ReactJs Complete Guide

Introduction

What is ReactJs?

If we explain ReactJs in a simple line, It is an open-source JavaScript library, which is used to build user interfaces (UIs) and front-end web apps or applications.

It provides us with many features to build high performance web applications,whether it is small, big or complex. ReactJs is a highly optimized and component based JavaScript library,which is particularly popular for single-page applications (SPAs) and allows developers to create interactive and dynamic UI components.

Who is the founder or developer of ReactJs?

Jordan Walke, who was a software engineer at Meta(Facebook), author of ReactJs. So it was developed by Facebook in 2011 but it was introduced officially by Facebook in 2013.

Since then, React.js has gained widespread adoption and has become one of the most popular JavaScript libraries for building user interfaces.

Why do we choose ReactJs?

ReactJs is most popular for its flexibility, performance, scalability, and solid features. It’s chosen by a wide developer community. Day by day, It's getting more and more popular.

So if you want to be a Front-end web developer or Full stack developer, you should learn ReactJs.

Key features

- Component-Based Architecture
- Virtual DOM
- JSX
- Unidirectional Data Flow
- Extensions
- Simplicity
- Performance Optimization
- Strong Community and Ecosystem, etc.

React latest Versions

Versions	Release date
18.2.0	*June 14, 2022*
18.1.0	*April 26, 2022*
18.0.0	*March 29, 2022*
17.0.2	*March 22, 2021*
17.0.1	*October 22, 2020*
17.0.0	*October 20, 2020*

Prerequisites

Before we start learning ReactJs and building our own app using it, we have to focus on some prerequisites. We must follow these prerequisites and go ahead.

Prerequisites to learn ReactJs

You should have a good understanding of **HTML (Hypertext Markup Language**) for creating the structure of web pages, **CSS (Cascading Style Sheets**) for styling and layout. Also you should have **basic knowledge of JavaScript**.

Essential JavaScript for ReactJs

Before learning reactjs you should have some essential javascript knowledge. It will help you in some core concepts of ReactJs from a JavaScript perspective. So, here all those topics of JavaScript are given about which you should have knowledge while you start learning ReactJs.

- **Functions and Arrow Functions**
- **JavaScript Objects**
- **Array and array methods**
- **Destructuring**
- **Template literals**
- **Ternary Operators**
- **ES Modules and Import / Export Syntax**

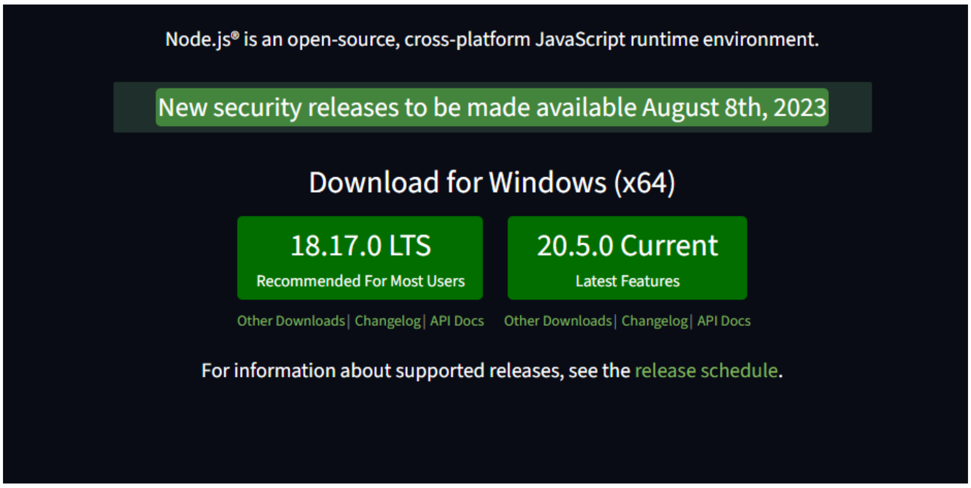
Hope you guys have knowledge in all these topics.

Prerequisites to install React App

Before installation of React App you have to install **Node.js** latest version in your system. Because React is a JavaScript library, and node.js provides a **runtime environment** for executing JavaScript outside the browser. Also you can use npm and install and manage dependencies in your React projects, once you have installed Node.js in your system.

If you have not installed **Node.js** yet, then let's see how to install it and which version to install.First go to the official website of **Node.js** https://nodejs.org

There on the home page, you will see two versions available for download, as you can see in the screenshot below.



Node.js® is an open-source, cross-platform JavaScript runtime environment.

New security releases to be made available August 8th, 2023

Download for Windows (x64)

18.17.0 LTS
Recommended For Most Users

20.5.0 Current
Latest Features

Other Downloads| Changelog| API Docs   Other Downloads| Changelog| API Docs

For information about supported releases, see the release schedule.

Download the ***18.17.0 LTS*** version, as it is recommended for most users and it's widely used by developers for production environments.

After the installer is downloaded. Install it by launching **installation wizard** and following all **instructions of installation wizard**, accepting **license agreement** and choosing the default installation settings.

After the installation, open the **Command Prompt** or **PowerShell** or **Terminal** (If you use **macOS**) then run the command ***node -v*** to check if Node.js is successfully installed.

Also run the command ***npm -v*** to check if the npm is successfully installed.

If you see the **Node.js** version displayed, then **congratulations** it's successfully installed.

```
Microsoft Windows [Version 10.0.19045.3086]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Code With Random> node -v
v18.17.0
```

ES6 in React

ES6, also known as the ECMAScript version 6.

What is ECMAScript?

ECMAScript is a scripting language which is based on specification and standardization by ECMA International Company in ECMA-262 and ISO/IEC 1623. It was created to standardize JavaScript language to bring multiple implementations.

Features of ES6

ES6 has introduced several new features mentioned below:

Variables
Arrow Function
Modules
Classes
Array Methods like `map()`
Destructuring
Ternary & Spread Operator

Arrow function

Arrow functions are a shorthand syntax for writing function expressions which makes your code more readable and organized. Arrow functions can be declared without the function keyword.

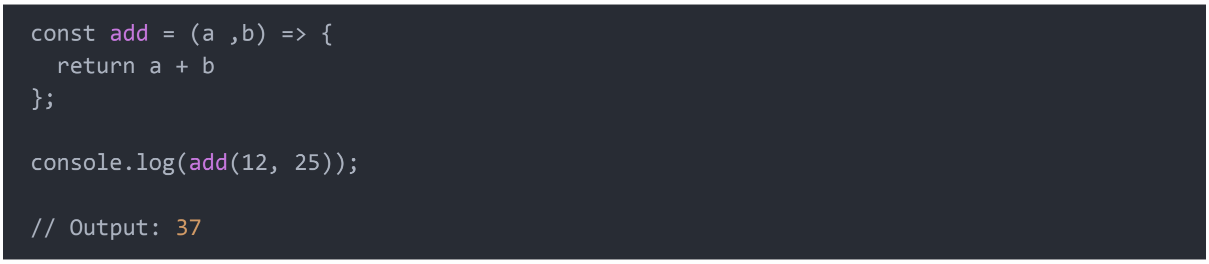
The basic syntax of Arrow Functions:

```
const functionName = (parameters) => {
  return returnValue
};
```

Arrow functions with no parameters:

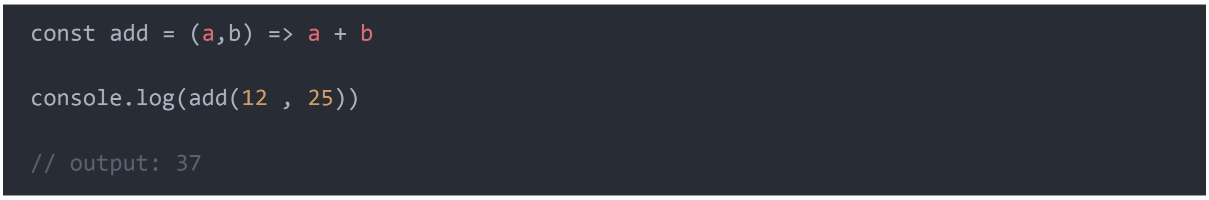
```
const add = () => {
  return "Hello World"
};

console.log(add());

// Output: Hello World
```

Arrow functions with parameters:



```
const add = (a ,b) => {
  return a + b
};

console.log(add(12, 25));

// Output: 37
```

Arrow function with a single expression (implicit return):



```
const add = (a,b) => a + b

console.log(add(12 , 25))

// output: 37
```

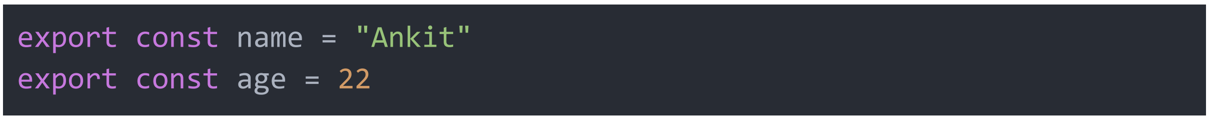
Modules

JavaScript Modules allow you to break up your code into separate files. Modules can be imported and exported.

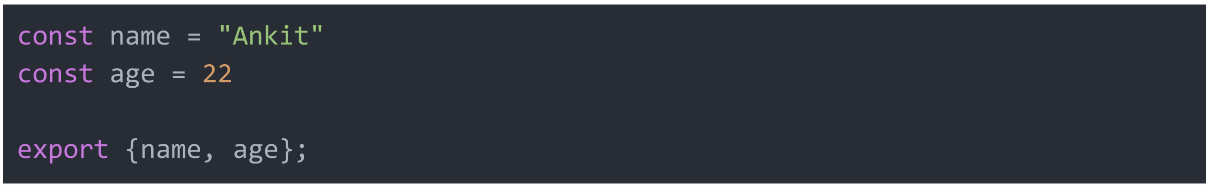
To define a module, you use the export statement to indicate which parts of the module should be accessible from the outside, and you use the import statement to bring those exported parts into another module.

Named Exports:

Suppose you have a person.js file.

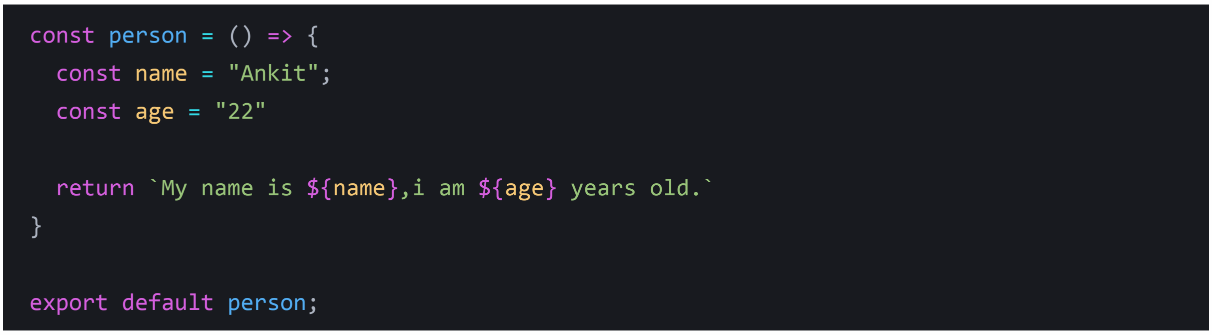


```
export const name = "Ankit"
export const age = 22
```



```
const name = "Ankit"
const age = 22

export {name, age};
```

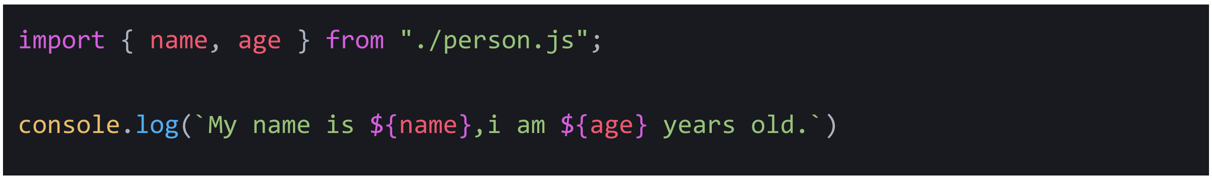
Default Exports



```
const person = () => {
  const name = "Ankit";
  const age = "22"

  return `My name is ${name},i am ${age} years old.`
}

export default person;
```

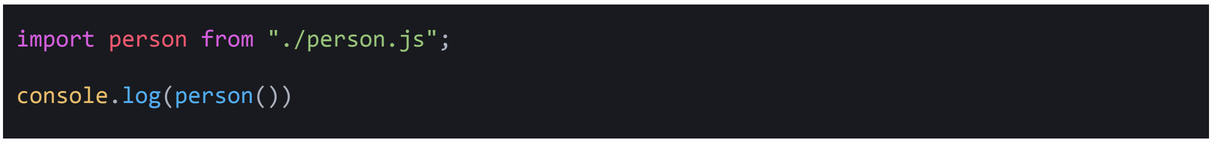
Import

Named import



```
import { name, age } from "./person.js";

console.log(`My name is ${name},i am ${age} years old.`)
```

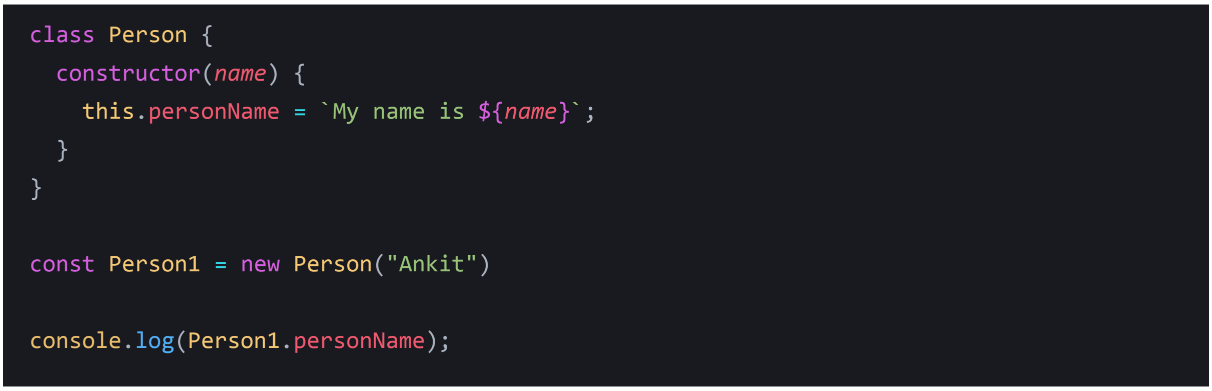
Default import



```
import person from "./person.js";

console.log(person())
```

