Design a Dynamic Frontend with React

Rendering, LifeCycle, and React Hook Concepts

A Day in the Life of a MERN Stack Developer

As a ReactJS developer embarking on a new project, your objective is to build a web application featuring a product list for an e-commerce site.

The application must effectively manage the product list through React, including tasks such as iterating over an array and creating a new array.

Additionally, a crucial component of the application will be a form enabling users to search for products by name or filter them based on a specified price range.

The forthcoming slides will guide the implementation of these tasks.

Learning Objectives

By the end of this lesson, you will be able to:

- Use lists for creating interactive user interfaces for efficient DOM manipulation
- Work with the map() method to implement conditional rendering
- Add CSS and styling to React components to enhance their user interface
- Handle forms in React to create interactive and dynamic applications

List Rendering

List Rendering: An Overview

List rendering displays a set of related data as a list on a web page.

It maps an array of data to create a new array of components.

It includes related data, such as names, products, books, and more.

List Rendering

React provides a simple and efficient way to render lists using the **map() method.**

```
const books = [
  { title: "Time Machine",
author: "H.G. Wells" },
  { title: "Origin of
Species", author: "Charles
Darwin" },
{ title: "The Odyssey",
author: "Homer" }
];
```

Example:
An array of objects representing a list of books.

Create a New List

To iterate through the current array, use the **map()** method as shown below:

```
 const bookList =
books.map((book) =>
 {
  return (
    <li>
      <h3>{book.title}</h3>
      <p>by {book.author}</p>
    </li>
  );
});
```

This code will generate a new array of React components, each representing an item in the list of books.

Create a New List

The components can then be displayed on the screen as an unordered list by using the following code:

```
<ul>
  {bookList}
</ul>
```

This will display the list of book titles and authors in the web page's list item.

Lists and Keys

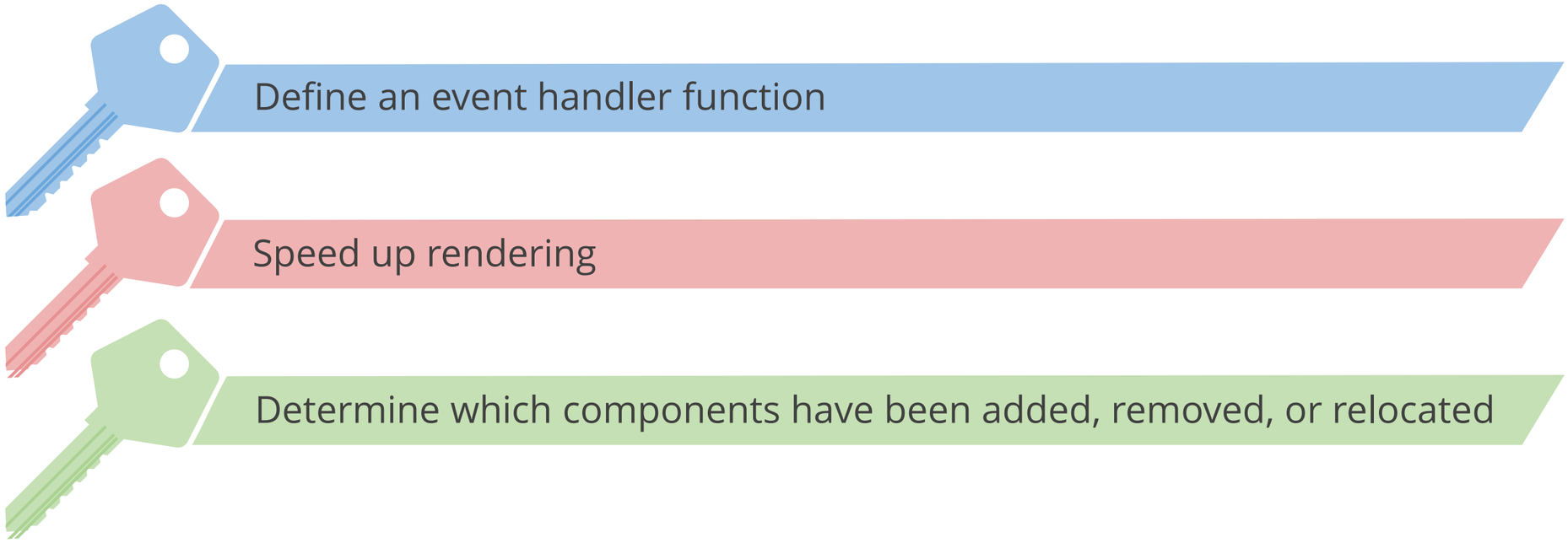
Lists and Keys

Lists	It is an array of related data rendered as a group of React components.
Keys	A special attribute is used when rendering lists to help identify each component on the list.

