

# **FRONTEND DEVELOPMENT**

## **WINTERSEMESTER 2021**

A large, white, sans-serif font text "FHS SNEAK PEEK" is overlaid on a photograph of a roller coaster track. The track is red and silver, with several cars visible. In the background, there are several palm trees and a clear sky.

FHS SNEAK PEEK

# HOMEWORK

- » verify your solution before handing it in
  - » you can always contact me in case of an issue
- » Please use Pull/Merge requests
  - » no PR means 0 points for the last assignment
- » delay function needs to return the promise

# EXAM

- » the lecture on the 21.12. was shortened
- » exam will take place 13.1. on site
  - » the 2 incoming students can do the exam remote
- » everything from the lecture/slides is part of the exam

# EXAMPLE QUESTIONS

- » What will be logged?
- » Explain the difference between block-scoped and function scoped.

```
function myFunction() {  
let university1 = 'FHS1'  
var university2 = 'FHS2'
```

# EXAMPLE QUESTIONS

- » Explain the difference between UMD and AMD modules.
- » Write a module './calculator.js' which can be used as the following:

```
import currentValue, { add, subtract } from './calculator.js'  
add(5)  
subtract(4)  
  
console.log(currentValue) // result should be 1
```

# EXAMPLE QUESTIONS

- » How can you run promises in parallel?
- » write a function which calls `fetch('/current-user', '/weather')` in parallel
- » after both resolved the result should be logged

# EXAMPLE QUESTIONS

- » What will be logged?
- » Explain the difference between block-scoped and function scoped.

```
function myFunction() {  
let university1 = 'FHS1'  
var university2 = 'FHS2'
```

# EXAMPLE QUESTIONS

- » Create a new promise which resolves after 200ms
- » wrap the following function to use promises

```
const fetchWithCallback = (url, callback) => {}
```



00PANDUS

# OOP AND JS CLASS BASED OOP

- » A class is like a blueprint – a description of the object to be created.
- » class: plan for a house
- » object: the actual house

# OOP AND JS

- » JS has a simple object based paradigm
- » An object is a collection of properties
- » A property is an association between a name and a value
- » Objects can be linked together, via prototypes

# OOP AND JS PROTOTYPAL INHERITANCE

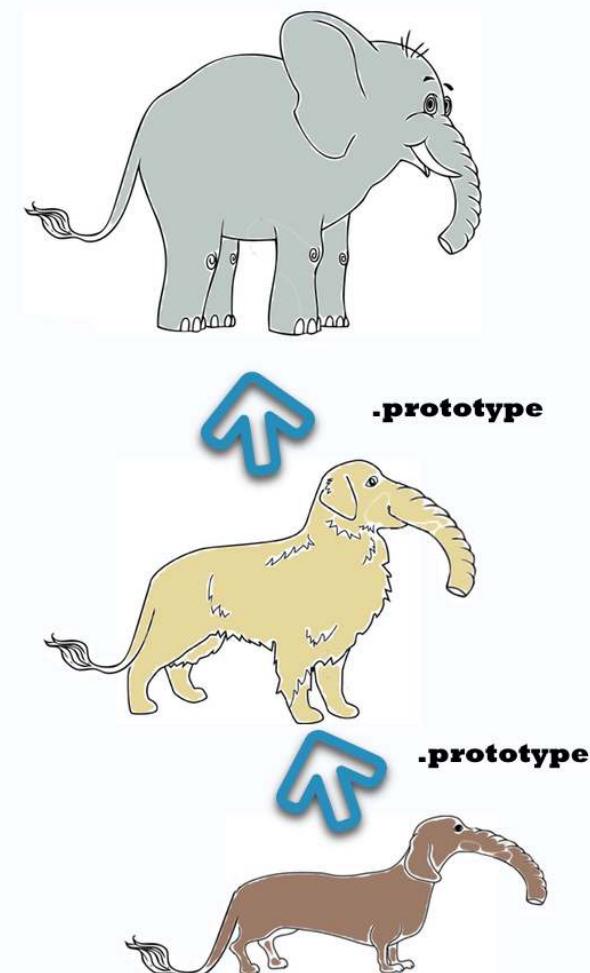
“A prototype is a working object instance. Objects inherit directly from objects”