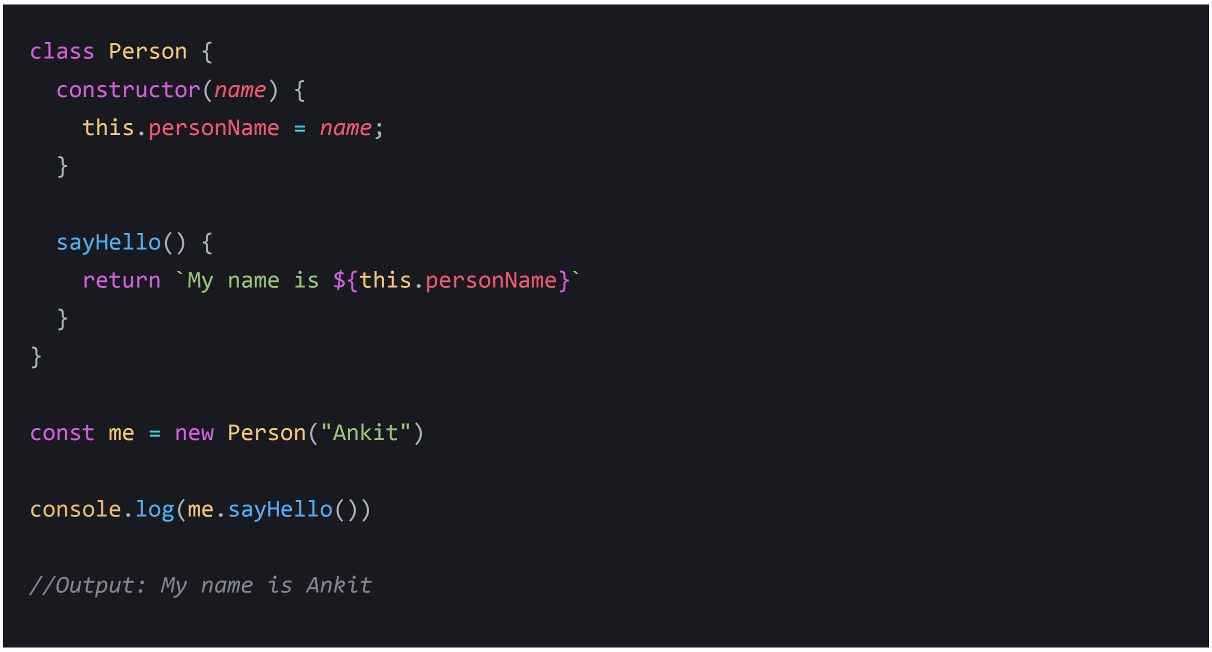
Classes

A class is a type of function, but instead of using the keyword **`function`** to initiate it, we use the keyword **`class`**, and the properties are assigned inside a **`constructor()`** method.



```
class Person {
  constructor(name) {
    this.personName = `My name is ${name}`;
  }
}

const Person1 = new Person("Ankit")

console.log(Person1.personName);
```

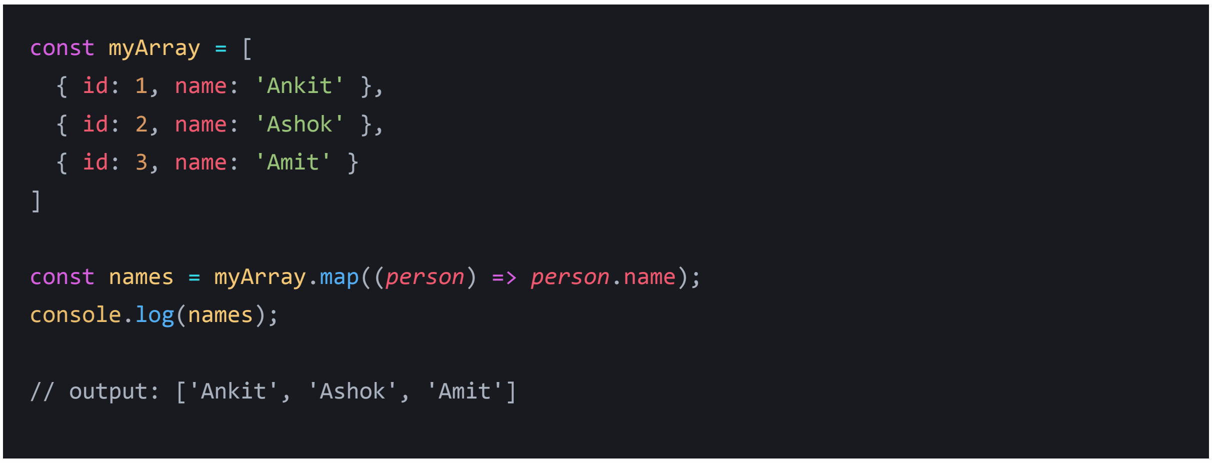
Method in Classes



```
class Person {
  constructor(name) {
    this.personName = name;
  }

  sayHello() {
    return `My name is ${this.personName}`
  }
}

const me = new Person("Ankit")

console.log(me.sayHello())

//Output: My name is Ankit
```

Array Methods like `map()`

In React the ***.map()*** array method is very useful. It allows you to create a new array by running a function to each element of an existing array. Example:

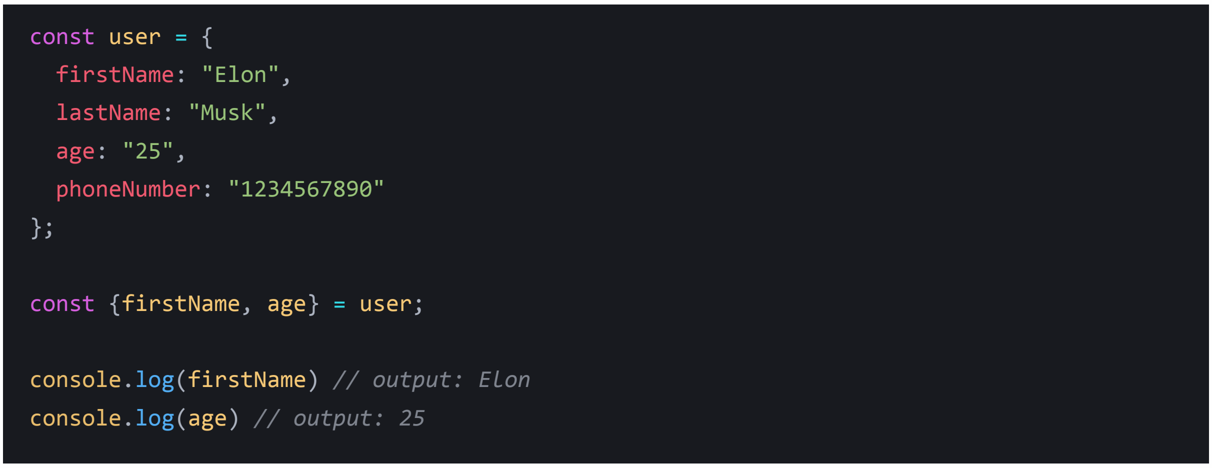


```
const myArray = [
  { id: 1, name: 'Ankit' },
  { id: 2, name: 'Ashok' },
  { id: 3, name: 'Amit' }
]

const names = myArray.map((person) => person.name);
console.log(names);

// output: ['Ankit', 'Ashok', 'Amit']
```

Destructuring

Destructuring is a way to extract values which we exactly want from objects and arrays into distinct variables. Like:

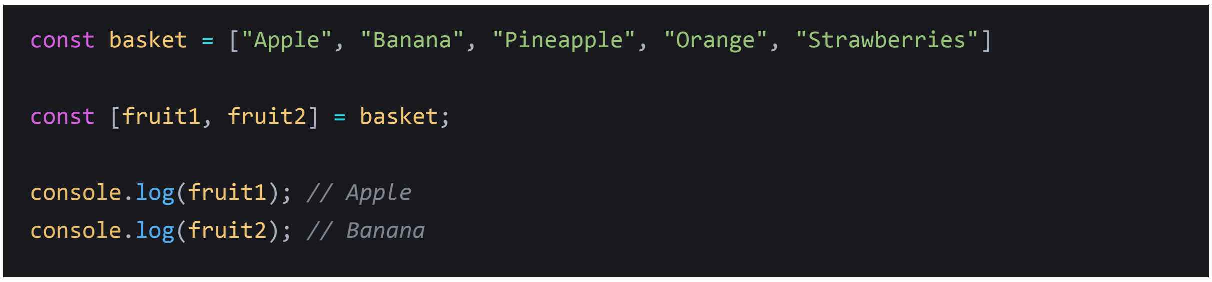
Destructuring Objects:



```
const user = {
  firstName: "Elon",
  lastName: "Musk",
  age: "25",
  phoneNumber: "1234567890"
};

const {firstName, age} = user;

console.log(firstName) // output: Elon
console.log(age) // output: 25
```

Here using the destructuring method I have extracted values from the `` `user` `` object and assigned them to variables `` `firstName` `` and `` `age` ``.

Destructuring Arrays:

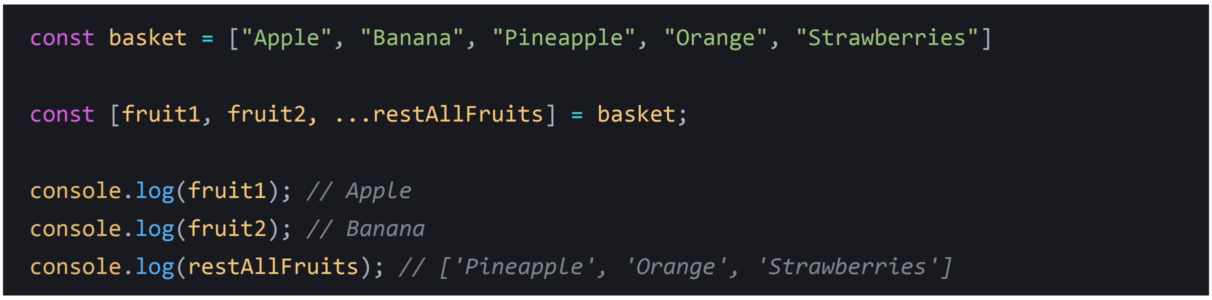


```
const basket = ["Apple", "Banana", "Pineapple", "Orange", "Strawberries"]

const [fruit1, fruit2] = basket;

console.log(fruit1); // Apple
console.log(fruit2); // Banana
```

Here using the destructuring method I have extracted values from the `` `basket` `` Array and assigned them to variables `` `fruit1` `` and `` `fruit2` ``.

Spread Operator

The JavaScript Spread Operator **(...)** allows us to quickly copy all or part of an existing Array or object into another array or object. Like this:



```
const basket = ["Apple", "Banana", "Pineapple", "Orange", "Strawberries"]

const [fruit1, fruit2, ...restAllFruits] = basket;

console.log(fruit1); // Apple
console.log(fruit2); // Banana
console.log(restAllFruits); // ['Pineapple', 'Orange', 'Strawberries']
```

Ternary Operator

The ternary operator in JavaScript is a simplified way of writing a conditional statement like **`if/else`**.

The syntax of the ternary operator is as follows:

```
condition ? expressionIfTrue : expressionIfFalse;
```

Example of using **`if/else`**:

```
const age = 20;

if(age >= 18) {
  console.log("You are an adult.")
}else{
  console.log("You are not an adult!")
}
```

Same Example of using **Ternary Operator**:

```
const age = 20;

const message = age >= 18 ? "You are an adult." : "You are not an adult!"

console.log(message);
```

Get started

In the Prerequisites chapter, we have seen that in order to build a reactjs application, we need to have **Node.js** installed in our system.

So make sure that you have installed Node.js and follow the next step: How to install and setup ReactJs App.

Installation and setup

ReactJs has a feature that you can install your react app by using `create-react-app`

Installation method 1

Open your terminal in the directory you would like to create your application. Then run this command:

```
npx create-react-app my-react-app
```

In place of the ***"my-react-app"*** in this command line, **you can replace and write the name of your app**.

Then you can move the `my-react-app` directory by using this command:

```
cd my-react-app .
```

Installation method 2

There is an another way to create your react app directly without specifying its name in the command line, like this:

```
npx create-react-app .
```

In this case, first go to your directory and create a new folder with the name of your app. Then enter that folder and open your terminal and run the above command.

React App naming criteria

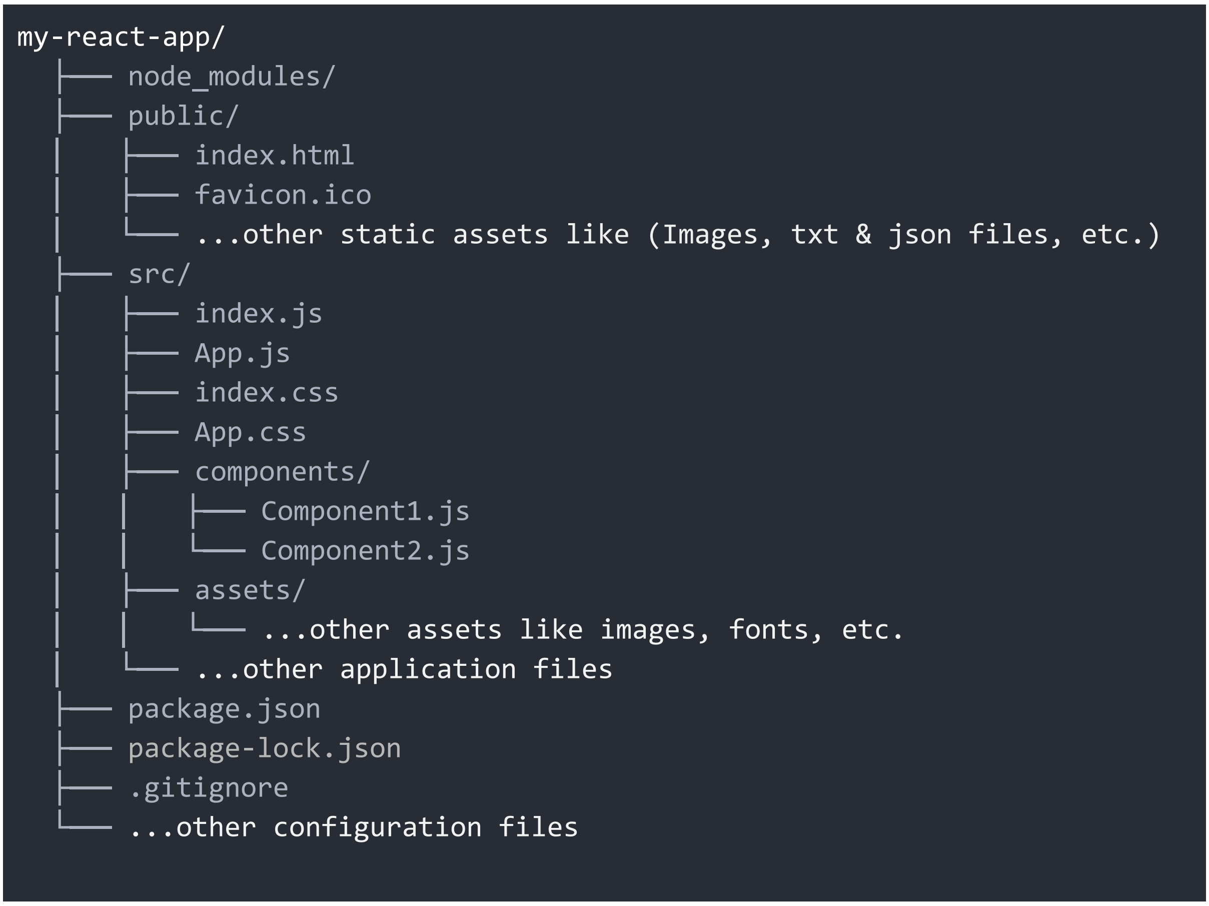
When creating your React App and specifying its name, **you must follow this criteria**: you should keep all the letters small & there should be no spaces in it. You can use **hyphen (-)** instead of space.