Use of Keys

The key prop should be a unique string or number that uniquely identifies a list item among the siblings of the components in the list.

React uses the key prop to perform the following actions:



Use of Keys: An Example

Use the **map() method** to iterate through the item array and generate a fresh array of React components.

```
const items = [
  { id: 1, name: "Item 1"
},
  { id: 2, name: "Item 2"
},
  { id: 3, name: "Item 3" }
];
```

Use of Keys: An Example

Keys are used to update the DOM sufficiently in the following code:

```
const itemComponents = items.map(item => (
  <li key={item.id}>
    {item.name}
  </li>
));
```

In the code,

- The ID property serves as the key prop for its corresponding component in the list.
- When a list item is added, removed, or reordered, the DOM is updated.
- Without keys, React may need to rerender the entire list on every update.

Assisted Practice

List Rendering **Duration: 15 Min.**

Problem Statement:

You are given a project to implement a component that renders the list of books as an unordered list and uses keys to optimize the rendering performance.

Assisted Practice: Guidelines

Steps to be followed:

1. Define a booklist component to accept an array of books as a prop
2. Assign unique key prop to each component of the book
3. Render the array of component as an unordered list

Styling and CSS Basics

Styling and Cascading Style Sheets (CSS) are used to enhance the visual appearance and layout of components.

CSS and styling can be added in the following ways:

- Inline styles
- CSS modules
- CSS in JS library

Styling and CSS Basics

This example defines a style object with CSS properties as keys and values.

```
function MyComponent() {
  const styles = {
    backgroundColor: "blue",
    color: "white",
    padding: "10px",
    borderRadius: "5px"
  };
  return <div style={styles}>Hello, world!</div>;
}
```

Inline Styles are defined for a component using JavaScript Object and are applied directly to the component's HTML elements.

Styling and CSS Basics

CSS modules define CSS styles in a separate file and import them into components as objects. It also defines class names that are scoped locally to the component level.

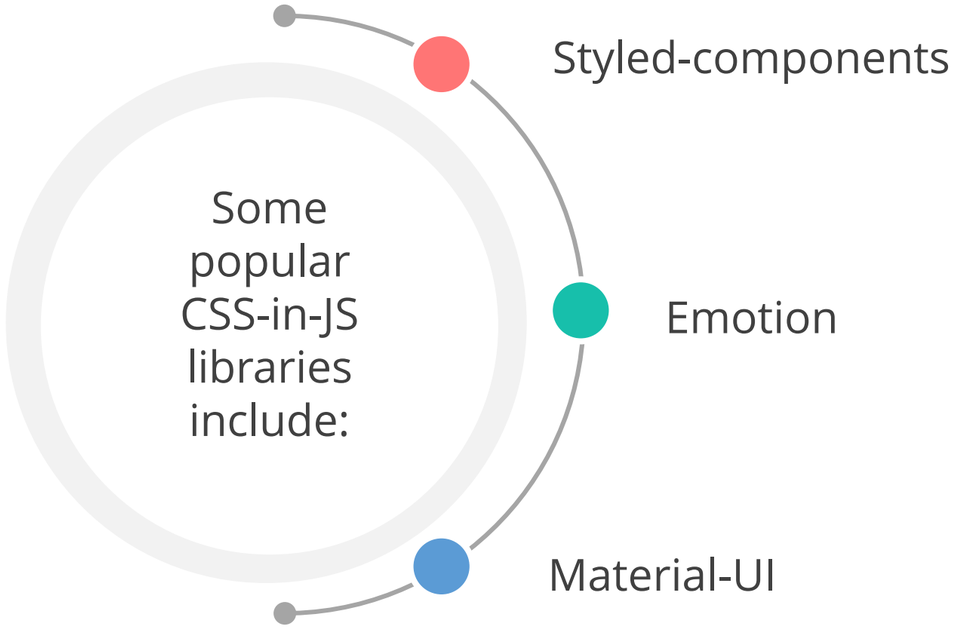
In this example, a CSS file called **MyComponent.module.css** is imported that has styles for the container class.

```
import styles from "./MyComponent.module.css";

function MyComponent() {
  return <div className={styles.container}>Hello, world!</div>;
}
```

