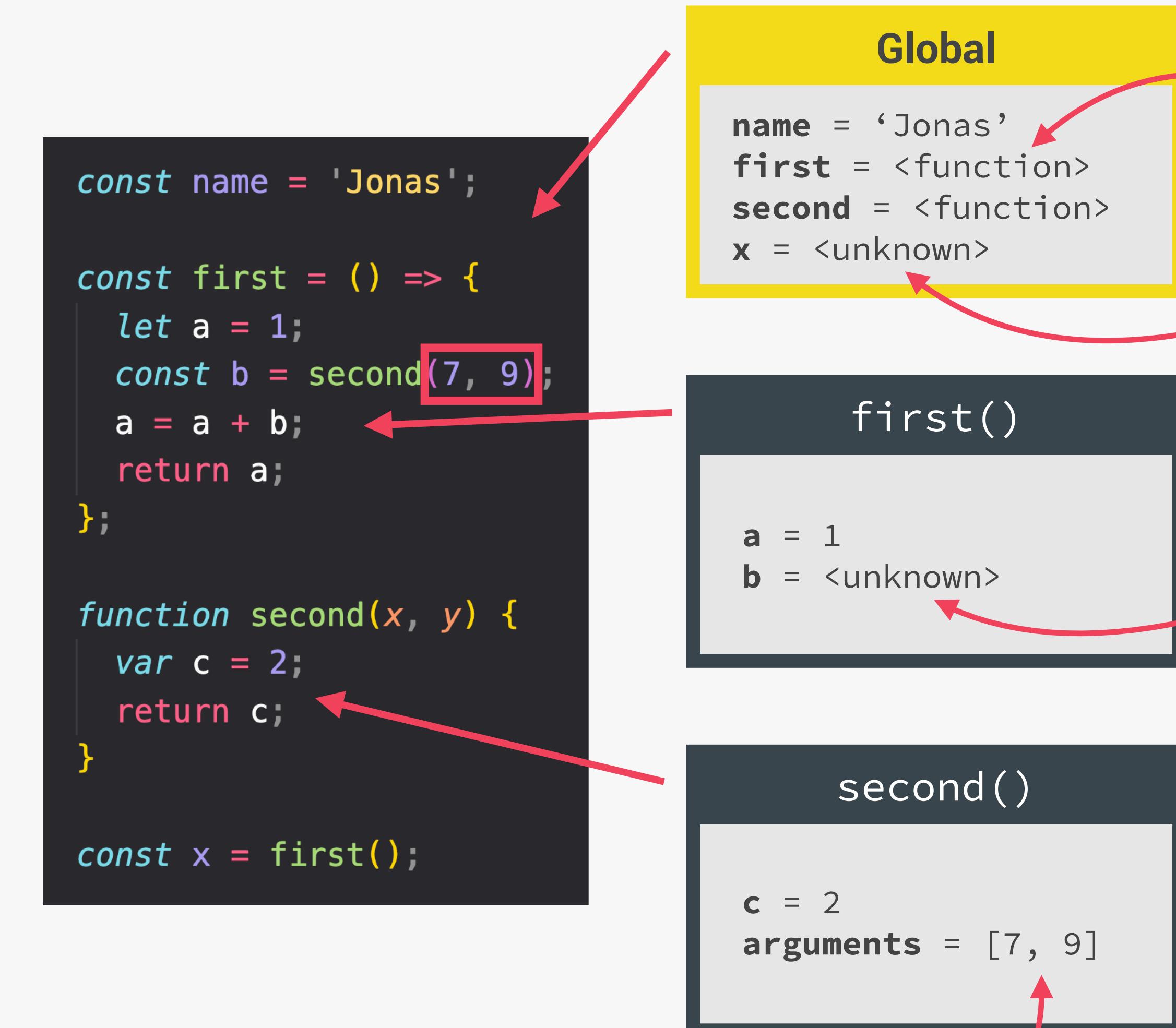
- 👉 let, const and var declarations
- 👉 Functions
- 👉 ~~arguments~~ object

2 Scope chain

3 ~~this~~ keyword

NOT in arrow functions!

Generated during “creation phase”, right before execution



Literally the function code

Need to run first() first

Need to run second() first

Array of passed arguments. Available in all “regular” functions (not arrow)

(Technically, values only become known during execution)

THE CALL STACK

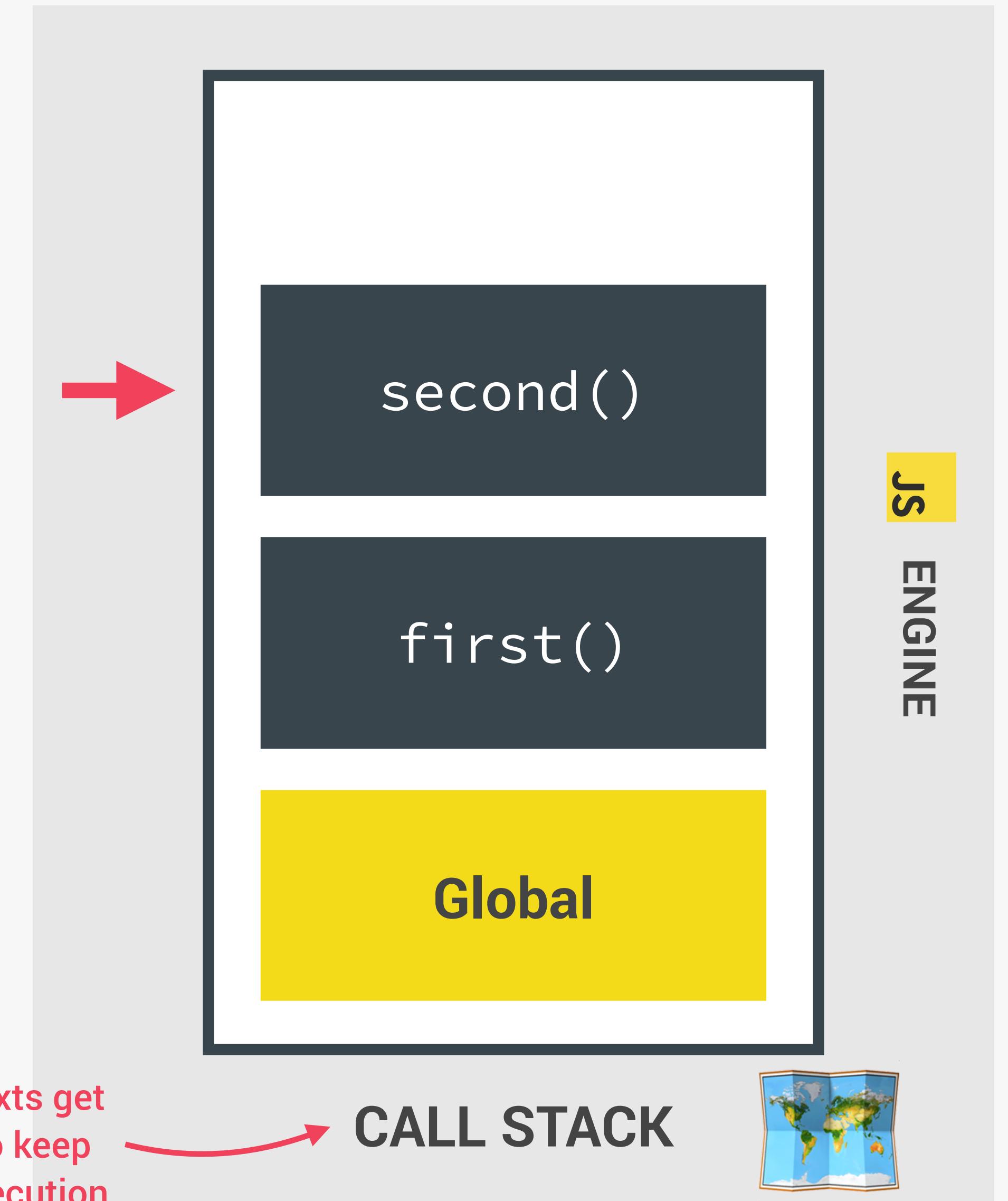
👉 Compiled code starts execution

```
const name = 'Jonas';

const first = () => {
  let a = 1;
  const b = second(7, 9);
  a = a + b;
  return a;
};

function second(x, y) {
  var c = 2;
  return c;
}

const x = first();
```





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SECTION

HOW JAVASCRIPT WORKS BEHIND THE
SCENES

LECTURE

SCOPE AND THE SCOPE CHAIN

JS

SCOPING AND SCOPE IN JAVASCRIPT: CONCEPTS

SCOPE CONCEPTS

EXECUTION CONTEXT

- 👉 Variable environment
- 👉 Scope chain
- 👉 this keyword

- 👉 **Scoping:** How our program's variables are **organized** and **accessed**. “*Where do variables live?*” or “*Where can we access a certain variable, and where not?*”;
- 👉 **Lexical scoping:** Scoping is controlled by **placement** of functions and blocks in the code;
- 👉 **Scope:** Space or environment in which a certain variable is **declared** (*variable environment in case of functions*). There is **global** scope, **function** scope, and **block** scope;
- 👉 **Scope of a variable:** Region of our code where a certain variable can be **accessed**.

THE 3 TYPES OF SCOPE

GLOBAL SCOPE

```
const me = 'Jonas';
const job = 'teacher';
const year = 1989;
```

FUNCTION SCOPE

```
function calcAge(birthYear) {
  const now = 2037;
  const age = now - birthYear;
  return age;

console.log(now); // ReferenceError
```

BLOCK SCOPE (ES6)

```
if (year >= 1981 && year <= 1996) {
  const millenial = true;
  const food = 'Avocado toast';
}

} ← Example: if block, for loop block, etc.

console.log(millenial); // ReferenceError
```

- 👉 Outside of **any** function or block
- 👉 Variables declared in global scope are accessible **everywhere**

- 👉 Variables are accessible only **inside function**, NOT outside
- 👉 Also called local scope

- 👉 Variables are accessible only **inside block** (block scoped)
 - ⚠️ **HOWEVER**, this only applies to **let** and **const** variables!
 - 👉 Functions are **also block scoped** (only in strict mode)