File structure

After successfully completing the React app installation, we get the default folder structure of React.

It's something looks like this:

Let’s understand the whole folder structure of our React App here.



```
my-react-app/
  ├── node_modules/
  ├── public/
  │    ├── index.html
  │    ├── favicon.ico
  │    └── ...other static assets like (Images, txt & json files, etc.)
  ├── src/
  │    ├── index.js
  │    ├── App.js
  │    ├── index.css
  │    ├── App.css
  │    ├── components/
  │    │    ├── Component1.js
  │    │    └── Component2.js
  │    ├── assets/
  │    │    └── ...other assets like images, fonts, etc.
  │    └── ...other application files
  ├── package.json
  ├── package-lock.json
  ├── .gitignore
  └── ...other configuration files
```

- **node_modules:** This folder is automatically generated. It contains project dependencies. You don’t need to edit this folder, it is managed by npm.

- **public:** This folder contains static files/assets like **images**, **logos**, **robots.txt**, other **json files**, and the main ***index.html*** for the application. Here the ***index.html*** file loads our react app and renders it on the browser.

- **src:** The src folder is known as the source folder. It contains the main source code of the react app.

- **index.js:** Inside the src folder there is an index.js file. This is the entry point of the React app, where the root component (*App.js*) is rendered into the DOM.

- **App.js:** This is the root component of the React app.

- **Index.css:** This CSS file is used to set default style of overall layout like default **font styles**, **margins**, **paddings**, etc. You can create **CSS variables** here.

- **App.css:** This CSS file is used for our root component ***App.js***.

- **components:** You can create a components folder inside the src folder. Here we will create reusable react components, which we use throughout the React App. We will discuss this in detail in the React Components chapter.

- **package.json:** This is the configuration and dependencies file. This file contains important metadata about the project, including its name, version, dependencies, scripts, and more.

- **package-lock.json:** It's automatically generated by npm for package version consistency. You don't need to edit anything in this file.

- **.gitignore:** Specifies files and directories that should be ignored by Git version control.

- **README.md:** Project documentation, providing an overview of the project and instructions on how to run it.

Run the React App

It's time to run our React Application. So you can run the app by invoking the start script configured in the package.json file. Use this command:

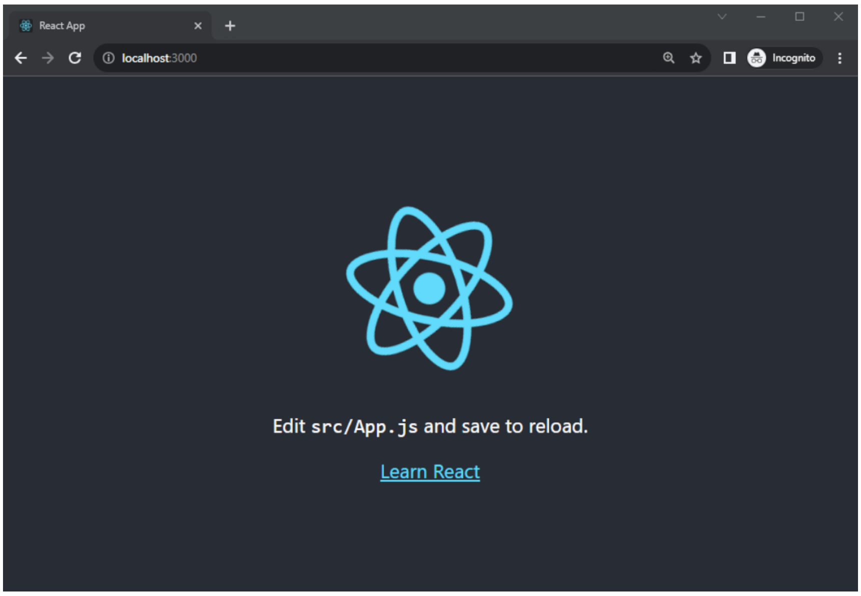
```
npm start
```

```
Compiled successfully!

You can now view my-react-app in the browser.

  Local:            http://localhost:3000
  On Your Network:  http://192.168.143.226:3000

Note that the development build is not optimized.
To create a production build, use npm run build.

webpack compiled successfully
```

Then it will start the application in the local system and a new browser window will automatically pop up with http://localhost:3000/

If the browser does not pop up automatically, then open your favorite browser and go to http://localhost:3000/

Output in browser:



Edit `src/App.js` and save to reload.

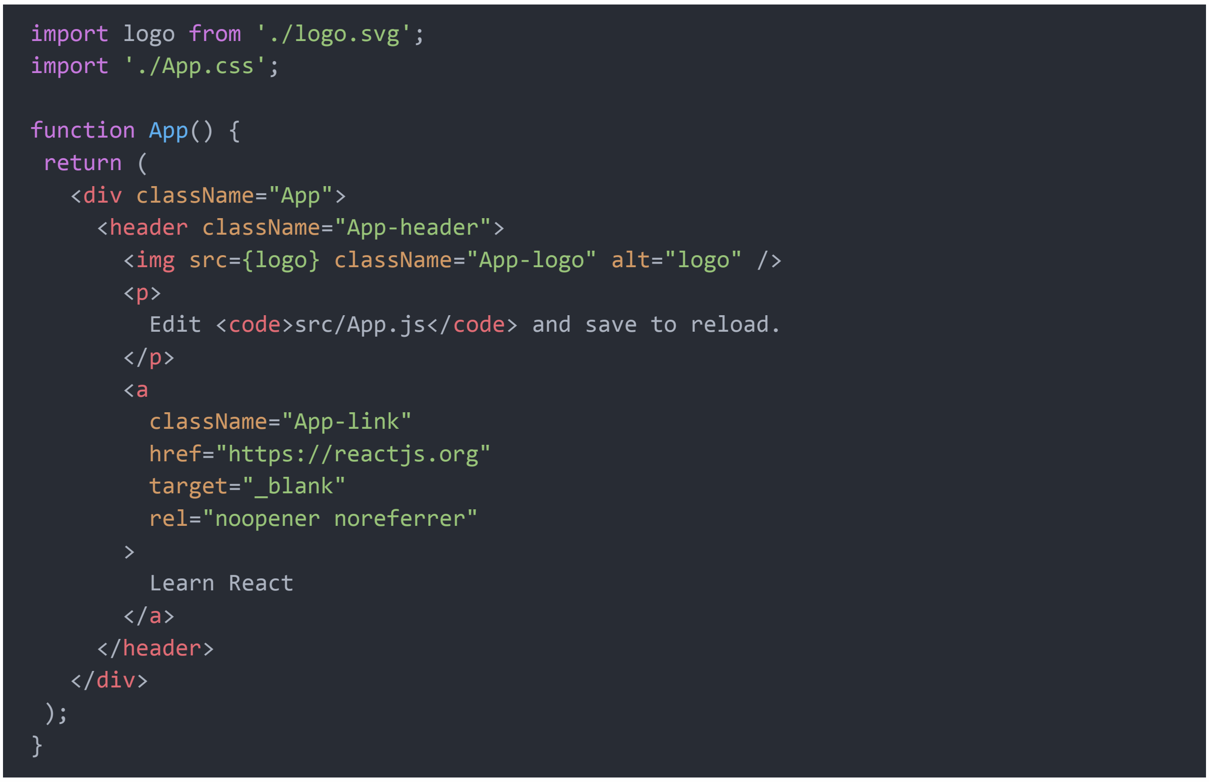
Learn React

Customize the code

Now you have your React app running, you can start customizing it:

The main source of customization will be in the `src/App.js` file. You can edit this file to create and customize React components and their behavior.

Firstly when you navigate the `src/App.js` file it looks like:



```
import logo from './logo.svg';
import './App.css';

function App() {
 return (
   <div className="App">
     <header className="App-header">
       <img src={logo} className="App-logo" alt="logo" />
       <p>
         Edit <code>src/App.js</code> and save to reload.
       </p>
       <a
         className="App-link"
         href="https://reactjs.org"
         target="_blank"
         rel="noopener noreferrer"
       >
         Learn React
       </a>
     </header>
   </div>
 );
}
```

```
export default App;
```

Anything you change here will be rendered on the HTML page.

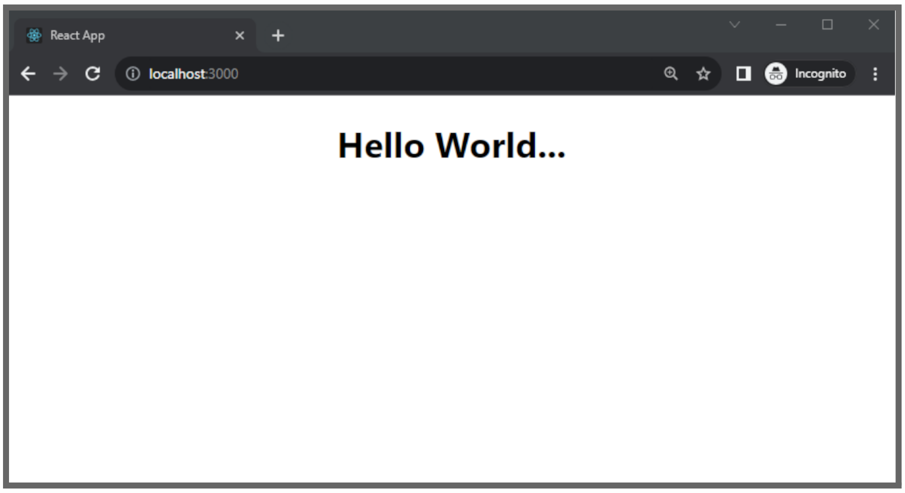
I have changed the code. I have removed the unnecessary part and only added a `<h1>` element.

Make sure you have saved the file after changes!

ProTips: You can also Turn Auto save afterdelay in VScode Editor, so that you don't need to manually save the file after any changes.

```
import './App.css';

function App() {
  return (
    <div className="App">
      <h1>Hello World...</h1>
    </div>
  );
}

export default App;
```

After making changes the output looks like this:



Hello World...

You can create new components in separate files within the src directory and import them into `App.js`

The **`src/App.css`** file allows you to add custom CSS styles for your components.

You can modify the **`public/index.html`** file to add or change the **page title**, add **meta tags**, or **link to external stylesheets**, etc.

React JSX

What is React JSX

JSX stands for JavaScript XML. It is not a different language, it's a syntax extension used in React to define and describe the structure of React elements and makes it easier to write and add HTML in React.

It allows you to write HTML elements directly in your JavaScript code.

Here is an example of without JSX:

Earlier we had to make an HTML element or append it into existing ones with these traditional DOM manipulation methods `createElement()` / `appendChild()`

```
import React from 'react';

function App() {
  return (
      React.createElement('h1', {}, 'Hello World!')
  );
}

export default App;
```

Here is an example of JSX:

Look, Using JSX we can write HTML syntax directly like this.

```
import React from 'react';

function App() {
  return (
      <h1>Hello World!</h1>
  );
}

export default App;
```

JSX Embedding Expressions

You can write JavaScript expressions inside the curly braces **{}** in JSX. Here is some code examples of JSX expressions given below for better understanding:

Variables:

```
function App() {
  const name = "Code With Random"
  return (
      <h1>Hello, {name}</h1>
  );
}
export default App;

// output
// Hello, Code With Random
```

Mathematical Operations:

```
function App() {
  return (
      <h1>{10 + 5}</h1>
  );
}

export default App;

// output
// 15
```

Ternary Operators:

```
function App() {
  const age = 22;
  return (
      <h1>{age >= 18 ? "You are a Adult" : "You are not a adult!"}</h1>
  );
}

export default App;

// output
// "You are a Adult"
```

JSX Attributes

In JSX, you can use attributes in HTML elements as regular HTML. Remember, JSX attributes use ***camelCase* naming convention** so when you add attributes, you have to specify its name using ***camelCase*** naming convention. For example, class attribute becomes className.

Here are some examples of JSX attributes given below:

Class and style Attributes

```
function App() {
  return (
      <h1 className="title" style={{color: "green"}}>
          Code With Random
      </h1>
  );
}

export default App;
```

Some more examples of ***camelCase* naming convention:**

htmlFor instead of *for*

```
<label htmlFor="input1"></label>
```

onClick instead of *onclick*

```
<button onClick={myFunction}>Login</button>
```

tabIndex instead of *tabindex*, etc.

