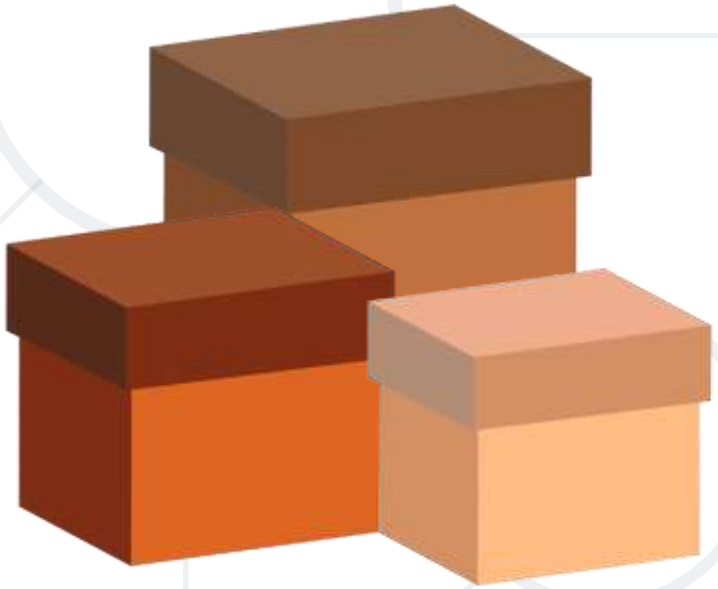
Data Types and Variables

Types of Operators



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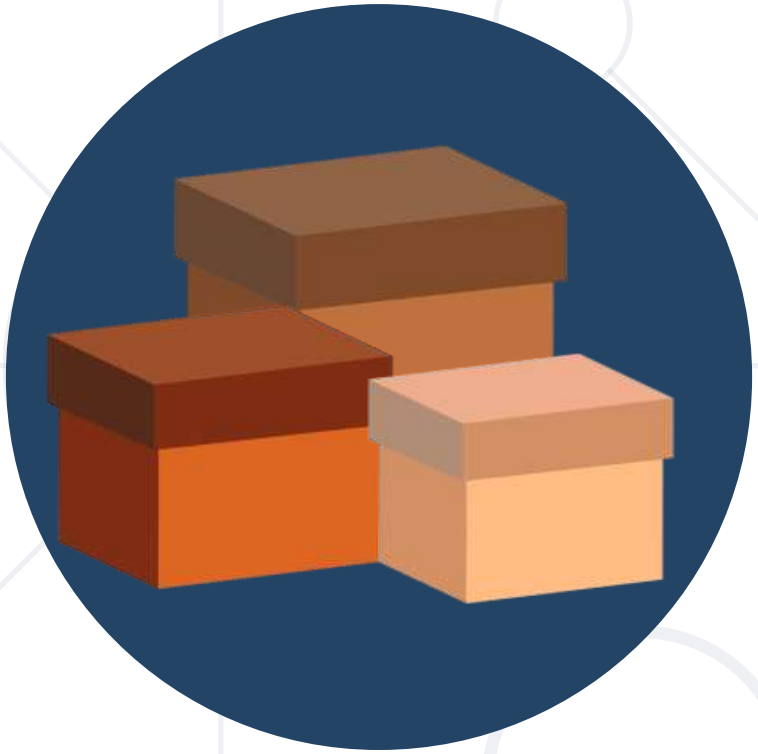


