



Props, Lists, and Stateful Components

Skills Bootcamp in Front-End Web Development

Lesson 13.2



The background is a dark charcoal gray with a series of parallel diagonal lines running from the top-left to the bottom-right. Overlaid on this are several teal-colored geometric shapes: a large central triangle pointing right, a smaller triangle to its left, and a square to its right. Scattered around these shapes are various white line-art symbols, including a plus sign, a minus sign, a circle with a dot, a circle with a horizontal line, a circle with a vertical line, a circle with a diagonal line, a circle with a cross, a circle with a dot, a circle with a horizontal line, a circle with a vertical line, a circle with a diagonal line, a circle with a cross, a circle with a dot, a circle with a horizontal line, a circle with a vertical line, a circle with a diagonal line, and a circle with a cross.

WELCOME

Learning Objectives

By the end of class, you will:



Deepen your understanding of passing props between React components.



Gain a firm understanding of the concept of child–parent relationships in React.

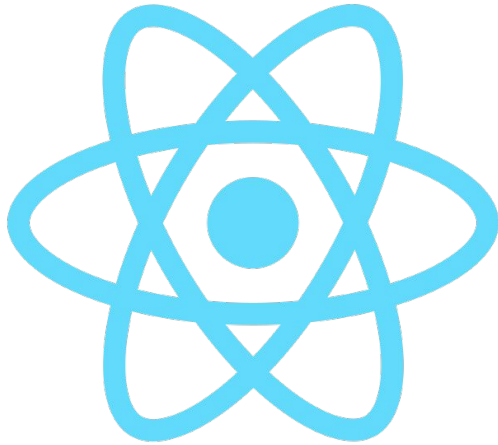


Programmatically render components from an array of data.

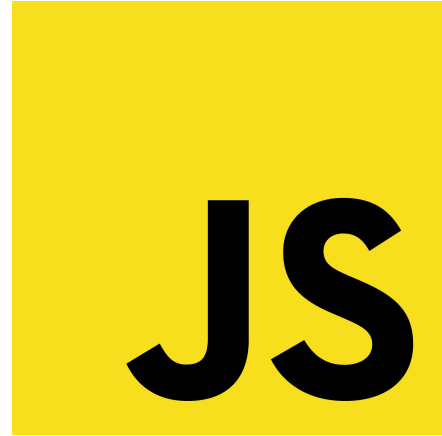


Understand the concepts of class components and component state.

We can conceptualize React components
as JavaScript functions.



Component



Function

Props

It's a component's job to describe and *return* some part of our application's UI.



Calendar



Chart



ColorPicker



ComboBox



DataView



DatePicker



Form



Grid



Layout



List



Menu



Message



Pagination



Popup



Ribbon



Sidebar



Slider



Tabbar



TimePicker



Toolbar



Tree



TreeGrid



Window



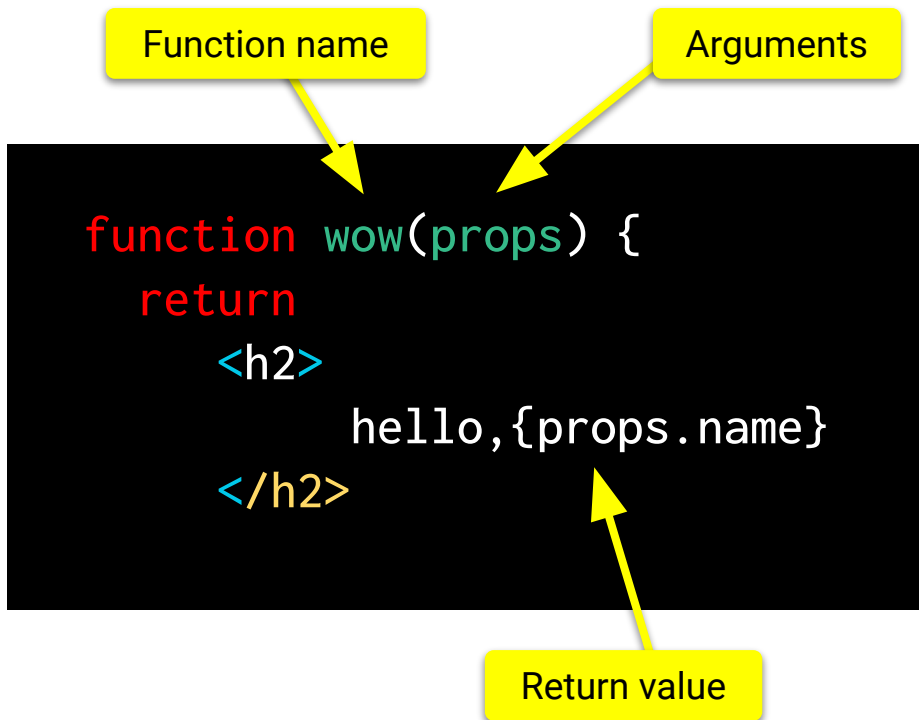
If a component is a function that *returns* some data, what else might a component be able to do?

