Objects and JSON

SoftUni Team

Technical Trainers

Software University

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Objects

Definition, Properties and Methods

What are Objects ?

- Collection of related data or functionality
- Consists of several variables and functions called **properties** and **methods**
- In JavaScript, at run time you can add and remove properties of any object

Object name

Property name

```
let obj = { name:'Peter', age: 20 }
console.log(obj.name) //Peter
```

Property value

Object Definition

- We can create an object with an **object literal**, using the following syntax:

```
let person = {name:'Peter', age: 20, hairColor: 'black'}
```

- We can define empty object and add the properties later

```
let person = {}
 person.name ='Peter'
 person["lastName"] = 'Parker'
 person.age = 20
 person.hairColor = 'black'
```

You can access and set properties using both ways

Object Methods

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- Functions within a JavaScript object are called **methods**
- We can define methods using several syntaxes:

```
let person = {
  sayHello : function() {
     console.log('Hi, guys')
  }
}
```

```
let person = {
  sayHello() {
     console.log('Hi, guys')
  }
}
```

- We can add a method to an already defined object

```
let person = { name:'Peter', age: 20 }
person.sayHello = () => console.log('Hi, guys')
```

The Object Methods

- Methods:
  - Object.**entries()** – returns array of all properties and their values of an object
  - Object.**keys()** – returns array with all the properties
  - Object.**values()** – returns array with all the values of the properties

```
Object.entries(cat) //[['name', 'Tom'], ['age', 5]]
```

```
Object.keys(cat) //['name', 'age']
```

```
Object.values(cat) //['Tom', 5]
```

Iterate through Keys

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- Use **for-in** to loop through the keys:

in loops through the properties

```
let obj = { name:'Peter', age:'18', grade:'5.50' }
for (let prop in obj) {
    console.log(`${prop}: ${obj[prop]}`);
}
```

Returns the value of the property

Problem: Person Info

- Create a person object that has first name, last name and age. Print the entries of a given object.

Input	Output
Peter Pan 20	firstName: Peter lastName: Pan age: 20

Input	Output
Jack Sparrow unknown	firstName: Jack lastName: Sparrow age: unknown

Solution: Person Info

- Create a Person object
- Set properties first name, last name and age
- Get the entries. Loop through them and print them

```
//TODO: create the object and set the properties
let entries = Object.entries(person);
for (let [ key, value ] of entries) {
    console.log(`${key}: ${value}`);
}
```

Check your solution here: https://judge.softuni.bg/Contests/1323

Problem: City

- Create a City object which will hold area, population, country and postcode. Loop through all the keys and print them with their values

Input	Output
Sofia 492 1238438 Bulgaria 1000	name -> Sofia area -> 492 population -> 1238438 country -> Bulgaria postCode -> 1000

Solution: City

- Create a City object
- Set the properties
- Loop through the entries and print them

```
//TODO: create the city object and set the properties
for (let prop in city) {
    //TODO: print in appropriate format
}
```

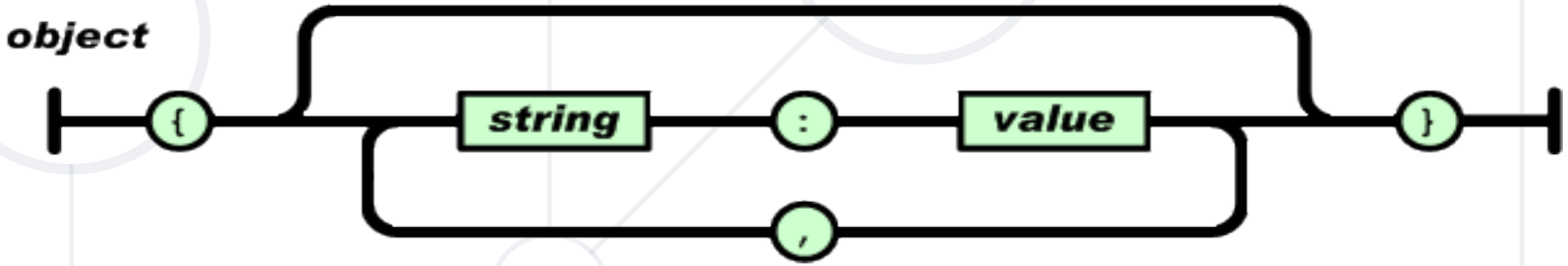
Check your solution here: https://judge.softuni.bg/Contests/1323

JSON

JavaScript Object Notation

What is JSON

- **JSON** stands for **J**ava**S**cript **O**bject **N**otation
- **Open-standard** file format that uses text to transmit data objects
- JSON is **language independent**
- JSON is "**self-describing**" and easy to understand



