Class Components:

1. Class Component Basics

Structure of a Class Component

- Extends React.Component.
- Must have a render() method that returns .
- Uses this.props and this.state to access props and state.

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

class Counter extends Component {
  constructor(props) {
    super(props);  // Required to call `super(props)` before using `this`
    this.state = { count: 0 };
  }

  increment = () => {
    this.setState({ count: this.state.count + 1 });
  };

  render() {
    return (
      <div>
        <h1>Count: {this.state.count}</h1>
        <button onClick={this.increment}>Increment</button>
      </div>
    );
  }
}

export default Counter;
```

Key Features

Feature	Description
constructor(props)	Initializes state and binds methods.
this.state	Holds component-specific data.
this.setState()	Updates state and triggers re-render.
this.props	Immutable data passed from parent.
render()	Returns (required).

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2. State Management in Class Components

Rules of State

1. **Never modify state directly:**

```
this.state.count = 1; // ❌ Wrong! Use `setState()`.
```

2. **State updates may be asynchronous:**

```
this.setState({ count: this.state.count + 1 }); // ✅ Correct
```

3. **Use a function if new state depends on previous state:**

```
this.setState((prevState) => ({ count: prevState.count + 1 })); // ✅ Safer for async updates
```

Example: Updating State Correctly

```
import React, { Component } from "react";

class Counter extends Component {

  state = { count: 0 };

  increment = () => {
    this.setState({ count: this.state.count + 1 });
  };

  decrement = () => {
    this.setState((prevState) => ({ count: prevState.count - 1 }));
  };

  render() {
```

```
    return (
      <div>
        <button onClick={this.decrement}>-</button>
        <span>{this.state.count}</span>
        <button onClick={this.increment}>+</button>
      </div>
    );
  }
}
export default Counter;
```

3. Props in Class Components

Props are Read-Only

- Passed from parent components.
- Cannot be modified by the child

```
class Greeting extends Component {
  render() {
    return <h1>Hello, {this.props.name}!</h1>;
  }
}

// Usage: <Greeting name="Alice" />
```

Default Props & PropTypes

```
import PropTypes from 'prop-types';

class Greeting extends Component {
  static defaultProps = { name: "Guest" }; // Fallback if prop is missing
  static propTypes = { name: PropTypes.string }; // Type-checking (optional)

  render() {
    return <h1>Hello, {this.props.name}!</h1>;
  }
}
```

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4. Lifecycle Methods (Most Important for Exams)

1. Mounting Phase (Component Creation)

Method	Purpose
constructor(props)	Initialize state, bind methods.
render()	Returns (required).
componentDidMount()	Runs after component mounts (API calls, subscriptions).

```
class DataFetcher extends Component {
  // State holds the fetched data (initially null)
  state = { data: null };

  // componentDidMount runs once when the component is added to the DOM
  componentDidMount() {
    fetch("https://jsonplaceholder.typicode.com/posts/1") // Fetching data from API
      .then((res) => res.json()) // Convert response to JSON
      .then((data) => this.setState({ data })); // Update state with fetched data
  }
  render() {
    return (
      <div>
        {/* Display data if available, otherwise show "Loading..." */}
        {this.state.data ? <p>{this.state.data.title}</p> : <p>Loading...</p>}
      </div>
    );
  }
}

export default DataFetcher;
```

Step-by-Step Explanation

1. **State Initialization:**
   - `state = { data: null };`
   - The `data` property is initialized as `null` because no data is available yet.
2. **Lifecycle Method (`componentDidMount`)**
   - This method runs **once** after the component is mounted.
   - `fetch("https://jsonplaceholder.typicode.com/posts/1")` makes an API call.
   - `.then(res => res.json())` converts the response into JSON format.
   - `.then(data => this.setState({ data }));` updates the `data` state.
3. **Rendering Data Conditionally**
   - `this.state.data ? <p>{this.state.data.title}</p> : <p>Loading...</p>;`
   - If `data` is available, it displays the title from the API.
   - If `data` is `null`, it shows `"Loading..."`

Why Use `componentDidMount`?

- It ensures the API call runs **after** the component is added to the DOM.
- If the API request was in `render()`, it would cause infinite re-renders.

2. Updating Phase (Props/State Change)

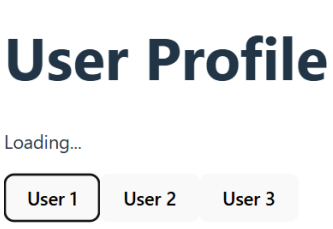
Method	Purpose
shouldComponentUpdate(nextProps, nextState)	Optimize re-renders (return true/false).
render()	Re-renders UI.
componentDidUpdate(prevProps, prevState)	Runs after update (side effects).

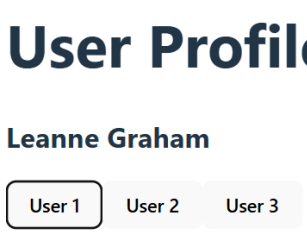
Parent.jsx

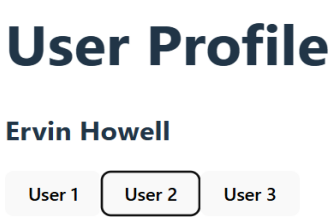
```jsx
import React, { useState } from "react";
import UserProfile from "./UserProfile.jsx"; // Import the
UserProfile component