Props

Since it's a function, a component can also receive arguments.

This allows us to write components that behave differently based on the arguments that they receive.

We call the arguments that we pass into React components props.





**Props are like function arguments
that you can pass to components
for them to use.**

Props

Every component has access to a **props** argument. Props are always objects containing all of the values passed to the component.

```
import React from "react";
```

```
function Alert(props) {  
  console.log(props);
```

Props is always an object
containing all the arguments
passed to the component

```
  return (  
    <div className={`alert alert-${props.type || "success"}`} role="alert">  
      {props.children}  
    </div>  
  );  
}
```

props.children is
being rendered
between the tags

Using props.type
to set the class
of the div

```
export default Alert;
```

Props

These props are being passed into the Alert component.

We have two ways of passing props to components:

```
function App() {  
  return <Alert type="danger">Invalid use id or password</Alert>;  
}
```

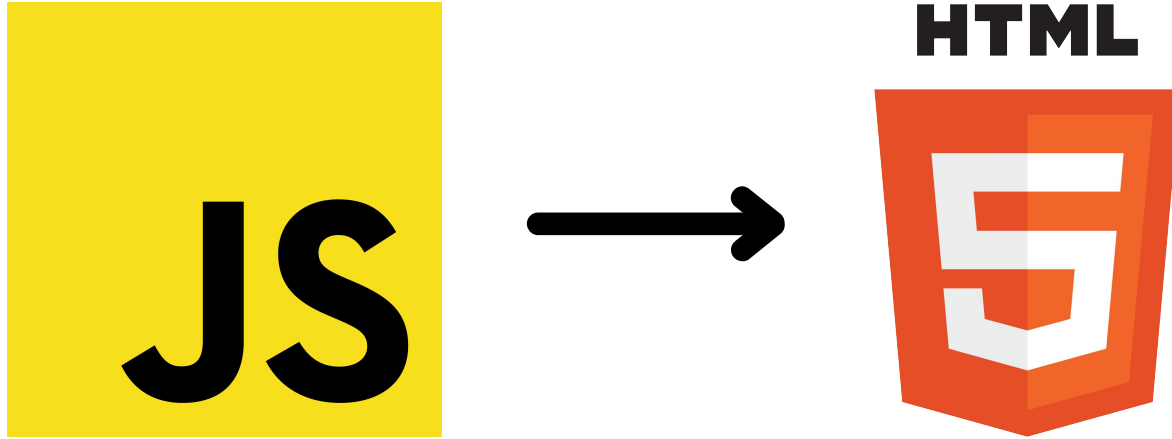


Using an attribute

The diagram consists of two yellow rounded rectangular boxes at the bottom. The left box contains the text 'Using an attribute' and has a yellow arrow pointing from it to the 'type' attribute in the code snippet above. The right box contains the text 'With children' and has a yellow arrow pointing from it to the text 'Invalid use id or password' (the children) in the code snippet above.

With children

This familiar syntax for passing props to our components is another way that JSX is similar to HTML.



Props

Props allow us to customize our components so that we can reuse them in different situations.

For example, we might use this **Alert** component on a sign-in page and render a different alert depending on whether or not a user has successfully logged in to their account.

