

## **Module-18) React - Components, State, Props**

### **1. Components (Functional & Class Components)**

#### **THEORY EXERCISE**

**1: What are components in React? Explain the difference between functional components and class components.**

**Ans:** Components are the building blocks of any React application. They are independent, reusable pieces of UI (User Interface) that can be combined to create complex user interfaces. Essentially, a component is a JavaScript function or class that optionally accepts inputs (called "props") and returns a React element that describes what should appear on the screen.

#### **Difference Between Functional components and Class componets**

<b>Feature</b>	<b>Functional Components</b>	<b>Class Components</b>
<b>State Management</b>	It can use Hooks like useState, useReducer	It uses this.state and this.setState()
<b>Lifecycle Methods</b>	It uses useEffect Hook for lifecycle methods	It uses traditional lifecycle methods like componentDidMount, componentWillUnmount
<b>Rendering</b>	Returns JSX directly inside the function	Uses a render() method to return JSX
<b>Performance</b>	Faster and more lightweight due to simpler structure	Slightly heavier due to the overhead of class instances
<b>Hooks</b>	Can use React hooks (useState, useEffect, etc.)	Cannot use hooks; relies on lifecycle methods and state
<b>This Keyword</b>	Does not use this keyword	Uses this to access props and state
<b>Code Complexity</b>	Less boilerplate code, easier to write and understand	More boilerplate code, especially for state and methods

<b>Event Handling</b>	Simple and direct event handling	Requires method binding for event handling
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## 2: How do you pass data to a component using props?

**Ans:** To pass data to a component using props in a component-based framework (like React, Vue, or Angular), you generally follow these steps:

### 1. Define the data in the parent component

- This is where the data originates. It could be state, a variable, or even data fetched from an API.

### 2. Pass the data as an attribute to the child component

- When you render the child component within the parent, you add attributes to the child component's tag. These attributes become the "props" that the child component receives.

### 3. Access the data in the child component

- The child component receives these props as an argument (often an object) in its function or class constructor.

#### ➤ Example: 1. Parent Component

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

function ParentComponent() {
  const userName = "Karan Sharma";
  const userAge = 25;
  const hobbies = ["Reading", "Playing", "Coding"];

  return (
    <div>
      <h1>Parent Component</h1>
      { /* Passing data to ChildComponent using props */ }
      <ChildComponent
        name={userName}
        age={userAge}
        hobbies={hobbies}
      />
    </div>
  );
}
```

```

        isLoggedIn={true}
      />
    </div>
  );
}

export default ParentComponent;

```

## 2. Child Component

```

import React from 'react';

function ChildComponent(props) {
  // props is the argument that holds all the passed data
  return ( <div>

    <h2>Child Component</h2>

    <p>Name: {props.name}</p>

    <p>Age: {props.age}</p>

    <p>Hobbies:</p>

    <ul> {props.hobbies.map((hobby, index) => (
      <li key={index}>{hobby}</li>
    ))}

    </ul>

    <p>User is logged in: {props.isLoggedIn ? "Yes" : "No"}</p>

  </div>

  );
} export default ChildComponent;

```

## 3: What is the role of render() in class components?

**Ans:** Render in React JS is a fundamental part of class components. It is used to display the component on the UI returned as HTML or JSX components. The ReactDOM.render() function takes two arguments, HTML code and an HTML element.

- In React class components, the render() method is a crucial and mandatory lifecycle method. Its primary role is to return the JSX (JavaScript XML) that describes the UI you want to display on the screen.

➤ **Purpose of render() method**

- React renders HTML to the web page by using a function called render().
- The purpose of the function is to display the specified HTML code inside the specified HTML element.
- In the render() method, we can read props and state and return our JSX code to the root component of our app.
- In the render() method, we cannot change the state, and we cannot cause side effects( such as making an HTTP request to the webserver).

➤ **Example: 1. Classcomponent .js**

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

class Classcompo extends Component {
  render() {
    return (
      <div>
        <h1>Hello this class component</h1>
        <h2>First Program to Class Component</h2>
      </div>
    )
  }
}
```

```

    }
    export default Classcompo;

```

## ➤ 2. App .js

```

import React from "react";
import Classcompo from "../Compoenet/Classcompo";

function App(){
    return(
        <div>

            <h1>This is App </h1>

            < Classcompo />

        </div>
    )
}

export default App;

```

## 2. Props and State

### THEORY EXERCISE

#### 1: What are props in React.js? How are props different from state?

**Ans:** Props are known as properties it can be used to pass data from one component to another. Props cannot be modified, read-only, and Immutable.