const App = () => {
  const [userId, setUserId] = useState(1);
// State to store userId

  return (
    <div>
      <h1>User Profile</h1>

      {/* Pass userId as a prop to UserProfile */}
      <UserProfile userId={userId} />

      {/* Buttons to change userId dynamically */}
      <button onClick={() => setUserId(1)}>User 1</button>
      <button onClick={() => setUserId(2)}>User 2</button>
      <button onClick={() => setUserId(3)}>User 3</button>
    </div>
  );
};

export default App;
```

UserProfile.jsx

```jsx
import React, { Component } from "react";

class UserProfile extends Component {
    // Initialize state with a null user
    state = { user: null };

    // Runs whenever props change (userId in this case)
    componentDidUpdate(prevProps) {
        // Check if userId has changed before making a new API call
        if (this.props.userId !== prevProps.userId) {
            fetch(`https://jsonplaceholder.typicode.com/users/${this.props.userId}`)
                .then((res) => res.json())
                .then((user) => this.setState({ user })); // Update state with new user
data
        }
    }

    render() {
        return (
            <div>
                {/* Show user's name if available, otherwise show "Loading..." */}
                {this.state.user ? <h2>{this.state.user.name}</h2> : <p>Loading...</p>}
            </div>
        );
    }
}

export default UserProfile;
```







3. Unmounting Phase (Component Removal)

Method	Purpose
componentWillUnmount()	Cleanup (remove event listeners, timers).

```jsx
import React, { Component } from "react";

class Timer extends Component {
  state = { seconds: 0 };
```

```
  componentDidMount() {
    // Start a timer when the component is mounted
    this.timerID = setInterval(() => {
      this.setState((prevState) => ({ seconds: prevState.seconds + 1 }));
    }, 1000);
  }

  componentWillUnmount() {
    // Clear the timer when the component is removed
    clearInterval(this.timerID);
    console.log("Timer stopped!");
  }

  render() {
    return <h2>Timer: {this.state.seconds} seconds</h2>;
  }
}

export default Timer;
```

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6. Class Components vs. Functional Components

Feature	Class Components	Functional Components
State	this.state & setState()	useState Hook
Lifecycle	componentDidMount, componentDidUpdate	useEffect Hook
Props	this.props	Direct props argument
Syntax	More verbose	Cleaner, modern
Error Boundaries	Supported (componentDidCatch)	Not supported

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7. When to Use Class Components Today

✅ **Legacy codebases** (if not migrated to hooks).
✅ **Error boundaries** (only possible with classes).
✅ **Exam scenarios** (if asked explicitly).

Otherwise, **use functional components with hooks** for new projects.

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8. Exam-Style Questions

1. **What is the purpose of `super(props)` in a class component?**
   - It calls the parent class (React.Component) constructor and initializes this.props.
2. **How do you prevent unnecessary re-renders in a class component?**
   - Use shouldComponentUpdate(nextProps, nextState) and return false if no update is needed.
3. **What is the difference between `componentDidMount` and `componentDidUpdate`?**
   - componentDidMount runs **once after initial render**, while componentDidUpdate runs **after every re-render**.

Lifecycle Methods (Class Components)

1. Mounting Phase

- constructor() → render() → componentDidMount()
- Used for initial setup (API calls, subscriptions).

```
componentDidMount() {
  console.log("Component mounted!");
  fetch("https://api.example.com/data")
    .then(res => res.json())
    .then(data => this.setState({ data }));
}
```

2. Updating Phase

- Triggered by setState() or new props.
- render() → componentDidUpdate(prevProps, prevState)

```
componentDidUpdate(prevProps) {
  if (this.props.userId !== prevProps.userId) {
    fetch(`https://api.example.com/users/${this.props.userId}`)
      .then(res => res.json())
```

```
    .then(user => this.setState({ user }));
  }
}
```

3. Unmounting Phase

- componentWillUnmount() → Cleanup (remove event listeners, timers).

```
componentWillUnmount() {
  window.removeEventListener("resize", this.handleResize);
}
```