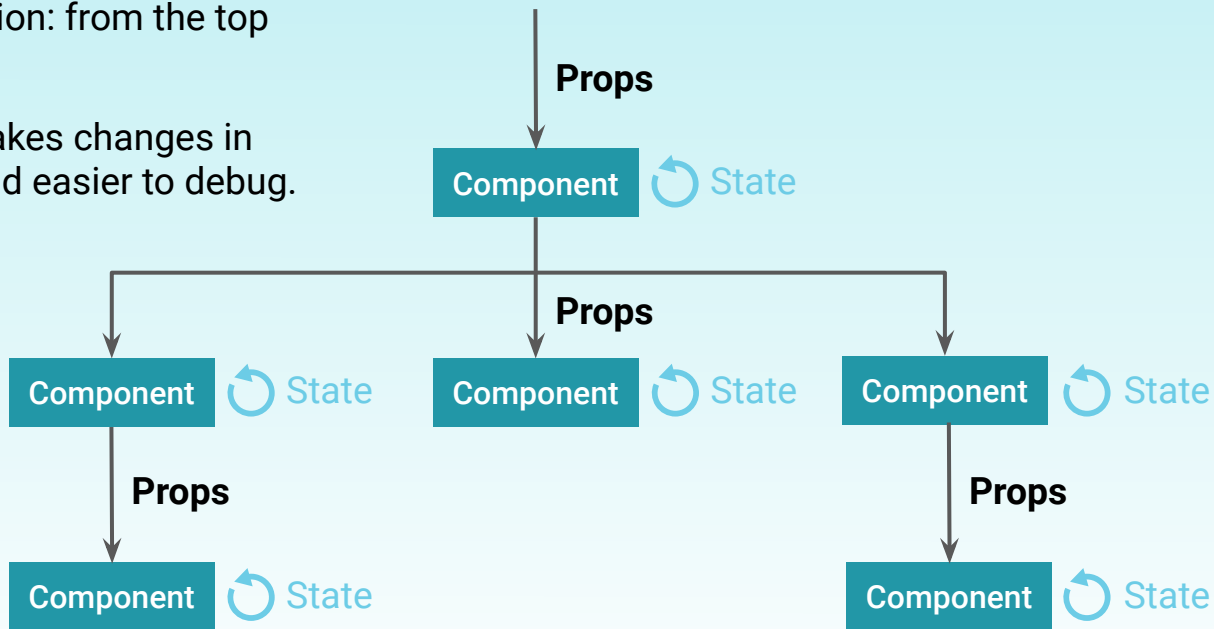


Props

Props are the primary means by which we pass data around our React apps.

React utilizes a unidirectional data flow, meaning that data only flow in one direction: from the top down, parent to child.

This unidirectional data flow makes changes in React apps more predictable and easier to debug.





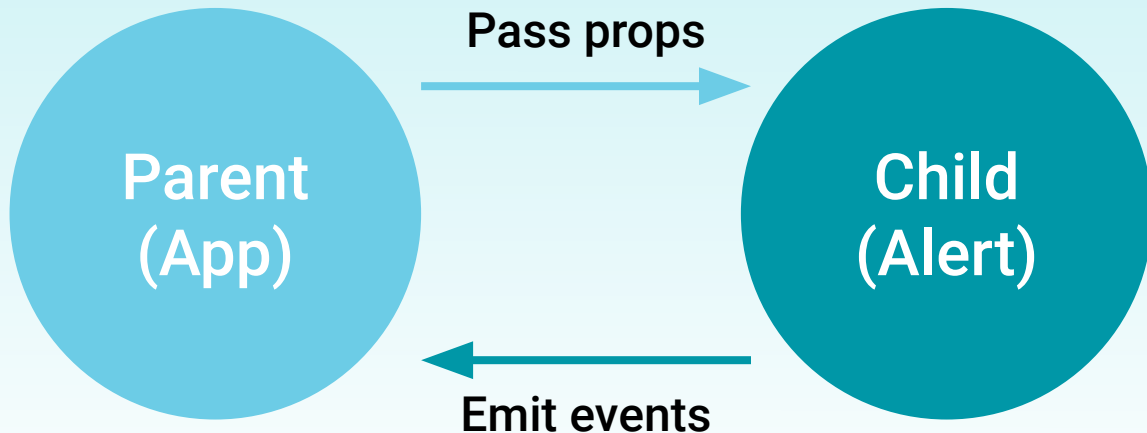
If a prop inside of our component
isn't what we expect it to be,
where could we look to find out why?

