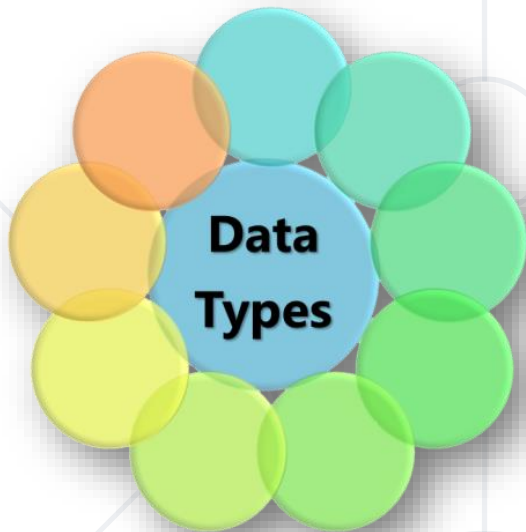


Data Types and Variables

Types of Operators



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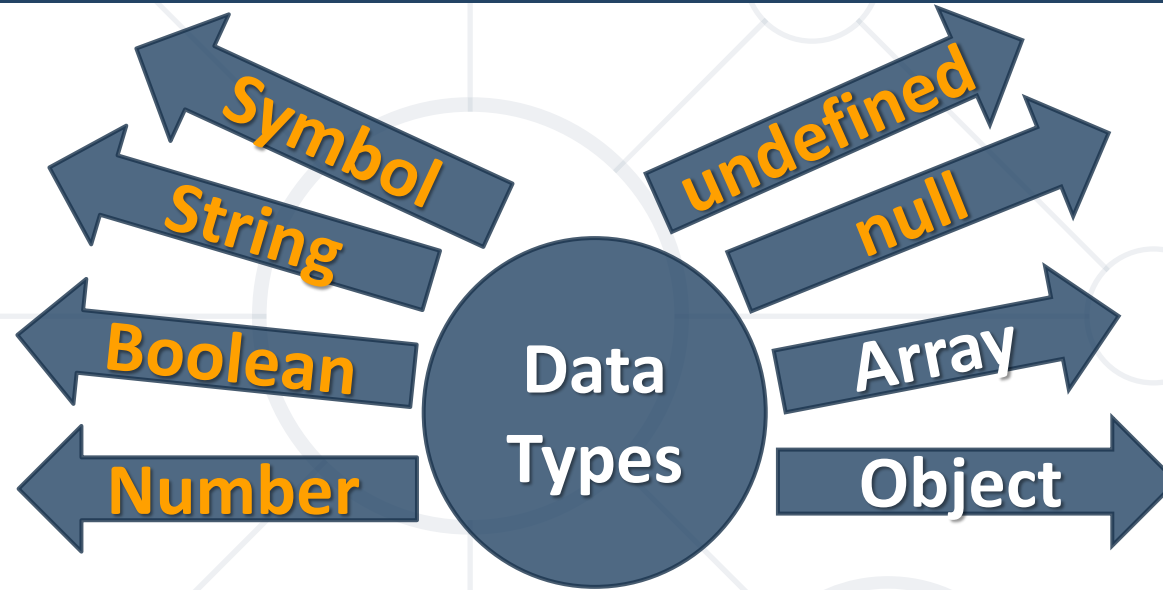
What is Data Type?

Definition and Examples

What is a Data Type?


- A **data type** is a classification that specifies what type of operations can be applied to it and the way values of that type are stored
- After **ECMAScript** 2015 there are **seven primitive** data types:
 - Seven **primitive**: Boolean, null, undefined, Number, String, Symbol, BigInt
 - and **Objects** (including Functions and Arrays)