THE SCOPE CHAIN

```
const myName = 'Jonas';

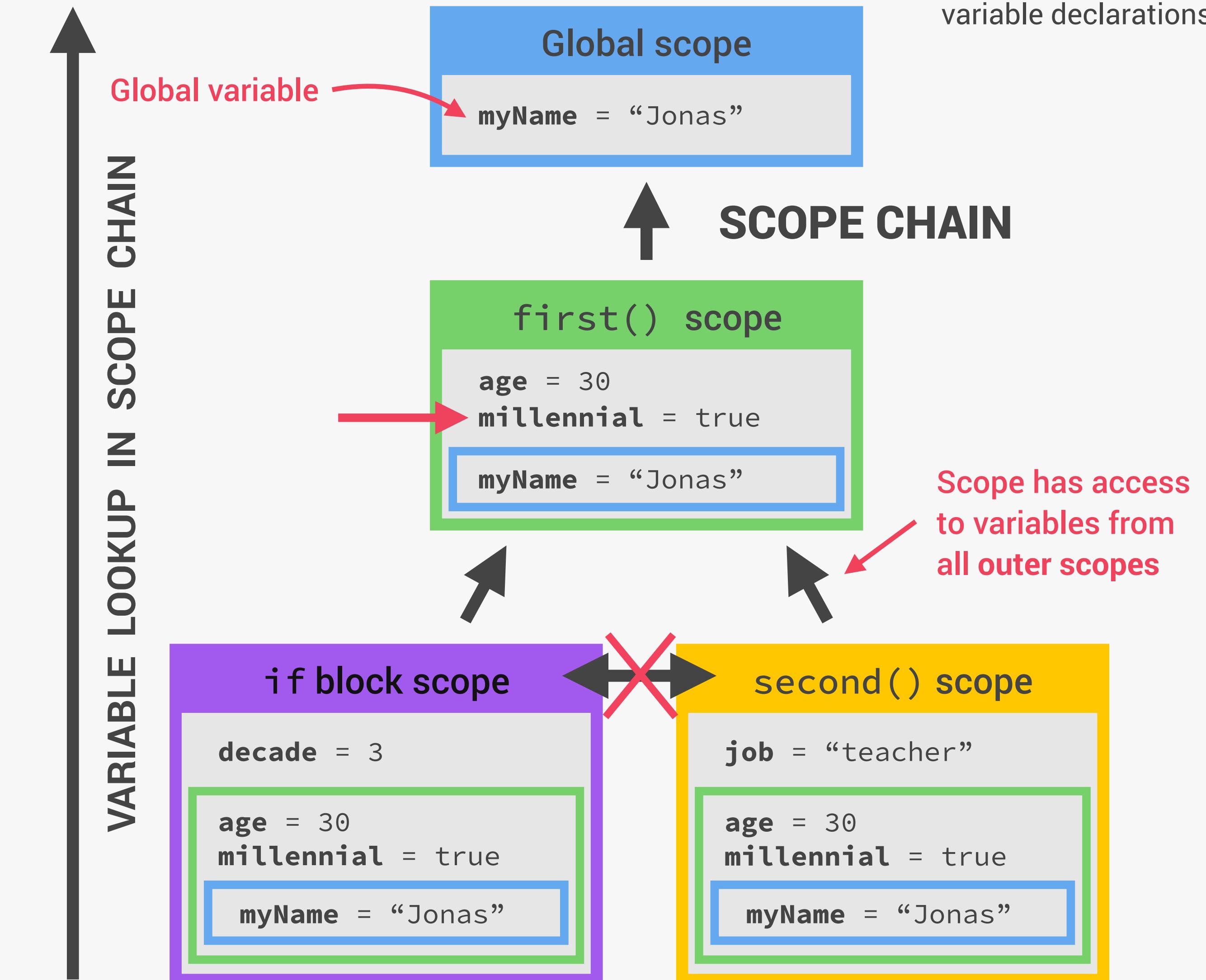
function first() {
  const age = 30;
  let and const are block-scoped
  if (age >= 30) { // true
    const decade = 3;
    var millennial = true;
  }
  var is function-scoped
  function second() {
    const job = 'teacher';
    console.log(`[myName] is a ${age}-old ${job}`);
    // Jonas is a 30-old teacher
  }
  second();
}

first();
```

Variables not in current scope

let and const are **block-scoped**

var is **function-scoped**



SCOPE CHAIN VS. CALL STACK

```
const a = 'Jonas';
first();

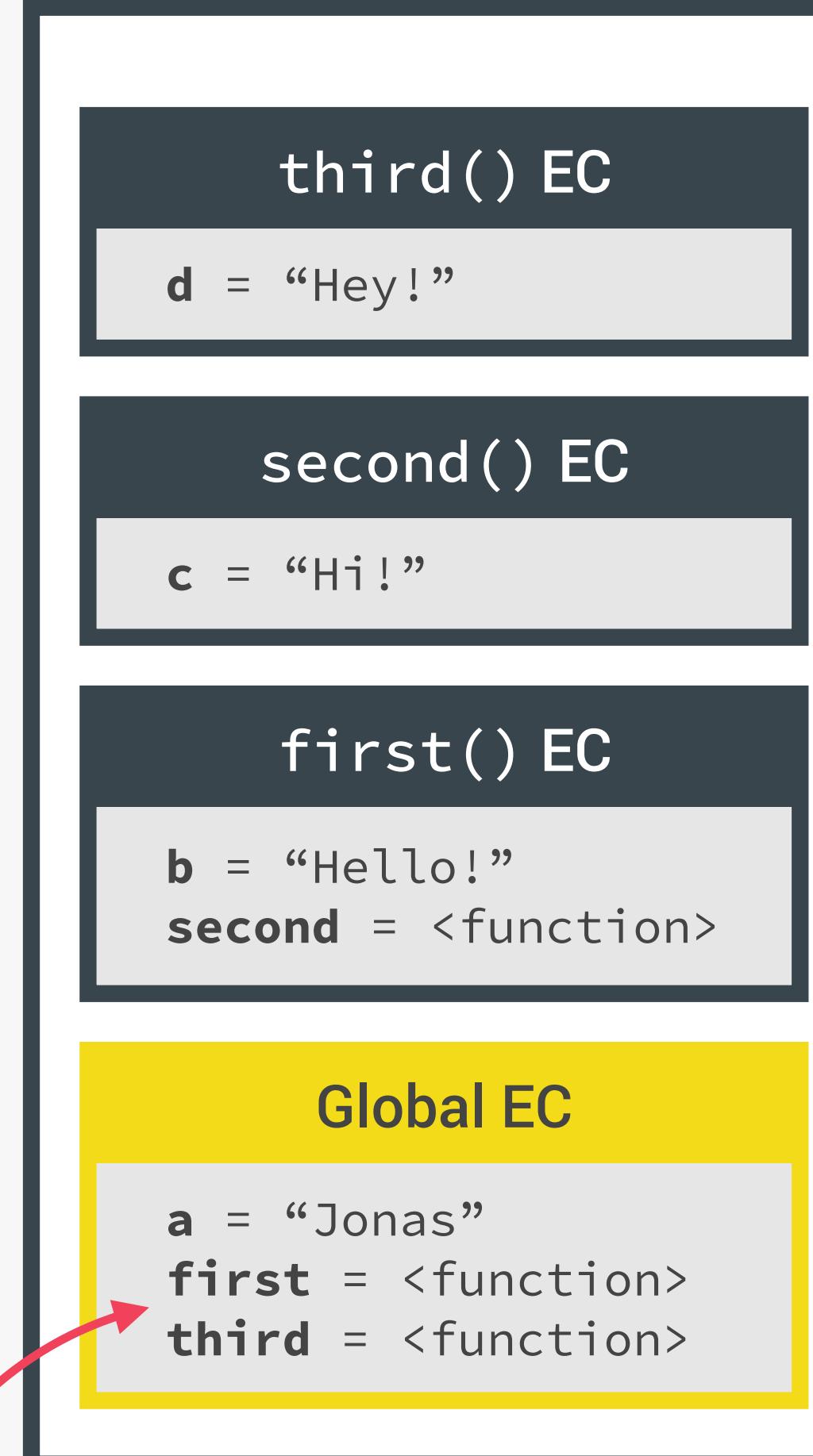
function first() {
  const b = 'Hello!';
  second();

  function second() {
    const c = 'Hi!';
    third();
  }
}

function third() {
  const d = 'Hey!';
  console.log(d + c + b + a);
  // ReferenceError
}
```

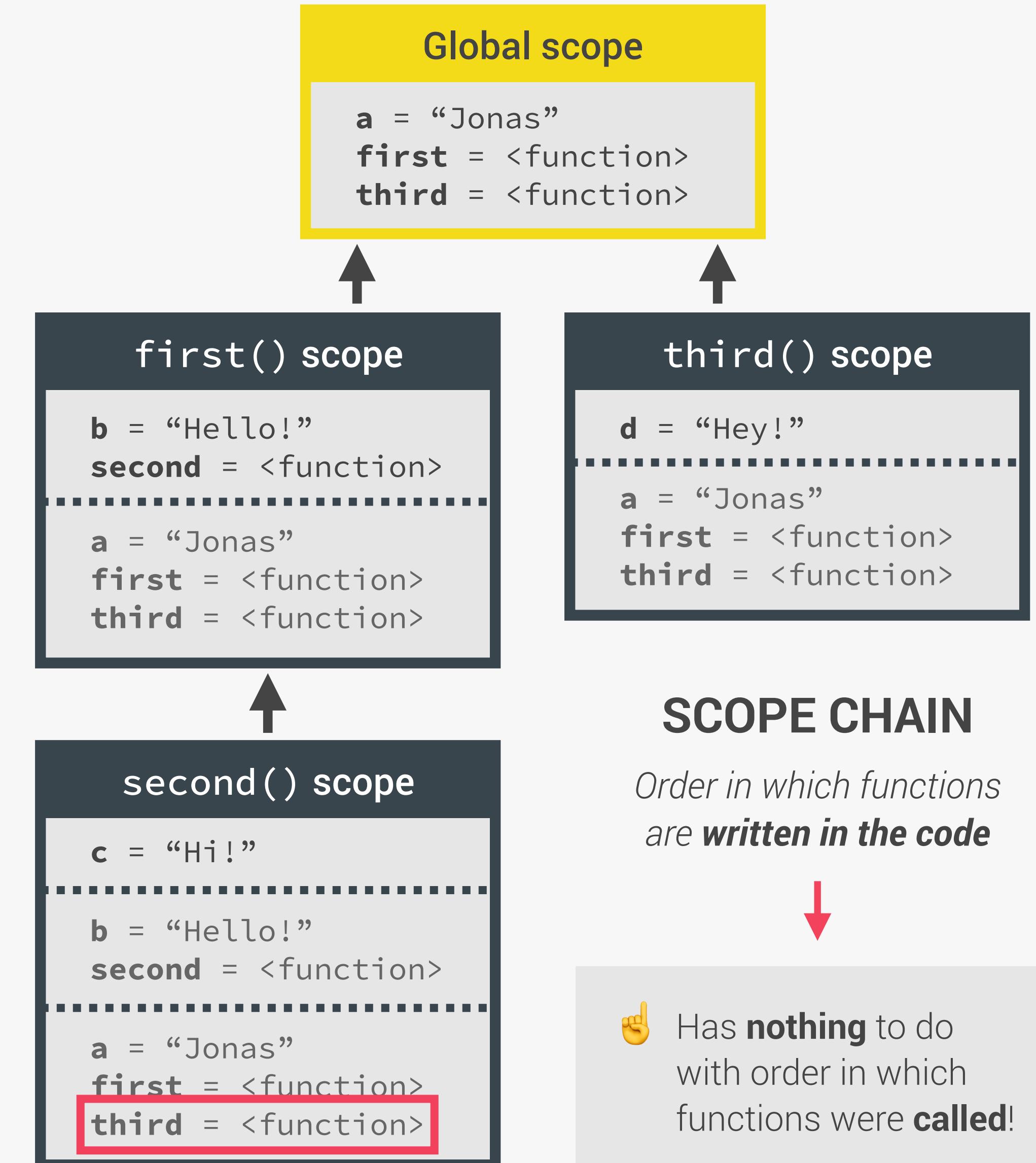
c and b can NOT be found
in third() scope!