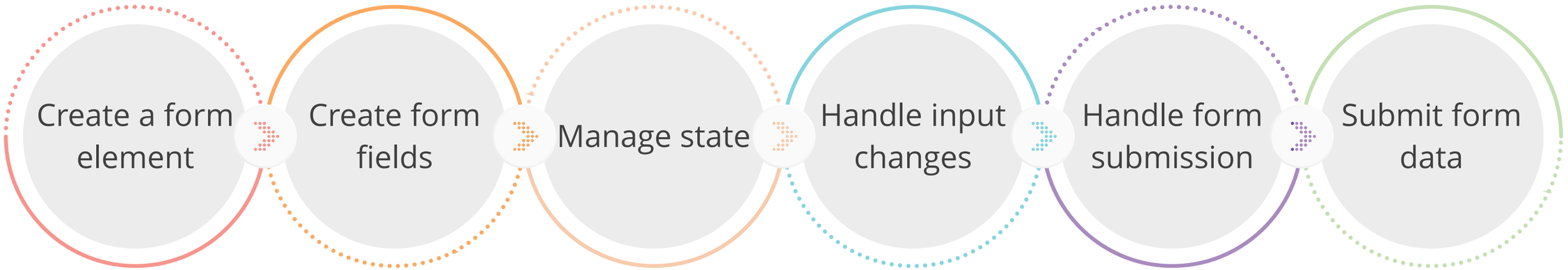
Styling and CSS Basics

The **CSS-in-JS Library** provides dynamic styling, server-side rendering, and other functionality by simply defining CSS styles in JavaScript code.



Basics of Form Handling

The basic steps involved in handling a Form in React are as follows:



Form Handling: An Example

Here's an example of basic Form Handling in React:

```
import { useState } from 'react';
function MyForm() {
  const [fullName, setFullName] = useState('');
  const [userEmail, setUserEmail] = useState('');
  const handleSubmit = (event) => {
    event.preventDefault();
    console.log(`Full Name: ${fullName}, Email: ${userEmail}`);
  };
  // Rest of the component code...
  return (
    // JSX code for your form...
  );
}
```

A React developer must use the useState Hook to manage the state of two form fields: name and email.