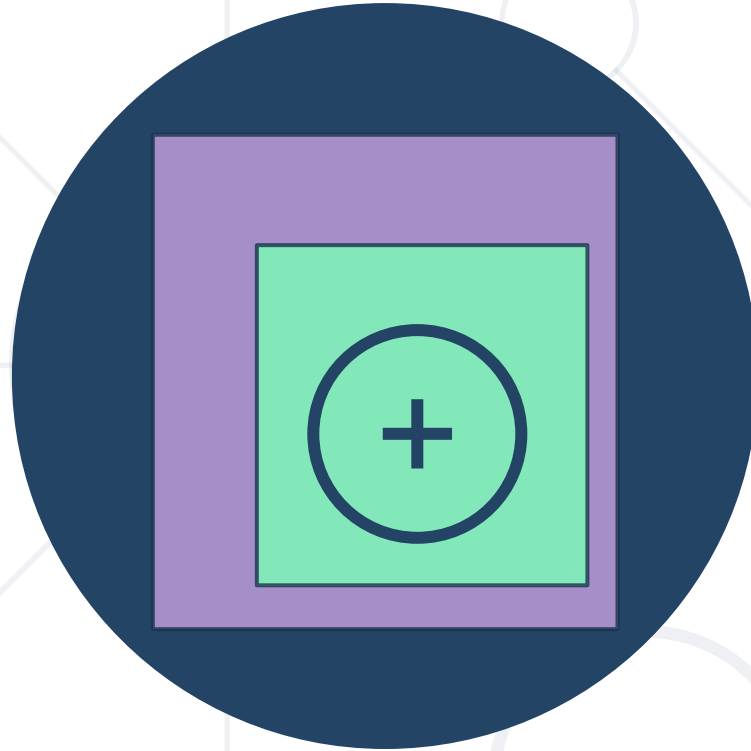
```
let number = 10;           // Number
let person = {name: 'George', age: 25}; // Object
let array = [1, 2, 3];     // Array
let isTrue = true;        // Boolean
let name = 'George';      // String
let empty = null;         // null
let unknown = undefined;  // undefined
```

Dynamic Typing

- 
- Variables in JavaScript are **not** directly **associated** with any particular **value type**
 - Any variable **can** be assigned (and **re-assigned**) values of all types

```
let foo = 42;      // foo is now a number  
foo = 'bar';      // foo is now a string  
foo = true;       // foo is now a Boolean
```

- **NOTE: The use of dynamic typing is considered a bad practice!**



Variable Declaration and Scope

Local vs. Global

Legacy Variable Declaration

- You will see **var** used in old examples
- Using **var** to declare variables is a **legacy** technique
- Since **ES2015** variables are declared using **let**
- **var** introduces function scope **hoisting**
 - ThereWill be discussed in the next slide
- Is no good reason to **ever** use **var**!



Variable Declaration

- **var** – use **function scope** – can be accessed anywhere in the function, including outside the initial block
- **let** – use **block scope** – when declared inside a block **{ }** can **NOT** be accessed from outside the block

```
{  
  var x = 2;  
}  
console.log(x); // 2
```

```
{  
  let x = 2;  
}  
console.log(x); // Error
```



- The scope of a variable is the **region** of the program in which it is defined
 - **Global Scope** – **Global** variables can be accessed from anywhere in a JavaScript function

```
var carName = "Volvo";  
// Code here can use carName  
function myFunction() {  
// Code here can also use carName  
}
```

- **Function Scope – Local** variables can only be accessed from inside the function where they are declared

```
function myFunction() {  
    var carName = "Volvo";  
    // Only here code CAN use carName  
}
```

- **Block Scope** - Variables declared inside a block **{ }** can **not** be accessed from outside the block

```
{  
    let x = 2;  
} // x can NOT be used here
```

Naming Variables

- Variable names are **case sensitive**
- Variable names must begin with a **letter** or **underscore** (`_`) character

`firstName, report, config, fontSize, maxSpeed`

- Variable names **can't** be one of JavaScript's reserved words like: **break, const, interface, typeof, true** etc.

`foo, bar, p, p1, LastName, last_name, LAST_NAME`



A background network diagram consisting of a grid of light gray lines intersecting at various points. At these intersections, there are several circles of different sizes, some solid light gray and some hollow, creating a web-like structure.


typeof

Typeof Operator

Checking for a Type

Definition and Examples

- Used to find the **type of data** stored in a **variable**



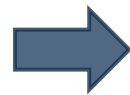
```
console.log(typeof "")           // Returns "string"  
console.log(typeof "John")      // Returns "string"  
console.log(typeof "John Doe")  // Returns "string"  
console.log(typeof 0)           // Returns "number"
```

```
let n = 5;  
if (typeof(n) === 'number') {  
    console.log(n); // 5  
}
```

Problem: Echo Type

- Receive one **parameter**
- Print the **data type** of the parameter
- If the parameter type is **string** or **number**, print its **value**
- Otherwise, print a special message

'Hello, JavaScript!'



string
Hello, JavaScript!

undefined



undefined
Parameter is not suitable for printing

Solution: Echo Type

```
function echo(param) {  
  const dataType = typeof param;  
  console.log(dataType);  
  if (dataType == 'string' || dataType == 'number') {  
    console.log(dataType);  
  } else {  
    console.log('Parameter is not suitable for printing');  
  }  
}
```




'ABC'

Strings

Sequence of Characters

What is a String?