Variable
environment (VE)



CALL STACK

Order in which
functions were **called**



SUMMARY



- 👉 Scoping asks the question “*Where do variables live?*” or “*Where can we access a certain variable, and where not?*”;
- 👉 There are 3 types of scope in JavaScript: the global scope, scopes defined by functions, and scopes defined by blocks;
- 👉 Only `let` and `const` variables are block-scoped. Variables declared with `var` end up in the closest function scope;
- 👉 In JavaScript, we have lexical scoping, so the rules of where we can access variables are based on exactly where in the code functions and blocks are written;
- 👉 Every scope always has access to all the variables from all its outer scopes. This is the scope chain!
- 👉 When a variable is not in the current scope, the engine looks up in the scope chain until it finds the variable it's looking for. This is called variable lookup;
- 👉 The scope chain is a one-way street: a scope will never, ever have access to the variables of an inner scope;
- 👉 The scope chain in a certain scope is equal to adding together all the variable environments of the all parent scopes;
- 👉 The scope chain has nothing to do with the order in which functions were called. It does not affect the scope chain at all!



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SECTION

HOW JAVASCRIPT WORKS BEHIND THE
SCENES

LECTURE

VARIABLE ENVIRONMENT: HOISTING
AND THE TDZ

JS

HOISTING IN JAVASCRIPT

👉 **Hoisting:** Makes some types of variables accessible/usable in the code before they are actually declared. “Variables lifted to the top of their scope”.

↓ **BEHIND THE SCENES**

Before execution, code is scanned for variable declarations, and for each variable, a new property is created in the **variable environment object**.

EXECUTION CONTEXT

- 👉 Variable environment
- ✓ Scope chain
- 👉 this keyword

	HOISTED?	INITIAL VALUE	SCOPE
function declarations	✓ YES	Actual function	Block
var variables	✓ YES	undefined	Function
let and const variables	✗ NO Technically, yes. But not in practice	<uninitialized>, TDZ	Block
function expressions and arrows	✗ Depends if using var or let/const		Temporal Dead Zone

TEMPORAL DEAD ZONE, LET AND CONST

```
const myName = 'Jonas';

if (myName === 'Jonas') {
    console.log(`Jonas is a ${job}`);
    const age = 2037 - 1989;
    console.log(age);
    const job = 'teacher';
    console.log(x);
}
```

TEMPORAL DEAD ZONE FOR **job** VARIABLE

- 👉 Different kinds of error messages:

ReferenceError: Cannot access 'job' before initialization

ReferenceError: x is not defined

WHY HOISTING?

- 👉 Using functions before actual declaration;
- 👉 var hoisting is just a byproduct.

WHY TDZ?

- 👉 Makes it easier to avoid and catch errors: accessing variables before declaration is bad practice and should be avoided;
- 👉 Makes const variables actually work



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LECTURE

THE THIS KEYWORD

JS

HOW THE THIS KEYWORD WORKS

👉 **this keyword/variable:** Special variable that is created for every execution context (every function).
Takes the value of (points to) the “owner” of the function in which the **this** keyword is used.

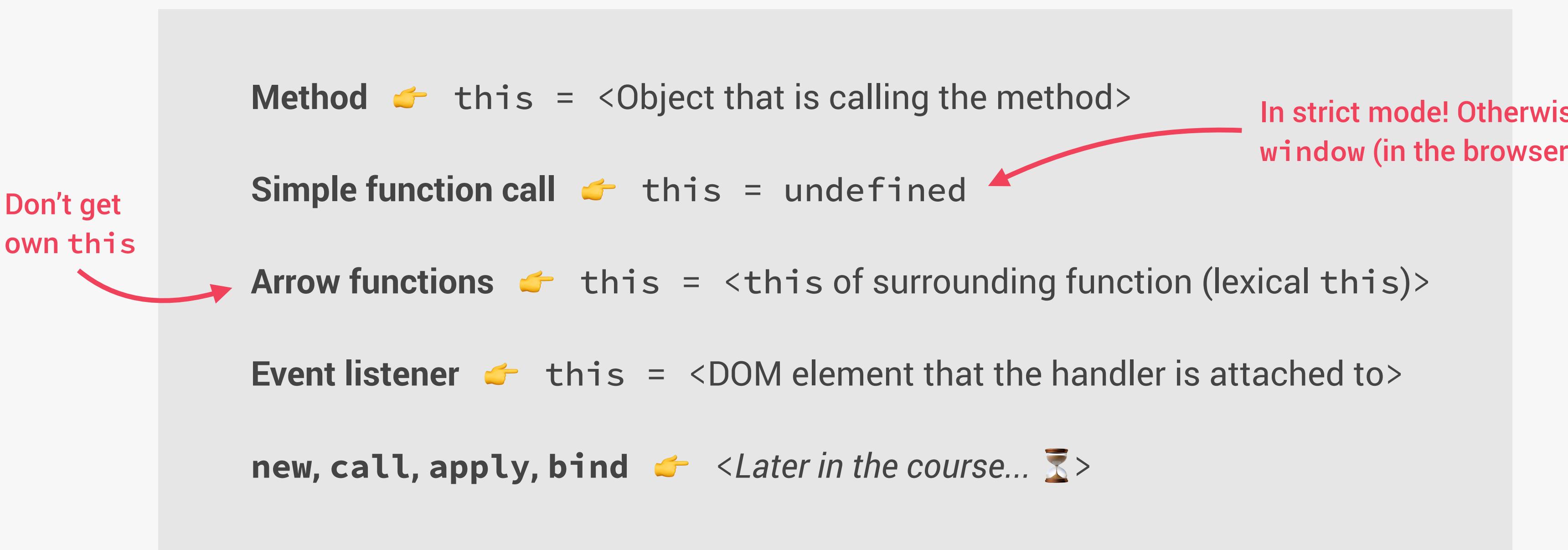
👉 **this** is **NOT** static. It depends on **how** the function is called, and its value is only assigned when the function **is actually called**.

EXECUTION CONTEXT

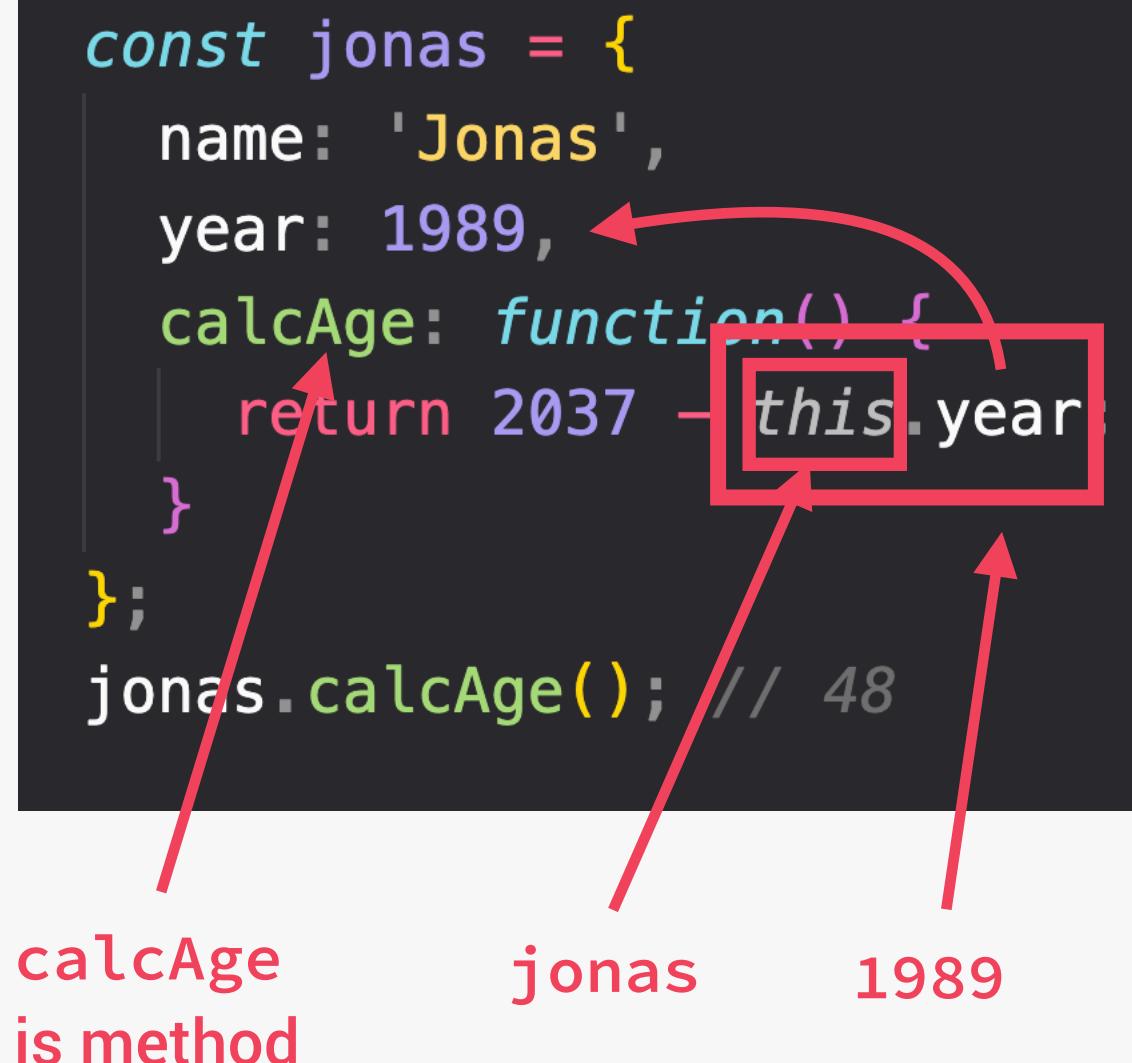
✓ Variable environment

✓ Scope chain

👉 **this keyword**



👉 Method example:



👉 **this** does **NOT** point to the function itself, and also **NOT** to its variable environment!

Way better than using
`jonas.year!`



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GOT QUESTIONS? FEEDBACK?
JUST POST IT IN THE Q&A OF THIS
VIDEO. AND YOU WILL GET HELP
THERE!

