Introduction To React

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Acknowledgment

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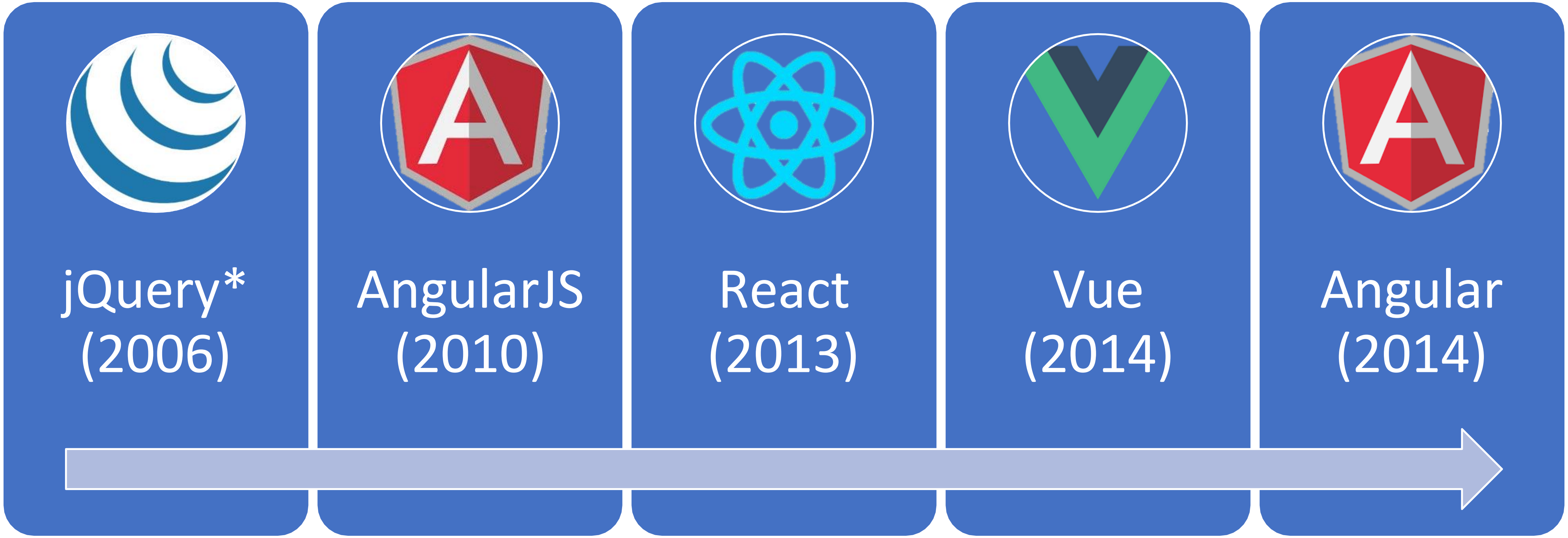
What is React?

- React is a **JavaScript library**
- Used for **front end web development**
- Think of jQuery, but more structured
- Created and used by **Facebook**
- Famous for implementing a **virtual dom**

Timeline of front-end JavaScript frameworks



jQuery* (2006)

AngularJS (2010)

React (2013)

Vue (2014)

Angular (2014)

* jQuery is more often considered a **library** than a **framework**

Common tasks in front-end development

App state	Data definition, organization, and storage
User actions	Event handlers respond to user actions
Templates	Design and render HTML templates
Routing	Resolve URLs
Data fetching	Interact with server(s) through APIs and AJAX

Fundamentals of React

1. JavaScript and HTML in the same file (JSX)
2. Embrace functional programming
3. Components everywhere

JavaScript and HTML *in the same file*

HTML CSS JS

JSX CSS or JSS

Traditional

React approach

JSX: the React programming language

```
const first = "Aaron";
const last  = "Smith";

const name = <span>{first} {last}</span>;


const list = (
  <ul>
    <li>Dr. David Stotts</li>
    <li>{name}</li>
  </ul>
);
```

```
const listWithTitle = (
  <>
    <h1>COMP 523</h1>
    <ul>
      <li>Dr. David Stotts</li>
      <li>{name}</li>
    </ul>
  </>
```