- Used to represent **textual data**
- Each **symbol** occupies a **position** in the String
- The **first** element is at **index 0**, the next at index 1, and so on
- The **length** of a String is the number of elements in it

```
let name = 'George';  
console.log(name[0]); // 'G'
```

Accessing element at index



Strings Are Immutable


- Unlike in languages like C, JavaScript strings are **immutable**
- This means that once a string is created, it is **not** possible to **modify** it

```
let name = 'George';  
name[0] = 'P';  
console.log(name)  // 'George'
```



String Interpolation

- In JS we can use **template literals**. These are string literals that allow **embedded** expressions



```
let name = 'Rick';  
let age = 18;  
console.log(`${name} = ${age}`);  
// 'Rick = 18'
```

Place your **variables** after the '\$' sign

Problem: Concatenate Names

- Receive two names as string parameters and a delimiter
- Print the names joined by the delimiter

`'John', 'Smith', '->'`



`John->Smith`

`'Jan', 'White', '<->'`



`Jan<->White`

```
function solve(first, second, del) {  
  console.log(` ${first}${del}${second} `);  
}  
solve('John', 'Wick', '***')
```

Problem: Right Place

- You will receive **3 parameters** (string, symbol, string)
- Replace the underscore '_' in the **first word** with the **symbol**
- Compare both strings and print **"Matched"** or **"Not Matched"**

'Str_ng', 'I', 'Strong'



Not Matched

'Str_ng', 'i', 'String'



Matched

```
function solve(str, symbol, result) {  
  let res = str.replace('_', symbol);  
  let output = res ===  
    result ? "Matched" : "Not Matched";  
  console.log(output);  
}  
solve('Str_ng', 'I', 'Strong')
```



123

Numbers

Integer, Float, Double – All in One

What is a Number?

- JavaScript has a **universal** numeric type **number**
 - Used for both **integer** and **floating-point** values
- The type has three **symbolic** values: **+Infinity**, **-Infinity**, and **NaN** (not-a-number)

```
let num1 = 1;  
let num2 = 1.5;  
let num3 = 'p';  
console.log(num1 + num2)    // 2.5  
console.log(num1 + num3)    // '1p'  
console.log(Number(num3))   // NaN
```

Concatenation

Trying to parse a
string



Problem: Integer or Float

- You will receive **3 numbers**
- Find their **sum** and print: "**{sum} - {Integer or Float}**"

9, 100, 1.1

➔ 110.1 - **Float**

100, 200, 303

➔ 603 - **Integer**

122.3, 212.3, 5

➔ 339.6 - **Float**

```
function solve(num1, num2, num3) {  
  let sum = num1 + num2 + num3;  
  let output = sum % 1 === 0  
    ? sum + ' - Integer'  
    : sum + ' - Float';  
  console.log(output);  
}
```

`solve(112.3, 212.3, 5)`



true
false

Booleans

Conditions, Truthy and Falsy values

What is a Boolean?

- **Boolean** represents a logical entity and can have two values: **true** and **false**
- You can use the **Boolean()** function to find out if an expression (or a variable) is true:

```
Boolean(10 > 9)    // Returns true
```

- Or even easier:

```
(10 > 9)    // Also returns true  
10 > 9      // Also returns true
```



Comparisons and Conditions

Operator	Description	Example
<code>==</code>	equal to (no type)	<code>if (day == 'Monday')</code>
<code>></code>	greater than	<code>if (salary > 9000)</code>
<code><</code>	less than	<code>if (age < 18)</code>
<code>===</code>	equal to (with type)	<code>if (5 === 5)</code>
<code>>=</code>	greater than or equal (no type)	<code>if (6 >= 6)</code>
<code>!==</code>	not equal (with type)	<code>if (5 !== '5')</code>
<code>!=</code>	not equal (no type)	<code>if (5 != 5)</code>

Booleans Examples

- Everything **with** a "value" is **true**

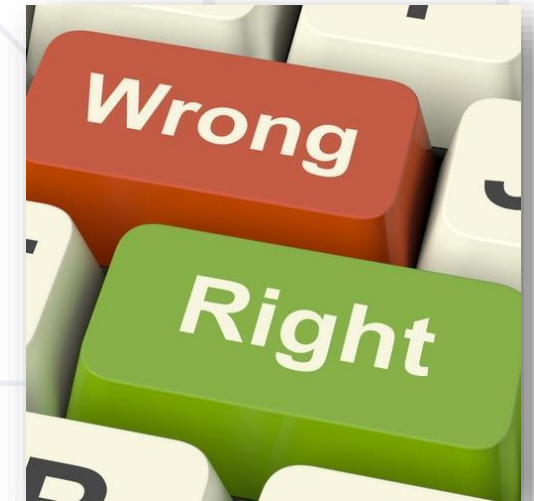
```
let number = 1;  
if (number) {  
  console.log(number) // 1  
}
```