Props

We could look at the component's parent.

In this example, App and Alert have a parent-child relationship.

Alert is being rendered inside of App, and App is passing props to Alert.





Instructor Demonstration

Props



Pair Programming Activity:

Calculator Props

In this activity, you will work with a partner to write a component that accepts props, performs arithmetic, and renders the result.

Suggested Time:



Time's Up! Let's Review.

Review:

Calculator Props

We're passing each **Math** component three props:

- **num1**
- **operator**
- **num2**

```
import React from "react";
import Math from "./Math";

// Calculator renders the Math component 4 times with different props
function Calculator() {
  return (
    <div>
      {/* Math renders a span tag containing the result */}
      {/* Each span is the font-size of the result in pixels */}
      <p>
        19 + 142 = <Math num1={19} operator="+" num2={142} />
      </p>
      <p>
        42 - 17 = <Math num1={42} operator="-" num2={17} />
      </p>
      <p>
        100 * 3 = <Math num1={100} operator="*" num2={3} />
      </p>
      <p>
        96 / 4 = <Math num1={96} operator="/" num2={4} />
      </p>
    </div>
  );
}

export default Calculator;
```

The numbers are wrapped in JSX curly braces, but the operator is in quotes.



Why do you think this is?

Review: Calculator Props

The operator is a string literal, and we can express that shorthand just by using quotes without curly braces. The following are equivalent:

```
<Math num1={19} operator={"+"} num2={341} />
```

This shorthand only works for string literals. All other values that we pass as props need to be in JSX curly braces.

```
<Math num1={19} operator="+" num2={341} />
```

Review: Calculator Props

- The `props` argument should be an object containing all of the values passed to the rendered `Math` component in the `Calculator.js` file.
- At the bottom of the function, we're returning `{value}`.

```
// The Math function component accepts a props argument
function Math(props) {
  let value;

  // Assign value based on the operator
  switch (props.operator) {
    case "+":
      value = props.num1 + props.num2;
      break;
    case "-":
      value = props.num1 - props.num2;
      break;
    case "*":
      value = props.num1 * props.num2;
      break;
    case "/":
      value = props.num1 / props.num2;
      break;
    default:
      value = NaN;
  }

  // Return a span element containing the calculated value
  // Set the fontSize to the value in pixels
  return <span style={{ fontSize: value }}>{value}</span>;
}
```



Pair Programming Activity:

Props Review

In this activity, you will work with a partner to make an existing React application DRY-er through the use of reusable components and props.

Suggested Time:



Time's Up! Let's Review.

Review: Props

The application being rendered to the browser doesn't look any different from the unsolved version, but now we've made our code DRY-er by creating a reusable component, `FriendCard`, to render each friend with the appropriate prop inside of the App component.