“React is just JavaScript”

Functional programming

1. Functions are "first class citizens"

2. Variables are immutable

3. Functions have no side effects

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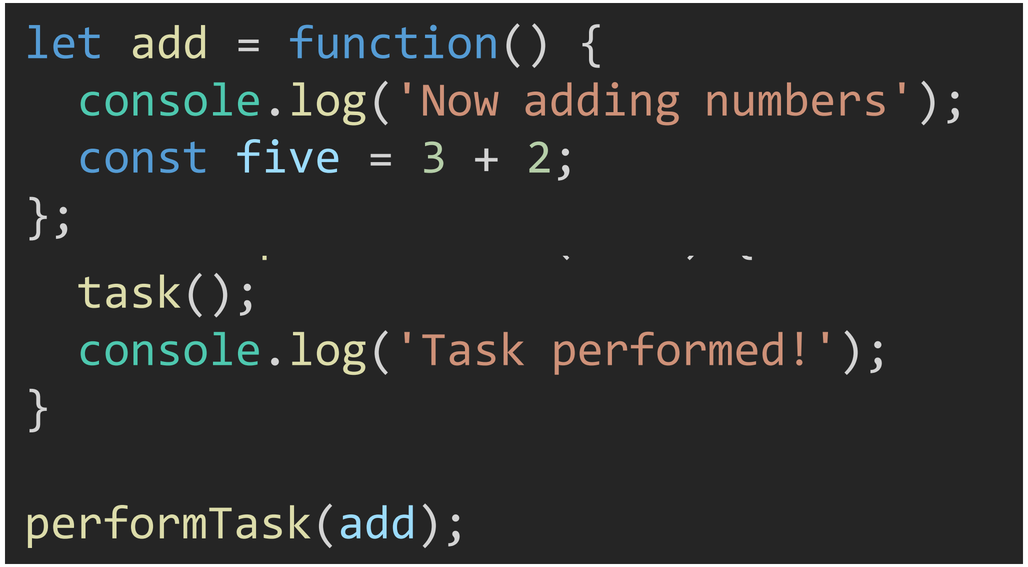
Functional programming

Functions are “first class citizens”

This means functions can be…

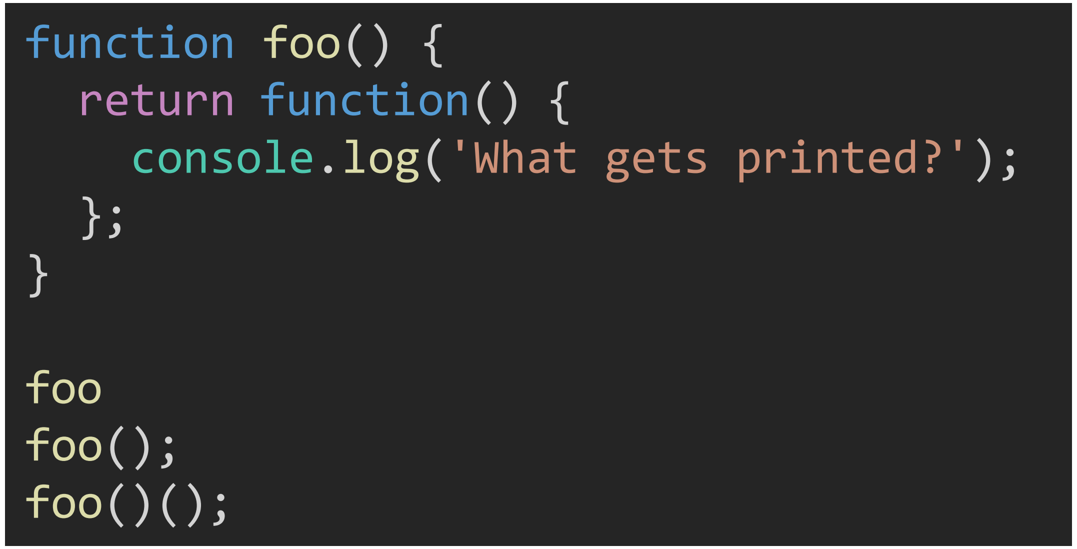
1. Saved as **variables**
2. Passed as **arguments**
3. **Returned** from functions



```
let add = function() {
  console.log('Now adding numbers');
  const five = 3 + 2;
};

  task();
  console.log('Task performed!');
}

performTask(add);
```



