GENERAL ASSEMBLY

JAVASCRIPT DEVELOPMENT

Sasha Vodnik, Instructor

HELLO!

1. Pull changes from the `svodnik/JS-SF-9-resources` repo to your computer
2. Open the `14-closures-module-pattern > starter-code` folder in your code editor

JAVASCRIPT DEVELOPMENT

CLOSURES & THE MODULE PATTERN

LEARNING OBJECTIVES

At the end of this class, you will be able to

- Describe the difference between functional programming and object oriented programming.
- Understand and explain closures.
- Instantly invoke functions.
- Implement the module pattern in your code.

AGENDA

- Objects
- Closures
- IIFEs
- Module pattern

WEEKLY OVERVIEW

WEEK 8	Project 2 Lab / Closures & the module pattern
WEEK 9	CRUD & Firebase / Deploying your app
WEEK 10	React / Final project lab

THE MODULE PATTERN

OBJECT-ORIENTED CODE

CLOSURES

IIFES

FUNCTIONS & OBJECTS

THE MODULE PATTERN

OBJECT-ORIENTED CODE

CLOSURES

IIFES

EXERCISE — CREATE AN OBJECT LITERAL

EXERCISE

TYPE OF EXERCISE

- Individual

TIMING

2 min

1. On your desk, on paper, or in your editor, write code that uses an object literal to create an object named `tortoise`.
2. Give your object a property named `mph` with a value of 1, and a property named `description` with a value of “slow and steady”.

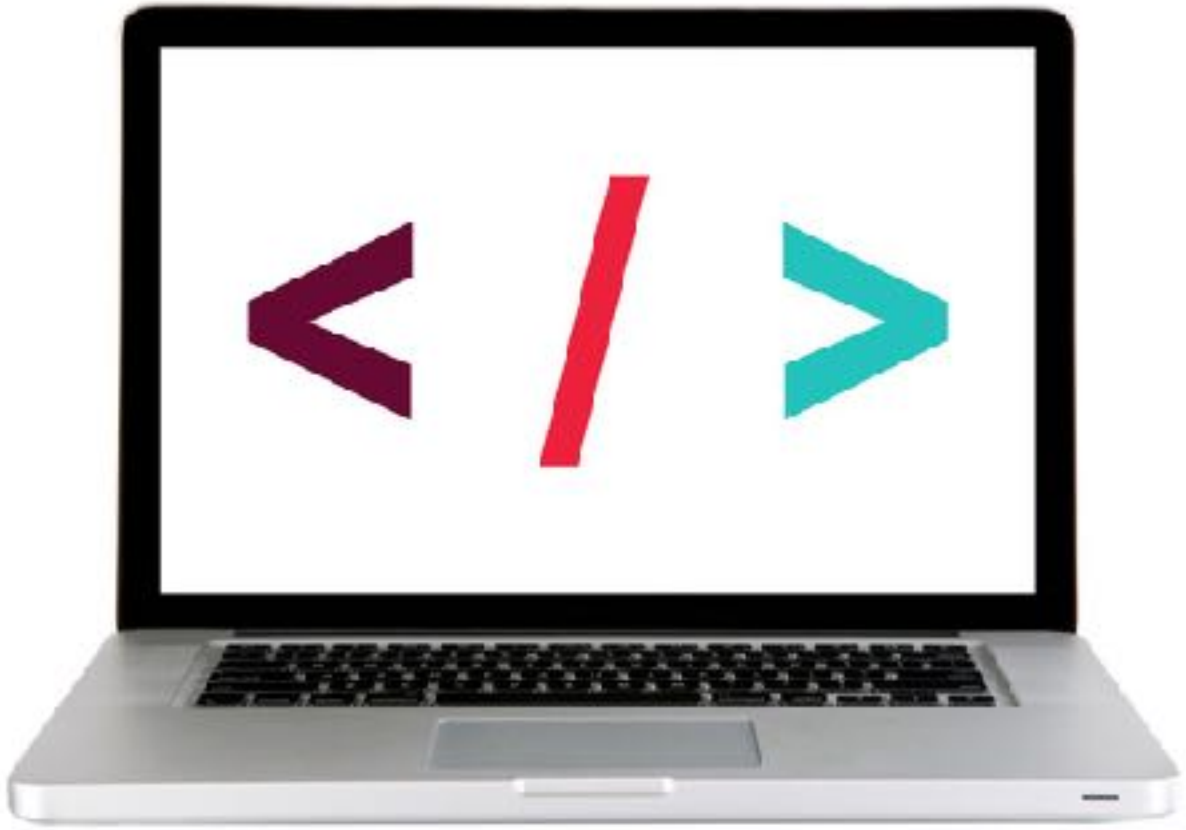
functional code

```
const taxRate = 0.0875;
let items = [];

function addToCart() {
  // do something
}

function calcTax() {
  // do something
}

function calcTotal() {
  // do something
}
```