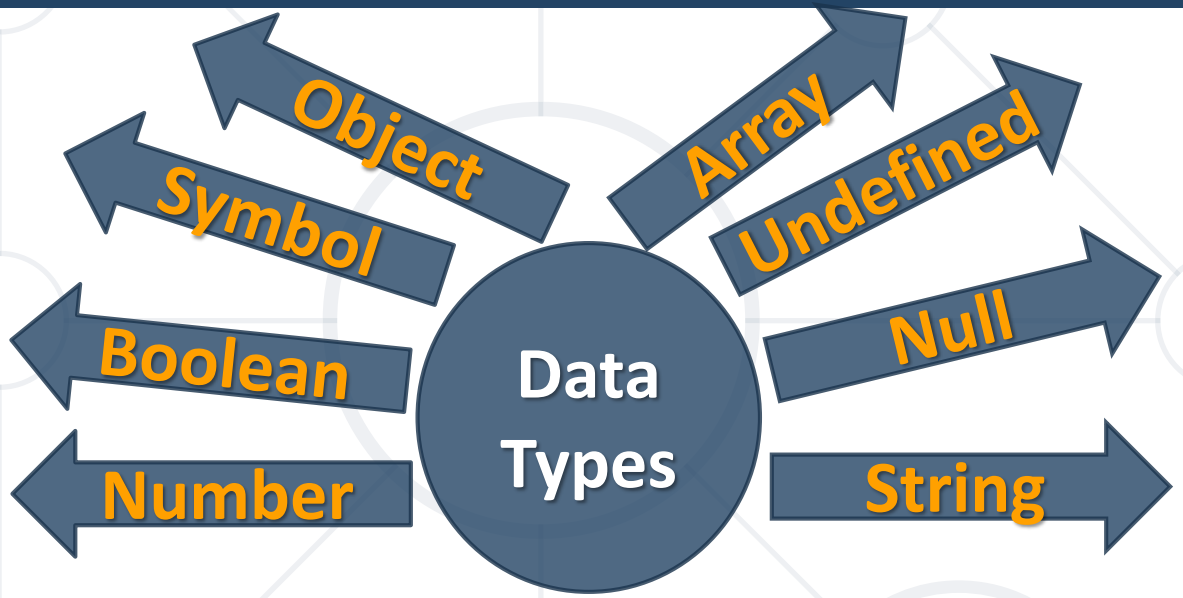
What is data type

Definition and examples

What is Data Type?

- A particular kind of **data item**, as defined by the values it can take, the programming language used, or the operations that can be performed on it
- After **ECMAScript** 2015 there are **seven** data types:
  - Six **primitive**: Boolean, Null, Undefined, Number, String, Symbol (new in ECMAScript 6)
  - and **Objects**

Examples




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

Data Types are dynamic

- JavaScript is a loosely typed or a **dynamic** language. Variables are **not** directly associated with any particular value type, and any variable can be **assigned** (and **re-assigned**) values of all types:

```
let variable = 42; // variable is now a number
variable = 'bar';  // variable is now a string
variable = true;   // variable is now a boolean
```

Let vs. Var

local vs. global

Var and Let

- JavaScript variables are **containers** for storing data values.

- **var** - variables declared inside a block **{}** can be accessed from outside the block

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

- **let** - variables declared inside a block **{}** can not be accessed from outside the block

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

Variables Scope

- 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
}
```

Variables Scope (2)

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

```
firstName, report, config, fontSize, maxSpeed
```

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

'ABC'

Strings

sequence of characters

What is a String?

- Used to represent **textual data**.
- Each element in the String 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.

Accessing element at index

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

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'
```

Use **back tick** to declare a strings

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`
`'Linda', 'Terry', '=>'`	→	`Linda=>Terry`

Solution: Concatenate Names

- Solution:

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

```
solve('John', 'Wick', '***')
```

Check your solution here: https://judge.softuni.bg/Contests/Practice/Index/1242

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`

Solution: Right Place

- Solution:

```
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')
```

Check your solution here: https://judge.softuni.bg/Contests/Practice/Index/1242

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Numbers

integer, float, double all in one

What is a Number?

- There is **no specific** type for integers and floating-point numbers.
- In addition to being able to represent floating-point numbers, the number 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 and 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`

Solution: Integer or Float

- Solution:

```
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)
```

Check your solution here: https://judge.softuni.bg/Contests/Practice/Index/1242

true

false

Booleans

conditions

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
==	equal to (no type)	if (day == 'Monday')
>	greater than	if (salary > 9000)
<	less than	if (age < 18)
===	equal to (with type)	if (5 === 5)
>=	greater than or equal (no type)	if (6 >= 6)
<==	less than or equal (with type)	if (10 <== 100)
!==	not equal (with type)	if (5 !== '5')
!=	not equal (no type)	if (5 != 5)

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 (2)

```
let x = 0;
Boolean(x);              // false
let x = -0;
Boolean(x);              // false
let x = '';
Boolean(x);              // false
let x = false;
Boolean(x);              // false
let x = null;
Boolean(x);              // false
let x = 10 / 'p';
Boolean(x);              // false
```

Problem: Amazing Numbers

- You will receive **a number,** check if it is **amazing**
- An amazing is a number, which **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

- Solution:

```
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`);
}
```

Check your solution here: https://judge.softuni.bg/Contests/Practice/Index/1242

Arrays & Objects

Reference types

Definition and examples

- Arrays are used to store multiple values in a single variable.

```
let cars = ["Saab", "Volvo", "BMW"];
```

in square brackets, separated by commas.