#### ❖ How are props different from state

PROPS	STATE
The Data is passed from one component to another.	The Data is passed within the component only.

It is Immutable (cannot be modified).	It is Mutable ( can be modified).
Props can be used with state and functional components.	The state can be used only with the state components/class component (Before 16.0).
Props are read-only.	The state is both read and write.
Props are known as properties it can be used to pass data from one component to another. Props cannot be modified, read-only, and Immutable.	The state represents parts of an Application that can change. Each component can have its State. The state is Mutable and It is local to the component only.

## 2: Explain the concept of state in React and how it is used to manage component data.

**Ans:** In React, the state refers to an object that holds information about a component's current situation. This information can change over time, typically as a result of user actions or data fetching, and when state changes, React re-renders the component to reflect the updated UI.

- Whenever state changes, React re-renders the component to reflect the updated data. This enables you to build dynamic UIs that respond to user interactions.

### ➤ Key Concepts of State

#### 1. Local and Private

- ✓ State is local to the component it's defined in. It's encapsulated within that component and not directly accessible to other components, unless explicitly passed down via props. Each instance of a component has its own independent state.

#### 2. Reactivity and Re-rendering

- ✓ When state changes, React automatically triggers a re-render of the component to reflect the updated state in the UI. React ensures that only the parts of the UI that depend on the state are re-rendered, improving performance.

#### 3. Mutable Within the Component

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#### 4. Initial Value

- ✓ State needs an initial value when the component first mounts.

#### ❖ Syntax:

- **const [state, setState] = useState(initialState);**
  - ✓ **state:** The current state value.
  - ✓ **setState:** A function that is used to update the state.
  - ✓ **initialState:** The initial value that the state will hold when the component is first rendered.

#### ❖ How State is Used to Manage Component Data

- React provides two primary ways to manage state, depending on whether you're using **Functional Components** (with Hooks) or **Class Components**.

##### 1. Functional Components (with the useState Hook)

- The useState Hook is the most common and recommended way to manage state in functional components.
- **Syntax: import React, { useState } from 'react';**

```
function MyComponent() {  
  
  const [stateVariable, setStateVariable] = useState(initialValue);  
  
  // ... rest of your component logic  
}
```

- ✓ useState is a Hook (a special function that lets you "hook into" React features in functional components).
- ✓ It returns an array with two elements
  - **stateVariable:** The current value of the state.
  - **setStateVariable:** A function that you use to update the state variable.

- ✓ **initialValue:** The value you want the state to have when the component first renders.

➤ **Example :** `import React, { useState } from 'react';`

```
function FuncState() {  
    // state define and method  
    const [name, setname] = useState("uttam");  
    const [count, setcount] = useState(0);  
    console.log(name);
```

```
return(  
    <div>
```

```
        <h1>
```

```
            This is State in Function </h1>
```

```
            <h1>hello name :- {name} </h1>
```

```
            <button onClick={() => setname("Pintu")}>Change Name</button>
```

```
            <button onClick={() => setname("Manish")}>Change Name</button>
```

```
            <h1>Hello count :- {count} </h1>
```

```
            <button onClick={() => setcount(count + 1)}>Increment</button>
```

```
            <button onClick={() => setcount(count + 2)}>Incment by 2</button>
```

```
            <button onClick={() => setcount(count - 1)}>Decrement</button>
```

```
            <button onClick={() => setcount(0)}> Zero</button>
```

```
        </div>
```

```
    )
```

```
    }
```

```
    export default FuncState
```

➤ **How it manages data:**

- ✓ The count variable holds the current value of our counter.
- ✓ When the user clicks "Increment" or "Decrement," we call `setcount()`.
- ✓ Calling `setcount()` tells React that the count state has changed.