# OOP AND JS PROTOTYPAL INHERITANCE

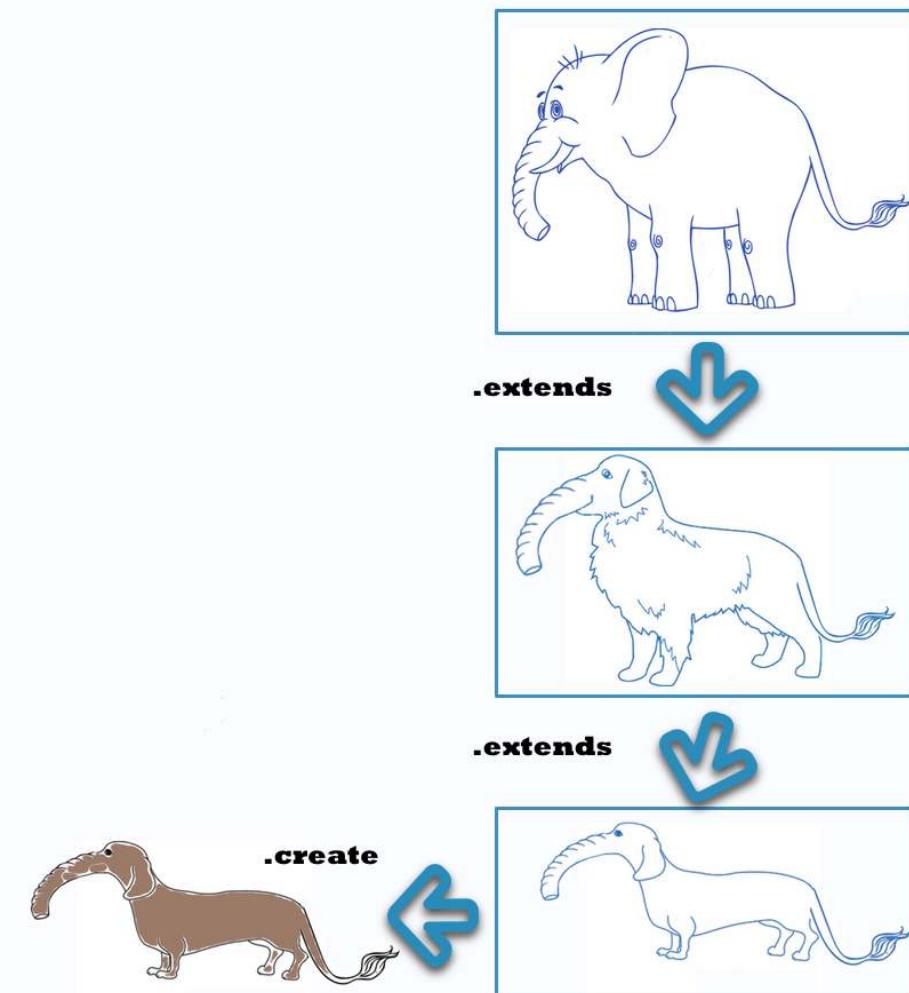
- » Prototypal inheritance is delegation
  - » You ask a friend for a pen
  - » Your friend does not have a pen but asks his neighbor
  - » This chain goes on until you either have a pen or none of your related friends have a pen
- » This could be seen as the prototype chain

# OOP AND JS<sup>5</sup>

## Prototypical



## Classical



<sup>5</sup> image from medium

# OOP AND JS CREATE OBJECT INSTANCES

```
function University(name) {  
  this.name = name  
  //^^^^  
  // define an instance variable  
}
```

```
University.prototype.isBestUniversity = function() {  
  // ^^^^^^  
  // you need to use function here, as () -> {} don't support 'this'  
  return this.name === 'FHS'  
  // ^^^  
  // prototype is able to access instance variables  
}
```

```
const fhs = new University('FHS')  
fhs.isBestUniversity() // true
```

# OOP AND JS WITH CLASS SYNTAX

» Emulates class based oop with prototypes

```
class University {  
  constructor(name) {  
    this.name = name  
    //^^^^  
    // define an instance variable  
  }  
  
  isBestUniversity() {  
    return this.name === 'FHS'  
  }  
}  
  
const fhs = new University('FHS')  
fhs.isBestUniversity() // true
```

# OOP AND JS EXTENDING CLASSES

- » Emulates class based oop with prototypes

```
class FHS extends University {  
    isBestUniversity() {  
        return true  
    }  
}
```

```
const fhs = new University('FHS')  
fhs.isBestUniversity() // true
```

# ARROW FUNCTIONS

# FUNCTIONS DECLARATION VS. FUNCTION EXPRESSIONS

- » functions in JavaScript are values
- » can be passed to other functions <sup>1</sup>

```
function myFunction() { console.log('Hallo') }
```

```
setTimeout(myFunction, 200)
//           ^^^^^^^^^^
// pass my function to setTimeout
// myFunction will be called after 200ms
```