Friends List



Name: SpongeBob

Occupation: Fry Cook

Location: A Pineapple Under the Sea



Name: Mr. Krabs

Occupation: Restaurant Owner

Location: A Giant Anchor



Name: Squidward

Occupation: Cashier

Location: An Easter Island Head

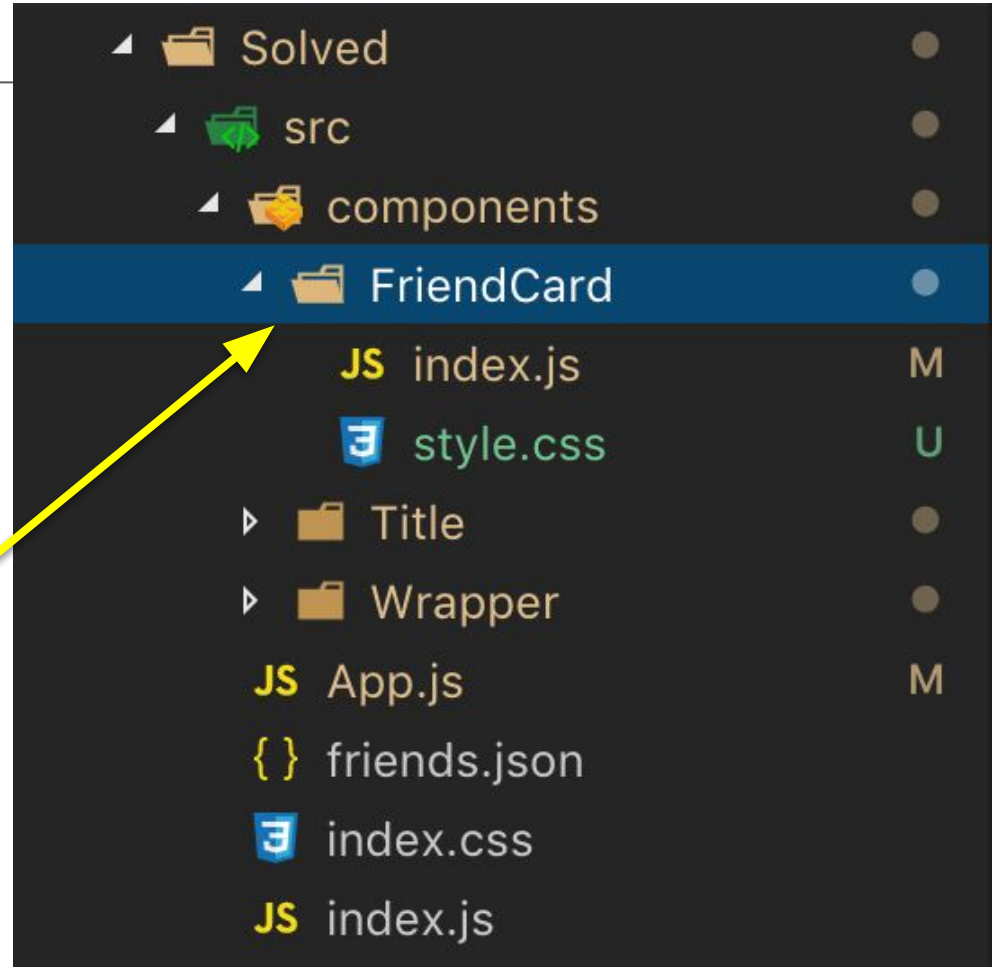


**In a real application, where might
all of the friend JSON data come from?**

Review: Props

Normally, we might receive the friend JSON from an AJAX request and probably won't know ahead of time which friends will need to be rendered.

Each component is contained inside of its own folder containing a CSS file and an `index.js` file.





Why are we using `index.js`
to hold the component instead of
`FriendCard.js`?

Review: Props

Whenever we require/import a folder instead of a file, the folder's `index.js` file is required/imported by default (if it exists).

This allows us to keep our paths for importing these components short. For example, we can do:

```
import FriendCard from "../components/FriendCard";
```

instead of:

```
import FriendCard from "../components/FriendCard/FriendCard";
```

Giving all of our components their own folder is another option for organizing our React apps. Each folder could contain any CSS or other dependencies that the component will need.



Activity: Component Map

In this activity, you will utilize the map method in order to render JSX from an array of objects.

Suggested Time:



Time's Up! Let's Review.

Review: Component Map

The array of grocery objects is passed into the **List** component from inside of **App**, making it available inside of the **List** component as **props.groceries**.

```
3 // Whenever we try to render an array containing JSX, React knows to render each JSX element separately
4 | const List = props => (
5 |   <ul className="list-group">
6 |     {props.groceries.map(item => (
7 |       <li className="list-group-item" key={item.id}>
8 |         {item.name}
9 |       </li>
10 |     ))}
11 |   </ul>
12 | );
```

Inside of the **List** component, we insert JSX curly braces inside of the **ul** element. We map over **props.groceries** and return one **li** tag for every element in **props.groceries**.