Form Handling: An Example

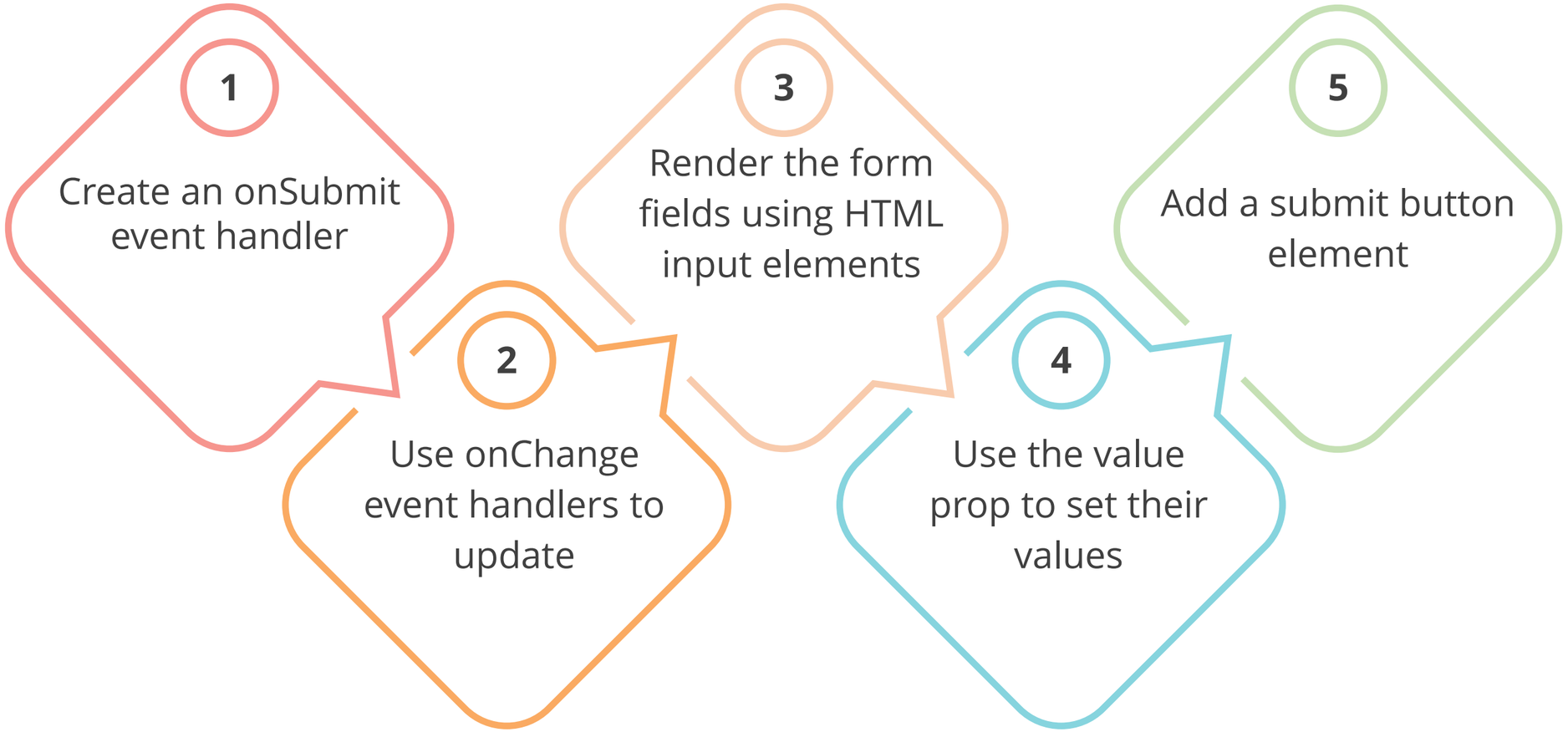
This code represents a form with input fields for name and email, allowing users to submit their information.

```
 return (
    <form onSubmit={handleSubmit}>
      <label>
        Name:
        <input type="text"
name="name" value={name}
onChange={(e) =>
setName(e.target.value)} />
      </label>
      <label>
```

```
Email:
        <input type="email"
name="email" value={email}
onChange={(e) =>
setEmail(e.target.value)} />
      </label>
      <button
type="submit">Submit</button>
    </form>
  ); }
```

Form Handling: An Example

This set of steps involves creating an event handler and updating and rendering form fields for submitting a form.



Assisted Practice

Form Handling **Duration: 15 Min.**

Problem Statement:

You are given a project to create a simple form with three input fields: name, email, and message.

Assisted Practice: Guidelines

Steps to be followed:

1. Create a **BasicFormHandling** function
2. Create state handlers to set the **formValues** and errors
3. Create a function to handle changes
4. Create a function handle for submission
5. Render the components on the page

Lifecycle of React Component

Component Lifecycle Methods

Component Lifecycle Methods in React are predefined methods that are invoked at different stages of a component's existence.

These methods have a range of advantages, such as:

- Control and flexibility
- Initialization and cleanup

Component Lifecycle Methods

Here are some more advantages of Component Lifecycle Methods:

- Dynamic updates
- Error handling
- Integration with third-party libraries
- Legacy support

Component Mounting Lifecycle Methods

Component Mounting refers to the process of creating an instance of a component and inserting it into the DOM.

1

constructor():
This method is called when the component is first initialized.

2

render():
This method is responsible for rendering the component's JSX and is required for every component.

3

componentDidMount():
This method is called after the component is inserted into the DOM.

Component Mounting Lifecycle Methods

There are many component-updating lifecycle methods in React, such as:

1. **shouldComponentUpdate(nextProps, nextState)**:
This method determines component updates based on changes in props or state.

2. **componentWillUpdate(nextProps, nextState)**:
This method prepares for the update.

3. **render()**:
This method rerenders the component with updated data.

4. **componentDidUpdate(prevProps, prevState)**:
This method is used to update the component's state.

Assisted Practice

Lifecycle Methods **Duration: 15 Min.**

Problem Statement:

You are given a project to create a React program to implement a timer.