<sup>1</sup> see callbacks from previous lecture

# FUNCTIONS DECLARATION VS. FUNCTION EXPRESSIONS

» functions can be defined like other values in JS

```
const myFunction1 = function myFunction1 () { console.log('Hallo') }  
// ^^^^^^
```

// functions can be assigned to a variable

```
const myFunction2 = function () { console.log('Hallo') }  
// ^^^
```

// name can be omitted here

```
setTimeout(myFunction1, 200)
```

# FUNCTIONS DECLARATION VS. FUNCTION EXPRESSIONS

```
// function declaration  
function myFunction1 () { console.log('Hallo') }
```

```
// function expression  
const myFunction2 = function () { console.log('Hallo') }
```

# ARROW FUNCTION VS. FUNCTION DECLARATION

- » compact alternative to function expressions
- » can't be used in all situations
- » no binding to this
- » no arguments keyword
- » can't be used as constructor

```
const myArrowFunction = () => { console.log('hallo') }
```

# ARROW FUNCTION

» arrow functions can have an implicit return value

```
const myFunction = () => 1 // returns 1
```

```
const myFunction = () => { 1 } // returns undefined
```

```
const myFunction = () => ({ test: 1 }) // returns { test: 1 }
```

# FUNCTION DECLARATIONS AND THIS

- » JavaScript functions bind this when the new keyword is used

```
function Person() {  
    this.age = 0  
    setInterval(function() {  
        this.age++  
        //^^^^ references to window as the function was not created via `new`  
    }, 1000)  
}  
const myPerson = new Person()  
  
// wait a couple of seconds  
myPerson.age === 0  
window.age === NaN
```

# FUNCTION DECLARATIONS AND THIS

```
function Person() {
  const that = this // save this as a variable so it can be used in setInterval
  this.age = 0
  setInterval(function() {
    that.age++
  }, 1000)
}
const myPerson = new Person()

// wait a couple of seconds
myPerson.age === 3
window.age === undefined
```

# FUNCTION DECLARATIONS AND THIS

```
function Person() {  
    this.age = 0  
    setInterval(() => {  
        this.age++ // no need to use that hack  
    }, 1000)  
}  
const myPerson = new Person()  
  
// wait a couple of seconds  
myPerson.age === 3  
window.age === undefined
```

# FUNCTIONS IN JS

```
// function declaration  
function myFunction { console.log('hallo') }
```

```
// function expression  
const myArrowFunction = function () { console.log('hallo') }
```

```
// arrow function  
const myFunction = () => { console.log('hallo') }
```

# FUNCTION DEFAULT VALUES

» since es6 functions accept default values

```
function myFunction (a = 1) {  
  //  
  // define a default value for your function  
  console.log(a)  
}  
myFunction() // 1  
myFunction(2) // 2
```

# FUNCTION DEFAULT WITH NAMED ARGUMENTS

```
function myFunction ({ a = 1, b = 2 }) {  
  //  
  // define a default value for your function  
  console.log(a + b)  
}  
myFunction() // 3  
myFunction({ a: 2 }) // 4  
myFunction({ b: 3 }) // 4  
myFunction({ a: 2, b: 3 }) // 5
```

# REST PARAMETERS

- » The rest parameter syntax allows us to represent an indefinite number of arguments as an array.

```
function myFunction (...values) {  
    // ^^^  
    // all arguments will be available as values  
    console.log(values)  
}  
myFunction() // []  
myFunction(1) // [1]  
myFunction(1, 2, 3, 4, 5, 6) // [1, 2, 3, 4, 5, 6]
```

# TEMPLATE LITERALS

# ARRAY METHODS

# ARRAY METHODS

## ARRAY.PROTOTYPE.FOREACH

- » calls given callback for each element inside the array

```
const myArray = [1, 2, 3, 4, 5]
const result = myArray.forEach(item => { console.log(item * 2) })
// logs 1
// logs 2
// ...
// result === undefined
```

# ARRAY METHODS

## ARRAY.PROTOTYPE.MAP

- » creates a new array populated with the result of the provided function

```
const myArray = [1,2,3,4,5]
const result = myArray.map(item => item * 2)
// result will be [2, 4, 6, 8, 10]
```

# ARRAY METHODS

## ARRAY.PROTOTYPE.FILTER

- » creates a new array with all elements that pass the given function

```
const myArray = [1,2,3,4,5]
const result = myArray.filter(item => (item % 2) === 0)
// result will be [2, 4]
```