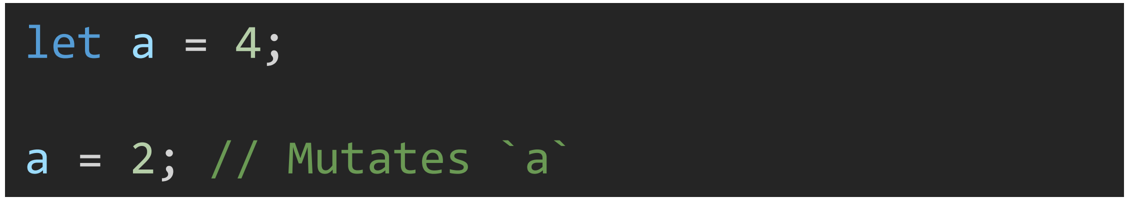
```
function foo() {
  return function() {
    console.log('What gets printed?');
  };
}

foo
foo();
foo()();
```

Functional programming

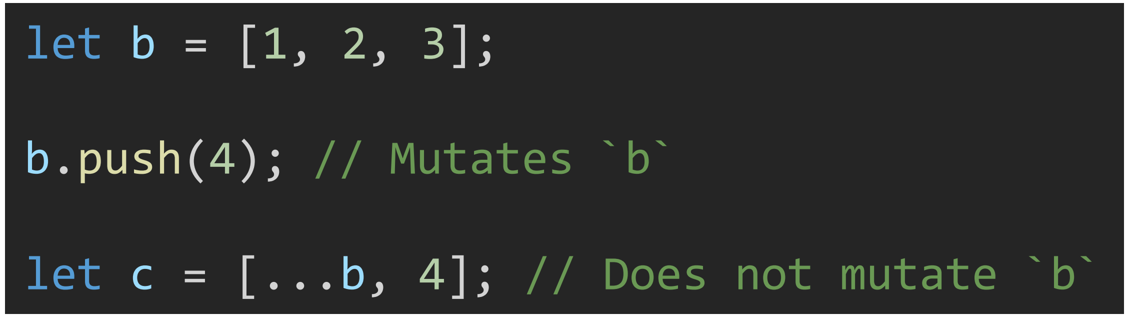
Tip: Use **`const`** instead of **`let`** to declare variables!

Variables are immutable



```
let a = 4;

a = 2; // Mutates `a`
```



```
let b = [1, 2, 3];

b.push(4); // Mutates `b`

let c = [...b, 4]; // Does not mutate `b`
```

Functional programming

Functions have no side effects

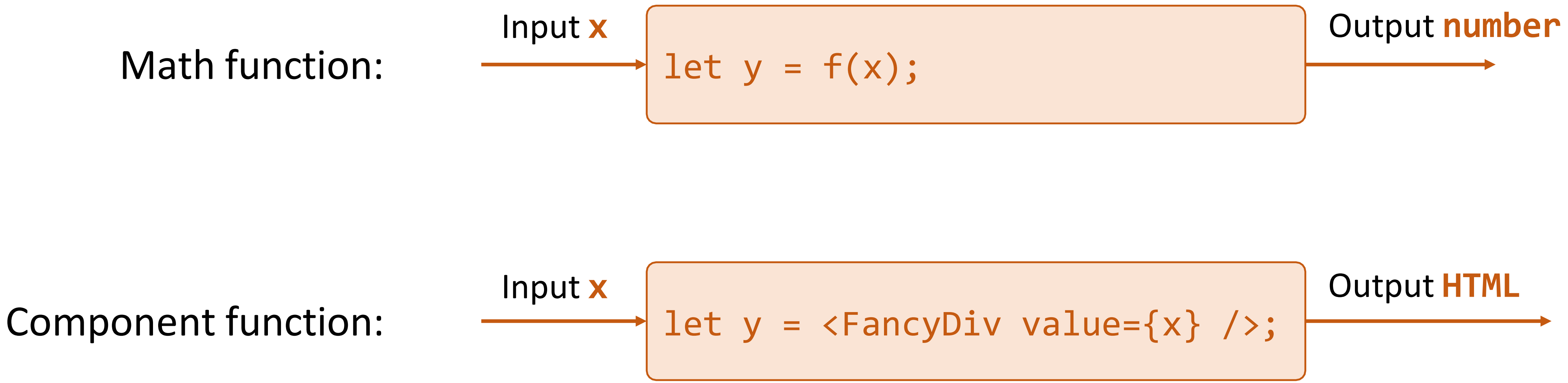
```
const b = [];

function hasSideEffects() {
  b = [0];
}
```