ASSISTED PRACTICE

Assisted Practice: Guidelines

Steps to be followed:

1. Define a timer component with a state property of seconds
2. Set the initial value of the second state
3. Use the **componentDidMount()** method to set up the interval in seconds
4. Avoid memory leaks using **componentWillUnmount()**
5. Display seconds value in **render()** methods

Fragments

A fragment is a feature that allows grouping a list of child elements without creating an additional DOM node.

Consider the given code:

```
render() {
  return (
    <div>
      <h1>Heading</h1>
      <p>Paragraph</p>
    </div>
  );
}
```

In this code example, the **render() method** generates a JSX expression as its output.

Fragments: Uses

The code given below shows how a Fragment can be used to achieve the same result:

```
render() {
  return (
    <>
      <h1>Heading</h1>
      <p>Paragraph</p>
    </>
  );
}
```

In the code, the **<>** and **</>** tags represent an empty Fragment that wraps the **h1** and **p** elements.

Fragments: Uses

Fragments are also used with keys to provide a stable identity for elements across updates. For example:

```
render() {
  return (
    <>
      {this.props.items.map(item => (
        <React.Fragment key={item.id}>
          <h1>{item.title}</h1>
          <p>{item.content}</p>
        </React.Fragment>
      ))}
    </>
  );
}
```

In this code, we use a Fragment with a key to render a list of items.

Pure Components

A pure component only rerenders when its props or state change.

In this example, MyComponent extends PureComponent, which automatically implements the **shouldComponentUpdate()** method.

Example of a pure component:

```
import React, { PureComponent } from 'react';

class MyComponent extends PureComponent {
  render() {
    return <div>{this.props.title}</div>;
  }
}
```

Pure Components

Some important points:

The **shouldComponentUpdate()** method is called whenever props or state change.

The method compares the previous and current props and states.

The pure components only work if the props and state are immutable.

Pure components can be a useful optimization technique to improve performance.

Assisted Practice

Pure Components **Duration: 15 Min.**

Problem Statement:

You are given a project to create a component called Greetings that takes in a name prop and returns a greeting message that says Hello, {name}! The component should only re-render when the name of the prop changes.

Assisted Practice: Guidelines

Steps to be followed:

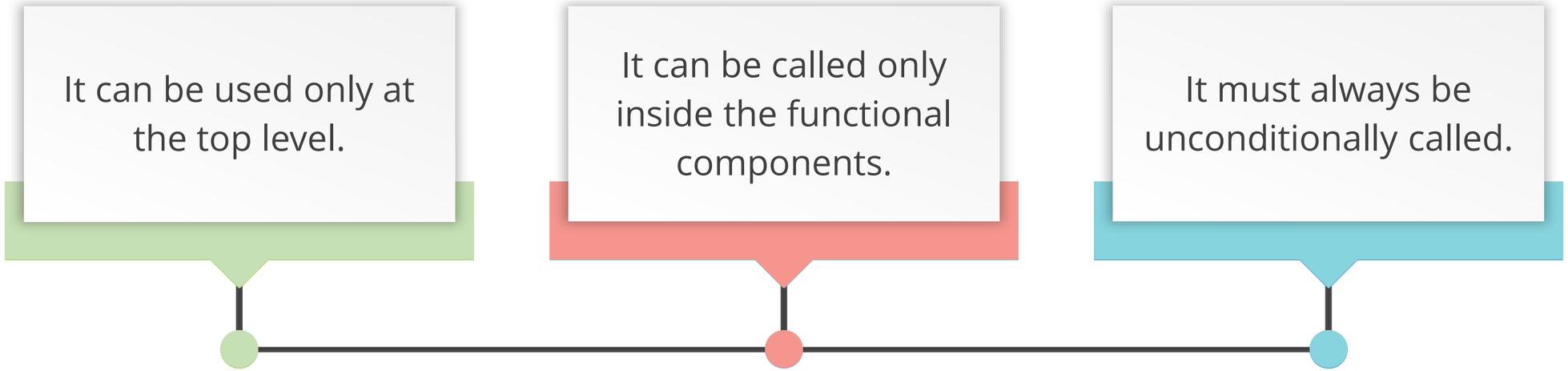
1. Create a pure function component that only re-renders when the **name prop** changes
2. Define an App component that uses the Greetings component
3. Define button to change the name of the prop
4. Import it and pass in the name prop to use this component in another part of the application