true

- Everything **without** a "value" is **false**

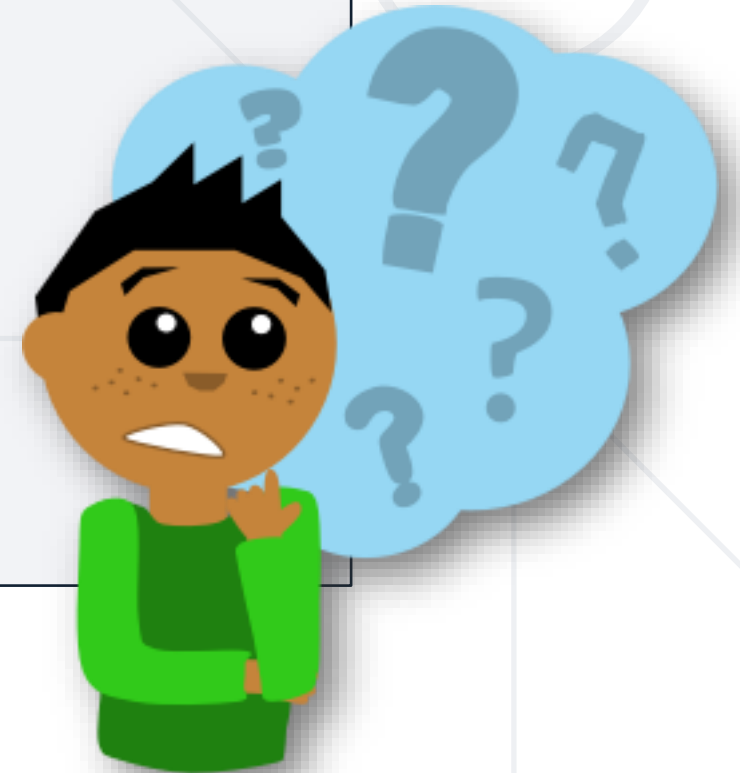
```
let number;  
if (number) {  
  console.log(number)  
} else {  
  console.log('false') // false  
}
```

false



Booleans Examples

```
Boolean(undefined); // false
Boolean(0);          // false
Boolean(-0);         // false
Boolean('');         // false
Boolean(false);      // false
Boolean(null);       // false
Boolean(10 / 'p');   // false
```



Problem: Amazing Numbers

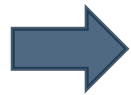
- You will receive **a number**, check if it is **amazing**
- An amazing is a number, whose **sum** of digits includes **9**
- Print it in format "**{number} Amazing? {True or False}**"

1233



1233 Amazing? **True**

999



999 Amazing? **False**

Solution: Amazing Numbers

```
function solve(num) {  
  num = num.toString();  
  let sum = 0;  
  for(let i = 0; i < num.length; i++)  
    sum += Number(num[i]);  
  let result = sum.toString().includes('9');  
  console.log(result ? `${num} Amazing? True`  
    : `${num} Amazing? False`);  
}
```




**Undefined
Null**

Undefined and Null

Non-Existent and Empty

Undefined

- A variable without a value has the value **undefined**. The **typeof** is also **undefined**

```
let car; // Value is undefined, type is undefined
```

- A variable can be emptied, by setting the value to **undefined**. The type will also be **undefined**

```
let car = undefined;  
// Value is undefined, type is undefined
```



Null

- **Null** is "**nothing**". It is supposed to be something that doesn't exist
- The **typeof** null is an **object**



```
let person = {  
  firstName: "John",  
  lastName: "Doe",  
  age: 50  
};  
person = null;  
console.log(person);           // null  
console.log(typeof(person));  // object
```

Null and Undefined

- **Null** is an assigned value. It means nothing
- **Undefined** typically means a variable has been declared but not defined yet
- **Null** and **Undefined** are **falsy** values
- **Undefined** and **Null** are equal in value but different in type:

```
null !== undefined    // true  
null == undefined     // true
```

- There are **7 data types** in JavaScript: **Number, String, Symbol, Null, Undefined, Object, Boolean**
- **let** has block scope, **var** has function scope
- With **typeof** we can receive the type of a variable
- **Null** is "nothing", **undefined** exists, but is empty



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