Components

Functions help break your code into small, reusable pieces

Components are functions for user interfaces



Math function:

Input **x**

```
let y = f(x);
```

Output **number**

Component function:

Input **x**

```
let y = <FancyDiv value={x} />;
```

Output **HTML**

Anatomy of a React **component**

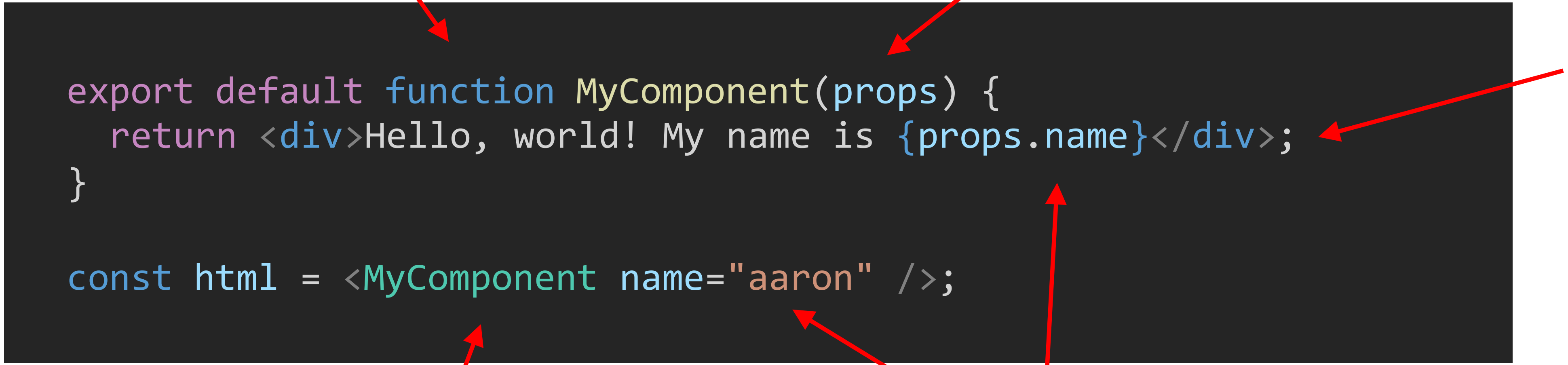
The component is just a function

Inputs are passed through a single argument called “props”

The function outputs HTML

The function is **executed** as if it was an HTML tag

Parameters are passed in as HTML attributes



```
export default function MyComponent(props) {
  return <div>Hello, world! My name is {props.name}</div>;
}

const html = <MyComponent name="aaron" />;
```

Component **rendering**

- When a component function **executes**, we say it "**renders**"
- Assume components may re-render at any time

Our job is to ensure that
every time the component re-renders,
the correct output is produced

“In React, everything is a component”