- Objects containers for named values called properties or methods.

```
let person = {
  firstName:"John",
  lastName:"Doe",
  age:50,
  eyeColor:"blue"
};
```

in curly braces, properties are written as name : value pairs, separated by commas.

typeof

Typeof Operator

checking for a type

Definition and examples

- Used to find the **type of** a JavaScript **variable**.
- **Returns** the **type** of a variable or an expression:

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

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

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

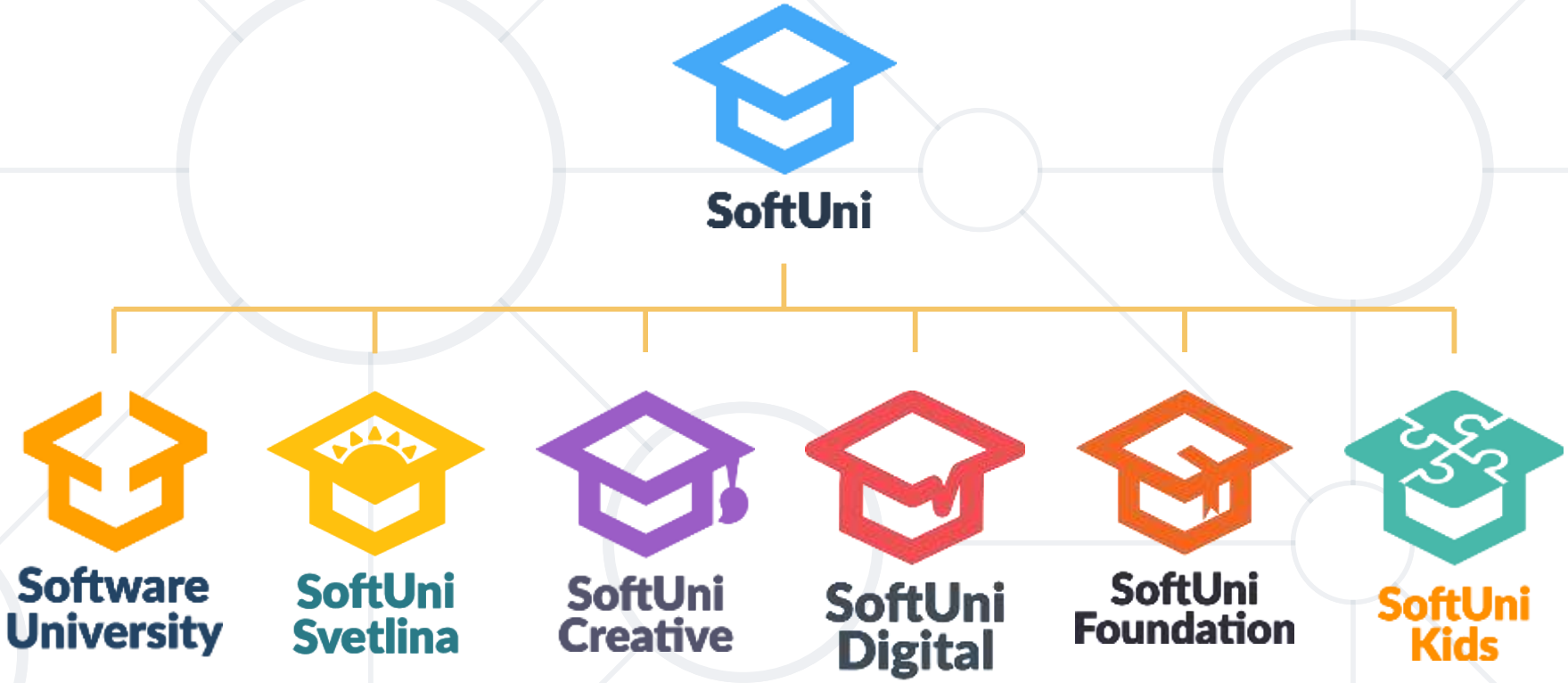
```
null !== undefined          // true
null == undefined           // true
```

Live Exercises

Summary

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

Questions?



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