# Module 3 Labs

## 1. Fundamentals

2. What are the results of these expressions?

```
"" + 1 + 0
"" - 1 + 0
true + false
6 / "3"
"2" * "3"
4 + 5 + "px"
"$" + 4 + 5
"4" - 2
"4px" - 2
"  -9  " + 5
"  -9  " - 5
null + 1
undefined + 1
" \t \n" - 2
```

3. Here's a code that asks the user for two numbers and shows their sum.
   It works incorrectly. The output in the example below is 12 (for default prompt values).
   Why? Fix it. The result should be 3.

```
let a = prompt("First number?", 1);
let b = prompt("Second number?", 2);

alert(a + b); // 12
```

4. What will be the result for these expressions?

```
5 > 4
"apple" > "pineapple"
"2" > "12"
undefined == null
undefined === null
null == "\n0\n"
```

```
null === +"\n0\n"
```

5. Will an alert be shown?

```
if ("0") {
  alert( 'Hello' );
}
```

6. Rewrite this if using the conditional operator '?':

```
let result;

if (a + b < 4) {
  result = 'Below';
} else {
  result = 'Over';
}
```

7. Write the delay method  with arrow function,  delay(func, ms)
   Should work like:

```
const hello = ( who )=> console.log(`Hello ` + who );

const delalyHello = delay(hello, 300);

delayHello(`world`);
```

8. Write the function isEmpty(obj) which returns true if the object has no properties, false otherwise.

   Should work like:

```
let schedule = {};

alert( isEmpty(schedule) ); // true

schedule["8:30"] = "get up";

alert( isEmpty(schedule) ); // false
```

9. There's a ladder object that allows to go up and down

```
let ladder = {
  step: 0,
  up() {
    this.step++;
```

```
  },
  down() {
    this.step--;
  },
  showStep: function() { // shows the current step
    console.log( this.step );
  }
};
```

Modify the code of up, down and showStep to make the calls chainable, like this:

```
ladder.up().up().down().showStep(); // 1
```

10. Create New Accumulator

    Create a constructor function `Accumulator(startingValue)`.

    Object that it creates should:

    - Store the "current value" in the property `value`. The starting value is set to the argument of the constructor `startingValue`.
    - The `read()` method should use `prompt` to read a new number and add it to `value`.

    In other words, the `value` property is the sum of all user-entered values with the initial value `startingValue`.

    Here's the demo of the code:

```
let accumulator = new Accumulator(1); // initial value 1

accumulator.read(); // adds the user-entered value

accumulator.read(); // adds the user-entered value

console.log(accumulator.value); // shows the sum of these values
```

# 2. Intermediate

1. Uppercase the first character
   Write a function `ucFirst(str)` that returns the string `str` with the capitalized first character, for instance:

   ```
   ucFirst("john") == "John";
   ```

2. Truncate the text
   Create a function truncate(str, maxlength) that checks the length of the str and, if it exceeds maxlength – replaces the end of str with the ellipsis character "…", to make its length equal to maxlength.

   The result of the function should be the truncated (if needed) string.

   For instance:

   ```
   truncate("What I'd like to tell on this topic is:", 20) =
   "What I'd like to te…"

   truncate("Hi everyone!", 20) = "Hi everyone!"
   ```

3. Array operations

   Let's try 5 array operations.

   1. Create an array `styles` with items "Jazz" and "Blues".
   2. Append "Rock-n-Roll" to the end.
   3. Replace the value in the middle by "Classics". Your code for finding the middle value should work for any arrays with odd length.
   4. Strip off the first value of the array and show it.
   5. Prepend `Rap` and `Reggae` to the array.

   The array in the process:

   ```
   Jazz, Blues

   Jazz, Blues, Rock-n-Roll

   Jazz, Classics, Rock-n-Roll

   Classics, Rock-n-Roll

   Rap, Reggae, Classics, Rock-n-Roll
   ```

4. Translate border-left-width to borderLeftWidth

   Write the function `camelize(str)` that changes dash-separated words like “my-short-string” into camel-cased “myShortString”.

   That is: removes all dashes, each word after dash becomes uppercased.