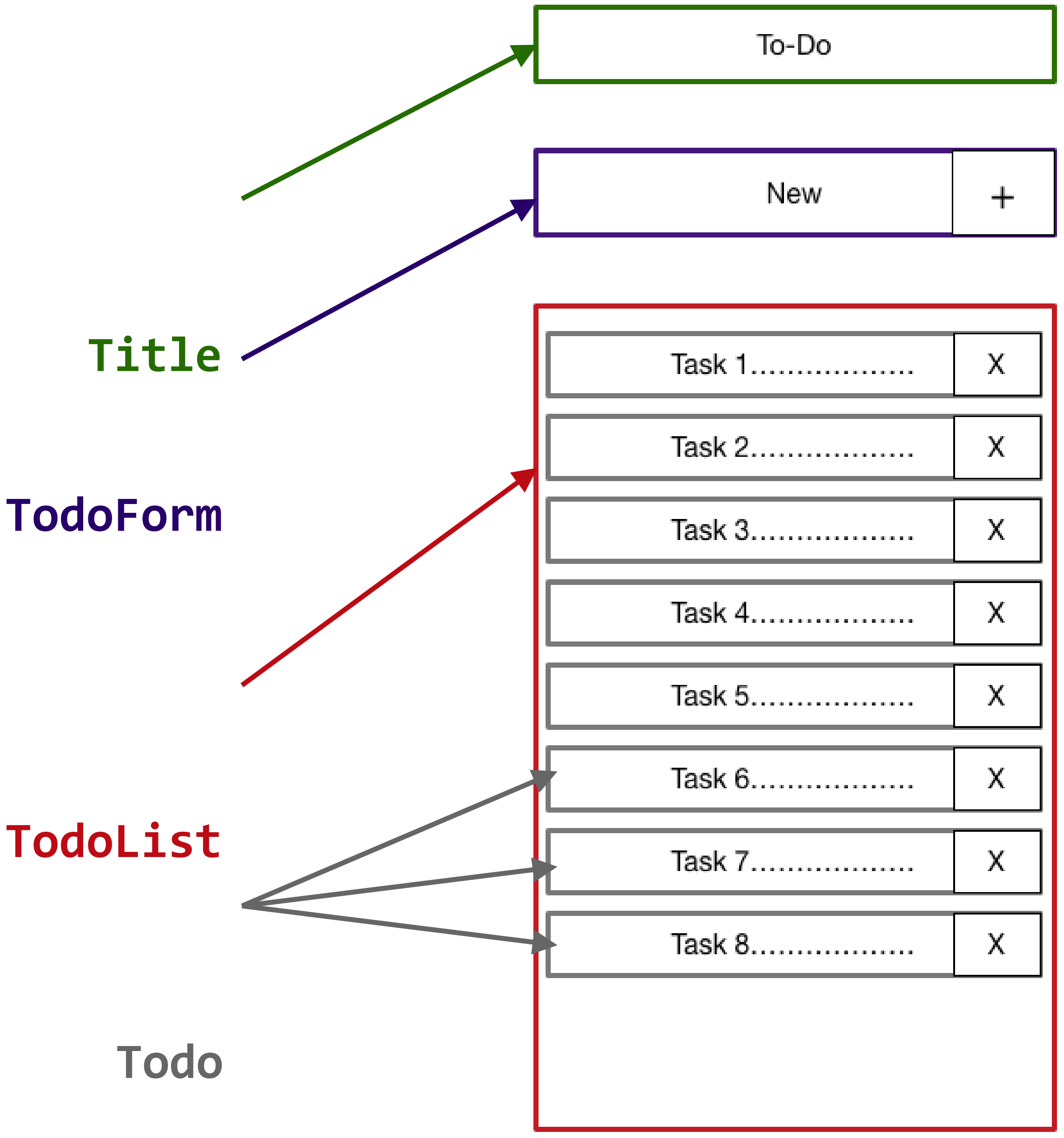
Todo application

Big idea:

- A digital to-do list

First step:

- mockup / wireframe



Creating a new React app

Creating a new React app is simple!

