Question 1: What is the Context API in React? How is it used to manage global state across multiple components**What is the Context API in React?**

The **Context API** in React is a feature that allows you to **share state or values** globally across your component tree without having to pass props down manually through every level of the tree. It helps to avoid **prop drilling**, where you have to pass props through many layers of components just to get data to a deeply nested component.

The Context API provides a way to share values like the current authenticated user, theme settings, language preferences, or any other global state that needs to be accessed by many components in your app.

Key Concepts of the Context API

1. **Context**: A context is a mechanism for passing data through the component tree without having to pass props at each level.
2. **Provider**: The Provider component allows you to define the **context value** that will be available to all components in the tree. It provides a way to pass down values to descendants.
3. **Consumer**: The Consumer component allows a component to **access the context value** provided by the nearest Provider higher up in the component tree.
4. **useContext Hook**: In function components, instead of using Consumer, you can use the useContext hook to easily access context values.

How the Context API Works

The Context API is built around three main components:

1. **Creating Context**:
   Use React.createContext() to create a context object. This object contains a Provider and a Consumer.

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const MyContext = React.createContext(defaultValue);

- defaultValue is optional and is used when no provider is found in the component tree. It's mostly used for testing or for fallback values.

2. **Providing Context**:
   The Provider component is used to **provide** the context value to its child components.

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```
<MyContext.Provider value={someValue}>
  {/* Child components */}
</MyContext.Provider>
```

3. **Consuming Context**:
   You can consume context in two main ways:
   - **useContext Hook** (preferred in functional components):
     This hook allows you to access the context value directly.

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```
const value = useContext(MyContext);
```

   - **Consumer Component** (used in class components):
     The Consumer component is used to access the context value. It requires a function as a child.

js

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```
<MyContext.Consumer>
  {(value) => <div>{value}</div>}
</MyContext.Consumer>
```

Example of Using Context API to Manage Global State

Here's an example to demonstrate how you can use the Context API to manage a global state (e.g., theme settings) across multiple components.

1. Create the Context

First, we create a context for our global state. In this case, we'll create a context for a **theme** (light or dark mode).

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


// Create a context with default value as 'light'
const ThemeContext = createContext('light');
```

2. Provide the Context

Now, we'll create a ThemeProvider component that will hold the value for the context and provide it to child components using the Provider.

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```
const ThemeProvider = ({ children }) => {
  const [theme, setTheme] = useState('light');


  // Toggle theme between 'light' and 'dark'
  const toggleTheme = () => {
    setTheme((prevTheme) => (prevTheme === 'light' ? 'dark' : 'light'));
  };


  return (
    <ThemeContext.Provider value={{ theme, toggleTheme }}>
      {children}
    </ThemeContext.Provider>
  );
};
```

3. Consuming the Context

Now that the ThemeProvider is passing the theme value to all child components, you can use the useContext hook to access it anywhere inside the tree.

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


const ThemeDisplay = () => {
  const { theme, toggleTheme } = useContext(ThemeContext);


  return (
    <div style={{ background: theme === 'light' ? '#fff' : '#333', color: theme === 'light' ? '#000' : '#fff' }}>
      <h1>Current Theme: {theme}</h1>
      <button onClick={toggleTheme}>Toggle Theme</button>
    </div>
  );
};
```

4. Wrap Components with the Provider

Finally, we wrap the root of the component tree with the ThemeProvider, so the theme state is available to all the components inside the tree.

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```
import React from 'react';
import ReactDOM from 'react-dom';
import { ThemeProvider } from './ThemeContext'; // Import the ThemeProvider
import ThemeDisplay from './ThemeDisplay';


const App = () => {
  return (
    <ThemeProvider>
      <ThemeDisplay />
    </ThemeProvider>
```

```
  );
};

ReactDOM.render(<App />, document.getElementById('root'));
```

How the Context API Manages Global State

- The ThemeProvider component holds the theme state and provides it to any component that consumes the ThemeContext.
- The useContext hook allows the ThemeDisplay component to access the current theme and update it without needing to pass the theme prop manually from the parent.
- By toggling the theme, the ThemeProvider updates its state, and the updated value is reflected in all the components consuming the context.

Advantages of Using Context API for Global State Management

- **Avoids Prop Drilling**: The Context API allows you to share state between components without passing props down manually at each level of the tree.
- **Centralized State**: You can keep the state in a central location (such as in the Provider) and update it from any component within the tree.
- **Simpler than Redux for Simple Cases**: For smaller apps or state that doesn't require complex actions or reducers, the Context API can be an easier and more intuitive alternative to state management libraries like Redux.

Things to Keep in Mind

- **Performance Considerations**:
    - If you provide a context value that changes frequently, it may cause unnecessary re-renders of all components that consume the context. To mitigate this, you can memoize the context value or optimize your state updates.
- **For Large Applications**:
    - For large-scale applications with more complex state management needs (e.g., actions, reducers), libraries like **Redux** or **Recoil** might be a better fit.
- **Context is not meant for everything**:

- It's ideal for global state or shared state (like themes, language preferences, etc.), but it's not meant for all types of local state or complex state management.

Question 2: Explain how createContext() and useContext() are used in React for sharing state

How createContext() and useContext() Are Used in React for Sharing State

In React, the **Context API** is designed to share state or values across multiple components without the need to pass props down manually at every level. This is particularly useful when you have deeply nested components that all need access to the same data or state.

The **createContext()** function and the **useContext()** hook are the two primary tools for creating and consuming context in functional components.

Let's break down how both of these are used.

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1. createContext(): Creating a Context

The createContext() function is used to **create a context** in React. It returns a context object, which contains two components:

- **Provider**: This is used to **provide** the context value to child components.
- **Consumer**: This allows components to **consume** the context value. (However, useContext is more commonly used in function components now.)

Syntax:

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```
const MyContext = React.createContext(defaultValue);
```