JSON Usage

- Exchange data between **browser** and **server**
- JSON is a **lightweight** format compared to XML
- JavaScript has built in functions to **parse JSON** so it's easy to use
- JSON uses **human-readable** text to transmit data

JSON Example

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Brackets define a JSON

Keys and values separated by :

Keys are in double quotes

It is possible to have object in object

In JSON we can have arrays

```
{
  "name": "Peter",
  "age": 25,
  "grades": {
    "Math": [2.50, 3.50],
    "Chemestry": [4.50]
  }
}
```

JSON Methods

- We can convert JavaScript object into JSON string using JSON.**stringify**(object) method

```
let text = JSON.stringify(obj)
```

- We can convert JSON string into JavaScript object using JSON.**parse**(text) method

```
let obj = JSON.parse(text)
```

Problem: Convert to Object

- Write a function that receives a string in **JSON** format and converts it to object
- Print the entries of the object

Input
`'{"name": "George", "age": 40, "town": "Sofia"}'`
Output

`name: George`
`age: 40`
`town: Sofia`

Tips: Convert to Object

- Use JSON.**parse**( ) method to parse JSON string to an object
- Use Object.entries( ) method to get object's properties names and values
- Loop through the entries and print them

```
function solve(json){
    //TODO: use the tips to write the function
}
```

Solution: Convert to Object

```
function solve(json) {
    let person= JSON.parse(json);

    let entries = Object.entries(person);

    for (let [key, value] of entries) {
        console.log(`${key}: ${value}`);
    }

}
```

Check your solution here: https://judge.softuni.bg/Contests/1323

Problem: Convert to JSON

- Write a function that receives first name, last name, hair color and sets them to an object.
- Convert the object to **JSON string** and print it.

Input
`'George', 'Jones', 'Brown'`
Output
`{"firstName": "George", "lastName": "Jones", "hairColor": "Brown"}`

Tips: Convert to JSON

- Create an object with the given input
- Use JSON.**stringify**( ) method to parse object to JSON string
- Keep in mind that the property name in the JSON string will be **exactly the same** as the property name in the object

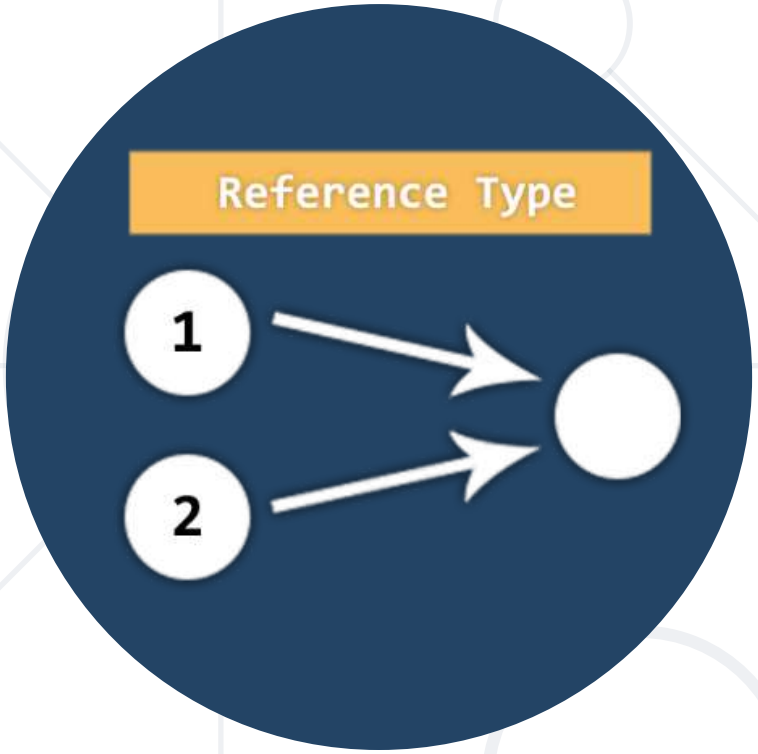
```
function solve(name, lastName, hairColor){
    //TODO: use the tips and write the code
}
```

Solution: Convert to JSON

```
function solve(firstName, lastName, hairColor){
    let person = {
        firstName,
        lastName,
        hairColor
    }

    console.log(JSON.stringify(person));
}
```