   Examples:

   ```
   camelize("background-color") == 'backgroundColor';
   camelize("list-style-image") == 'listStyleImage';
   camelize("-webkit-transition") == 'WebkitTransition';
   ```

5. Create an extendable calculator

   Create a constructor function `Calculator` that creates “extendable” calculator objects.

   The task consists of two parts.

   First, implement the method `calculate(str)` that takes a string like `"1 + 2"` in the format “NUMBER operator NUMBER” (space-delimited) and returns the result. Should understand plus `+` and minus `-`.

   Usage example:

   ```
   let calc = new Calculator();

   alert( calc.calculate("3 + 7") ); // 10
   ```

   Then add the method `addMethod(name, func)` that teaches the calculator a new operation. It takes the operator `name` and the two-argument function `func(a,b)` that implements it.

   For instance, let’s add the multiplication `*`, division `/` and power `**`:

   ```
   let powerCalc = new Calculator();
   powerCalc.addMethod("*", (a, b) => a * b);
   powerCalc.addMethod("/", (a, b) => a / b);
   powerCalc.addMethod("**", (a, b) => a ** b);

   let result = powerCalc.calculate("2 ** 3");
   ```

```
alert( result ); // 8
```

- No parentheses or complex expressions in this task.
- The numbers and the operator are delimited with exactly one space.
- There may be error handling if you'd like to add it.
- Create an extendable calculator

6. Filter unique array members

   Let `arr` be an array.

   Create a function `unique(arr)` that should return an array with unique items of `arr`.

   For instance:

   ```
   function unique(arr) {
     /* your code */
   }

   let values = ["Hare", "Krishna", "Hare", "Krishna",
     "Krishna", "Krishna", "Hare", "Hare", ":-O"
   ];


   alert( unique(values) ); // Hare, Krishna, :-O
   ```

   P.S. Here strings are used, but can be values of any type.

7. Iterable keys

   We'd like to get an array of `map.keys()` in a variable and then apply array-specific methods to it, e.g. `.push`.

   But that doesn't work:

   ```
   let map = new Map();

   map.set("name", "John");
   ```

```
let keys = map.keys();

// Error: keys.push is not a function


keys.push("more");
```

Why? How can we fix the code to make `keys.push` work?

8. Store "unread" flags
   There's an array of messages:

   ```
   let messages = [
     {text: "Hello", from: "John"},
     {text: "How goes?", from: "John"},
     {text: "See you soon", from: "Alice"}
   ];
   ```

   Your code can access it, but the messages are managed by someone else's code. New messages are added, old ones are removed regularly by that code, and you don't know the exact moments when it happens.

   Now, which data structure could you use to store information about whether the message "has been read"? The structure must be well-suited to give the answer "was it read?" for the given message object.

   P.S. When a message is removed from messages, it should disappear from your structure as well.

   P.P.S. We shouldn't modify message objects, add our properties to them. As they are managed by someone else's code, that may lead to bad consequences.

9. Sum the properties

   There is a `salaries` object with arbitrary number of salaries.

   Write the function `sumSalaries(salaries)` that returns the sum of all salaries using `Object.values` and the `for..of` loop.

If `salaries` is empty, then the result must be `0`.

For instance:

```
let salaries = {
  "John": 100,
  "Pete": 300,
  "Mary": 250
};

alert( sumSalaries(salaries) ); // 650
```

10. The maximal salary

    There is a `salaries` object:

    ```
    const salaries = {

      "John": 100,

      "Pete": 300,

      "Mary": 250

    };
    ```

    Create the function `topSalary(salaries)` that returns the name of the top-paid person.

    - If `salaries` is empty, it should return `null`.
    - If there are multiple top-paid persons, return any of them.

    P.S. Use `Object.entries` and destructuring to iterate over key/value pairs.

11. How many seconds have passed today?

    Write a function `getSecondsToday()` that returns the number of seconds from the beginning of today.

    For instance, if now were `10:00 am`, and there was no daylight savings shift, then:

    ```
    getSecondsToday() == 36000 // (3600 * 10)
    ```

The function should work in any day. That is, it should not have a hard-coded value of “today”.

12. Exclude backreferences

In simple cases of circular references, we can exclude an offending property from serialization by its name.

But sometimes we can’t just use the name, as it may be used both in circular references and normal properties. So we can check the property by its value.