JS



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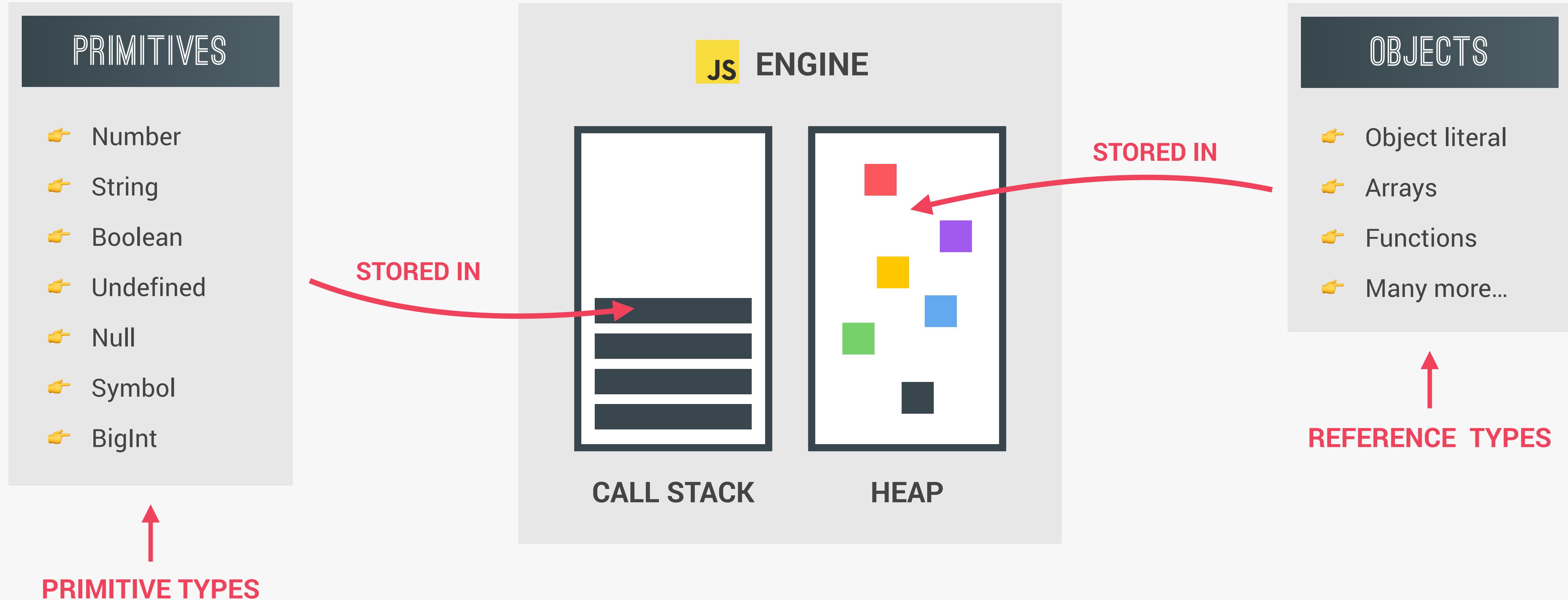
HOW JAVASCRIPT WORKS BEHIND THE
SCENES

LECTURE

PRIMITIVES VS. OBJECTS (PRIMITIVE
VS. REFERENCE TYPES)

JS

REVIEW: PRIMITIVES, OBJECTS AND THE JAVASCRIPT ENGINE



PRIMITIVE VS. REFERENCE VALUES

👉 Primitive values example:

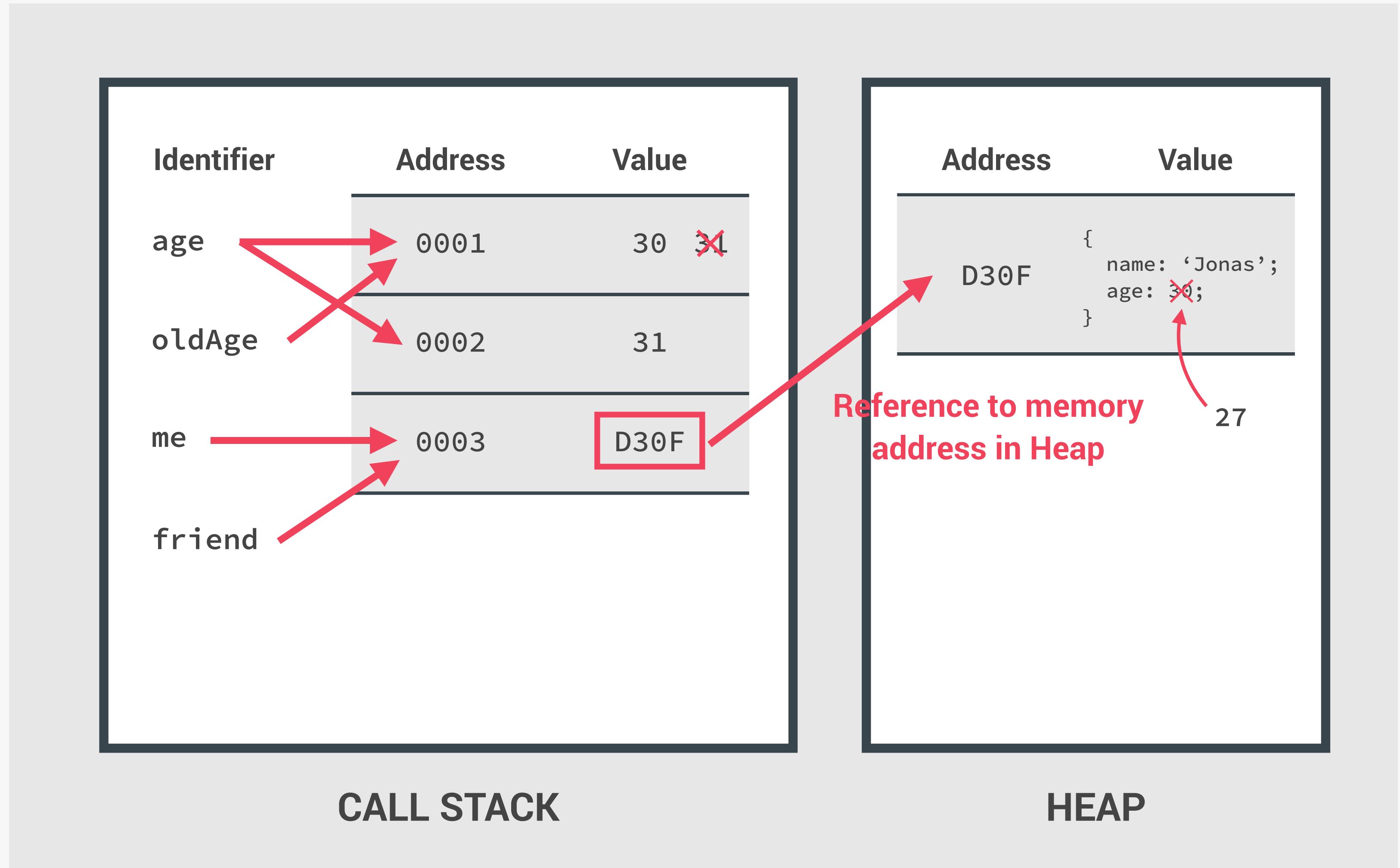
```
let age = 30;
let oldAge = age;
age = 31;
console.log(age); // 31
console.log(oldAge); // 30
```

👉 Reference values example:

```
const me = {
  name: 'Jonas'      No problem, because
  age: 30            we're NOT changing the
};                   value at address 0003!
const friend = me;
friend.age = 27;

console.log('Friend:', friend);
// { name: 'Jonas', age: 27 }

console.log('Me:', me);
// { name: 'Jonas', age: 27 }
```



"HOW JAVASCRIPT WORKS BEHIND THE SCENES" TOPICS FOR LATER...



1

Prototypal Inheritance ➡ Object Oriented Programming (OOP) With JavaScript

2

Event Loop ➡ Asynchronous JavaScript: Promises, Async/Await and AJAX

3

How the DOM Really Works ➡ Advanced DOM and Events

DATA STRUCTURES,
MODERN OPERATORS
AND STRINGS



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SECTION

DATA STRUCTURES, MODERN
OPERATORS AND STRINGS

LECTURE

SUMMARY: WHICH DATA STRUCTURE
TO USE?

JS

DATA STRUCTURES OVERVIEW

SOURCES OF DATA

- 1 **From the program itself:** Data written directly in source code (e.g. status messages)
- 2 **From the UI:** Data input from the user or data written in DOM (e.g tasks in todo app)
- 3 **From external sources:** Data fetched for example from web API (e.g. recipe objects)



Collection of data



Data structure

SIMPLE LIST?

Arrays or Sets

KEY/VALUE PAIRS?

Objects or Maps

OTHER BUILT-IN:

- 👉 WeakMap
- 👉 WeakSet

NON-BUILT IN:

- 👉 Stacks
- 👉 Queues
- 👉 Linked lists
- 👉 Trees
- 👉 Hash tables

Application
Programming
Interface

Keys allow us to
describe values

The diagram shows a JSON object structure with three levels of nesting. The first level is an object with keys "count" and "recipes". The "recipes" key points to an array containing three objects. Each object at this level has keys for publisher, title, source_url, recipe_id, image_url, social_rank, and publisher_url. Red arrows point from the text labels "Object", "Array", and "Object" to the corresponding JSON structures.

```
{
  "count": 3,
  "recipes": [
    {
      "publisher": "101 Cookbooks",
      "title": "Best Pizza Dough Ever",
      "source_url": "http://www.101cookbooks.com/archiv",
      "recipe_id": "47746",
      "image_url": "http://forkify-api.herokuapp.com/im",
      "social_rank": 100,
      "publisher_url": "http://www.101cookbooks.com"
    },
    {
      "publisher": "The Pioneer Woman",
      "title": "Deep Dish Fruit Pizza",
      "source_url": "http://thepioneerwoman.com/cooking",
      "recipe_id": "46956",
      "image_url": "http://forkify-api.herokuapp.com/im",
      "social_rank": 100,
      "publisher_url": "http://thepioneerwoman.com"
    },
    {
      "publisher": "Closet Cooking",
      "title": "Pizza Dip",
      "source_url": "http://www.closetcooking.com/2011/",
      "recipe_id": "35477",
      "image_url": "http://forkify-api.herokuapp.com/im",
      "social_rank": 99.99999999999994,
      "publisher_url": "http://closetcooking.com"
    }
  ]
}
```

👉 JSON data format example

ARRAYS VS. SETS AND OBJECTS VS. MAPS

ARRAYS

VS.

SETS

```
tasks = ['Code', 'Eat', 'Code'];
// ["Code", "Eat", "Code"]
```

- 👉 Use when you need **ordered** list of values (might contain duplicates)
- 👉 Use when you need to **manipulate** data

```
tasks = new Set(['Code', 'Eat', 'Code']);
// {"Code", "Eat"}
```

- 👉 Use when you need to work with **unique** values
- 👉 Use when **high-performance** is *really* important
- 👉 Use to **remove duplicates** from arrays

OBJECTS

VS.