object oriented code

```
let cart = {
  taxRate: 0.0875,
  items: [],
  addToCart: function() {
    // do something
  },
  calcTax: function() {
    // do something
  },
  calcTotal: function() {
    // do something
  }
};
```

LET'S TAKE A CLOSER LOOK



EXERCISE — CREATE A MAKECAR FUNCTION

EXERCISE

TYPE OF EXERCISE

- Individual/pair

LOCATION

- start files > 1-make-car-function

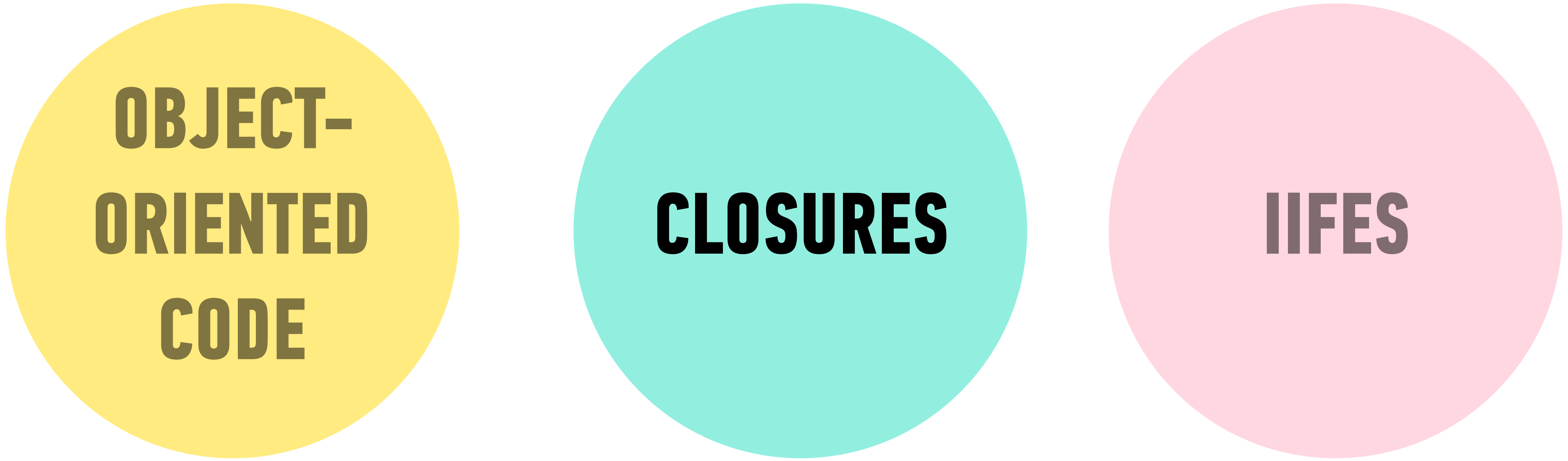
TIMING

8 min

1. In app.js, Define a function called makeCar() that takes two parameters (model, color), makes a new object literal for a car using those params, and returns that object.
2. Be sure your function returns the fuel property and the drive and refuel methods that you worked with in the previous exercise.