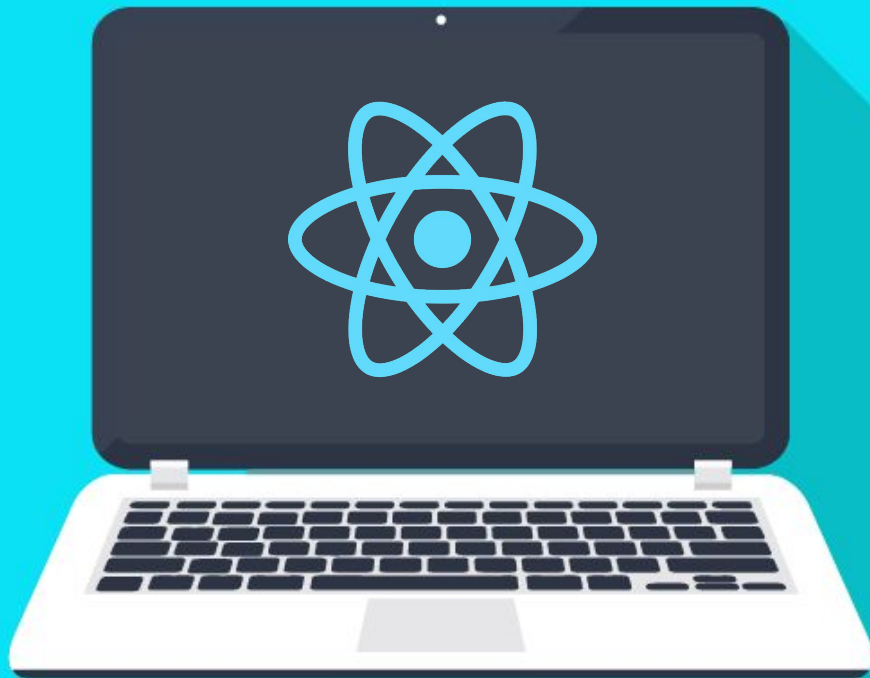


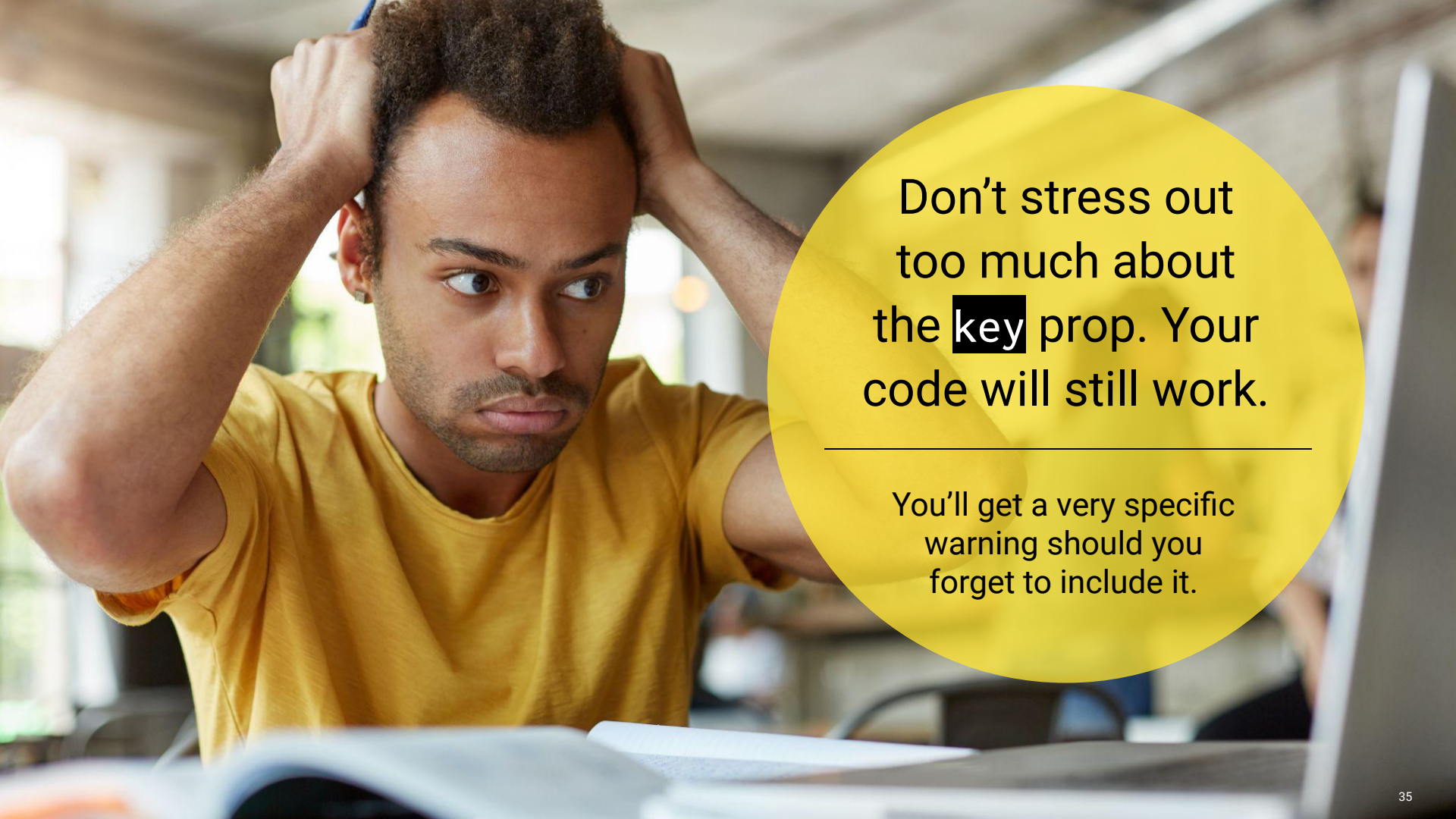
**What type of value is returned
by the map method here?**