MAPS

```
task = {
  task: 'Code',
  date: 'today',
  repeat: true
};
```

- 👉 More “traditional” key/value store (“abused” objects)
- 👉 Easier to write and access values with . and []

- 👉 Use when you need to include **functions** (methods)
- 👉 Use when working with JSON (can convert to map)

```
task = new Map([
  ['task', 'Code'],
  ['date', 'today'],
  [false, 'Start coding!']
]);
```

- 👉 Better performance
- 👉 Keys can have **any** data type
- 👉 Easy to iterate
- 👉 Easy to compute size

- 👉 Use when you simply need to map key to values
- 👉 Use when you need keys that are **not** strings

A CLOSER LOOK AT FUNCTIONS



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A CLOSER LOOK AT FUNCTIONS

LECTURE

FIRST-CLASS AND HIGHER-ORDER
FUNCTIONS

JS

FIRST-CLASS VS. HIGHER-ORDER FUNCTIONS

FIRST-CLASS FUNCTIONS

- 👉 JavaScript treats functions as **first-class citizens**
- 👉 This means that functions are **simply values**
- 👉 Functions are just another "**type**" of object

- 👉 Store functions in variables or properties:

```
const add = (a, b) => a + b;  
  
const counter = {  
  value: 23,  
  inc: function() { this.value++; }  
}
```

- 👉 Pass functions as arguments to OTHER functions:

```
const greet = () => console.log('Hey Jonas');  
btnClose.addEventListener('click', greet)
```

- 👉 Return functions FROM functions

- 👉 Call methods on functions:

```
counter.inc.bind(someOtherObject);
```

HIGHER-ORDER FUNCTIONS

- 👉 A function that **receives** another function as an argument, that **returns** a new function, or **both**
- 👉 This is only possible because of first-class functions

- 1 Function that receives another function

```
const greet = () => console.log('Hey Jonas');  
btnClose.addEventListener('click', greet)
```

Higher-order
function

Callback
function



- 2 Function that returns new function

```
function count() {  
  let counter = 0;  
  return function() {  
    counter++;  
  };  
}
```

Higher-order
function

Returned
function



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SECTION

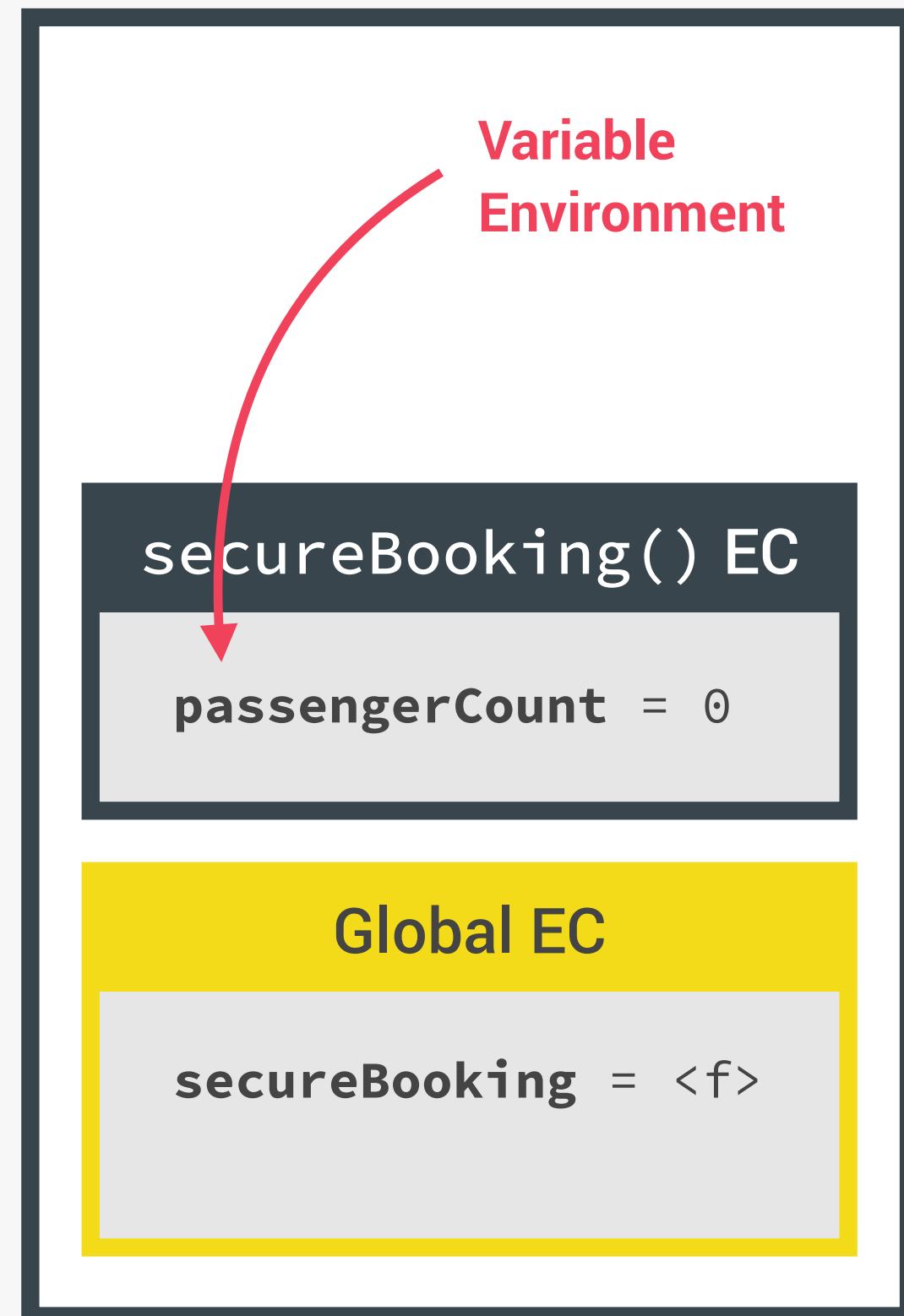
A CLOSER LOOK AT FUNCTIONS

LECTURE

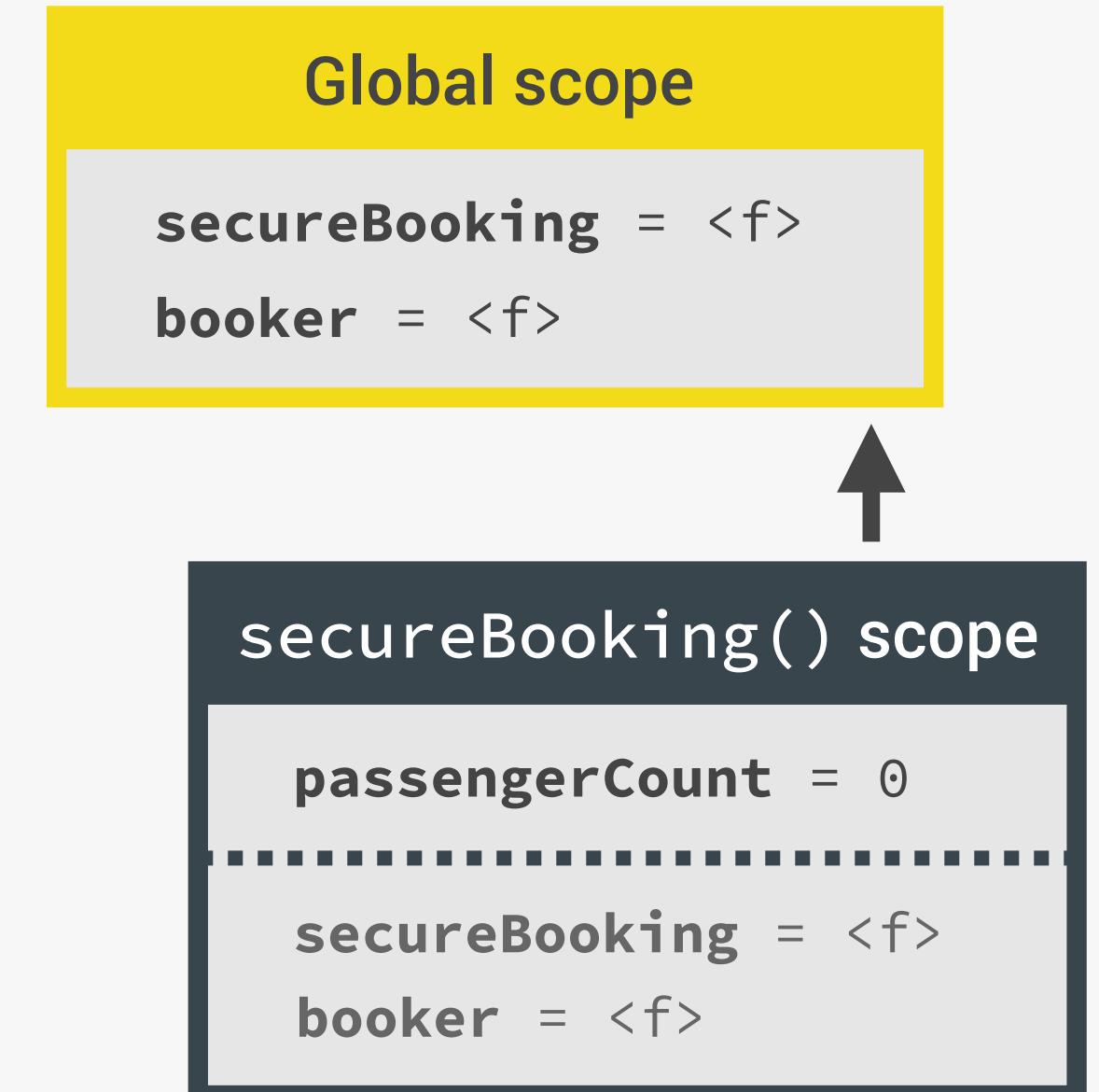
CLOSURES

JS

"CREATING" A CLOSURE



```
const secureBooking = function () {  
    let passengerCount = 0;  
  
    return function () {  
        passengerCount++;  
        console.log(` ${passengerCount} passengers`);  
    };  
};  
  
const booker = secureBooking();
```



