

CMPS 356 Enterprise Application Development - Spring 2020

Lab 6 –JavaScript Asynchronous Programming

Objective

The objective of this lab is to practice JavaScript asynchronous programming using **Callbacks**, **Promises** and **async/await**.

Overview

This lab has three parts:

- **Part A:** Practice JavaScript Unit testing using Mocha and Chai (1h).
- **Part B:** Practice Callbacks, Promises and Async-Await (1h 50mins).

Part A – Unit Testing Using Mocha and Chai

1. Sync cmps356-lab repo to get the Lab files.
2. Copy *Lab6-AsyncJS* folder from cmps356-content repo to your repository.
3. Open *Lab6-AsyncJS\UnitConverter* in Webstorm. You should see a JavaScript file named *UnitConverter.js*. In this exercise, you will create a spec file to unit test the function of the *UnitConverter* class.
4. First, create the package.json file using **npm init**. This file is used to define dependencies by listing the npm packages used by the app.

Refresh your project to see the **package.json** file.

5. Install mocha and chai using *node package manager* (npm):

```
npm install mocha -D
npm install chai -D
```

This will add 2 dev dependencies to package.json file.

```
"devDependencies": {
  "chai": "^4.1.2",
  "mocha": "^5.0.4"
}
```

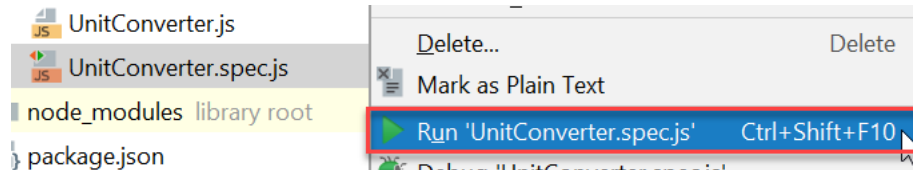
6. Create a JavaScript file named **UnitConverter.spec.js**
7. Import an instance the *UnitConverter* class to be tested and the *chai expect* package.

```
const unitConverter = require('./UnitConverter');
const expect = require("chai").expect;
```
8. Write 2 test cases for each method of **UnitConverter** class.

You may start with the following inputs and expected results. Then use search for “google unit converter” to compute the expected results for more input values.

Method	Input	Expected Result
kgToOunce	1	35.274
kgToPound	2	4.4092
meterToInch	1	39.3701
meterToFoot	2	6.5617

9. Run the unit tests as you develop them using WebStorm:



Also run the unit tests from the command line using: `npm test`

But first, you should have the following in package.json file.

```
"scripts": {
  "test": "mocha **/*.spec.js"
},
```

Part B – Practice Callbacks, Promises, and Async-Await

In this exercise, we will collaboratively build the solution of each step after you attempting it by yourself. Then the instructor will demonstrate and explain the model solution. At the end of this exercise, you should be able to use **callbacks**, **promises** and **async/await** to read/write files. This will enable you to complete the remaining tasks of the Lab.

First, open *Lab5-AsyncJS\CountryExplorer* in WebStorm. You should see a folder named **data** containing three files: *country.json* and *country-literacy.json* and *world-universities.json*



1. Create a JavaScript file named `countryRepo-cb.js` and implement the following functions. Make sure that you test as you go. You may write the test function in the same file to keep it simple (no need to use mocha).
 - a. **getCountries**: reads all the countries from the *country.json* file using `fs` package and return an array of countries. **[test it]**