Review: Component Map

The map method will always return an array—in this example, it's returning an array of JSX elements.

React is smart enough to know that whenever we're rendering an array containing JSX, it should deconstruct the array and render each element inside of its parent.





Don't stress out too much about the **key** prop. Your code will still work.

You'll get a very specific warning should you forget to include it.

Stateful Components



**What we've been working with so far are
known as stateless, functional components**

Stateless Components Can...



**Render
JSX**

**Receive
props**

**Embed JavaScript
expressions inside
of themselves**

Stateful vs. Stateless Components

In a React application, **most** components should be stateless components.

Stateless

These are easy to test, debug, and they tend to be more reusable—even across applications—because they usually don't depend on how the rest of the application works.

Stateful

These components have a bit more going on. They can be re-rendered (re-run) upon a variable changing value.

Stateful Components



state is how we describe a property that can contain data that we want to associate with a component.



Values stored on a component's state are different from regular variables because, unlike regular variables, when a component updates its **state**, the React application will update itself in the browser to reflect the change wherever necessary.



A component can set and update its own state, whereas its props are always received from a parent element and considered immutable (can't/shouldn't be changed).



Instructor Demonstration

Basic State

Stateful Components

Takeaways

01

We can use state to associate data with our components and keep track of any values that we want to update the UI when changed.

02

We can define methods on a component and pass them as props.

03

The `onClick` prop can be used to set a click event listener to an element.

Stateful vs. Stateless Components

Use a stateless component when:	Use a stateful component when:
You just need to present the prop.	Building an element that accepts user input.
You don't need a state or any internal variables.	Building an element that is interactive on the page.
Creating an element that does not need to be interactive.	Dependent on state for rendering, such as fetching data before rendering.
You want reusable code.	Dependent on any data that cannot be passed down as props.



Pair Programming Activity:

Decrement Counter

In this activity, you will add a “Decrement” button and event handler to the previous click counter example.

(Instructions sent via Slack)

Suggested Time:



Time's Up! Let's Review.

Review: Decrement Counter

You'll get more practice with working with class components.

Click Counter!

Click Count: 0

Increment

Decrement



Activity: Friend Refactor

In this activity, you will further refactor the friends list application from earlier to use class components, events, and programmatically render the `FriendCard` components.