- ✓ React then automatically re-renders the FuncState component, and the count value

## 2. Class Components (using this.state and this.setState())

- This is the traditional way to manage state in class components. While still valid, it's less common in new React development.

- **Syntax:** `import React, { Component } from 'react';`  
`class MyClassComponent extends Component {`  
    `constructor() {`  
        `super();`  
        `this.state = { // Define initial state properties here`  
            `someData: 'initial value',`  
            `anotherValue: 0 }; }`

`// Method to update state`

```
updateState = () => {  
  
    this.setState({ someData: 'new value',  
anotherValue: this.state.anotherValue + 1
```

```
});
```

```
};
```

```
render() {  
    return (  
        // Access state using this.state.propertyName  
        <p>{this.state.someData}</p>  
    );  
}
```

- **Example:** `import React, { Component } from 'react'`  
`class ClassState extends Component {`  
    `constructor(){`  
        `super();`  
        `this.state = {`

```

        name : "Rahul Kumar",
        count : 0,
    }
}
Incrementby2 = () =>{
    this.setState({
        count : this.state + 2
    })
}

render() {
    console.log(this.state)
    return (
        <div>
            <h1>hello this class in State</h1>
            // use state this.state.objectname
            <h1>Hello name :- {this.state.name}</h1>

            <button onClick={() => this.setState({ name: "Mohan" })}>Change
name</button>

            <button onClick={() => this.setState({ name: "Karan" })}>Chnage
name2</button>.

            <h1>Hello count :- {this.state.count}</h1>

            <button onClick={() => this.setState({ count: this.state.count + 1
            })}>increment</button>

            <button onClick={() => this.setState({ count: this.state.count - 1
            })}>decrment</button>

            <button onClick={() => this.setState({ count: 0 })}>Zero</button>

            <button onClick={this.incrementby2}>Incment by 2</button>

        </div>
    )
}

```

```
  })  
}
```

➤ **How it manages data:**

- ✓ The name property in `this.state` holds the current name.
- ✓ The constructor is where you define the initial state.
- ✓ When `Incrementby2` is called (e.g., by clicking the button), `this.setState()` is used to update the count property.
- ✓ `this.setState()` signals to React that the component's state has changed, prompting a re-render.
- ✓ The `render()` method then uses the updated `this.state.isOn` value to determine the button text and status message.

### **3: Why is `this.setState()` used in class components, and how does it work?**

**Ans:** `this.setState()` is a fundamental method used in React class components for managing and updating their internal state. It's crucial because it's the only correct way to trigger a re-render of the component and its children when the state changes.

#### **❖ Why `this.setState()` is Used in Class Components**

➤ **Immutability of State**

- ✓ In React, the state object should be treated as immutable. You should *never* directly modify `this.state` like `this.state.count = 5`; Doing so will not trigger a re-render, and your UI will not reflect the changes. `setState()` provides a controlled and predictable way to update the state.

➤ **Triggering Re-renders**

- ✓ When `this.setState()` is called, React knows that the component's state has potentially changed. This signals React to:
  - Re-run the component's `render()` method.
  - Compare the new virtual DOM tree with the previous one.
  - Efficiently update the actual DOM to reflect only the necessary changes (a process called "reconciliation").

➤ **Batching Updates**

- ✓ React often batches multiple `setState()` calls together for performance optimization. If you call `setState()` multiple times within a single event handler, React might consolidate them into a single update to avoid unnecessary re-renders.

➤ **Asynchronous Nature**

- ✓ `setState()` is asynchronous. This means that React might not update the state immediately after you call `setState()`. If you need to perform actions *after* the state has definitely updated, you should use the optional callback function of `setState()`.

❖ **How this.setState() Works**

1. You call `this.setState()` with the desired state changes (either as an object or a function).
2. React queues the update.
3. React batches multiple updates for efficiency.
4. React calculates the new state by shallowly merging your update with the current state (or by calling your updater function).
5. React triggers a re-render of the component.
6. The `render()` method is called, creating a new virtual DOM tree.
7. React's reconciliation algorithm compares the new virtual DOM with the previous one.
8. React updates the actual DOM only where necessary.
9. If a callback function was provided, it's executed after the re-render is complete.