Dynamic Attributes

You can set attributes dynamically based on variables or expressions. For example:

```
function App() {
  const isDisabled = true;
  const buttonText = "Login"
  return (
     <button disabled={isDisabled}>{buttonText}</button>
  );
}

export default App;
```

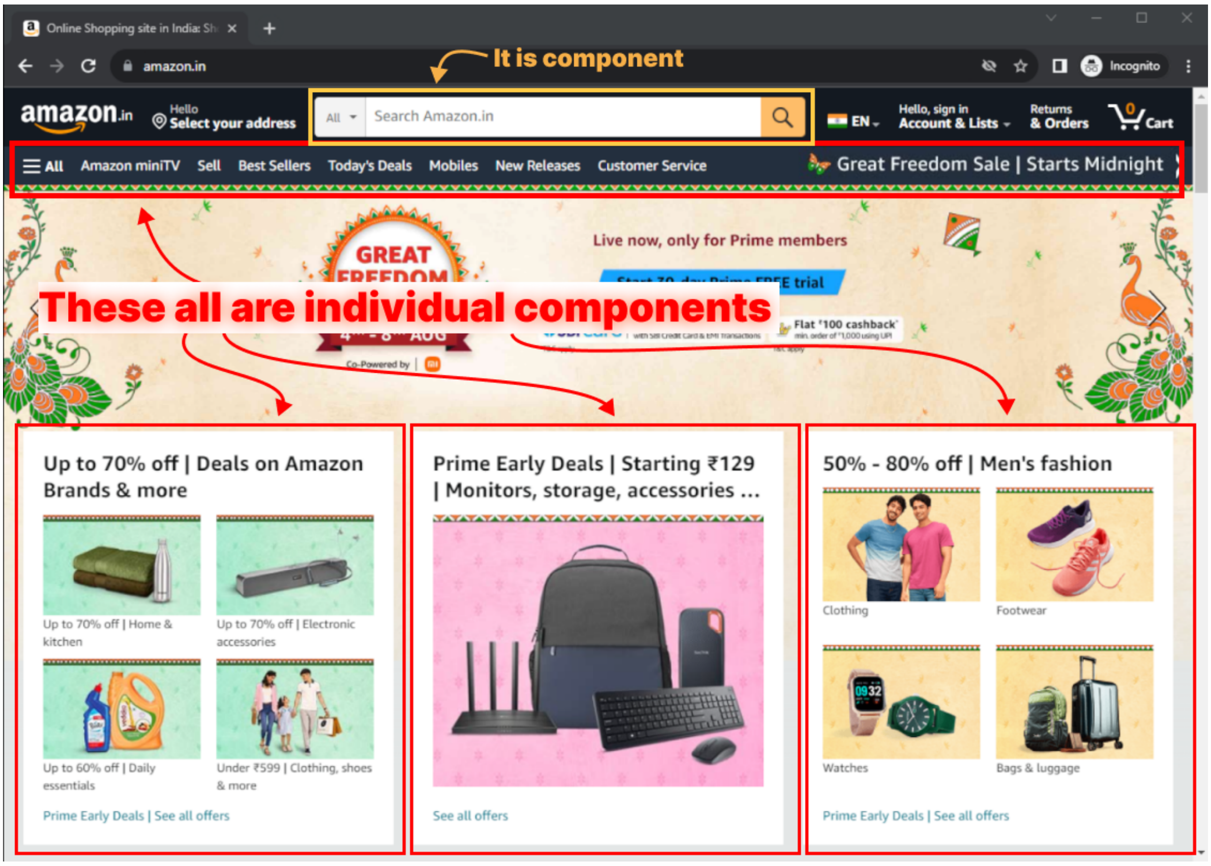
React Components

What is a React Component?

As I said, React is a component based Javascript library. So the components are core and fundamental building blocks of React. If we say in a simple way, a component is a piece of code that can be reused anywhere throughout the react application.

Components make the task of building UIs much easier and leads to better code organization, reusability, and maintainability.

Let’s understand the components more better way:


It is component
These all are individual components
Online Shopping site in India: Sh
amazon.in
Incognito
amazon.in
Hello
Select your address
All
Search Amazon.in
EN
Hello, sign in
Account & Lists
Returns
& Orders
Cart
All
Amazon miniTV
Sell
Best Sellers
Today's Deals
Mobiles
New Releases
Customer Service
Great Freedom Sale | Starts Midnight
GREAT FREEDOM
Live now, only for Prime members
Flat ₹100 cashback
Co-Powered by
Up to 70% off | Deals on Amazon Brands & more
Up to 70% off | Home & kitchen
Up to 70% off | Electronic accessories
Up to 60% off | Daily essentials
Under ₹599 | Clothing, shoes & more
Prime Early Deals | See all offers
Prime Early Deals | Starting ₹129 | Monitors, storage, accessories ...
See all offers
50% - 80% off | Men's fashion
Clothing
Footwear
Watches
Bags & luggage
Prime Early Deals | See all offers

You can see in the above image, I have taken a screenshot of Amazon's Home page UI. In that UI the items I have marked with red and yellow color, these are all the components.

The search bar on the top is an individual component, the header is a component. Then you can see these three cards, these are not individual components, here a single component rendered 3 times with different data, and these data are dynamically rendered by using react props. This is the importance of components in React.

We will discuss components with props further but for now let’s know the types of React Components.

Types of React Components

In React, there are mainly **two types** of components, **Class components** and **Functional components**. Let's know more about these components.

Functional Components

Functional components are also known as stateless components. These are simply javascript functions and made with simple JSX code. These components are simple to use and easy to understand.

Let's understand the functional components through the examples:

First create a folder and give its name **"components"** inside the `` `src` `` folder. Then inside `` `src/components` `` create a new file called `` `User.js` `` it will be our functional component.

May your file structure something looks like this:

```
├── src/
│   ├── components/
│   │   └── User.js
└──...other files and folders
```

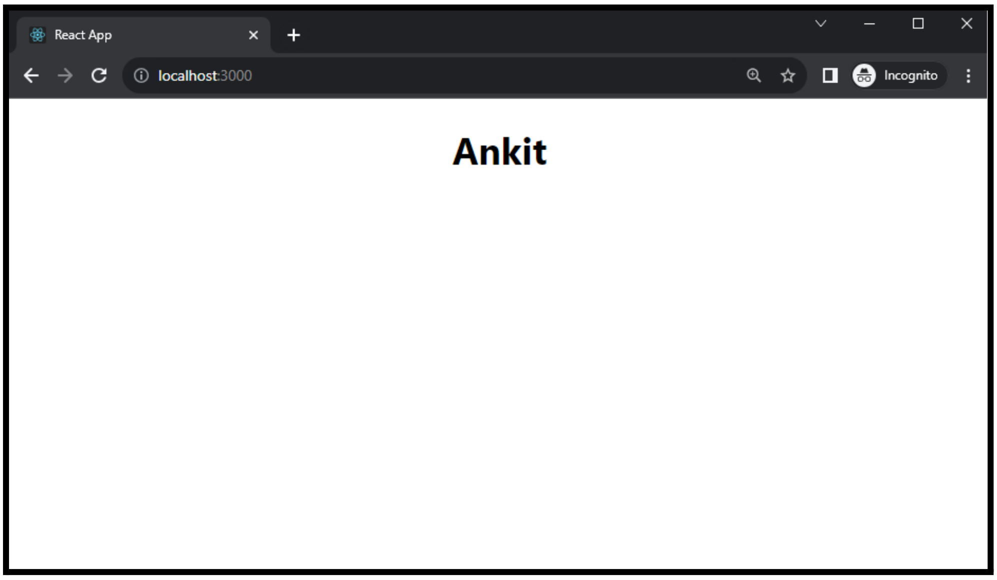
I have added some JSX in `` `User.js` ``

```
import React from 'react'

function User() {
  return (
     <h1>Ankit</h1>
  )
}

export default User;
```

Then import this component and render it in **`` `App.js` ``,** Like the below example:

```
import "./App.css"
import User from "./components/User";

function App() {
  return (
     <div className="App">
         <User/>
     </div>
  );
}

export default App;
```

Let's see the output on browser



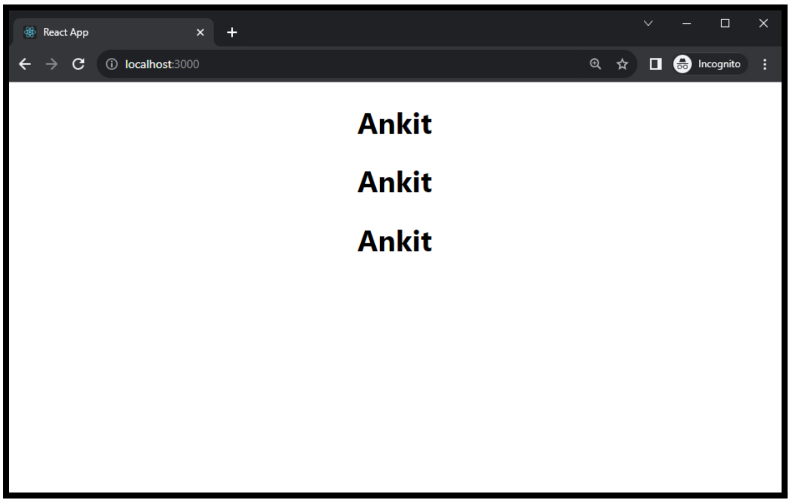
Ankit

If you use that component multiple times, the output will also change and render the component multiple times. For example:

`App.js`

```
import "./App.css"
import User from "./components/User";

function App() {
  return (
     <div className="App">
         <User/>
         <User/>
         <User/>
     </div>
  );
}

export default App;
```

Browser Output:



Ankit

Ankit

Ankit

Class Components

Class based Components are little different and complex than the Functional Components. Class components are stateful and when react needs to maintain its state, class components can be employed. We can pass data from one Class component to another. These are widely used in many complex projects.

Class Component Syntax

A class component must include the `extends React.Component` statement. It also requires a `render()` method. Like this:

```
class Componentname extends React.Component {
  render() {
    return (
      <h1>Welcome Text!</h1>;
    )
  }
}
export default Componentname;
```

You can write `extends Component` instead of `extends React.Component`, but you have to import `**Component**` from React first. As example below:

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

class Componentname extends Component {
  render() {
    return (
      <h1>Welcome Text!</h1>;
    )
  }
}
export default Componentname;
```

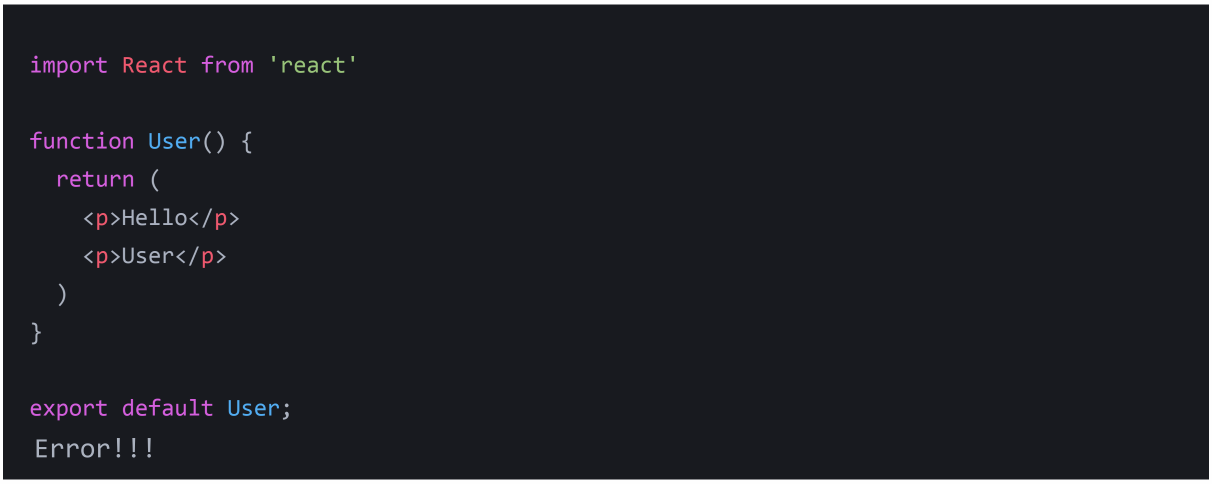
React Fragment

In React, fragments allow you to return multiple elements in a component without wrapping them in a parent container.

Why use React Fragment?

In React when you render multiple elements it will require a ‘`div`’ tag around the content as this will only render a single root node inside it at a time.

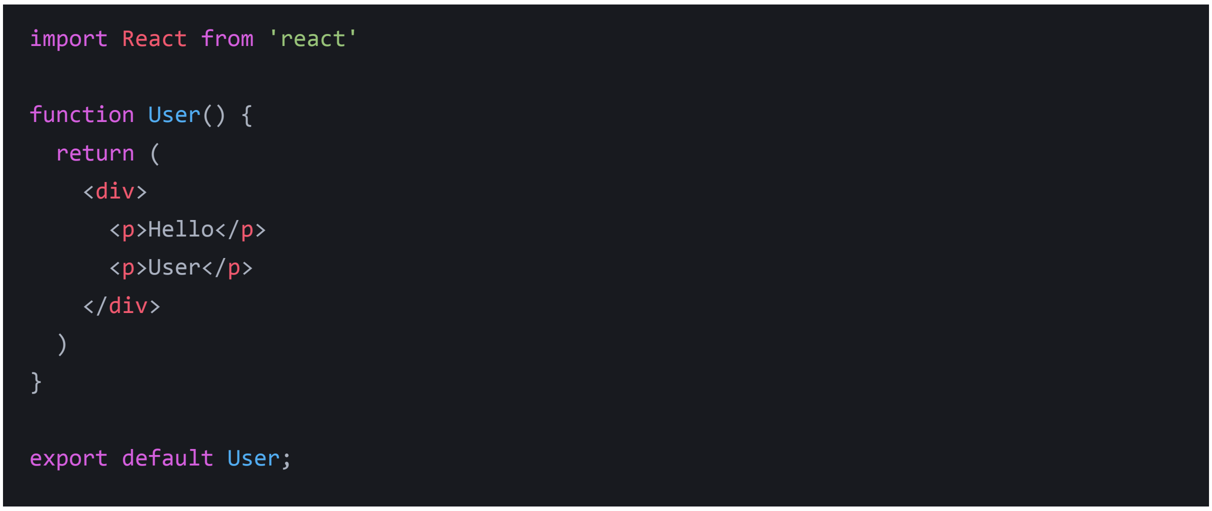
For example:



```
import React from 'react'

function User() {
  return (
    <p>Hello</p>
    <p>User</p>
  )
}

export default User;
 Error!!!
```

In the above code example, I have tried to render **two *`<p>`*** elements without a parent wrapper. So, this will show an Error!

To correct it you have to add a `` `<div>` `` element to wrap those **two `<p>`** tags. Like this:

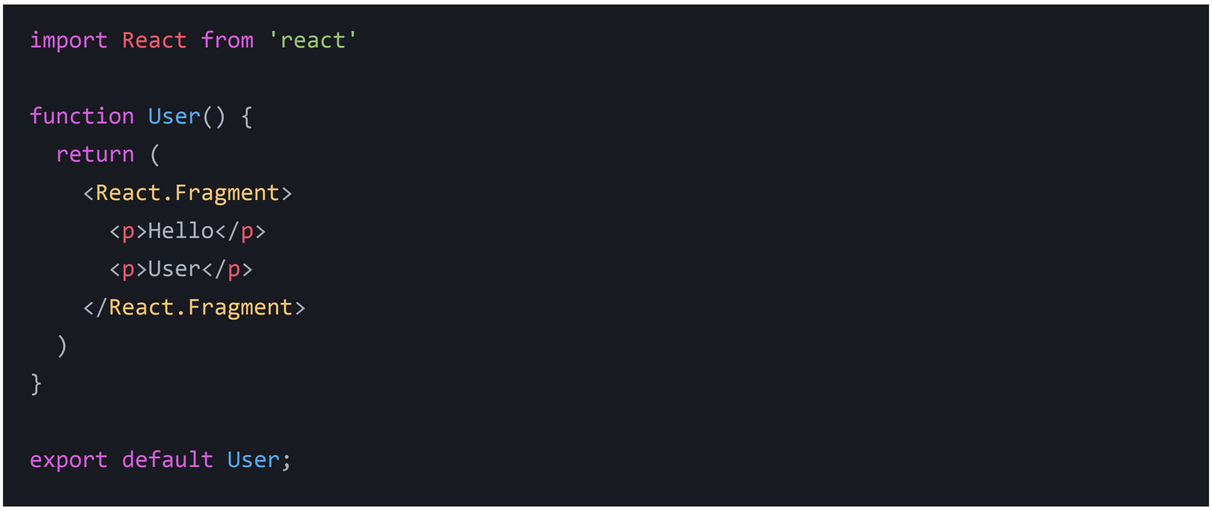