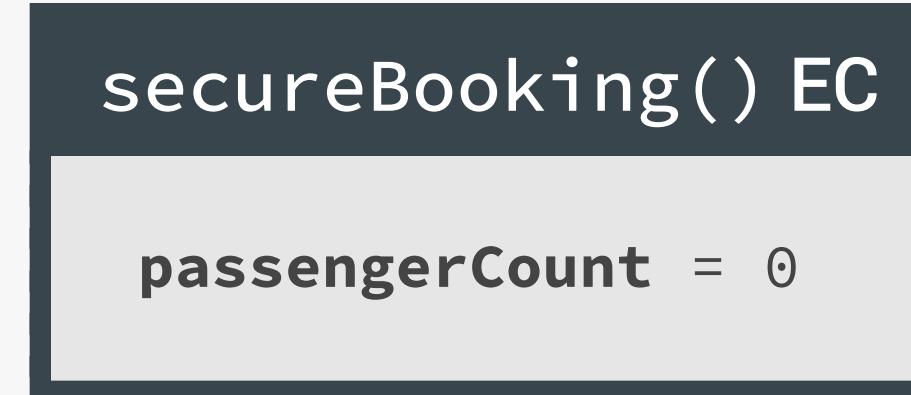
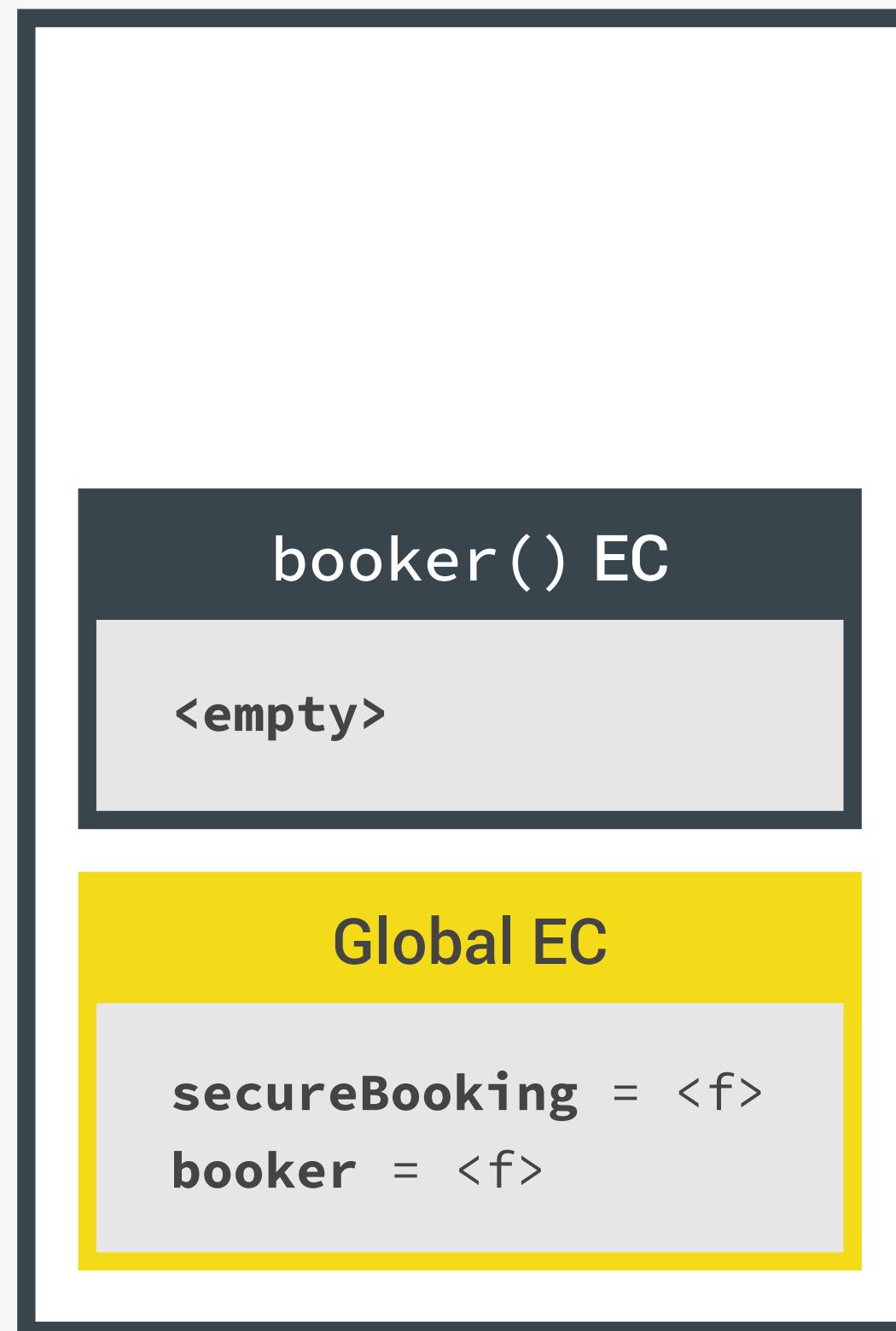
CALL STACK

Order in which
functions were *called*

Order in which functions
are *written in the code*

SCOPE CHAIN

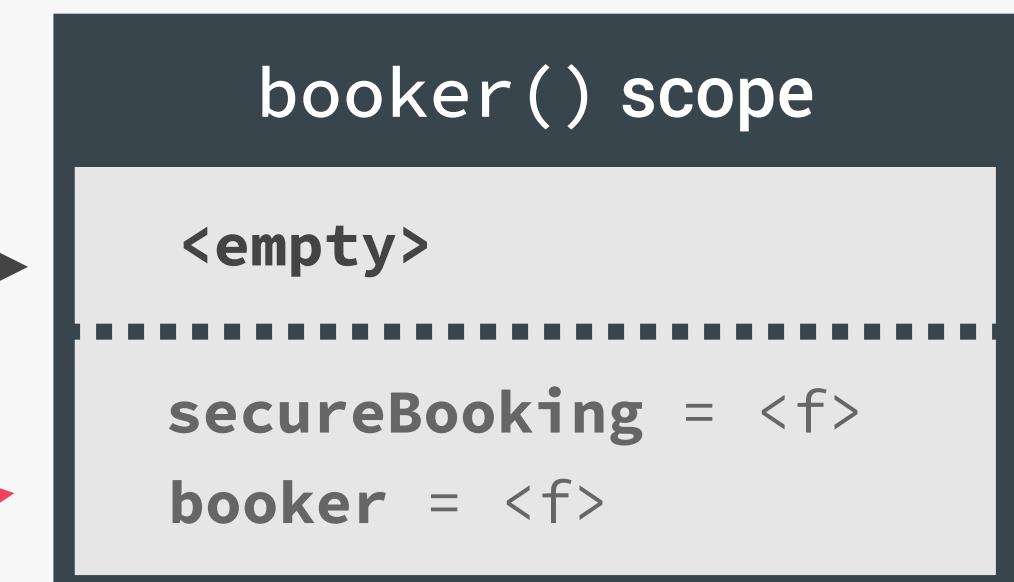
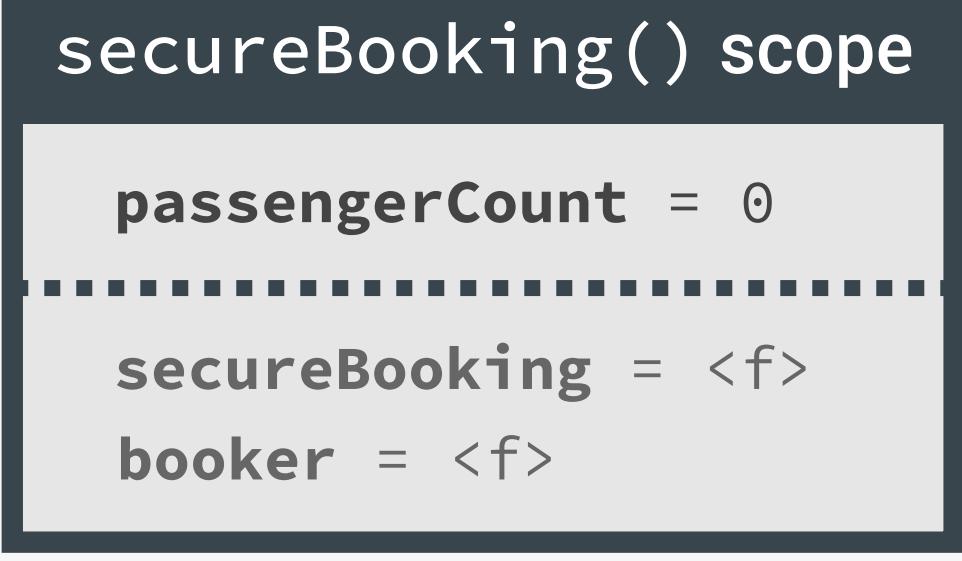
UNDERSTANDING CLOSURES



Variable Environment of
Execution Context in which
booker was created

```
const secureBooking = function () {  
  let passengerCount = 0;  
  
  return function () {  
    passengerCount++;  
    console.log(` ${passengerCount} passengers`);  
  };  
};  
  
const booker = secureBooking();  
  
booker(); // 1 passengers  
booker(); // 2 passengers
```

This is the function



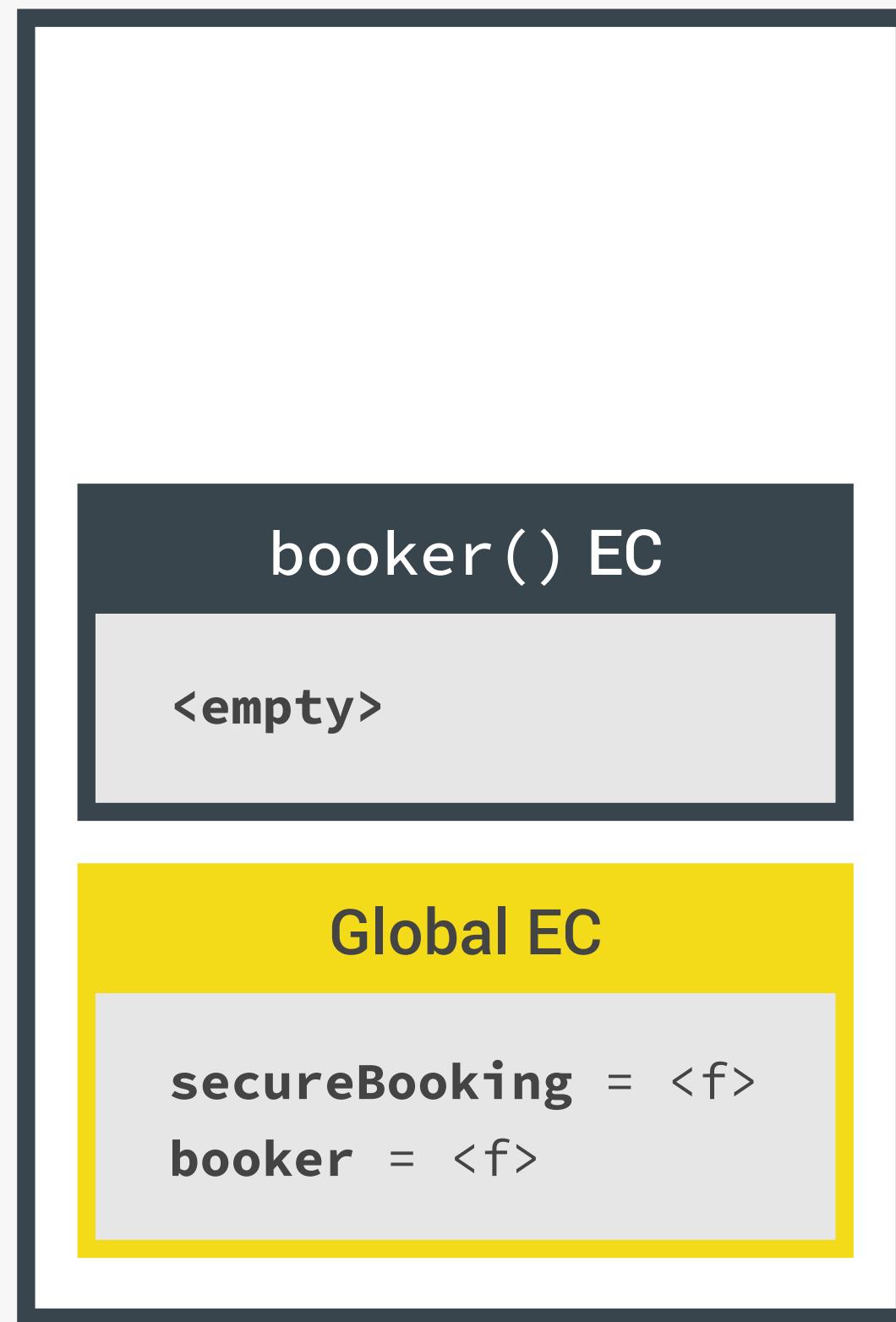
How to access
passengerCount?