useState Hook

React Hooks: Introduction

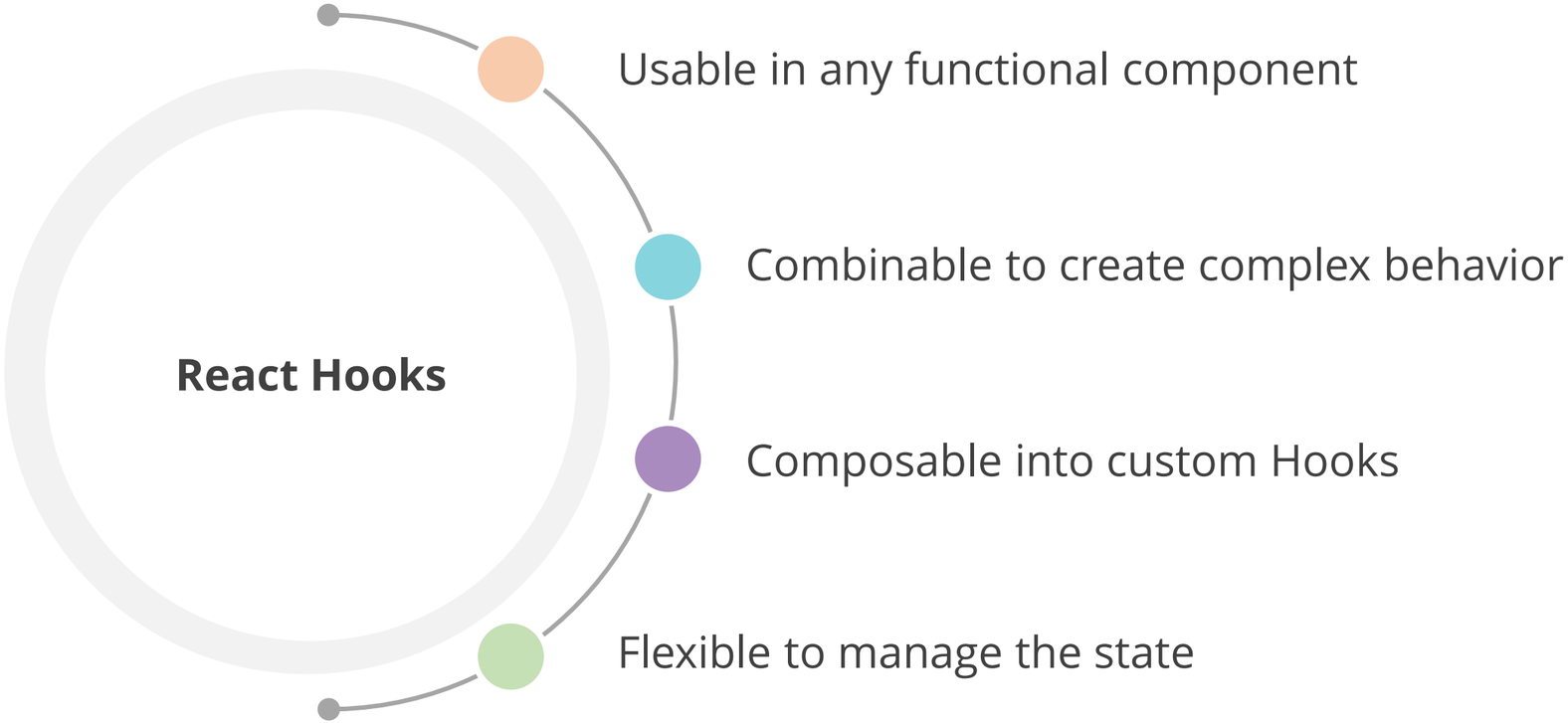
React Hooks enable the use of state and other features in functional components, eliminating the need for class components.