CLOSURES

THE MODULE PATTERN



SCOPE

- Describes the set of variables you have access to

GLOBAL SCOPE

- A variable declared outside of a function is accessible everywhere, even within functions. Such a variable is said to have **global scope**.

a variable declared outside of the function is in the global scope

```
let temp = 75;
function predict() {
  console.log(temp); // 75
}
console.log(temp); // 75
```

LOCAL SCOPE

- A variable declared within a function is not accessible outside of that function. Such a variable is said to have **local scope**.

```
let temp = 75;
function predict() {
  let forecast = ‘Sun’;
  console.log(temp + " and " + forecast); // 75 and Sun
}
console.log(temp + " and " + forecast);
// ‘forecast’ is undefined
```

a variable declared within a function is in the local scope of that function

a local variable is not accessible outside of its local scope

BLOCK SCOPE

- A variable created with `let` or `const` creates local scope within any block, including blocks that are part of loops and conditionals.
- This is known as **block scope**.

```
let temp = 75;
if (temp > 70) {
  let forecast = ‘It’s gonna be warm!’;
  console.log(temp + “! ” + forecast); // 75! It’s gonna be warm!
}
console.log(temp + “! " + forecast); // ‘forecast’ is undefined
```

`let` creates a local variable within any block, such as an `if` statement

a variable with block scope is not accessible outside of its block

BUILDING BLOCKS OF CLOSURES

- nested functions
- scope
  - inner function has access to outer function’s variables
- `return` statements
  - outer function returns reference to inner function

CLOSURES

- A **closure** is an inner function that has access to the outer (enclosing) function's variables.

the `tempAccess()` function is a closure

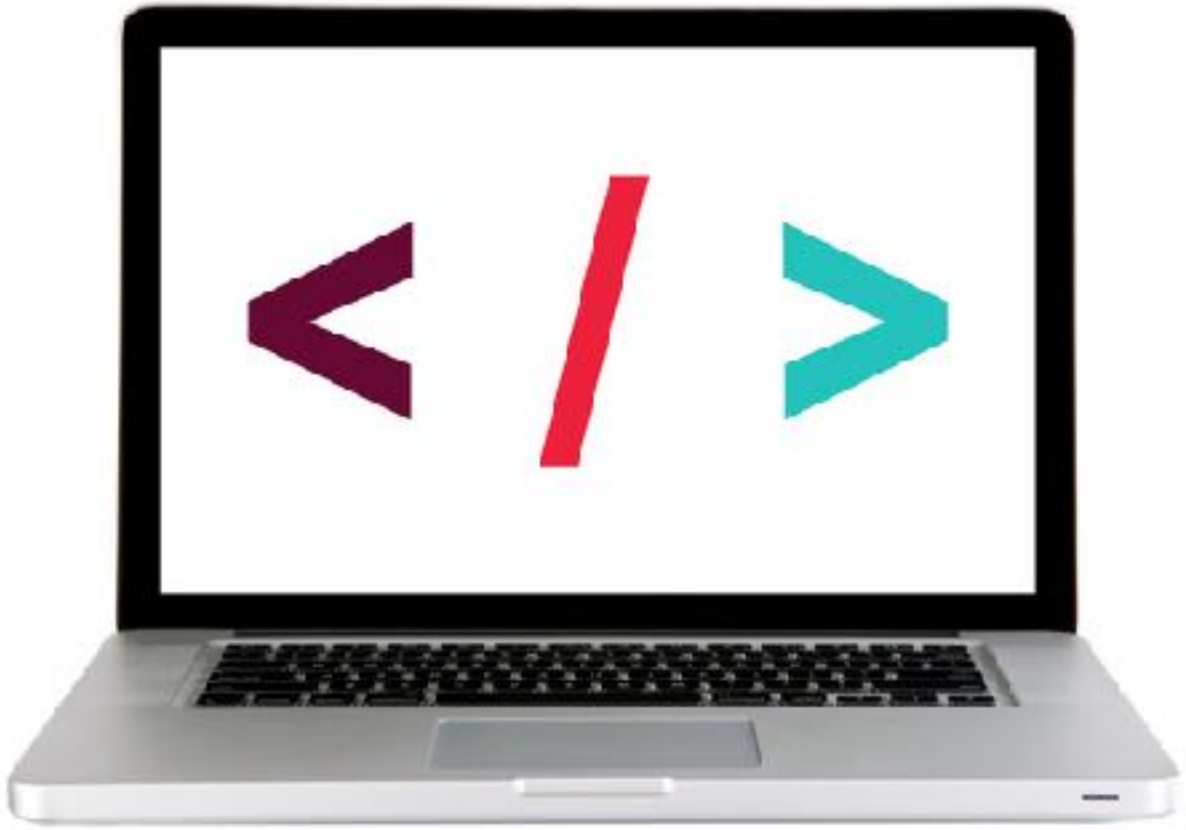
```
function getTemp() {
  let temp = 75;
  let tempAccess = function() {
    console.log(temp);
  }
  return tempAccess;
}
```

outer function `getTemp()` returns a reference to the inner function `tempAccess()`