```
import React from 'react'

function User() {
  return (
    <div>
      <p>Hello</p>
      <p>User</p>
    </div>
  )
}

export default User;
```

In this case if you don't want to add an extra unnecessary `<div>` or other container element to the DOM. Then you need to use **React Fragment**.

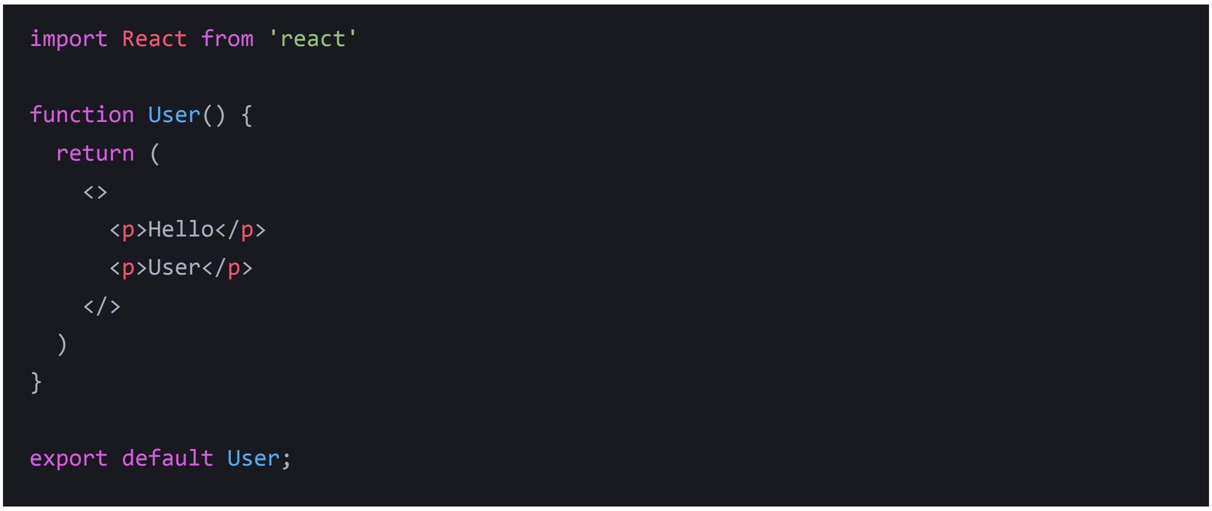
For example:

Use this fragment syntax.



```
import React from 'react'

function User() {
  return (
    <React.Fragment>
      <p>Hello</p>
      <p>User</p>
    </React.Fragment>
  )
}

export default User;
```

Or you can use a shorthand syntax called "**empty tags**" or "**fragment shorthand**" (**`<></>`**).



```
import React from 'react'

function User() {
  return (
    <>
      <p>Hello</p>
      <p>User</p>
    </>
  )
}

export default User;
```

React Styling

In React, there are several ways to apply **CSS** styling to the React Components. Generally we can add css styles to the React components by using CSS classes through className attributes.

As you know React JSX supports JavaScript Expressions, so there are many methods to add CSS to React components.

We will learn here the **three most common** ways of CSS styling in React:

- Inline styling
- CSS stylesheets
- CSS Modules

Inline CSS

Normally, we can add Inline CSS by using style attributes to the JSX elements. But as you learned in the JSX chapter, JavaScript expressions are written inside curly braces in JSX, and since JavaScript objects also use curly braces, so when you use inline CSS styles in JSX, you have to use double curly braces (`` `{{}}` ``). For example:

Inline CSS styles in regular HTML:

```
<h1 style="color: red; background-color: blue;"}>Hello Style!</h1>
```

Inline CSS styles in JSX.

```
import React from 'react'

function User() {
  return (
    <h1 style={{color: "red", backgroundColor: "blue"}}>Hello Style!</h1>
  )
}

export default User;
```

As you can see in the above example, how I have used Inline CSS styles in JSX. There are two more things to be noted and keep in mind:

1. When you add more than one CSS style, then you have to use **comma** (**,**) to separate each.
2. You have to use **camelCase naming convention** with CSS properties, when you use CSS properties with hyphen separators like `` `background-color` `` in Inline CSS, it must be written in camelCase. For example: **backgroundColor`**, **fontSize**, etc.

Inline CSS using JavaScript Objects

You can use Inline CSS by passing a JavaScript Object. For that, you have to first create an object with CSS styling information, then use that object in the style attribute of the JSX element.

See the example below, I have created an object named `` `mystyles` `` with the CSS properties, then I used it in the **style attribute** of **H1**

```
import React from 'react'

const myStyles = {
  color: "red",
  backgroundColor: "blue",
  fontSize: "150px"
};

function User() {
  return (
    <h1 style={myStyles}>Hello Style!</h1>
  )
}

export default User;
```

CSS Stylesheets

Writing CSS in a stylesheet is probably the most common and basic approach to styling a React application. It's very easy to use and understand.

The CSS stylesheet method has many features like, CSS variables to store dynamic values, advanced selectors to select child elements with precision, and **pseudo-classes** like `` `::after` ``, `` `::before` ``, `` `:hover` ``,etc.

You can use regular CSS stylesheets to style your components in React. Using CSS stylesheets in React is similar to using CSS stylesheets in traditional web development, but there are few differences between them.

Let's talk about How to use CSS stylesheets in React?

- First create a CSS file inside the `` `src` `` **folder**, and give its name whatever is your choice but when you create a CSS file for a specific component, then i recommend to give its name the same as that component name. **For example:** if I have a component named **`User.js`** then I will create a CSS file for it named `` `User.css` ``.

- Then **import** that CSS file into the Components. For example:

```
import React from 'react'
import "../User.css"

function User() {
  return (
    <h1 className='Heading'>Hello Style!</h1>
  )
}

export default User;
```

After importing the CSS file into the component, you can write the CSS to style that component. Okay!

CSS Modules

Styling your React application using **CSS Modules** is a very popular approach. It allows you to write **modular**, **reusable**, and **scoped** CSS styles for your components. **CSS modules** make it easier to manage styles within components.

This method is the same CSS stylesheets method but there are some **fundamental differences** between them. Let's understand with examples:

First, in this method when we create a CSS file we have to follow its naming convention. Instead of `.css`, we have to use `.module.css` as the file extension. So, we have created a CSS file named `User.css` for the `User` component, we will change this name to `User.module.css`.

Then **import** that CSS module file with a JavaScript expression named `styles` into the `User` Components. Like:

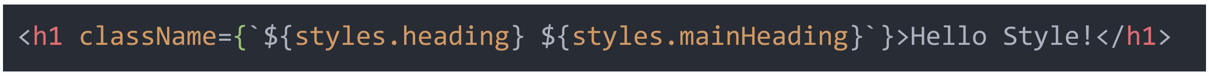
```
import styles from "../User.module.css"
```

Then to apply style to your JSX element, you need to use **mapped class names** from the `styles` object. Like `styles.heading`, here **styles** is the object & **heading** is the class name. Code example below:

```
import React from 'react'
import styles from "../User.module.css"

function User() {
  return (
    <h1 className={styles.heading}>Hello Style!</h1>
  )
}

export default User;
```

Then you can write CSS in your `User.module.css` file.

Pro Tips: When you are using CSS modules, if you want to add multiple class names in JSX elements, then you can do it by combining them using **template literals (`  `)**. Example below:



```
<h1 className={`${styles.heading} ${styles.mainHeading}`}>Hello Style!</h1>
```

Template Literals feature introduced in ECMAScript 6 (ES6). We have already learned about it in **ES6 chapter**.

React Props

Props stand for "Properties." They are read-only components. Props is an object which stores the value of attributes of a JSX element, similar to the HTML attributes.

Props are used to make components more dynamic by passing data from parent component to child component. Like whenever we call child components from parents we can pass data as props.

Let’s see the example of How to pass and receive the Props:

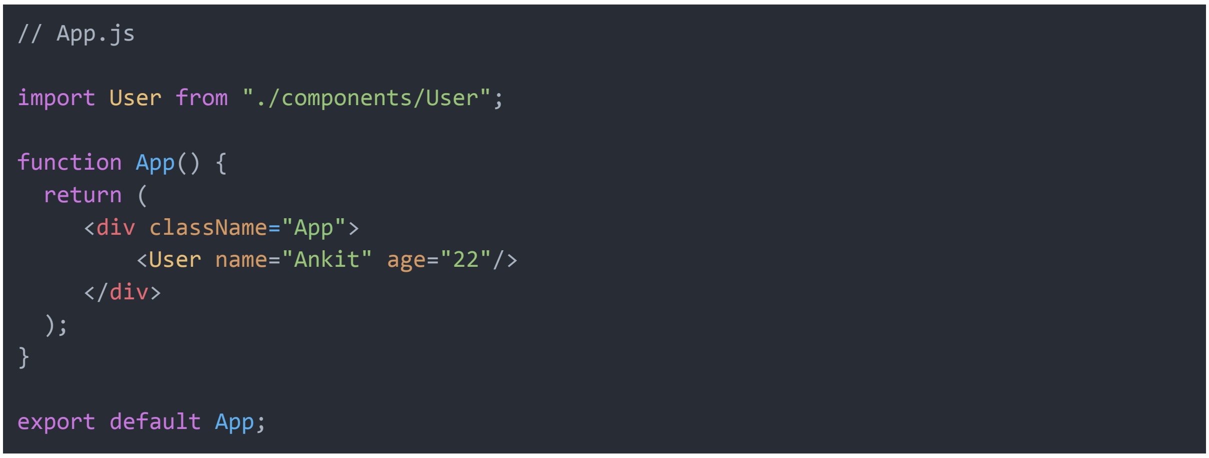
Passing Props in Components

In the parent component, when you render the child component, you can pass props by adding attributes to the child component.

For example, I have created a component named User, then I have imported it in **`App.js`** as **`App.js`** is our root component, same as the parent component.

Then I have rendered the User component with **`name`** & **`age`** attributes in **`App.js`**.

Here the **`name`** & **`age`** are props and **“Ankit”** & **“22”** are the values of those props.



```
// App.js

import User from "./components/User";

function App() {
  return (
     <div className="App">
         <User name="Ankit" age="22"/>
     </div>
  );
}

export default App;
```

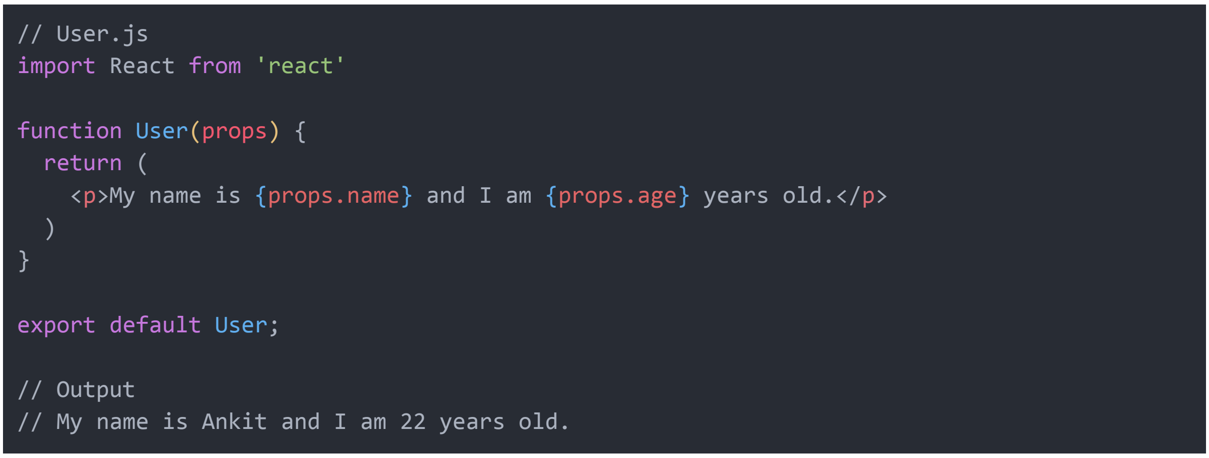
Receiving Props in Components

After passing the **Props** in parent component to child component, you can **access those Props** using **`props`** object in the child component.

Let’s see the example of this process:

User component receives **`props`** as **function parameters** then it uses the value of **`props`** by defining the parameter as a **`props`** object. Then renders its value inside the JSX elements.

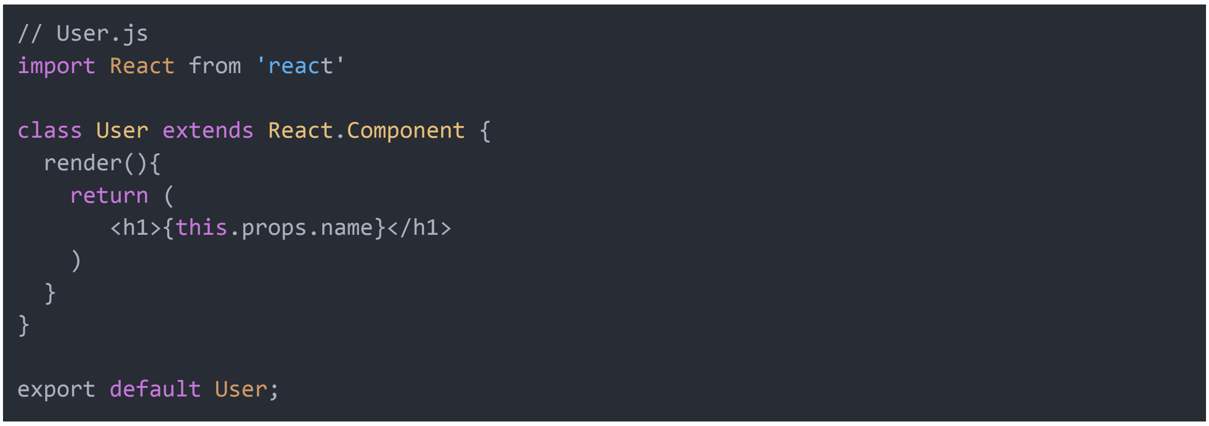
See the code example below:



```
// User.js
import React from 'react'

function User(props) {
  return (
    <p>My name is {props.name} and I am {props.age} years old.</p>
  )
}

export default User;

// Output
// My name is Ankit and I am 22 years old.
```

Props in Class Components

Here is an example of how to use **Props** in **Class Based Components.**