- defaultValue is an optional argument that is used when a component does not have a matching Provider above it in the component tree. It's mainly used for testing and fallback values.

Example:

js

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```
const MyContext = React.createContext('light'); // 'light' is the default value
```

---

2. useContext(): Consuming the Context

Once you have created a context using createContext(), you can use the **useContext()** hook to access the context value in any functional component.

The useContext() hook allows a component to **consume** the context value provided by a Provider higher up in the component tree.

Syntax:

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```
const value = useContext(MyContext);
```

- **MyContext** is the context object created with createContext().
- **value** is the current value of the context, which will be the value passed by the nearest Provider.

Putting It Together: Example of Sharing State with createContext() and useContext()

Here's a full example demonstrating how to use createContext() and useContext() to share a simple state (like a theme) across components in React:

Step 1: Create the Context

First, create the context using createContext() and define its default value.

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


// Step 1: Create Context
const ThemeContext = createContext('light'); // Default theme is 'light'
```

Step 2: Provide the Context Value

Next, create a ThemeProvider component that will **provide** the context value to its child components.

js

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```
// Step 2: Create a ThemeProvider component that uses the Provider
const ThemeProvider = ({ children }) => {
  const [theme, setTheme] = useState('light'); // State to manage theme

  // Function to toggle theme
  const toggleTheme = () => {
    setTheme((prevTheme) => (prevTheme === 'light' ? 'dark' : 'light'));
  };

  return (
    <ThemeContext.Provider value={{ theme, toggleTheme }}>
      {children}
    </ThemeContext.Provider>
  );
};
```

- The ThemeProvider holds the theme state and provides the context value { theme, toggleTheme } to the entire component tree below it.

Step 3: Consume the Context Value

Now, in any child component, you can use useContext() to consume the context value.

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```
// Step 3: Use useContext() to consume the context value
const ThemeDisplay = () => {
  const { theme, toggleTheme } = useContext(ThemeContext);

  return (
    <div
```

```
      style={{
        background: theme === 'light' ? '#fff' : '#333',
        color: theme === 'light' ? '#000' : '#fff',
      }}
    >
      <h1>Current Theme: {theme}</h1>
      <button onClick={toggleTheme}>Toggle Theme</button>
    </div>
  );
};
```

- Here, the useContext(ThemeContext) hook is used to access the theme and toggleTheme from the context.
- The component renders the current theme and provides a button to toggle between "light" and "dark" themes.

Step 4: Wrap the App with the Provider

Finally, wrap your root component with the ThemeProvider so that the context value is available to all child components.

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```
import React from 'react';
import ReactDOM from 'react-dom';
import { ThemeProvider } from './ThemeProvider'; // Import the ThemeProvider
import ThemeDisplay from './ThemeDisplay'; // Import the ThemeDisplay component

const App = () => {
  return (
    <ThemeProvider>
      <ThemeDisplay />
    </ThemeProvider>
```

```
  );
};

ReactDOM.render(<App />, document.getElementById('root'));
```

- The ThemeProvider component provides the theme state to the ThemeDisplay component via the ThemeContext.Provider.

Summary of Key Concepts

1. **createContext()**:
    - This function creates a context object, which includes a Provider (used to pass values down the component tree) and a Consumer (or useContext for functional components) that allows components to access the context value.
2. **useContext()**:
    - The useContext() hook is used in functional components to **consume** the context value provided by the nearest Provider component in the component tree.

Advantages of Using createContext() and useContext() for State Management

- **Avoid Prop Drilling**: The main advantage of using the Context API is to **avoid prop drilling**—the process of passing props down multiple layers of components just to get data to a deeply nested child.
- **Global State**: Context is ideal for managing **global state** or data that needs to be shared across multiple components, such as user authentication status, themes, or language settings.
- **Cleaner and Simpler**: For small to medium-sized apps, the Context API is a simpler and more efficient solution compared to more complex state management tools like Redux.

Example Recap

1. **Creating Context**:
   `const ThemeContext = createContext('light');`
    - This creates a context object with 'light' as the default value.

2. **Providing Context**:
   Use <ThemeContext.Provider value={{ theme, toggleTheme }}> to provide the context value.

3. **Consuming Context**:
   Use const { theme, toggleTheme } = useContext(ThemeContext); in child components to consume the context value.