Here are some rules to follow when implementing React Hooks:



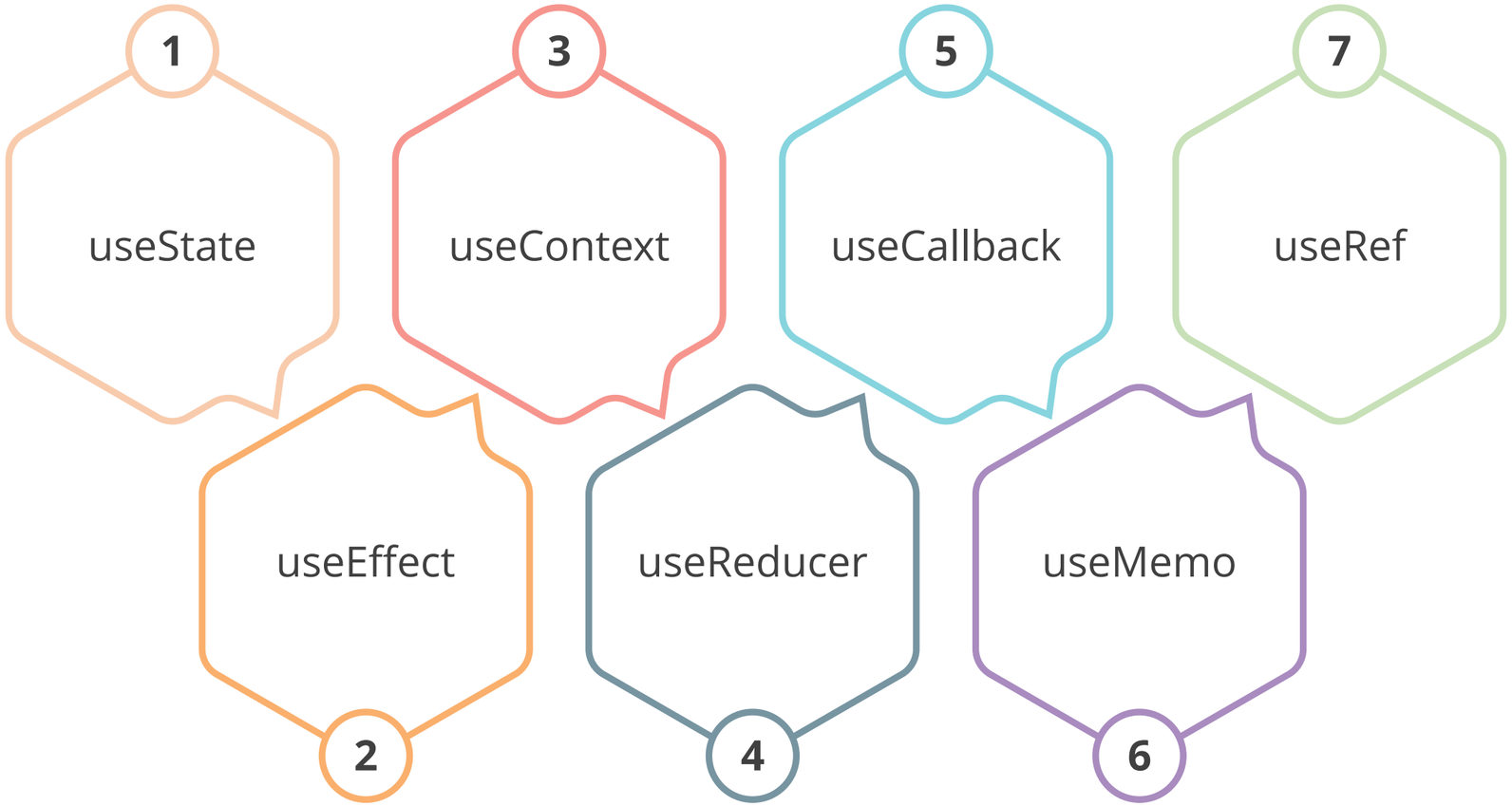
React Hooks: Features

The salient features of React Hooks are as follows:



React Hooks: Examples

Here are the following built-in Hooks that allow developers to manage the state:



useState Hook: Example

This example uses **useState** to define a state variable called count and two event handlers to update it, with **setCount** replacing the previous value of count.

```
import React, { useState } from 'react';
const Counter = () => {
  const [counterValue, setCounterValue] =
useState(0);
  const handleIncrement = () => {
    setCounterValue(counterValue + 1);
  };
  const handleDecrement = () => {
    setCounterValue(counterValue - 1);
  };
```

```
  return (
    <div>
      <p>Count: {counterValue}</p>
      <button
onClick={handleIncrement}>+</button>
      <button onClick={handleDecrement}>-
</button>
    </div>
  );
};
export default Counter;
```

useState Hook: Example

This example consists of an App component that renders the **counter** component, which updates the count state variable when the + or - buttons are clicked.

```
import React from 'react';
import Counter from './Counter';

const App = () => {
  return (
    <div>
      <Counter />
    </div>
  );
};

export default App;
```

useState: Updating State

To update the state based on its previous value in React using **useState**, use the functional form of **setState**, which takes a function as its argument. Here is an example:

```
import React, { useState } from 'react';

const Counter = () => {
  const [count, setCount] = useState(0);
```

```
const handleIncrement = () => {
    setCount(prevCount => prevCount + 1);
  };

  const handleDecrement = () => {
    setCount(prevCount => prevCount - 1);
  };
```

In the example, the **counter** component uses **useState** to manage the count state and event handlers to update it with the functional form of **setCount**.

useState: Updating State

The code given below renders a counter component in React, displaying the current count value and providing buttons to increment and decrement the count.

```
return (
    <div>
      <p>Count: {count}</p>
      <button onClick={handleIncrement}>+</button>
      <button onClick={handleDecrement}>-</button>
    </div>
  );
};

export default Counter;
```

useState: Defining Object State Variables

Object State Variables can be defined in React using the **useState** Hook by passing an object as the initial state value. Here is an example:

```
import React, { useState } from 'react';

const Form = () => {
  const [user, setUser] = useState({
    name: '',
    email: '',
    password: '',
  });

  const handleChange = event => {
    setUser({
      ...user,
      [event.target.name]: event.target.value,
    });
  };
```

useState: Defining Object State Variables

The following code defines a **handleSubmit** function that prevents default form submission. It also logs the user object and renders a form with an input field.

```
 const handleSubmit = event => {
    event.preventDefault();
    console.log(user);
  };

  return (
    <form onSubmit={handleSubmit}>
      <label htmlFor="name">Name</label>
      <input type="text" id="name" name="name" value={user.name} onChange={handleChange} />

;
```

useState: Defining Object State Variables

Here, the code includes input fields for email and password with corresponding labels and a submit button, all contained within a form component.

```
 <label htmlFor="email">Email</label>
      <input type="email" id="email"
name="email" value={user.email}
onChange={handleChange} />

      <label
htmlFor="password">Password</label>
      <input type="password"
id="password" name="password"
```

```
value={user.password}
onChange={handleChange} />

      <button
type="submit">Submit</button>
    </form>
  );
};

export default Form
```

useState: Defining Array State Variables

The following code uses the **useState** Hook to define Array State Variables by passing an array as the initial state.

```
import React, { useState } from 'react';

const List = () => {
  const [items, setItems] =
useState(['Item 1', 'Item 2', 'Item 3']);

  const handleClick = () => {
    setItems([...items, `Item
${items.length + 1}`]);
  };

  return (
    <div>
```

```
<div>
      <ul>
        {items.map((item, index) => (
          <li key={index}>{item}</li>
        ))}
      </ul>
      <button onClick={handleClick}>Add
Item</button>
    </div>
  );
};

export default List;
```

The code defines a List component that maintains a state variable called **items** as an array of strings.

Assisted Practice

useState Hook **Duration: 15 Min.**

Problem Statement:

You are given a project to build a new React component called **Counter** using the useState Hook.

Assisted Practice: Guidelines

Steps to be followed:

1. Create a new React component called **Counter**
2. Define a state variable called count using the **useState Hook**, with an initial value of 0
3. Render a heading that displays the current value of the count variable
4. Render two buttons: one that increments the count by 1, and another that decrements the count by 1
5. Add functionality to the buttons so that when they are clicked, the count variable is updated
6. Make sure the count variable cannot go below 0

Key Takeaways

- The map() method allows the iteration of an array of data to create a new array of React components based on that data.
- There are several ways to add styling and CSS to the React components, such as Inline styles, CSS modules, and CSS-in-JS Libraries.
- A fragment is a feature in React that allows users to group a list of child elements without creating an additional DOM node.
- In React, a pure component only rerenders when its props or state changes.
- The useState Hook is a built-in React Hook that allows users to add a state to the functional components.

Thank You