Check your solution here: https://judge.softuni.bg/Contests/1323



Value vs. Reference Types

Memory Stack and Heap

Value vs. Reference Types

pass by reference

cup =

fillCup( )

pass by value

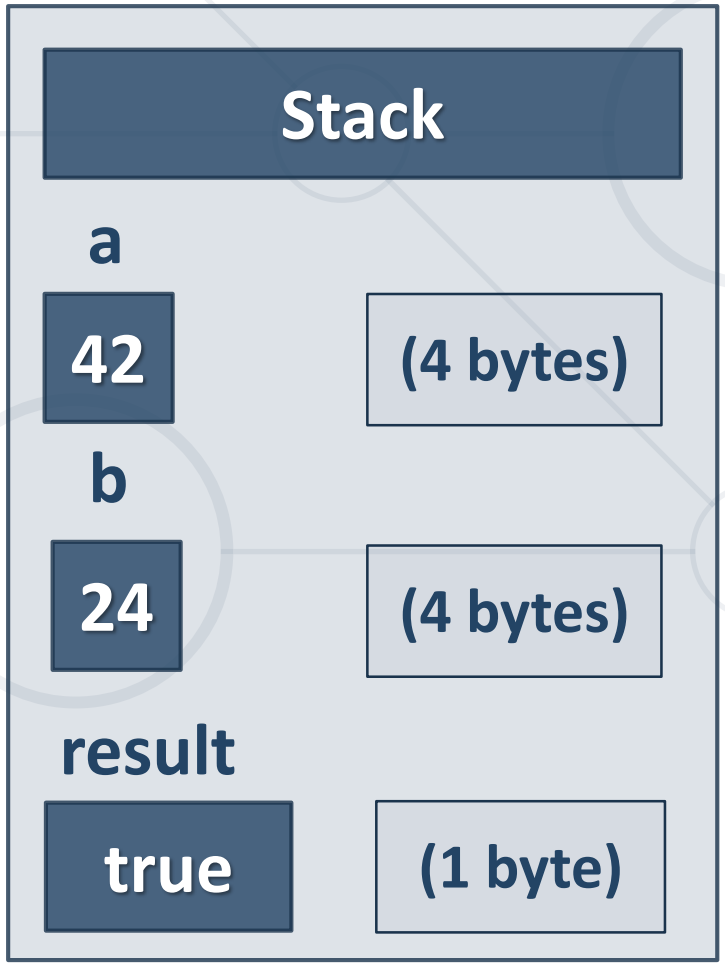
cup =

fillCup( )

Value Types

- **Value type** variables hold directly their value
- Each variable has its own **copy** of the **value**

```
let a = 42;
let b = 24;
let result = true;
```



Value Types Example

```
let a = 4 // a = 4
let b = a // b = 4
console.log(a + b)// 8
b = doubleNumber(b)// b = 10
console.log(a + b) // 14
```

Each variable has its own value

- When we pass variables as parameters we are passing copy of their values

You must return the new value

```
let doubleNumber = (num) => return num *= 2
```

What is Reference Type ?

- **Object** is not the only reference type in JavaScript
  - Arrays are also regular objects
- Variables assigned with non-primitive values are given a **reference** to the memory address with that value
- Many variables can **reference** the **same** object
  - Operations on any variable modify the same data

Reference Type Example

```
function test() {
    let person = { name: 'Peter' };
    let obj = person;
    console.log(person.name);
    changeName('object', obj);
    console.log(person.name);
}

function changeName(name, obj){
    obj.name = name;
}
```

Reference is passed to the function

The function is accessing the object directly, there is no need of return.

Reference vs Value Example: Value Types

```
function solve(){
  let num = 5;
  increment(num, 15);
  console.log(num);
}

function increment(num, value){
  num += value;
}
```

num = 5

Reference vs Value Example: Reference Types

```
function solve(){
  let nums = [ 5 ];
  increment(nums, 15);
  console.log(nums[0]);
}

function increment(nums, value){
  nums[0] += value;
}
```

num = 20

Class

Classes

Object Models

What are classes

- Extensible program-code-template for creating **objects**
- Provides **initial values** for the state of an object
- An object created by the class pattern is called an **instance** of that class
- A class has a **constructor** - subroutine called to create an object. It prepares the new object for use

Class Declaration

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- Declaring a class

To declare a class we use the **class** keyword with the name of the class.

```
class Student {
  constructor(name) {
    this.name = name
  }
}
```

The **constructor** is a special method for creating and initializing an object

Class Example

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- Creating a class:

```
class Student {
  constructor(name, grade) {
    this.name = name
    this.grade = grade
  }
}
```

this keyword is used to set a property of the objects to a given value

- Creating an instance of the class:

```
let student = new Student('Peter', 5.50)
```

Functions in a Class

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- Classes can also have functions as property, called methods:

```
class Dog {
  constructor() {
    this.speak = () => {
      console.log('Woof')
    }
  }
}

let dog = new Dog()
dog.speak() //Woof
```

We access the method as a regular property

Problem: Cat

- Write a function that receives **array of strings** in the following format: '{cat name} {age}'
- Create a Cat class that receives the **name** and the **age** parsed from the input
- It should also have a function named "**meow**" that will print "{cat name}, age {age} says Meow" on the console
- For each of the strings provided you must create a cat object.