Write replacer function to stringify everything, but remove properties that reference meetup:

```
let room = {
  number: 23
};

let meetup = {
  title: "Conference",
  occupiedBy: [{name: "John"}, {name: "Alice"}],
  place: room
};

// circular references
room.occupiedBy = meetup;
meetup.self = meetup;

alert( JSON.stringify(meetup, function replacer(key, value) {
  /* your code */
}));

/* result should be:
{
  "title":"Conference",
  "occupiedBy":[{"name":"John"},{"name":"Alice"}],
  "place":{"number":23}
}
*/
```

# 3. Advanced

1. Are counters independent?

   Here we make two counters: `counter` and `counter2` using the same `makeCounter` function.

   Are they independent? What is the second counter going to show? `0,1` or `2,3` or something else?

   ```
   function makeCounter() {
     let count = 0;

     return function() {
       return count++;
     };
   }

   let counter = makeCounter();
   let counter2 = makeCounter();

   alert( counter() ); // 0
   alert( counter() ); // 1

   alert( counter2() ); // ?
   alert( counter2() ); // ?
   ```

2. Set and decrease counter?

   Modify the code of `makeCounter()` so that the counter can also decrease and set the number:

   - `counter()` should return the next number (as before).
   - `counter.set(value)` should set the counter to `value`.
   - `counter.decrease()` should decrease the counter by 1.

   See the sandbox code for the complete usage example.

   P.S. You can use either a closure or the function property to keep the current count. Or write both variants.

3. Output every second

Write a function `printNumbers(from, to)` that outputs a number every second, starting from `from` and ending with `to`.

Make two variants of the solution.

1. Using `setInterval`.
2. Using nested `setTimeout`.

4. Debounce decorator

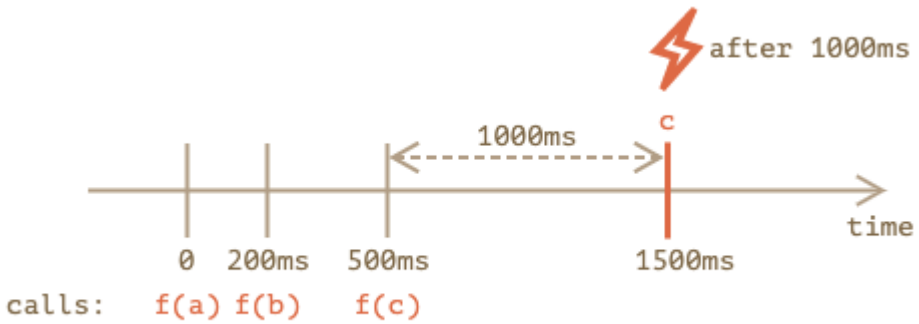
The result of `debounce(f, ms)` decorator is a wrapper that suspends calls to `f` until there's `ms` milliseconds of inactivity (no calls, "cooldown period"), then invokes `f` once with the latest arguments.

In other words, `debounce` is like a secretary that accepts "phone calls", and waits until there's `ms` milliseconds of being quiet. And only then it transfers the latest call information to "the boss" (calls the actual `f`).

For instance, we had a function `f` and replaced it with `f = debounce(f, 1000)`.

Then if the wrapped function is called at 0ms, 200ms and 500ms, and then there are no calls, then the actual `f` will be only called once, at 1500ms. That is: after the cooldown period of 1000ms from the last call.

---




...And it will get the arguments of the very last call, other calls are ignored.

Here's the code for it (uses the debounce decorator from the Lodash library):

```
let f = _.debounce(alert, 1000);

f("a");

setTimeout( () => f("b"), 200);

setTimeout( () => f("c"), 500);

// debounced function waits 1000ms after the last call
and then runs: alert("c")
```

5. Partial application for login
   What should we pass `askPassword` in the code below, so that it calls `user.login(true)` as `ok` and `user.login(false)` as `fail`?

```
function askPassword(ok, fail) {
  let password = prompt("Password?", '');
  if (password == "rockstar") ok();
  else fail();
}

let user = {
  name: 'John',

  login(result) {
    alert( this.name + (result ? ' logged in' : ' failed
to log in') );
  }
};

askPassword(?, ?); // ?
```

   Your changes should only modify the highlighted fragment.