1. Install Node.js
2. Run: **`npx create-react-app app-name`**
3. New app created in folder: **`./app-name`**

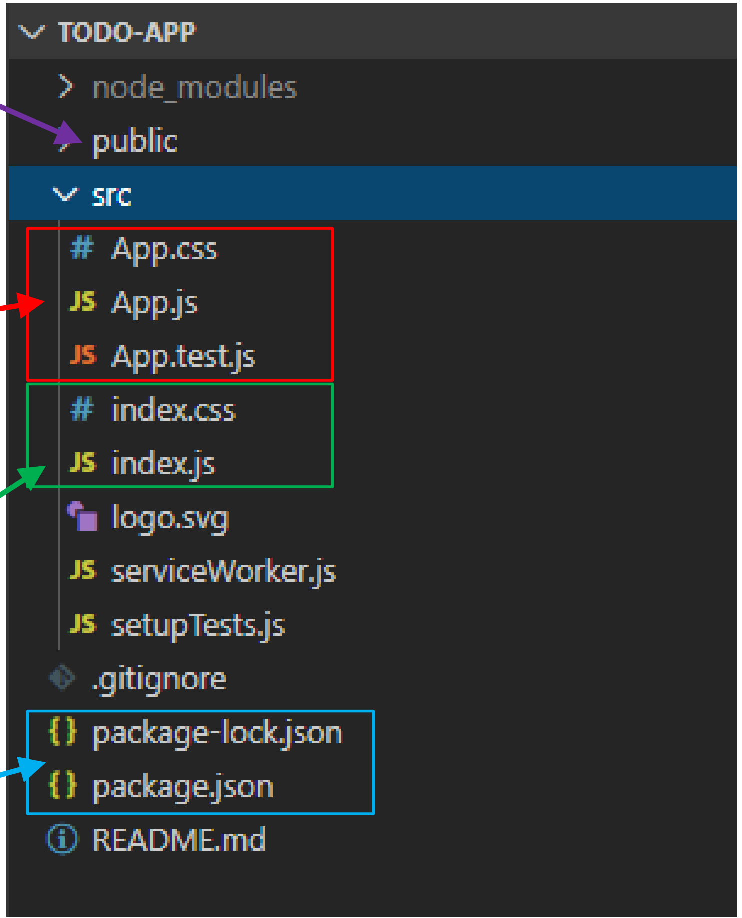
Anatomy of a new React app

`public` holds the initial html document and other static assets

App is a boilerplate starter component

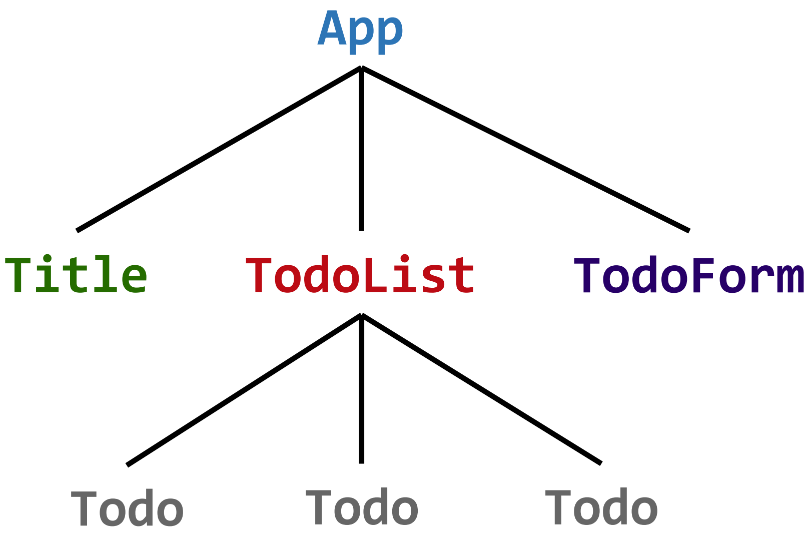
`index.js` binds React to the DOM

`package.json` configures npm dependencies



```
TODO-APP
  node_modules
  public
  src
    App.css
    App.js
    App.test.js
    index.css
    index.js
    logo.svg
    serviceWorker.js
    setupTests.js
  .gitignore
  package-lock.json
  package.json
  README.md
```