Input	Output
['Mellow 2','Tom 5']	Mellow, age 2 says Meow Tom, age 5 says Meow

Tips: Cat

- Create a Cat class
- Set properties name and age
- Set property 'meow' to be a function that prints the result
- Parse the input data
- Create all objects using class constructor and the parsed input data and store them in an array
- Loop through the array using for…of cycle and invoke .meow() method

Solution: Cat

```
function solve(arr){
    //TODO: create the Cat class
     let cats = [];
     for(let i = 0; i < arr.length; i++){
        let catData = arr[i].split(' ');
        let [name, age] = [catData[0], catData[1]];
         cats.push(new Cat(name, age));
      }
     //TODO iterate through cats[] and invoke .meow()
            using for…of loop
}
```

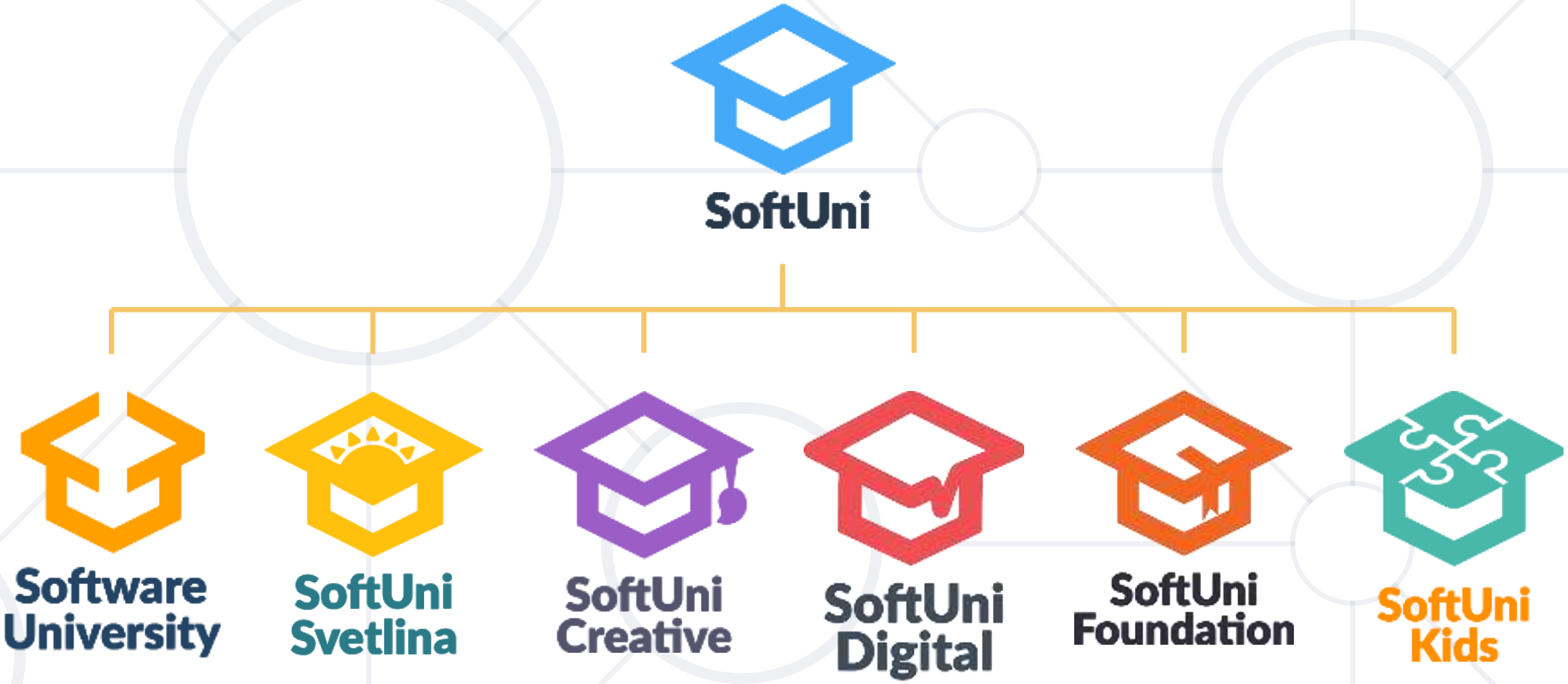
Check your solution here: https://judge.softuni.bg/Contests/1323

Live Exercises

Summary

- Objects hold **key-value pairs**
  - Access key and value **by index** in loops
  - Access value with **[**'key name'**]**
  - Access value with obj.key
- Use Object **Methods** such as:
  - **Object.keys**
  - **Object.values**
- **Parse** and **stringify** objects in **JSON** formats

Questions?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