CLOSURES

- A **closure** is an inner function that has access to the outer (enclosing) function's variables.
- You create a closure by nesting a function inside another function.
- A closure is also known as **lexical scope**

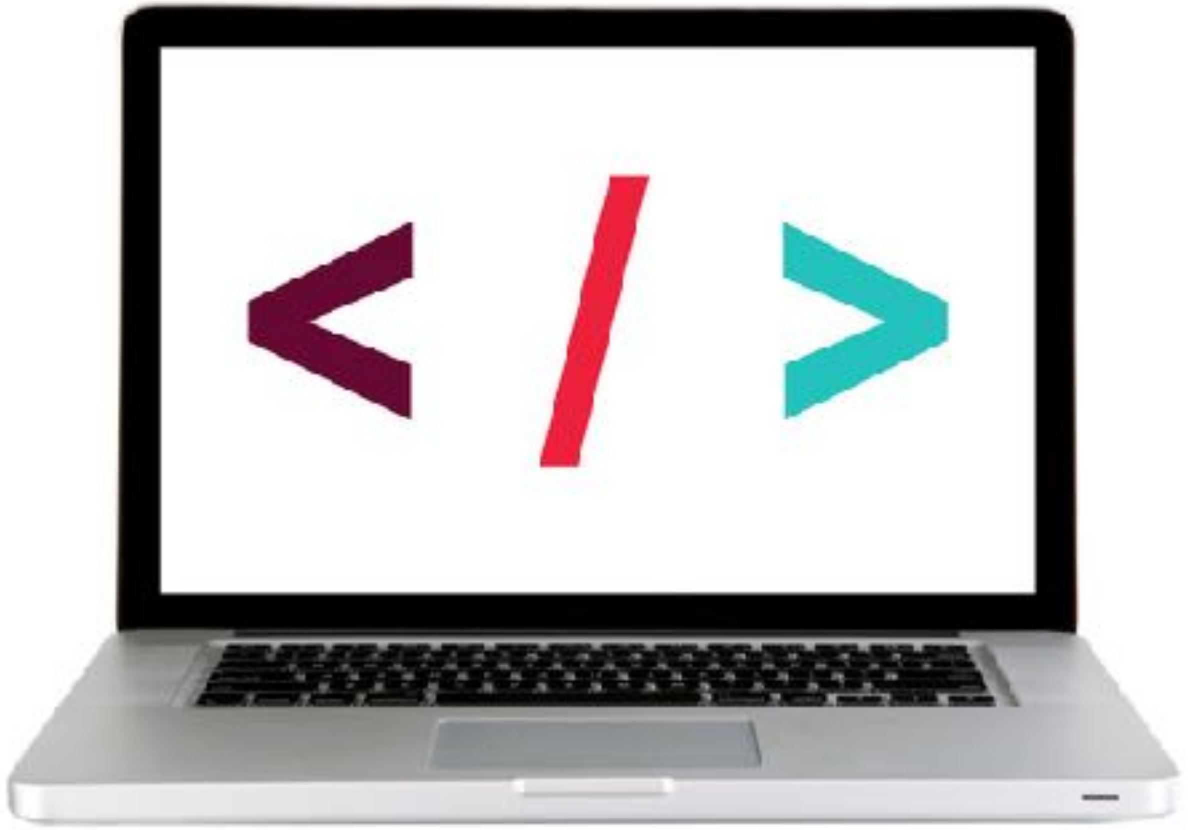
LET'S TAKE A CLOSER LOOK



CLOSURES — KEY POINTS

- Closures have access to the outer function's variables (including parameters) **even after the outer function returns**.
- Closures store **references** to the outer function's variables, not the actual values.

LET'S TAKE A CLOSER LOOK



WHAT ARE CLOSURES USED FOR?