CALL STACK

SCOPE CHAIN

UNDERSTANDING CLOSURES

- 👉 A function has access to the variable environment (VE) of the execution context in which it was created
- 👉 **Closure:** VE attached to the function, exactly as it was at the time and place the function was created



```
const secureBooking = function () {
  let passengerCount = 0;

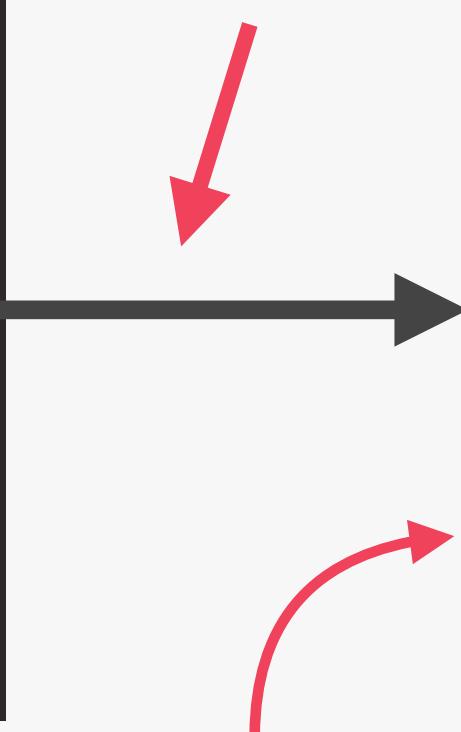
  return function () {
    passengerCount++;
    console.log(`#${passengerCount} passengers`);
  };
};

const booker = booker();
booker(); // 1 passengers
booker(); // 2 passengers
```

This is the function

The code defines a closure where the inner function `booker()` has access to the `passengerCount` variable from its outer scope. The first call to `booker()` logs "1 passengers" and increments the count to 1. The second call logs "2 passengers" and increments the count to 2.

(Priority over
scope chain)
CLOSURE



How to access
passengerCount?

CALL STACK

SCOPE CHAIN

CLOSURES SUMMARY



- 👉 A closure is the closed-over **variable environment** of the execution context **in which a function was created**, even *after* that execution context is gone;

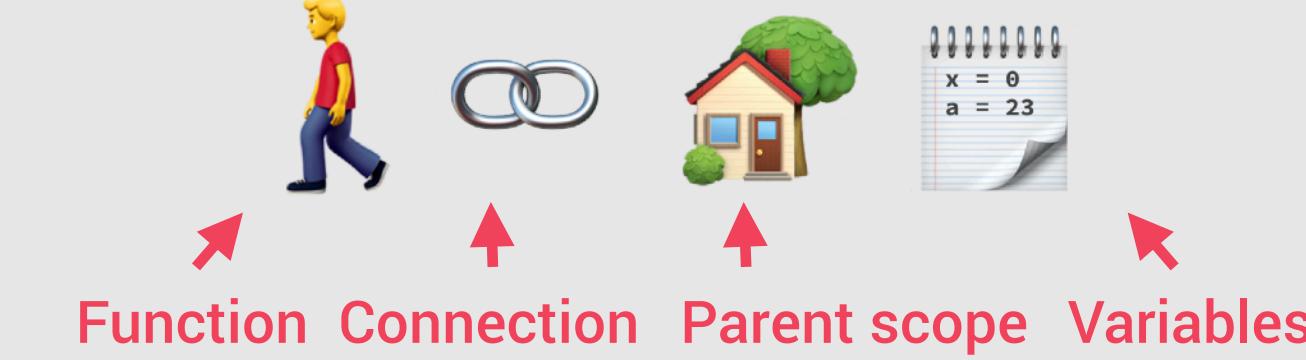
↓ Less formal

- 👉 A closure gives a function access to all the variables **of its parent function**, even *after* that parent function has returned. The function keeps a **reference** to its outer scope, which *preserves* the scope chain throughout time.

↓ Less formal

- 👉 A closure makes sure that a function doesn't loose connection to **variables that existed at the function's birth place**;

↓ Less formal



- 👉 A closure is like a **backpack** that a function carries around wherever it goes. This backpack has all the **variables that were present in the environment where the function was created**.



- 👉 We do **NOT** have to manually create closures, this is a JavaScript feature that happens automatically. We can't even access closed-over variables explicitly. A closure is **NOT** a tangible JavaScript object.

WORKING WITH ARRAYS



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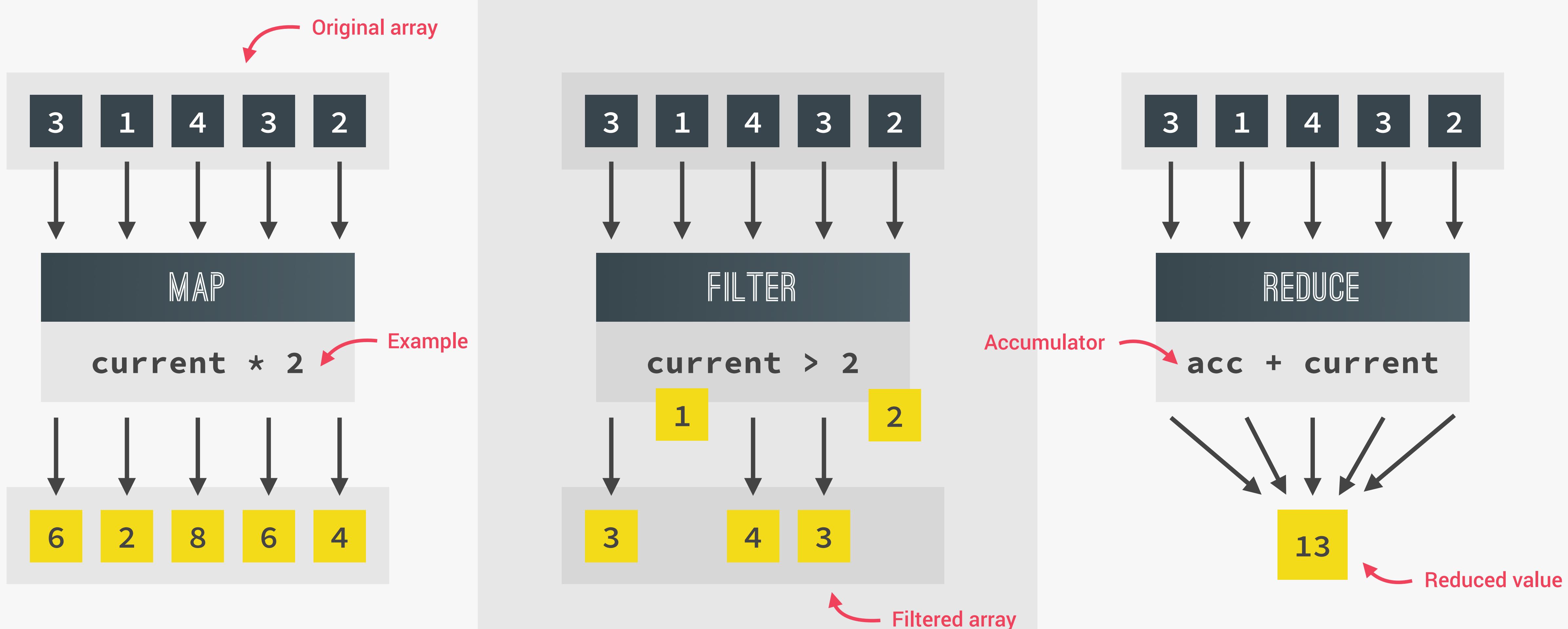
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SECTION
WORKING WITH ARRAYS

LECTURE
DATA TRANSFORMATIONS: MAP, FILTER,
REDUCE

JS

DATA TRANSFORMATIONS WITH MAP, FILTER AND REDUCE



👉 map returns a **new array** containing the results of applying an operation on all original array elements

👉 filter returns a **new array** containing the array elements that passed a specified **test condition**

👉 reduce boils ("reduces") all array elements down to one single value (e.g. adding all elements together)



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SECTION
WORKING WITH ARRAYS

LECTURE
SUMMARY: WHICH ARRAY METHOD TO
USE?

JS

WHICH ARRAY METHOD TO USE?



"I WANT..."

To mutate original array

👉 Add to original:

`.push` (end)

`.unshift` (start)

👉 Remove from original:

`.pop` (end)

`.shift` (start)

`.splice` (any)

👉 Others:

`.reverse`

`.sort`

`.fill`

A new array

👉 Computed from original:

`.map` (loop)

👉 Filtered using condition:

`.filter`

👉 Portion of original:

`.slice`

👉 Adding original to other:

`.concat`

👉 Flattening the original:

`.flat`

`.flatMap`

An array index

👉 Based on value:

`.indexof`

👉 Based on test condition:

`.findIndex`

An array element

👉 Based on test condition:

`.find`

Know if array includes

👉 Based on value:

`.includes`

👉 Based on test condition:

`.some`

`.every`

A new string

👉 Based on separator string:

`.join`

To transform to value

👉 Based on accumulator:

`.reduce`

(Boil down array to single value of any type: number, string, boolean, or even new array or object)

To just loop array

👉 Based on callback:

`.forEach`

(Does not create a new array, just loops over it)

ADVANCED DOM AND EVENTS



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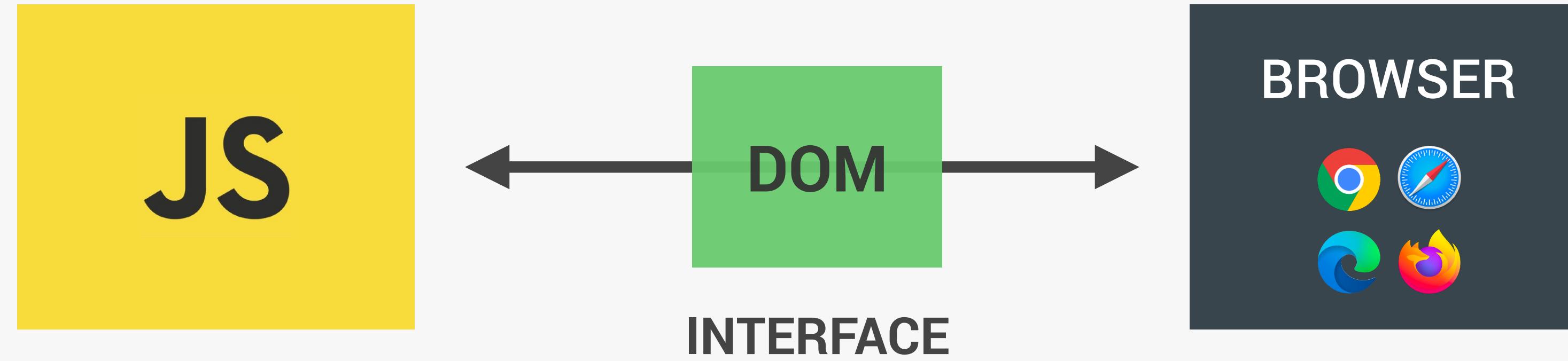
ADVANCED DOM AND EVENTS

LECTURE

HOW THE DOM REALLY WORKS

JS

REVIEW: WHAT IS THE DOM?

