JavaScript Data Types & Type Conversion

1. Types in JavaScript

JavaScript is dynamically typed, meaning variable types are determined at runtime.

There are two main categories of data types:

A. Primitive Data Types (Immutable)

- String - textual data: "Hello", '123'
- Number - integer or float: 42, 3.14, -0.5
- BigInt - very large integers: 12345678901234567890n
- Boolean - true or false: true, false
- Undefined - declared variable with no value: let x; // undefined
- Null - intentional absence of value: let y = null;
- Symbol - unique identifiers: Symbol("id")

B. Non-Primitive Data Types (Reference)

- Object - key-value pairs: { name: "John", age: 25 }
- Array - ordered values: [1, 2, 3]
- Function - code block: function greet() { ... }
- Others: Date, RegExp, etc.

2. Type Checking

Use typeof to check types:

```
typeof "Hello"       // "string"
typeof 42            // "number"
typeof true          // "boolean"
typeof undefined     // "undefined"
typeof null          // "object" (legacy quirk)
typeof {a:1}         // "object"
typeof [1,2]         // "object"
typeof function(){}  // "function"
```

3. Type Conversion

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JavaScript allows implicit and explicit conversions.

A. Convert String to Number

- Number("42") -> 42
- parseInt("42px") -> 42
- parseFloat("3.14") -> 3.14
- +"42" -> 42

B. Convert Number to String

- String(42) -> "42"
- (42).toString() -> "42"
- 42 + "" -> "42"

C. Convert Any to Boolean

- Boolean("hello") -> true
- Boolean(0) -> false
- Boolean([]) -> true
- Boolean(null) -> false

4. Examples

```
let str = "100";
let num = Number(str);       // 100
let str2 = String(num);      // "100"
let floatNum = parseFloat("3.14"); // 3.14
let result = "5" * 2;        // 10
let result2 = "5" + 2;       // "52"
```

5. Common Pitfalls

"5" + 1 -> "51"

"5" - 1 -> 4

null + 1 -> 1

undefined + 1 -> NaN

[] + {} -> "[object Object]"

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6. Summary Table

From -> To | Method | Example

String -> Number | Number(), +, parseInt() | Number("42") -> 42

Number -> String | String(), .toString(), + "" | String(42) -> "42"

Any -> Boolean | Boolean() | Boolean(0) -> false