```
// User.js
import React from 'react'

class User extends React.Component {
  render(){
    return (
       <h1>{this.props.name}</h1>
    )
  }
}

export default User;
```

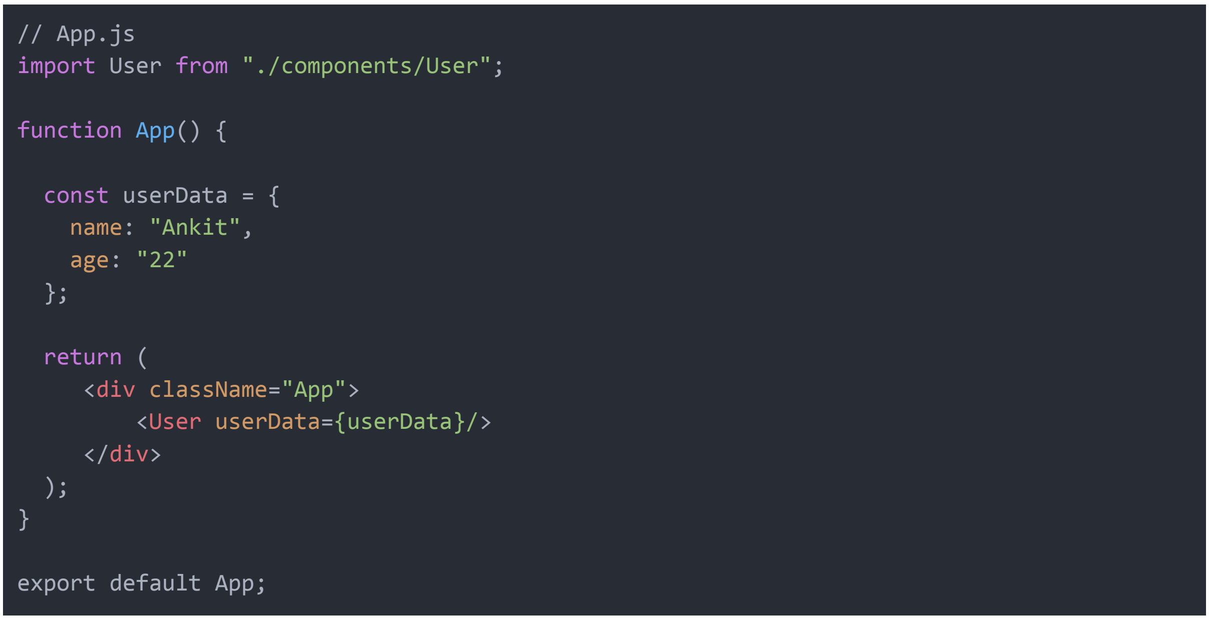
React Props is not limited to simple data types like Strings or Numbers. You can pass different types of data values through Props. Here are some data types given below, which React Props can support as its data type.

- String
- Number
- Boolean
- Objects
- Array
- Functions, etc.

Objects as props

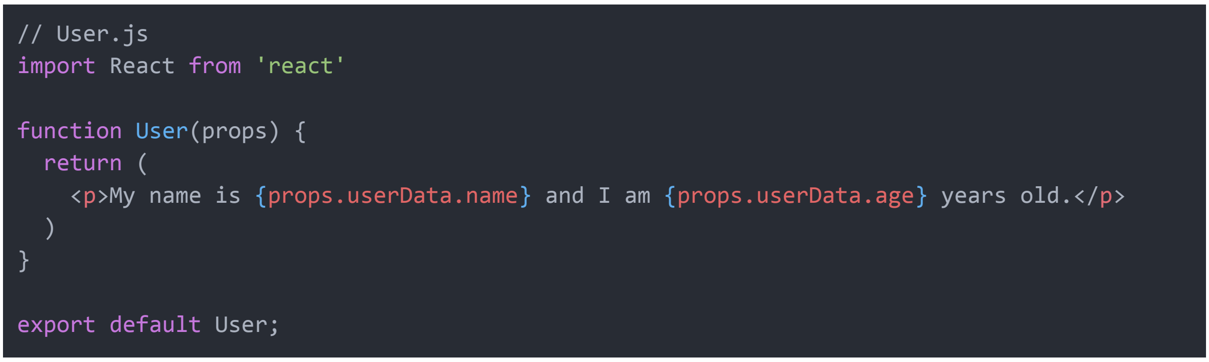
Let’s see How you can pass props as objects in React components.

In the below example, I have created an object called userData with properties such as name and age. Then i have passed this object as prop to the User component.



```
// App.js
import User from "./components/User";

function App() {

  const userData = {
    name: "Ankit",
    age: "22"
  };

  return (
     <div className="App">
         <User userData={userData}/>
     </div>
  );
}

export default App;
```

Then, we can access this **object props** in User component something like this:



```
// User.js
import React from 'react'

function User(props) {
  return (
    <p>My name is {props.userData.name} and I am {props.userData.age} years old.</p>
  )
}

export default User;
```

Similarly, you can also pass props as JS Events and Functions. We will learn this in further chapters.

React Events

JavaScript Event handling is a fundamental part of front-end development. It is an action that can be triggered as a result of a user action. Like mouse click, window resize, key press, etc.

React Event Handling

React has its own Event handling system known as Synthetic Events. It is very similar to standard DOM events.

This synthetic event system wraps native browser events and provides a consistent cross-browser API.

Handling Events in React have some important **syntactic differences** like:

- As we learned in **JSX Attributes**, React Event names should be written in **camelCase** instead of **lowercase** names in regular HTML & vanilla JavaScript. For example **`` `onClick` ``** instead of **`` `onclick` ``**.
- In JSX, a function should be passed as the event handler instead of a string. For example:

Instead of declaring like this:

```
<button onClick="submitForm()">Submit</button>
```

Do like this. This is the event declaration in React.

```
<button onClick={submitForm}>Submit</button>
```

Let’s see some example of **Event Handling in React:**

Here, I have created an event handler function called `` `handleClick` ``, then I have added this function into the button element using the `` `onClick` `` attribute.

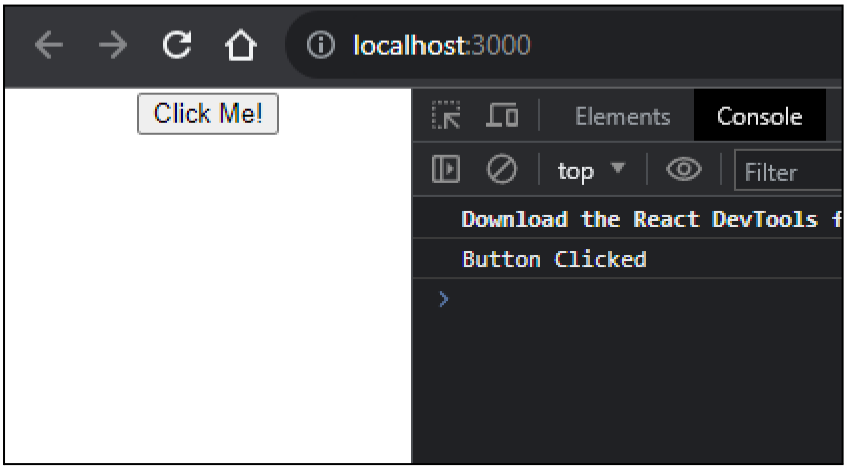
When the user clicks on that button, the `` `handleClick` `` function will be executed.

See the code example below:

```
function App() {

  const handleClick = () => {
    console.log("Button Clicked")
  };

  return (
     <div className="App">
         <button onClick={handleClick}>Click Me!</button>
     </div>
  );
}

export default App;
```

When you click on the button, the log value is getting printed on the browser console. so our event handler function is working properly.

See the below screenshot:



```
Download the React DevTools f
Button Clicked
>
```

Event Handler in Class Component

Defining the event handler & Attaching the event handler to the JSX elements method within the **Class Components** is little different than the functional components. See the code below:

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

class User extends Component {

  handleClick = () => {
    console.log("Button Clicked")
  };

  render(){
    return (
      <button onClick={this.handleClick}></button>
    )
  }
}

export default User;
```

Passing Arguments

You can pass arguments to an event handler by using **Arrow Functions** in React. Let’s see some examples.

In the below code example, I have used an **Arrow Function** as the **`onClick`** event handler and passed a string value **“Button Clicked”** as an **argument** to the **`handleClick`** function.

See the code carefully.

```
function App() {

  const handleClick = (value) => {
    console.log(value)
  };

  return (
     <div className="App">
         <button onClick={() => handleClick("Button Clicked")}>Click Me!</button>
     </div>
  );
}
export default App;
```

Output: When that function is executed, the argument **"`Button Clicked`"** as log value is getting printed on the browser console. so it is working properly.

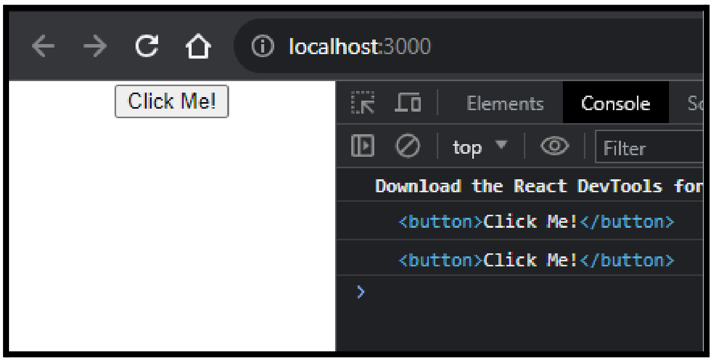
Event Object in a React event handler

When an event is executed, a **synthetic event object** is created and passed as an **argument** to the event handler function in React.

Let's see the example of how you can access the **synthetic event object** in a React event handler:

```
function App() {

  const handleClick = (e) => {
    console.log(e.target)
  };

  return (
     <div className="App">
         <button onClick={handleClick}>Click Me!</button>
     </div>
  );
}
export default App;
```

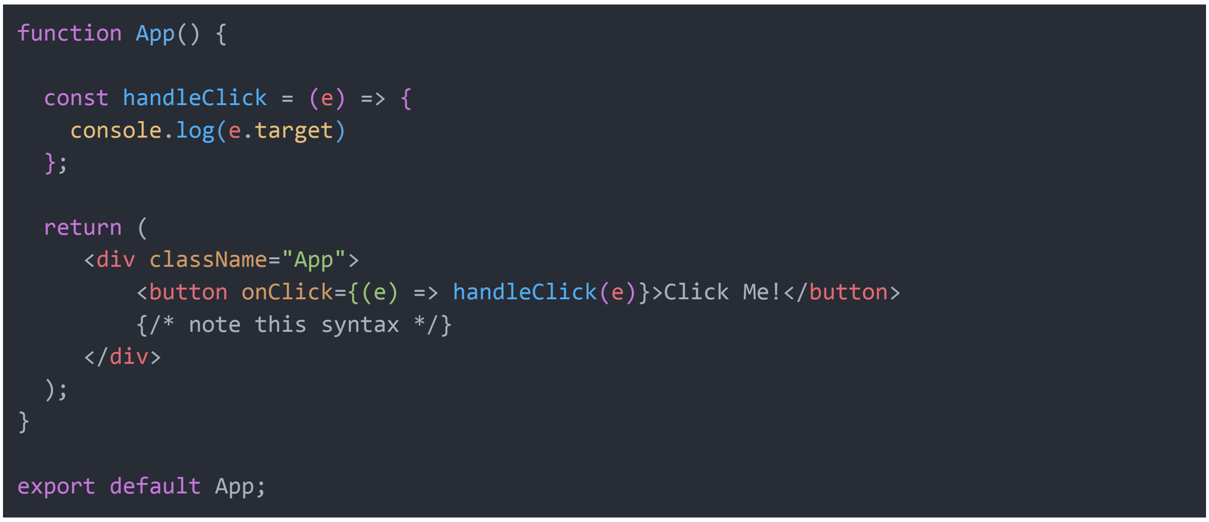
When the function will be executed, the output will come in the browser console like this:



```
Download the React DevTools for
<button>Click Me!</button>
<button>Click Me!</button>
```

But, when you pass arguments to the event handler by using arrow function, in that case, the event object is not automatically passed as an argument to the arrow function.

So in order to access the **synthetic event object** in that case, you have to pass it explicitly as an argument to the arrow function. Something like this:



```
function App() {

  const handleClick = (e) => {
    console.log(e.target)
  };

  return (
     <div className="App">
         <button onClick={(e) => handleClick(e)}>Click Me!</button>
         {/* note this syntax */}
     </div>
  );
}

export default App;
```

I hope you have understood everything 🙂

React State

React State is a fundamental concept that represents the mutable part of a component and is used to store information that can change over time and affect the component's behavior and rendering.

State is a JavaScript object associated with a component and is used to store data that can be updated and cause the component to **re-render** when changes occur. **State** can be accessed using the `this.state` member variable in the component. But it's not accessible or modifiable from outside the component.

To manage **`state`** in a **Class Component**, you use the `setState()` method, and in Functional Components, you can use the `useState()` hook.

In this chapter we will see how we can manage **`state`** in **Class Component**, and managing **`state`** in Functional Component will learn in **React Hooks chapter**.

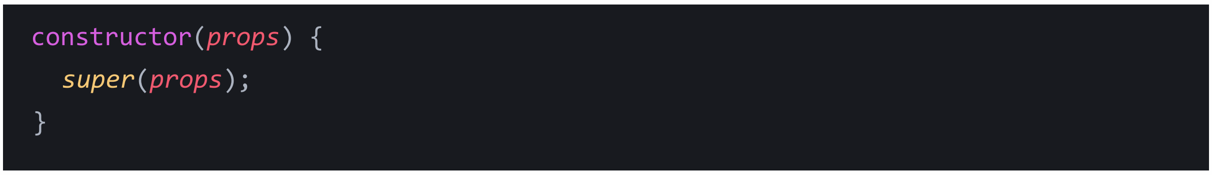
State management in Class Component

In Class Component you can access state using the `this.state` and you can update state using the `setState()` method and control how the component re-renders when the state changes.

To initialize the `state` in the Class Component we will use a **special method** called **Constructor**.

Constructor in React

The **constructor** is a special method used to initialize an object's **`state`** and **bind event handlers** in a class component. When you implement the constructor, you need to call the `super(props)` method before any other statement. Like this:



```
constructor(props) {
  super(props);
}
```

It is necessary to call `super()` inside a constructor. If you need to set a **property (prop)** or access `this` inside the constructor, you need to call `super()`.

After calling the `super(props)` method If the component needs to use a local state, you can directly use '**this.state**' to assign the initial state in the constructor.

Okay, then. Let's understand state management in a class component with a simple example.

Example of state management in a Class Component

So, here we will create a Counter.

First create a Class Component named Counter (Counter.js), inside the src/components folder.