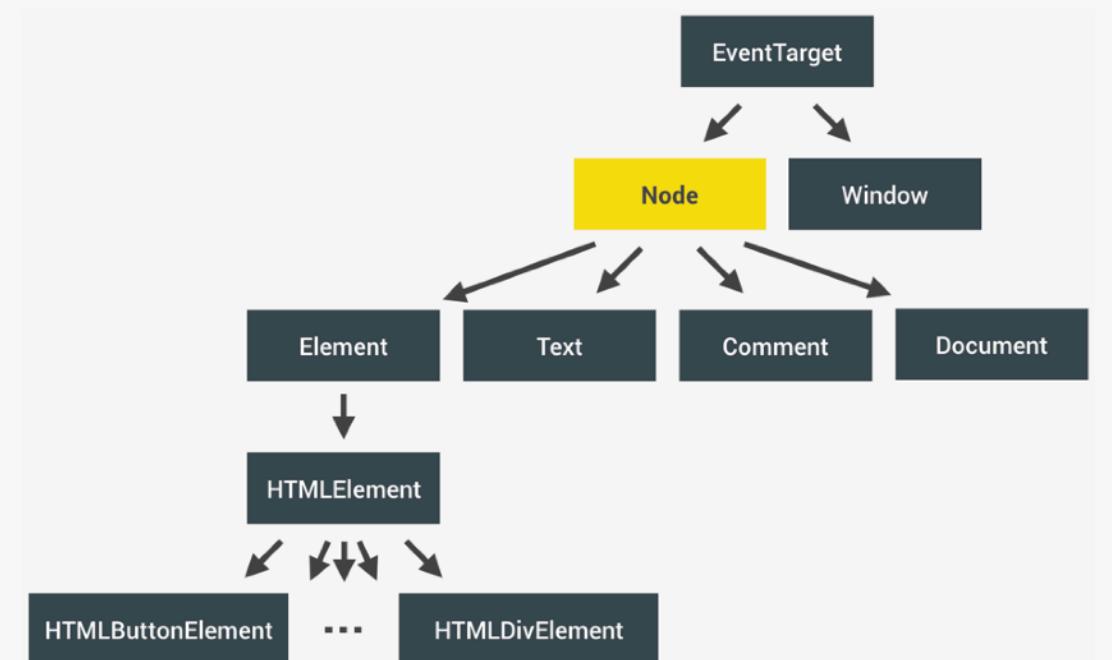


- 👉 Allows us to make JavaScript interact with the browser;
- 👉 We can write JavaScript to create, modify and delete HTML elements; set styles, classes and attributes; and listen and respond to events;
- 👉 DOM tree is generated from an HTML document, which we can then interact with;
- 👉 DOM is a very complex API that contains lots of methods and properties to interact with the DOM tree

Application Programming Interface

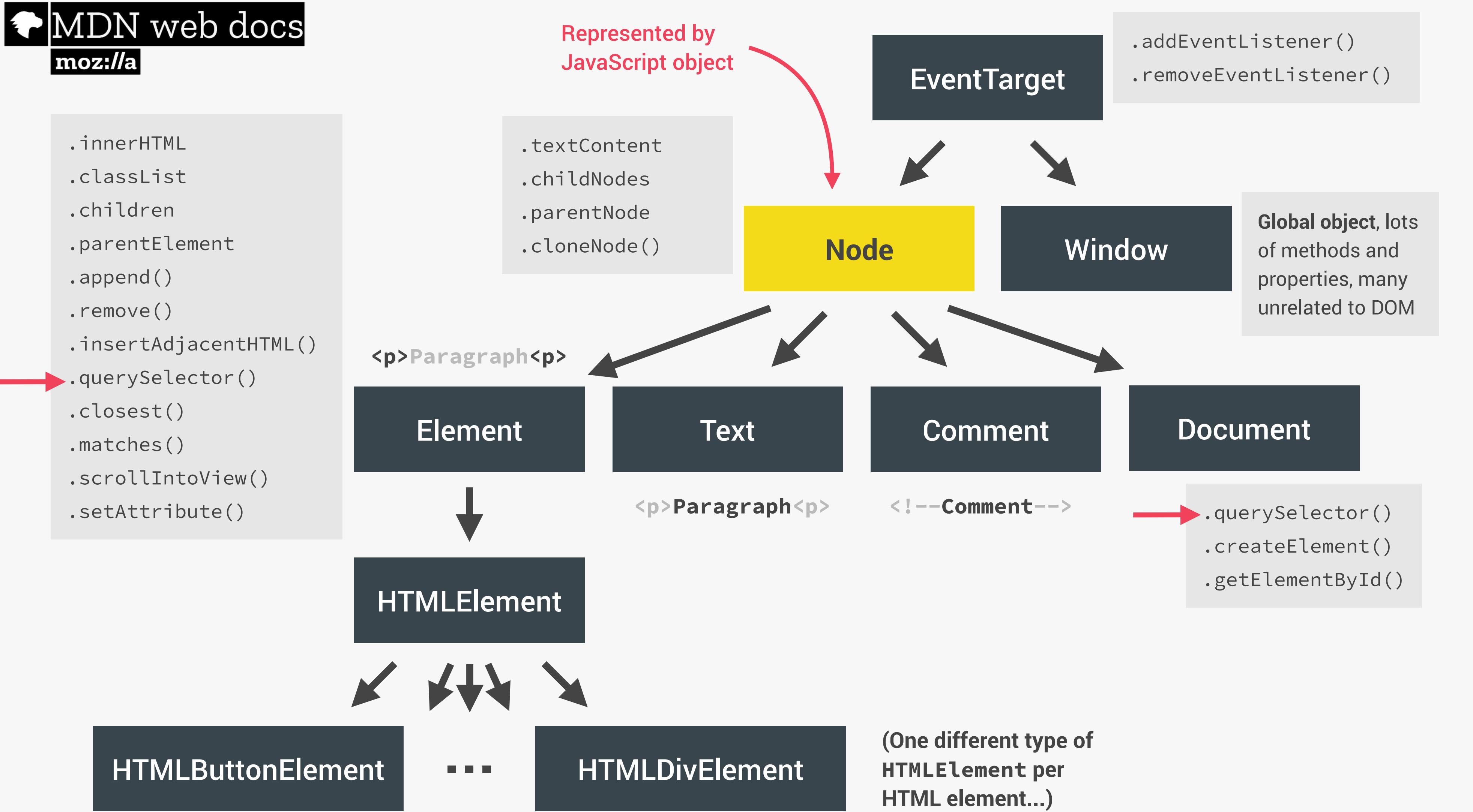


```
.querySelector() / .addEventListener() / .createElement() /  
.innerHTML / .textContent / .children / etc ...
```



"Types" of
DOM objects
(next slide)

HOW THE DOM API IS ORGANIZED BEHIND THE SCENES



INHERITANCE OF METHODS AND PROPERTIES

Example:

Any **HTMLElement** will have access to `.addEventListener()`, `.cloneNode()` or `.closest()` methods.

(THIS IS NOT A DOM TREE)



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SECTION

ADVANCED DOM AND EVENTS

LECTURE

EVENT PROPAGATION: BUBBLING AND
CAPTURING

JS

BUBBLING AND CAPTURING

```
<html>
  <head>
    <title>A Simple Page</title>
  </head>
  <body>
    <section>
      <p>A paragraph with a <a>link</a></p>
      <p>A second paragraph</p>
    </section>
    <section>
      
    </section>
  </body>
</html>
```

(THIS DOES NOT HAPPEN
ON ALL EVENTS)

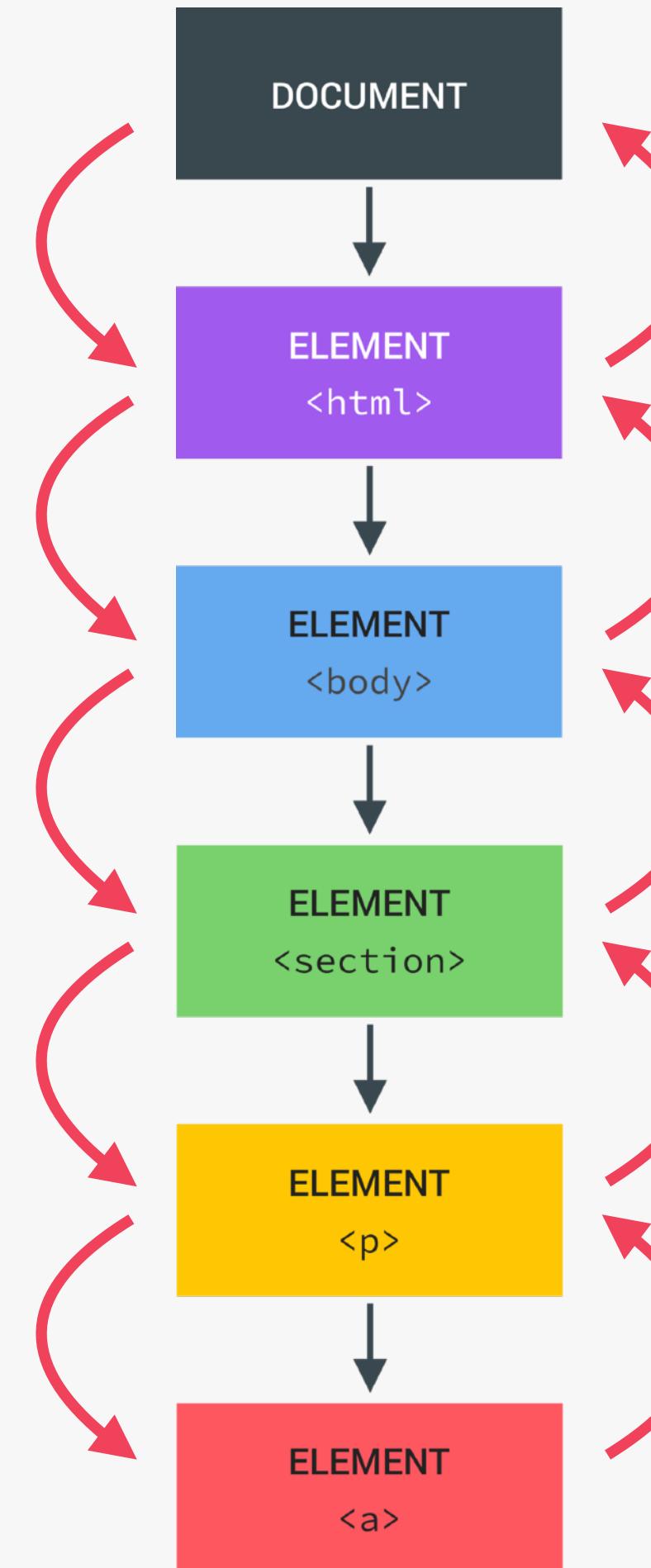
1 CAPTURING PHASE

Click event

1

2

TARGET PHASE



3 BUBBLING PHASE

```
document
  .querySelector('section')
  .addEventListener('click', () => {
    alert('You clicked me 😊');
  });

```

127.0.0.1:8080 says
You clicked me 😊

```
document
  .querySelector('a')
  .addEventListener('click', () => {
    alert('You clicked me 😊');
  });

```

127.0.0.1:8080 says
You clicked me 😊



JONAS.IO
SCHMEDTMANN

THE COMPLETE JAVASCRIPT COURSE

FROM ZERO TO EXPERT!



@JONASSCHMEDTMAN

SECTION

ADVANCED DOM AND EVENTS

LECTURE

EFFICIENT SCRIPT LOADING: DEFER
AND ASYNC

JS