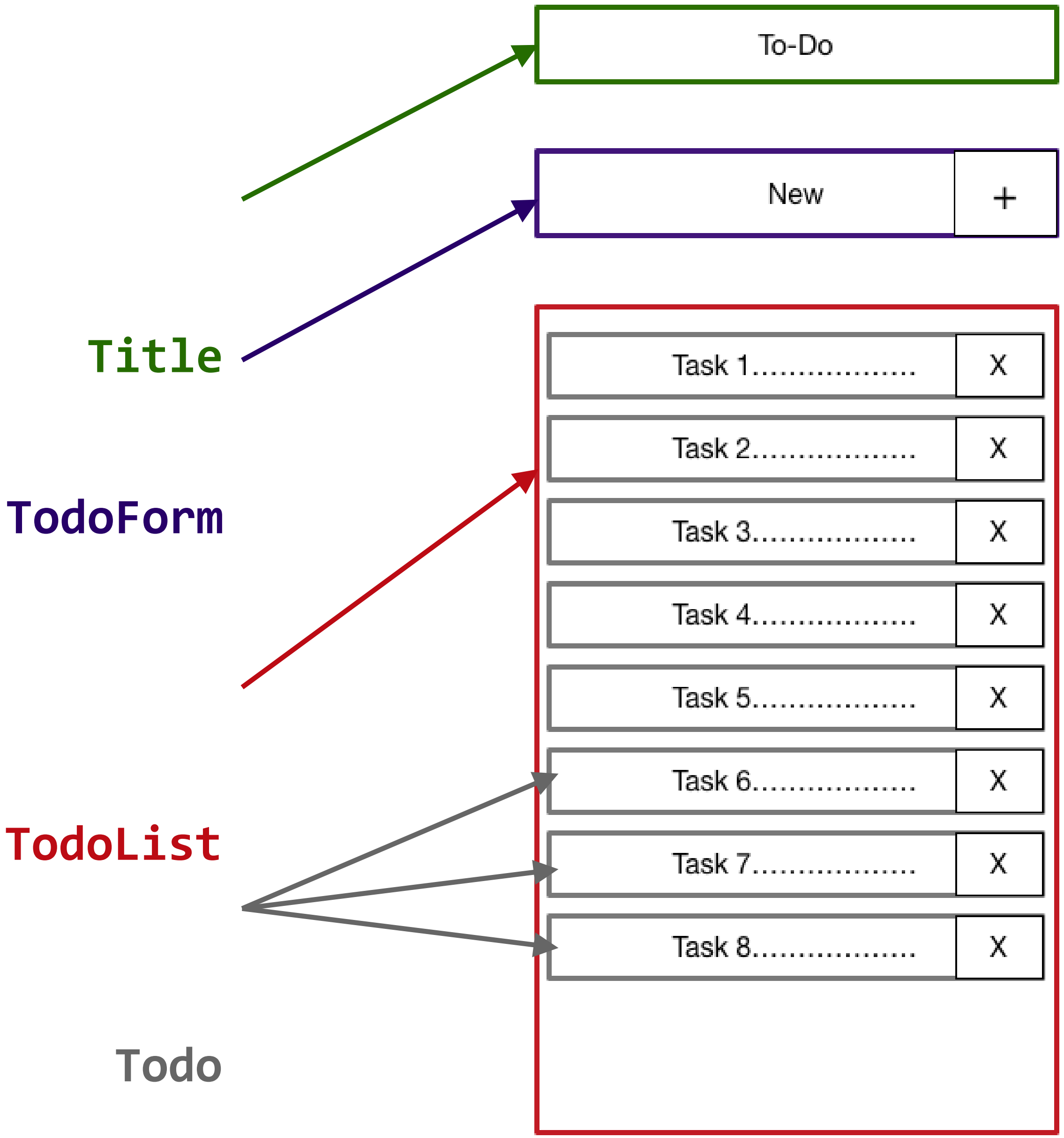
Component Hierarchy



App

Title TodoList TodoForm

Todo Todo Todo



Title

TodoForm

TodoList

Todo

Special list key property

- **Situation:** Display a **dynamic array of elements**
- Must specify a special “**key**” property for each element
- The key of an item **uniquely identifies it**
- Used by React internally for **render optimization**
- Can be any unique value (string or number)

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What are **hooks**?