6. Searching algorithm

   The task has two parts.

   Given the following objects:

```
let head = {
  glasses: 1
};

let table = {
```

```
  pen: 3
};

let bed = {
  sheet: 1,
  pillow: 2
};

let pockets = {
  money: 2000
};
```

- Use `__proto__` to assign prototypes in a way that any property lookup will follow the path: `pockets` → `bed` → `table` → `head`. For instance, `pockets.pen` should be `3` (found in `table`), and `bed.glasses` should be `1` (found in `head`).
- Answer the question: is it faster to get `glasses` as `pockets.glasses` or `head.glasses`? Benchmark if needed.

7. Create an object with the same constructor

   Imagine, we have an arbitrary object `obj`, created by a constructor function – we don't know which one, but we'd like to create a new object using it.

   Can we do it like that?

   ```
   let obj2 = new obj.constructor();
   ```

   Give an example of a constructor function for `obj` which lets such code work right. And an example that makes it work wrong.

8. Add the decorating "defer()" to functions
   Add to the prototype of all functions the method `defer(ms)`, that returns a wrapper, delaying the call by `ms` milliseconds.

   Here's an example of how it should work:

   ```
   function f(a, b) {

     alert( a + b );
   ```

```
}

f.defer(1000)(1, 2); // shows 3 after 1 second
```

Please note that the arguments should be passed to the original function.

9. Add toString to the dictionary

   There's an object `dictionary`, created as `Object.create(null)`, to store any `key/value` pairs.

   Add method `dictionary.toString()` into it, that should return a comma-delimited list of keys. Your `toString` should not show up in `for..in` over the object.

   Here's how it should work:

```
let dictionary = Object.create(null);

// your code to add dictionary.toString method

// add some data

dictionary.apple = "Apple";

dictionary.__proto__ = "test"; // __proto__ is a regular property key here

// only apple and __proto__ are in the loop

for(let key in dictionary) {

  alert(key); // "apple", then "__proto__"

}

// your toString in action

alert(dictionary); // "apple,__proto__"
```

10. Extended clock

    We've got a `Clock` class. As of now, it prints the time every second.

```
class Clock {
```

```
  constructor({ template }) {
    this.template = template;
  }

  render() {
    let date = new Date();

    let hours = date.getHours();
    if (hours < 10) hours = '0' + hours;

    let mins = date.getMinutes();
    if (mins < 10) mins = '0' + mins;

    let secs = date.getSeconds();
    if (secs < 10) secs = '0' + secs;

    let output = this.template
      .replace('h', hours)
      .replace('m', mins)
      .replace('s', secs);

    console.log(output);
  }

  stop() {
    clearInterval(this.timer);
  }

  start() {
    this.render();
    this.timer = setInterval(() => this.render(), 1000);
  }
}
```

Create a new class `ExtendedClock` that inherits from `Clock` and adds the parameter `precision` – the number of `ms` between “ticks”. Should be `1000` (1 second) by default.

- Your code should be in the file `extended-clock.js`
- Don’t modify the original `clock.js`. Extend it.

11. Inherit from SyntaxError

Create a class FormatError that inherits from the built-in SyntaxError class.

It should support message, name and stack properties.

Usage example:

```
let err = new FormatError("formatting error");

alert( err.message ); // formatting error
alert( err.name ); // FormatError
alert( err.stack ); // stack

alert( err instanceof FormatError ); // true


alert( err instanceof SyntaxError ); // true (because
inherits from SyntaxError)
```

12. Delay with a promise

    The built-in function `setTimeout` uses callbacks. Create a promise-based alternative.

    The function `delay(ms)` should return a promise. That promise should resolve after `ms` milliseconds, so that we can add `.then` to it, like this:

    ```
    function delay(ms) {

      // your code

    }

    delay(3000).then(() => alert('runs after 3 seconds'));
    ```

13. Rewrite using async/await
    Rewrite this example code from the chapter Promises chaining using `async/await` instead of `.then/catch`:

    ```
    function loadJson(url) {
      return fetch(url)
        .then(response => {
          if (response.status == 200) {
    ```

```
      return response.json();
    } else {
      throw new Error(response.status);
    }
  });
}

loadJson('no-such-user.json')
  .catch(alert); // Error: 404
```