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

class Counter extends Component {
  render() {
    return (
      <div>Counter</div>
    );
  }
}

export default Counter;
```

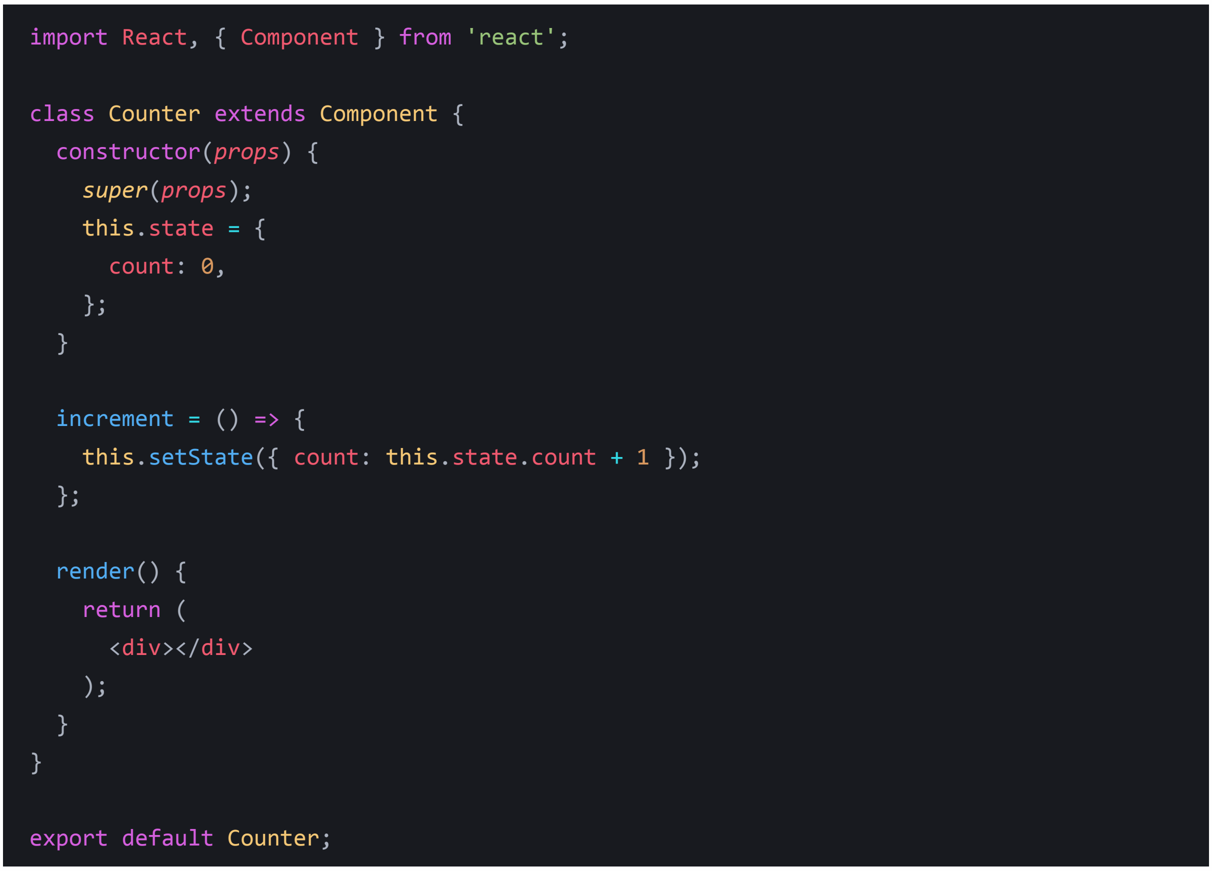
Then in the constructor method initialize the **`state`** using the **`` `this.state` ``** property.

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

class Counter extends Component {

  constructor(props) {
    super(props);
    this.state = {
      count: 0,
    };
  }
  render() {
    return (
      <div></div>
    );
  }
}

export default Counter;
```

Here it initializes the component's state object with an initial **count** value **0**.

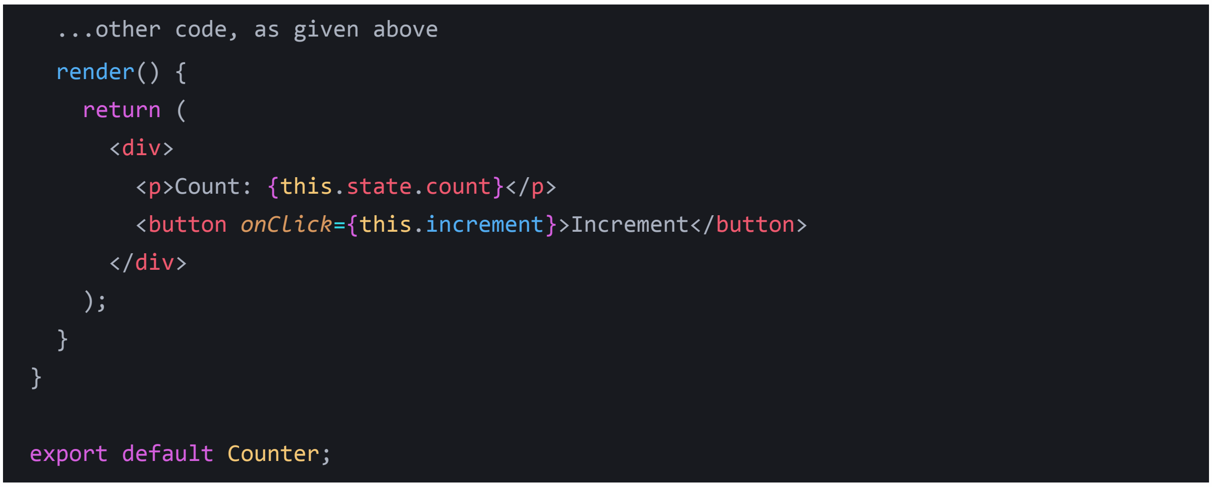
Then define an arrow function named **increment** to update the `count` state.

When the **increment function** executes, the setState method will update the `count` state by incrementing the current value by **1**. Like this:



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

class Counter extends Component {
  constructor(props) {
    super(props);
    this.state = {
      count: 0,
    };
  }

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

  render() {
    return (
      <div></div>
    );
  }
}

export default Counter;
```

Then use the render() method to return JSX elements. Here It renders a ***<div>*** containing a paragraph (***<p>***) element displaying the current `count`, and a ***<button>*** element with an `onClick` **event handler** that triggers the `increment` **function** when clicked.



```
  ...other code, as given above
  render() {
    return (
      <div>
        <p>Count: {this.state.count}</p>
        <button onClick={this.increment}>Increment</button>
      </div>
    );
  }
}

export default Counter;
```

React Hooks

React has introduced a feature called React Hooks from React 16.8 version. This feature allows functional components to have state and lifecycle management without using class components.

Let's learn more about it and learn how to do state management in functional components using React Hooks feature.

What is React Hooks

React Hooks is a feature that allows you to use features like **State**, **Lifecycle methods**, etc in functional components. Basically, React Hooks are **special functions** that start with the prefix **"use"** (for example: `` `useState` ``, `` `useEffect` ``, `` `useRef` ``, etc.) and it provides way to use reuse stateful logic across the components without using of class components and higher-order components (HOCs).

React provides us some built-in Hooks and also allows us to create custom Hooks as well. So first we will learn about built-in Hooks.

Here are the list of built-in Hooks in React:

- useState
- useEffect
- useRef
- useMemo
- useReducer
- useContext
- useCallback
- useLayoutEffect
- useImperativeHandle
- useDebugValue

How to use React Hooks

Let's learn how to use each react hook one by one.

useState Hook

The **`useState`** Hook allows you to add and track state in **functional components**. It returns a state variable and a function to update that state.

Let’s understand the basic syntax of **`useState`** Hook. The useState syntax looks like this:

```
const [stateVariable, setState] = useState(initialValue);
```

In the basic syntax of **`useState`**, here the **`stateVariable`** is a state variable that holds the current state value.

`setState` is a function used to update the state variable. It takes a new value as an argument and triggers a re-render with the updated state.

`initialValue` is the initial value of the state variable. It is only used during the first render of the component.

Let’s see How to use useState Hook in a functional component by creating a counter:

First import the **useState** Hook in your functional component. Like this:

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

Use the **useState** hook to declare a state variable and its setter function. Like this:

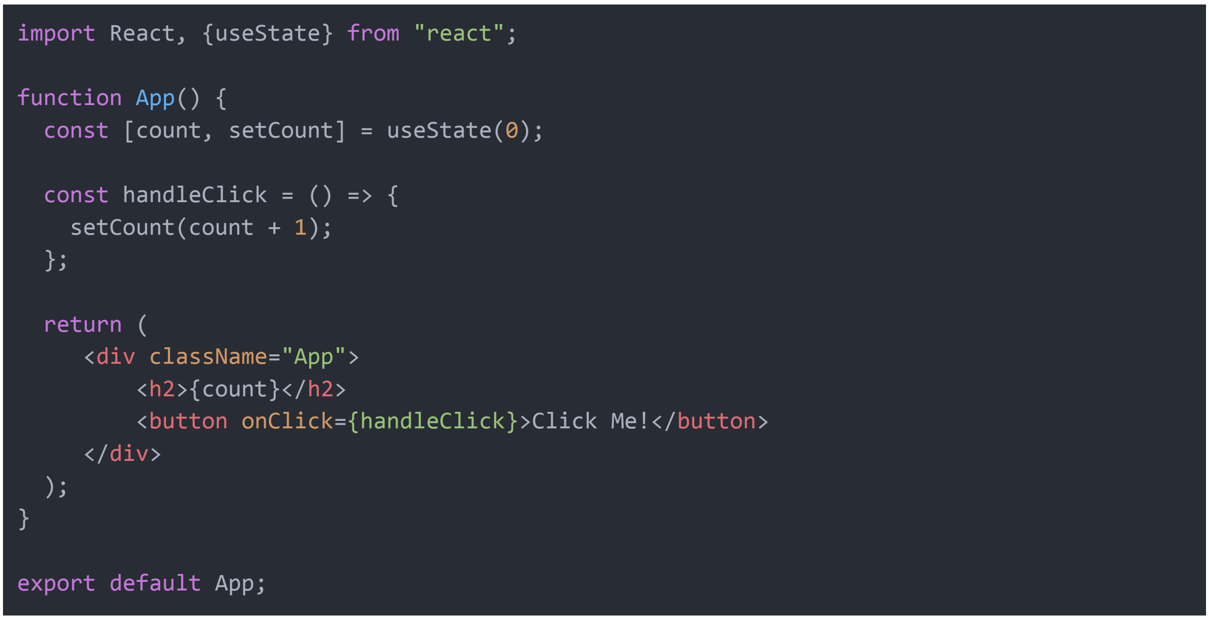
Here **`count`** is a state variable, **`setCount`** is a function to update the state value. These names are like variables, so you can name them anything as you want.

Here **`0`** is the **initial state** and the **initial state** is stored in the **`count`** variable. I render the **`count`** variable as a **JavaScript expression** in the JSX element (h2). Output will be: **0**

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

function App() {
  const [count, setCount] = useState(0);

  return (
     <div className="App">
         <h2>{count}</h2>
     </div>
  );
}

export default App;
```

Then I have created an event handler function called ` **`handleClick`** `. Inside this function I have called `**`setCount(count + 1)`**`, and added this event handler function to the button JSX element.

So, when the button is clicked by the user, the **`count`** state will keep **updating** and **incrementing**, and **1** will be added to count value every time the button is clicked.



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

function App() {
  const [count, setCount] = useState(0);

  const handleClick = () => {
    setCount(count + 1);
  };

  return (
     <div className="App">
         <h2>{count}</h2>
         <button onClick={handleClick}>Click Me!</button>
     </div>
  );
}

export default App;
```

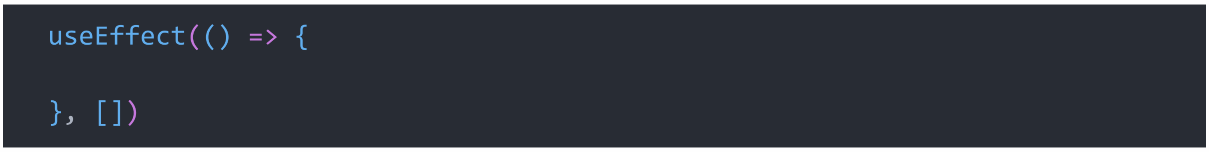
Final Output: 1, 2, 3, 4, 5, 6, ...

useEffect Hook

The useEffect Hook allows you to perform side effects in your functional components. Side effects in React refer to any action that affects the outside world, such as data fetching, directly updating the DOM, setting up event listeners, etc.

useEffect accepts two arguments, the second one is optional, but in some cases you need to use it.

useEffect syntax:



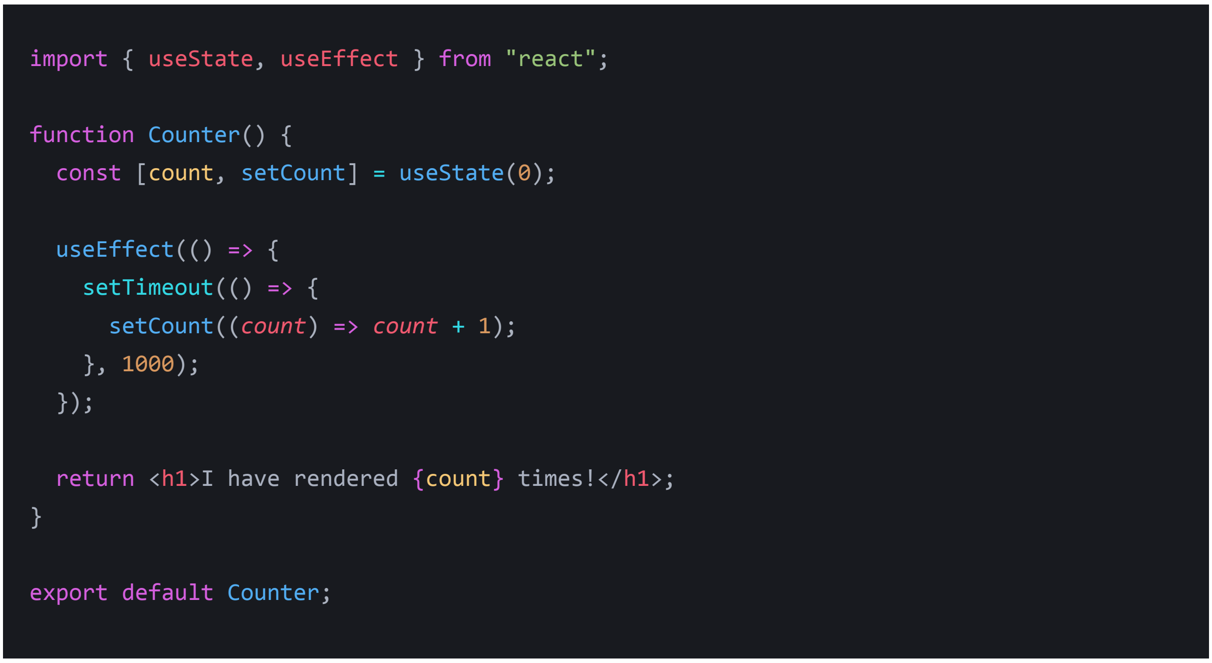
```
  useEffect(() => {