# ARRAY METHODS

## ARRAY.PROTOTYPE.REDUCE

- » executes a reducer function on each element of the array
- » results in a single value

```
const myArray = [1,2,3,4,5]
const sumOfArray = myArray.reduce(result, item) => {
  return result + item
}, 0)
// sum of array 15
```

# ARRAY METHODS

## ARRAY.PROTOTYPE.REDUCE

```
const myArray = [1,2,3,4,5]
const sumOfArray = myArray.reduce((accumulator, item) => {
    // 1) ^^^^^^
    // 2) ^^^^
    // 3)      ^
    // 1) reducer function
    // 2) accumulated value of previous iterations
    // 3) the current value of the iteration (1, 2, 3, ...)

    return accumulator + item
    // 4) ^^^^^^
    // 4) return the result for the next iteration
}, 0)
// ^
// define initial value
```

# ARRAY METHODS

## ARRAY METHODS CAN BE COMBINED

```
const makeSmoothie = (ingredients) => {
  return ingredients
    .filter((ingredient) => ingredient.rotten === false)
    .map((ingredient) => ingredient.slice())
    .reduce((smoothie, ingredient) => smoothie.add(ingredient), new Smoothie())
}
```

# ARRAY METHODS

## ARRAY.PROTOTYPE.FIND

» finds the first matching element in an array

```
const myArray = [1,2,3,4,5]
const result = myArray.find((item) => (item % 2) === 0)
// result will be 2
```

# ARRAY METHODS

## ARRAY.PROTOTYPE.FLAT

- » The `flat()` method converts nested objects into a flat list

```
const myArray = [1,[2,[3],4],5]
myArray.flat() // [1, 2, [3], 4, 5]
myArray.flat(2) // [1, 2, 3, 4, 5]
//           ^^^
// amount of levels to flatten
```

# EXERCISE TIME



# EXERCISE TIME

- » You have a list of students:
  - » create a function `countStudentLength` which
  - » gets a string as argument
  - » filter students by given string
  - » sum the length of the students names

# EXERCISE TIME

```
const students = [
  { name: "Hans" },
  { name: "Mike" },
  { name: "Fabian" },
  { name: "Anna" }
]
// todo: implement me
```

# TEMPLATE LITERALS

- » es6 enhances strings with a completely new syntax
- » called template literals
- » they make it possible to
  - » interpolate strings
  - » multiline strings
  - » embed expressions

<sup>2</sup> see <https://developers.google.com/web/updates/2015/01/ES6-Template-Strings> for more info

# TEMPLATE LITERALS

## STRING INTERPOLATION

```
const university = 'FHS'  
const myString = `My University is ${university}`  
// ^  
// template literals are using back-ticks ``
```

# TEMPLATE LITERALS EMBEDDED EXPRESSIONS

```
const myUniversity = () => 'FHS'  
const myString = `My University is ${myUniversity()}`  
// ^  
// functions and methods can be called ``
```

# TEMPLATE LITERALS

```
const myUniversity = () => 'FHS'  
const myString = `My University is ${myUniversity()}`  
// ^  
// functions and methods can be called ``
```

# TEMPLATE LITERALS

## MULTI LINE STRINGS

```
const greeting1 = "Hello \
World";
//                                     ^
// use backslash \ to start a new line

const greeting2 = "Hello " +
"World";
//                                     ^
// use backslash + to concat 2 strings

const greeting3 = `Hello
World`;
//                                     ^
// with template literals new lines
// will be put into one line
```

# OPTIONAL CHAINING

# OPTIONAL CHAINING



# OPTIONAL CHAINING OBJECT VALUES<sup>3</sup>

- » Allows to read values deep within an object chain
- » When value is null or undefined returns null

```
const adventurer = {  
  cat: { name: 'Dinah' }  
}
```

```
const dogName = adventurer.dog?.name;  
//  
// dogName will be undefined and no error
```

```
const catName = adventurer.cat?.name;  
//  
// catName will be 'Dinah' as cat is defined
```

<sup>3</sup> Compiled Source

# OPTIONAL CHAINING, NESTED FUNCTIONS<sup>4</sup>

```
const adventurer = {  
  name: 'Alice',  
  dogName: () => 'Dinah'  
}  
adventurer.dogName.?() // undefined  
adventurer.catName.?() // 'Dinah'
```

<sup>4</sup> Compiled Source

# FEEDBACK

- » Questions: [tmayrhofer.lba@fh-salzburg.ac.at](mailto:tmayrhofer.lba@fh-salzburg.ac.at)
- » Feedback Link