Hooks: Special functions that allow developers to hook into **state** and **lifecycle** of React components.

State: One or more data values associated with a React component instance.

Lifecycle: The events associated with a React component instance (create, render, destroy, etc).

Built-in hooks:

We will cover these today

We will **not** cover these today

useState useEffect

useReducer useMemo useRef

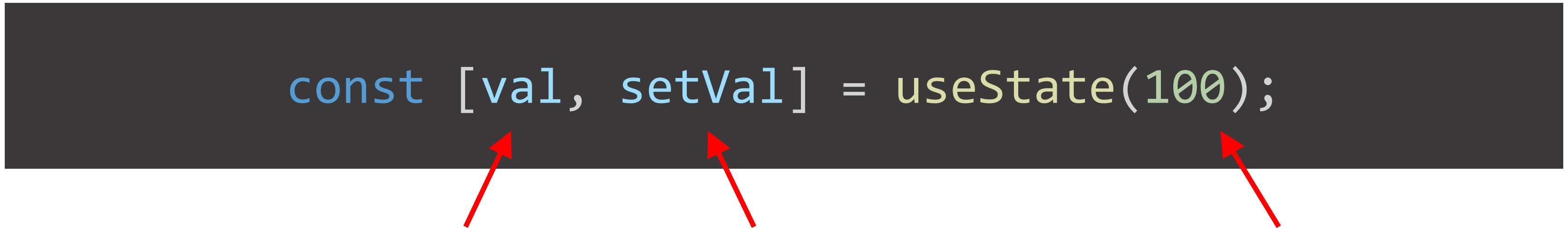
useCallback

First React hook: useState

Purpose:

1. Remember values internally when the component re-renders
2. Tell React to re-render the component when the value changes

Syntax:



```
const [val, setVal] = useState(100);
```

The current value

A setter function to change the value

The initial value to use

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Predicting component re-rendering

A component will only re-render when…

1. A value inside **`props`** changes

– or –

2. A **`useState`** setter is called

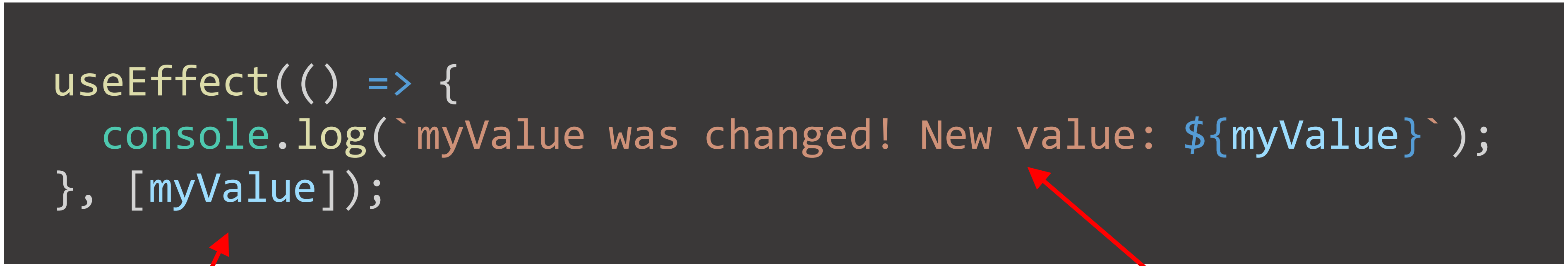
This means all data values displayed in the HTML should depend on either **`props`** or **`useState`**

Second React hook: useEffect

Purpose:

Act as an **observer**, running code in response to value changes

Syntax:



```
useEffect(() => {
  console.log(`myValue was changed! New value: ${myValue}`);
}, [myValue]);
```

A list of values such that changes should trigger this code to run

The code to run when values change

Building a React project

- When you're ready to launch your app, run this command:

```
npm run build
```

- This bundles your app into CSS/JS/HTML files and puts them in the **/build** folder
- These files can be served from an AWS S3 bucket

3rd party components and libraries

- React-Router
- Redux
- Material-UI
- Bootstrap
- Font-Awesome

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- SWR