- Turning an outer variable into a private variable
- Namespacing private functions

LAB — CLOSURES

KEY OBJECTIVE

- Understand and explain closures

TYPE OF EXERCISE

- Pairs

LOCATION

- starter-code > 3-closures-lab

EXECUTION

15 min

1. Follow the instructions in app.js to build and test code that uses a closure.

Immediately-invoked function expressions

THE MODULE PATTERN

OBJECT-ORIENTED CODE

CLOSURES

IIFES

Immediately-invoked function expression (IIFE)

- A function expression that is executed as soon as it is declared
- Pronounced “iffy”

IIFE based on a function expression

- Make a function expression into an IIFE by adding () to the end (before the semicolon)

```
let countDown = function() {
  let counter;
  for(counter = 3; counter > 0; counter--) {
    console.log(counter);
  }
}();
```

IIFE based on a function expression

- Make a function expression into an IIFE by adding () to the end (before the semicolon)

```
let countDown = function() {
  let counter;
  for(counter = 3; counter > 0; counter--) {
    console.log(counter);
  }
}();
```

IIFE based on a function declaration

- Make a function declaration into an IIFE by adding `(` at the start and `)();` to the end

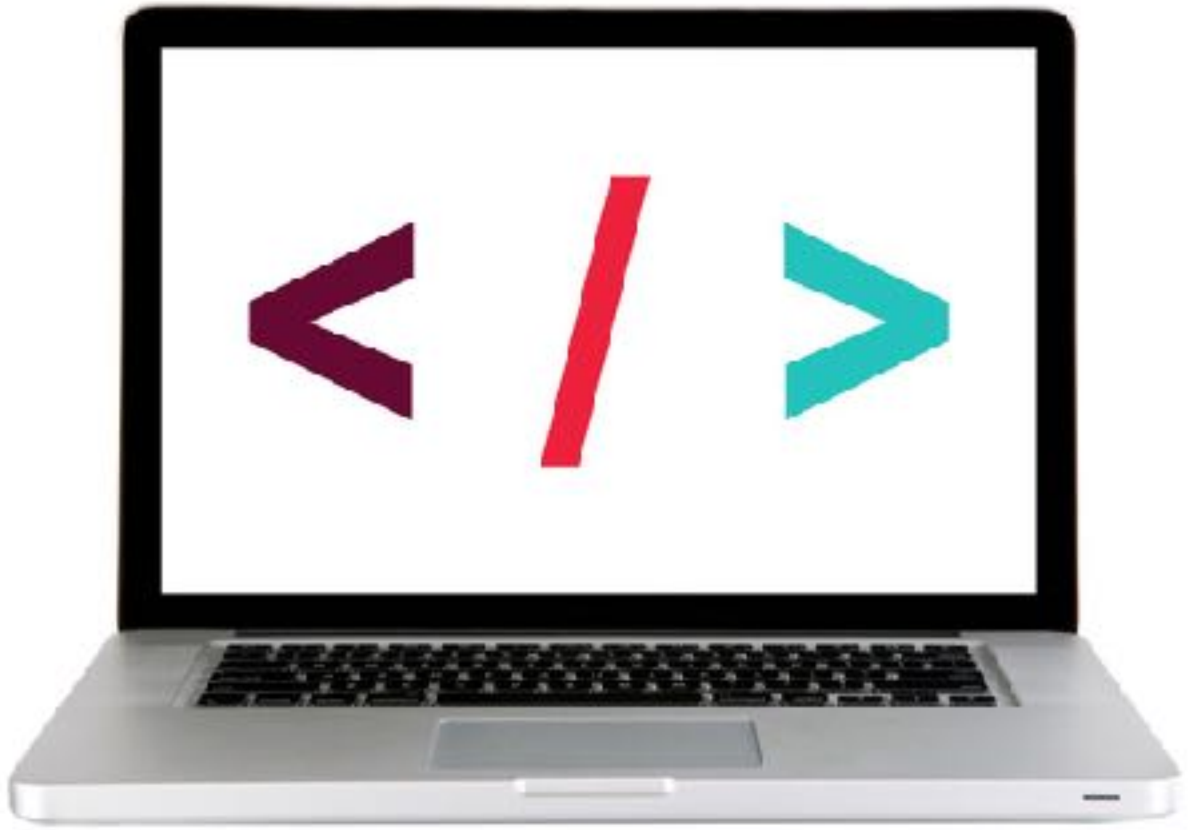
```
(function countDown() {
  let counter;
  for(counter = 3; counter > 0; counter--) {
    console.log(counter);
  }
})();
```

IIFE based on a function declaration

- Make a function declaration into an IIFE by adding
  `(` at the start and
  `)();` to the end

```
(function countDown() {
  let counter;
  for(counter = 3; counter > 0; counter--) {
    console.log(counter);
  }
})();
```

LET'S TAKE A CLOSER LOOK



THE MODULE PATTERN

PUTTING IT ALL TOGETHER!