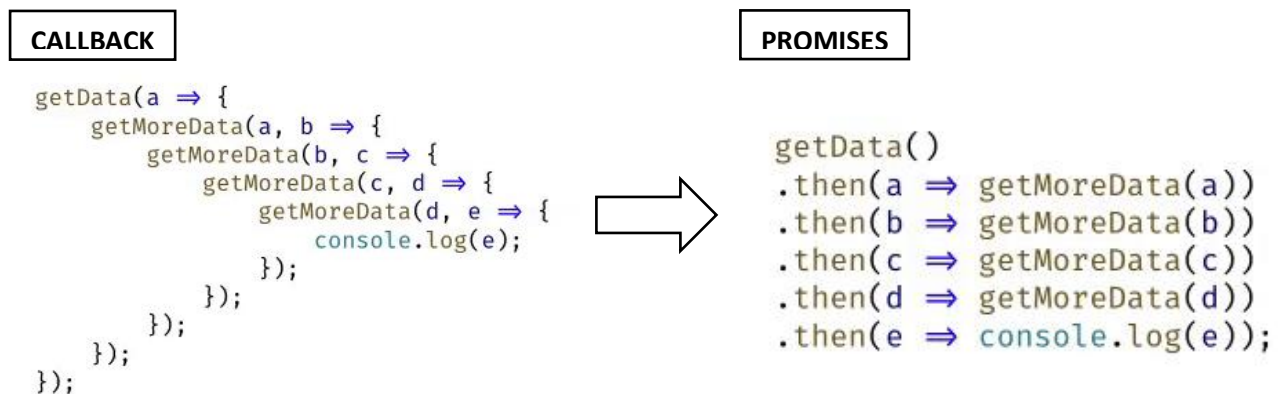
Note: *It's critical that you do not move to the next method without testing the previous one. By testing your code frequently as soon as you write them, will help you avoid accumulated errors and allow you to debug your code faster.*
 - b. **getCountry(countryName)**: return the matching country details. This function should reuse getCountries function. **[test it]**.
 - c. **getCapitalCity(countryName)** : return the capital city of the matching country

- d. **getCountryLiteracy(countryName)**: returns a country literacy details from country-literacy-rate.json. **[test it]**.
- e. Now, change the **getCountry** function done in (b) to call **getCountryLiteracy** function then return a country object with an extra attribute **literacyRate** **[test it]**.

$$\text{LiteracyRate} = \frac{\text{maleLiteracy} + \text{femaleLiteracy}}{2}$$



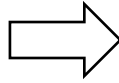
In the previous exercise, you have seen the **callbacks JavaScript pattern** as an excellent way of writing code that is non-blocking. However, this approach can cause a **callback hell** as shown in **getCountry(countryName)** function. We solve this issue by using **Promises and Async-Await**



1. To use promises, first install the **fs-extra** package using npm. fs-extra provides promises based API to read/write files:
npm install fs-extra
2. Create a JavaScript file named **country-promise.js** and re-write the functions you did in **countryRepo-cb.js** using promises instead of callbacks. Use **fs-extra** instead of **fs** , i.e., use **const fs = require('fs-extra');** to be able to read from files using promises. Make sure that you test as you go. You may write the test function in the same file to keep it simple.

PROMISES

```
getData()  
.then(a ⇒ getMoreData(a))  
.then(b ⇒ getMoreData(b))  
.then(c ⇒ getMoreData(c))  
.then(d ⇒ getMoreData(d))  
.then(e ⇒ console.log(e));
```



ASYNC-AWAIT

```
const a = await getData();  
const b = await getMoreData(a);  
const c = await getMoreData(b);  
const d = await getMoreData(c);  
const e = await getMoreData(d);  
console.log(e);
```



1. Create a JavaScript file named `country-async.js`. Create a class named `CountryRepo` and re-write the functions using `async-await` instead of promises. `CountryRepo` should have the methods shown in the table below. Make sure that you test as you go. You can create an `app.js` file to test `CountryRepo` class (no need to use `mocha`).

<code>getCountry(country)</code>	Returns country details from the <code>country.json</code> file. The returned object should also have a <i>literacyRate</i> attribute computed as the average <code>femaleLiteracyRate</code> and <code>maleLiteracyRate</code> retrieved from <i>country-literacy-rate.json</i> file.
<code>getNeighboursLiteracy(country)</code>	Returns neighboring countries and their literacy rates. The returned list of countries should be sorted based on the literacy rate.
<code>getRegionLiteracy(region)</code>	Returns all the countries in the region (e.g., Asia). Sort the list based on the <code>femaleLiteracyRate</code> .
<code>getTop3LowLiteracy</code>	Get the top 3 countries with the lowest literacy rate.
<code>getTop3HighLiteracy</code>	Get the top 3 countries with the highest literacy rate.

Important Notes: the country objects returned by all methods (except the first one) should have the following structure: `countryCode`, `country`, `femaleLiteracyRate`, `maleLiteracyRate`, `literacyRate` (which is the average of `femaleLiteracyRate` and `maleLiteracyRate`).