(Instructions sent via Slack)

Suggested Time:



Time's Up! Let's Review.

Review: Friend Refractor

We can remove friends by clicking the red **X** icon.



Friends List



Name: SpongeBob
Occupation: Fry Cook
Address: A Pineapple Under the Sea



Name: Mr. Krabs
Occupation: Restaurant Owner
Address: A Giant Anchor



Name: Squidward
Occupation: Cashier
Address: An Easter Island Head





We'll continue to go through forms
in the next lesson.

Next Class

Do your best to go through the following sections of the React documentation before the next class:

Forms

The screenshot shows the React documentation page for "Forms". The page title is "Forms". The main text explains that HTML form elements work a little differently from other DOM elements in React, because form elements naturally keep some internal state. For example, this form in plain HTML accepts a single name:

```
<form>
<label>
  Name:
  <input type="text" name="name" />
</label>
<input type="submit" value="Submit" />
</form>
```

This form has the default HTML form behavior of browsing to a new page when the user submits the form. If you want this behavior in React, it just works. But in most cases, it's convenient to have a JavaScript function that handles the submission of the form and has access to the data that the user entered into the form. The standard way to achieve this is with a technique called "controlled component".

The right sidebar contains a table of contents with sections: INSTALLATION, MAIN CONCEPTS (1. Hello World, 2. Introducing JSX, 3. Rendering Elements, 4. Components and Props, 5. State and Lifecycle, 6. Handling Events, 7. Conditional Rendering, 8. Lists and Keys, 9. Forms, 10. Lifting State Up, 11. Composition vs Inheritance, 12. Thinking in React), ADVANCED GUIDES, API REFERENCE, and HOOKS.

Lifting State Up

The screenshot shows the React documentation page for "Lifting State Up". The page title is "Lifting State Up". The main text explains that often, several components need to reflect the same changing data. We recommend lifting the shared state up to their closest common ancestor. Let's see how this works in action.

In this section, we will create a temperature calculator that calculates whether the water would boil at a given temperature.

We will start with a component called `BoilingVerdict`. It accepts the `celsius` temperature as a prop, and prints whether it is enough to boil the water:

```
function BoilingVerdict(props) {
  if (props.celsius >= 100) {
    return 'The water would boil.';
  }
  return 'The water would not boil.';
}
```

Next, we will create a component called `Calculator`. It renders an `<input>` that lets you

The right sidebar contains a table of contents with sections: INSTALLATION, MAIN CONCEPTS (1. Hello World, 2. Introducing JSX, 3. Rendering Elements, 4. Components and Props, 5. State and Lifecycle, 6. Handling Events, 7. Conditional Rendering, 8. Lists and Keys, 9. Forms, 10. Lifting State Up, 11. Composition vs Inheritance, 12. Thinking in React), ADVANCED GUIDES, API REFERENCE, and HOOKS.

State and Lifecycle

The screenshot shows the React documentation page for "State and Lifecycle". The page title is "State and Lifecycle". The main text explains that this page introduces the concept of state and lifecycle in a React component. You can find a [detailed component API reference here](#).

Consider the ticking clock example from one of the previous sections. In `Rendering Elements`, we have only learned one way to update the UI. We call `ReactDOM.render()` to change the rendered output:

```
function tick() {
  const element = (
    <div>
      <h1>Hello, world!</h1>
      <h2>It is {now} local {toLocaleTimeString()}!</h2>
    </div>
  );
  ReactDOM.render(
    element,
    document.getElementById('root')
  );
}

setInterval(tick, 1000);
```

The right sidebar contains a table of contents with sections: INSTALLATION, MAIN CONCEPTS (1. Hello World, 2. Introducing JSX, 3. Rendering Elements, 4. Components and Props, 5. State and Lifecycle, 6. Handling Events, 7. Conditional Rendering, 8. Lists and Keys, 9. Forms, 10. Lifting State Up, 11. Composition vs Inheritance, 12. Thinking in React), ADVANCED GUIDES, API REFERENCE, and HOOKS.

*The
End*