OBJECT-ORIENTED CODE

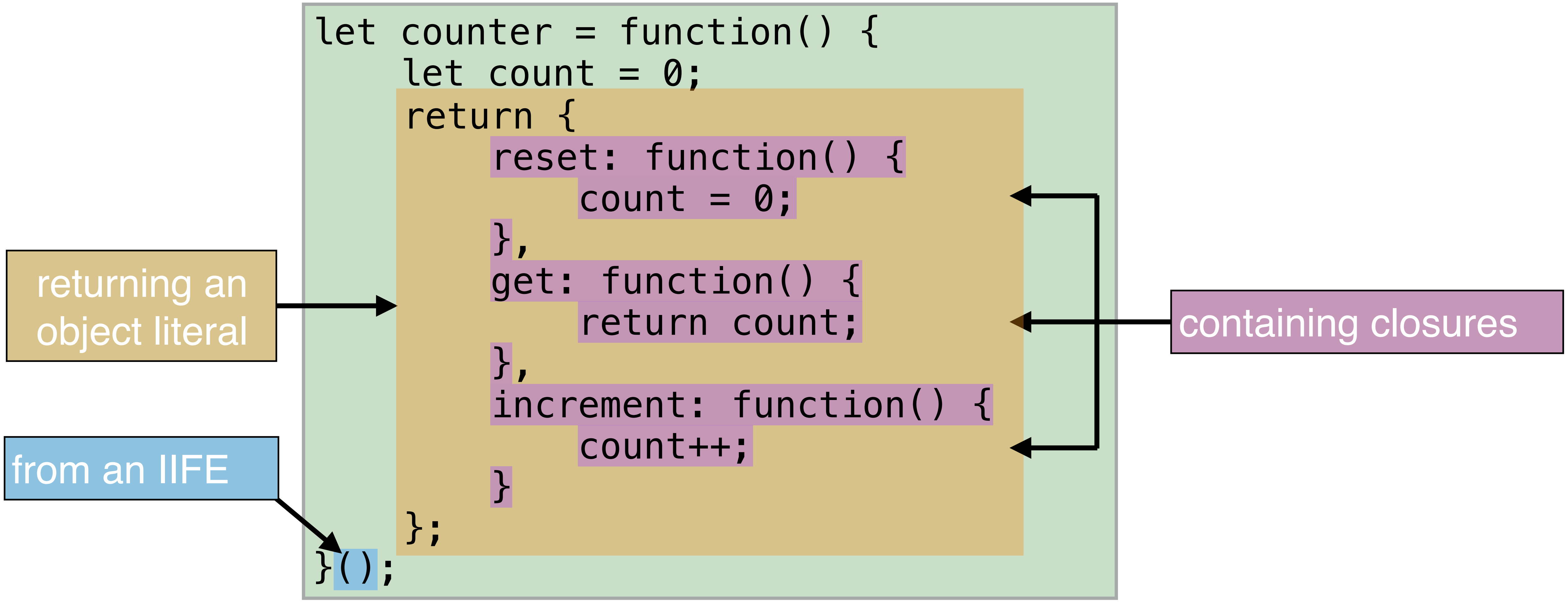
CLOSURES

IIFES

THE MODULE PATTERN

- Using an IIFE to return an object literal
- The methods of the returned object can access the private properties and methods of the IIFE (closures!), but other code cannot do this
- This means specific parts of the IIFE are not available in the global scope

BUILDING A MODULE

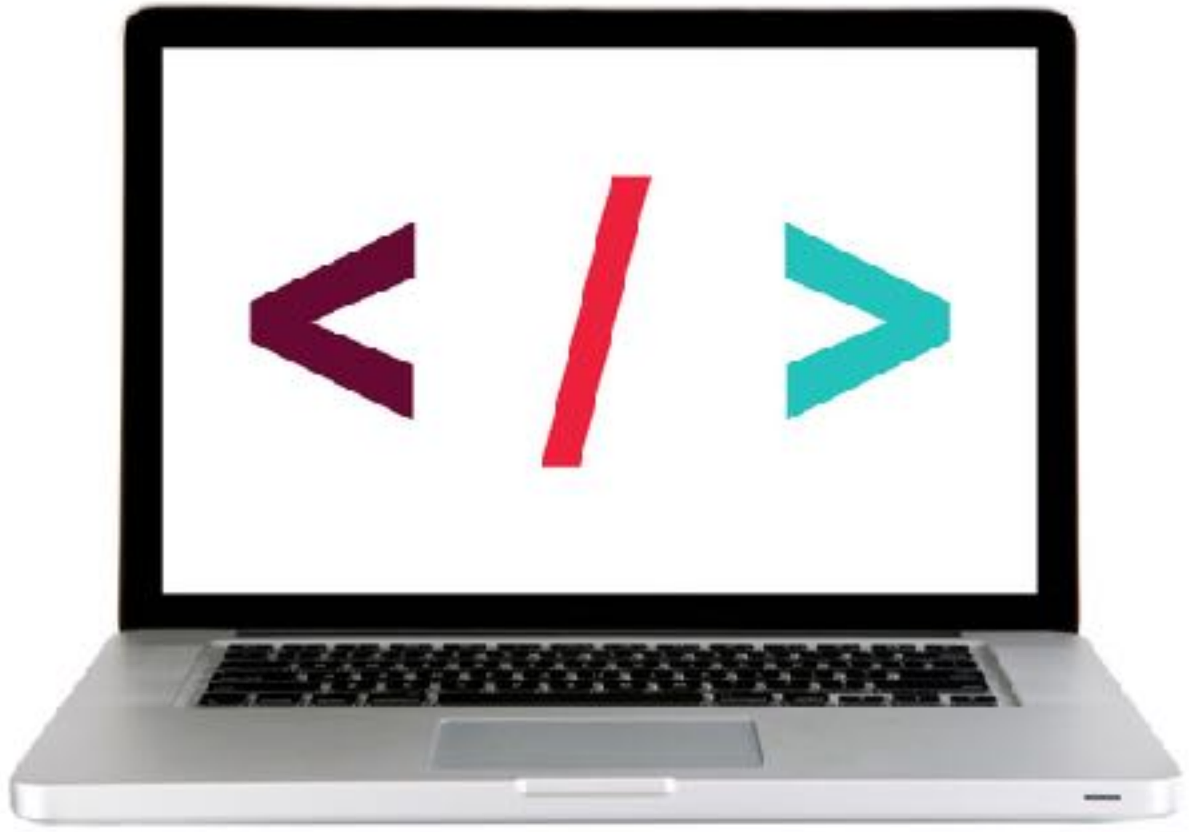


```
let counter = function() {
    let count = 0;
    return {
        reset: function() {
            count = 0;
        },
        get: function() {
            return count;
        },
        increment: function() {
            count++;
        }
    };
}();
```

BENEFITS OF THE MODULE PATTERN

- Keeps some functions and variables private
- Avoids polluting the global scope
- Organizes code into objects

LET'S TAKE A CLOSER LOOK



EXERCISE — CREATE A MODULE

EXERCISE

TYPE OF EXERCISE

- Pair

LOCATION

- start files > 6-modules-exercise

TIMING

until 9:20

1. In app.js, complete the module so it exports methods for the behaviors described in the comment at the top of the file.
2. When your code is complete and works properly, the statements at the bottom of the file should all return the expected values in the console.
3. BONUS: Add a "tradeIn" method that lets you change the make of the car and refuels it. Be sure the `getMake` method still works after doing a tradeIn.

Exit Tickets!

(Class #14)

LEARNING OBJECTIVES - REVIEW

- Describe the difference between functional programming and object oriented programming.
- Understand and explain closures.
- Instantly invoke functions.
- Implement the module pattern in your code.

NEXT CLASS PREVIEW

In-class lab: Intro to CRUD and Firebase

- Explain what CRUD is. (**Preview**: Create, Read, Update, Delete)
- Explain the HTTP methods associated with CRUD.
- Implement Firebase in an application.
- Build a full-stack app.

Q&A