  }, [])
```

In the useEffect syntax, the two arguments are function and dependency array.

Example of `useEffect` Hook in a functional component

First import the **useEffect** Hook and **useSate** Hook in your functional component.

Example 1:

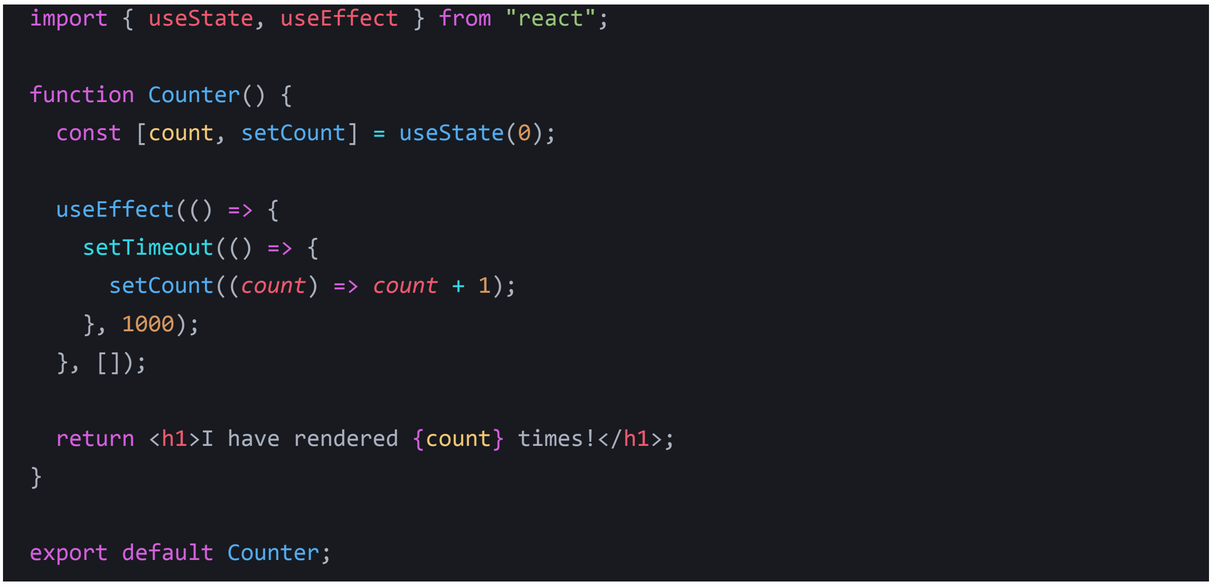


```
import { useState, useEffect } from "react";

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

  useEffect(() => {
    setTimeout(() => {
      setCount((count) => count + 1);
    }, 1000);
  });

  return <h1>I have rendered {count} times!</h1>;
}

export default Counter;
```

In the above code example, I have created a simple counter. The useEffect hook is used to handle side effects in this component. In this case, it sets up a timer using setTimeout. After a delay of 1000 milliseconds (1 second), it updates the count state by incrementing its current value using the setCount function. It runs on every render.

As you noted the setCount function is used in a callback to ensure that the update is based on the latest value of count.

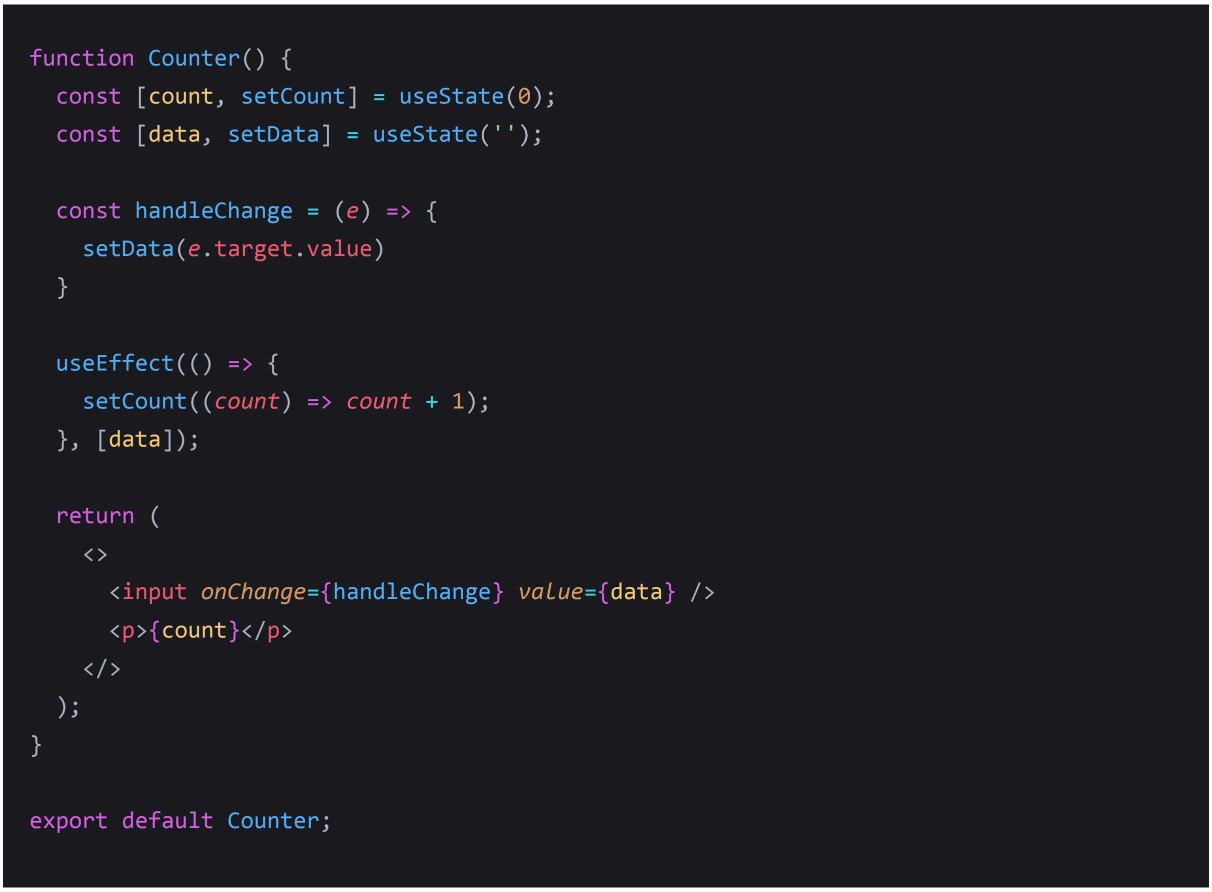
Example 2:



```
import { useState, useEffect } from "react";

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

  useEffect(() => {
    setTimeout(() => {
      setCount((count) => count + 1);
    }, 1000);
  }, []);

  return <h1>I have rendered {count} times!</h1>;
}

export default Counter;
```

In the second example, after adding the **empty dependency array `[]`** passed as **the second argument to useEffect** indicates that the effect should only run once on the first render, specifically after the component mounts.

Example 3:



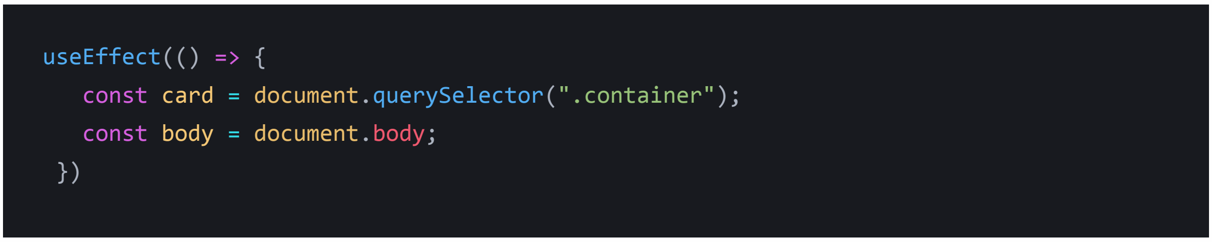
```
function Counter() {
  const [count, setCount] = useState(0);
  const [data, setData] = useState('');

  const handleChange = (e) => {
    setData(e.target.value)
  }

  useEffect(() => {
    setCount((count) => count + 1);
  }, [data]);

  return (
    <>
      <input onChange={handleChange} value={data} />
      <p>{count}</p>
    </>
  );
}

export default Counter;
```

In the third example, the **`handleChange` function** is used as an **event handler** for the **`onChange`** event of the **`input`** element. It updates the **`data` state** with the value of the input field whenever the user types.

Then, useEffect Hook updates the **`count` state** by incrementing its value by **1** whenever the **`data` state** changes.

The dependency array **`[data]`** indicates that the effect will run whenever the **`data` state** changes.

Must know: You can also select DOM elements using useEffect Hook. Like this:

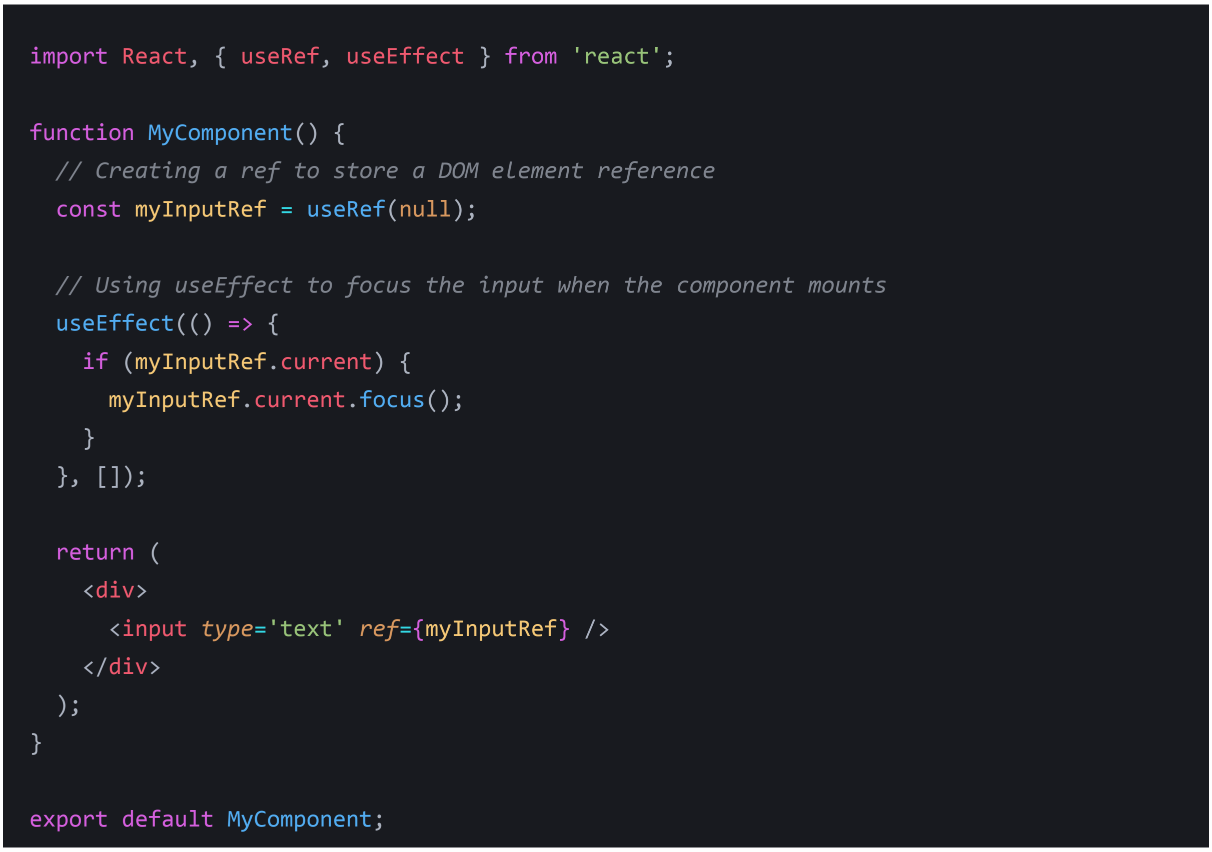


```
 useEffect(() => {
    const card = document.querySelector(".container");
    const body = document.body;
  })
```

useRef Hook

In React **useRef Hook** allows you to create a mutable reference to a **DOM element** or any other value. It's a way to access and interact with **DOM elements** directly, without triggering a re-render when the reference changes.

Accessing DOM elements with **using useRef Hook**



```
import React, { useRef, useEffect } from 'react';

function MyComponent() {
  // Creating a ref to store a DOM element reference
  const myInputRef = useRef(null);

  // Using useEffect to focus the input when the component mounts
  useEffect(() => {
    if (myInputRef.current) {
      myInputRef.current.focus();
    }
  }, []);

  return (
    <div>
      <input type='text' ref={myInputRef} />
    </div>
  );
}

export default MyComponent;
```

In this example, we're creating a ref using the **useRef hook** and assigning it to the ref attribute of the **`input`** element. We're also using the **useEffect hook** to focus the **`input`** when the **component mounts**.

Notice that we're accessing the **DOM element** using the **`` `.current` ``** property of the **`` `ref` ``** (**`myInputRef.current`**).

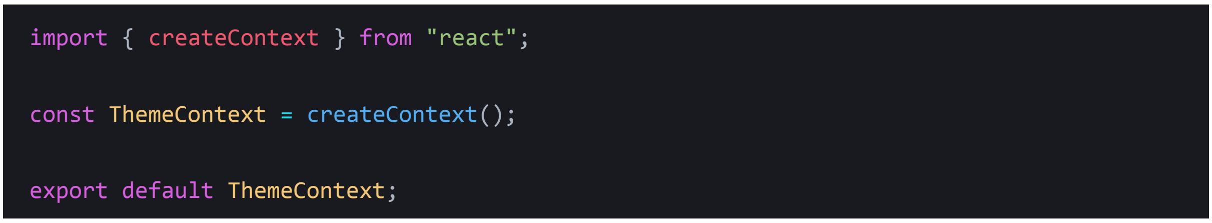
useContext Hook

React Context is a way to manage state globally. Like, context provides a way to share data that can be considered "global" means you access the context of a parent component from a child component, without having to pass props through every level of the component tree.

By this Hook data can be shared across multiple components in a more efficient and convenient manner.

Example of useContext Hook

First we have to create a context, so create **`ThemeContext.js`** file in the **`src`** folder.

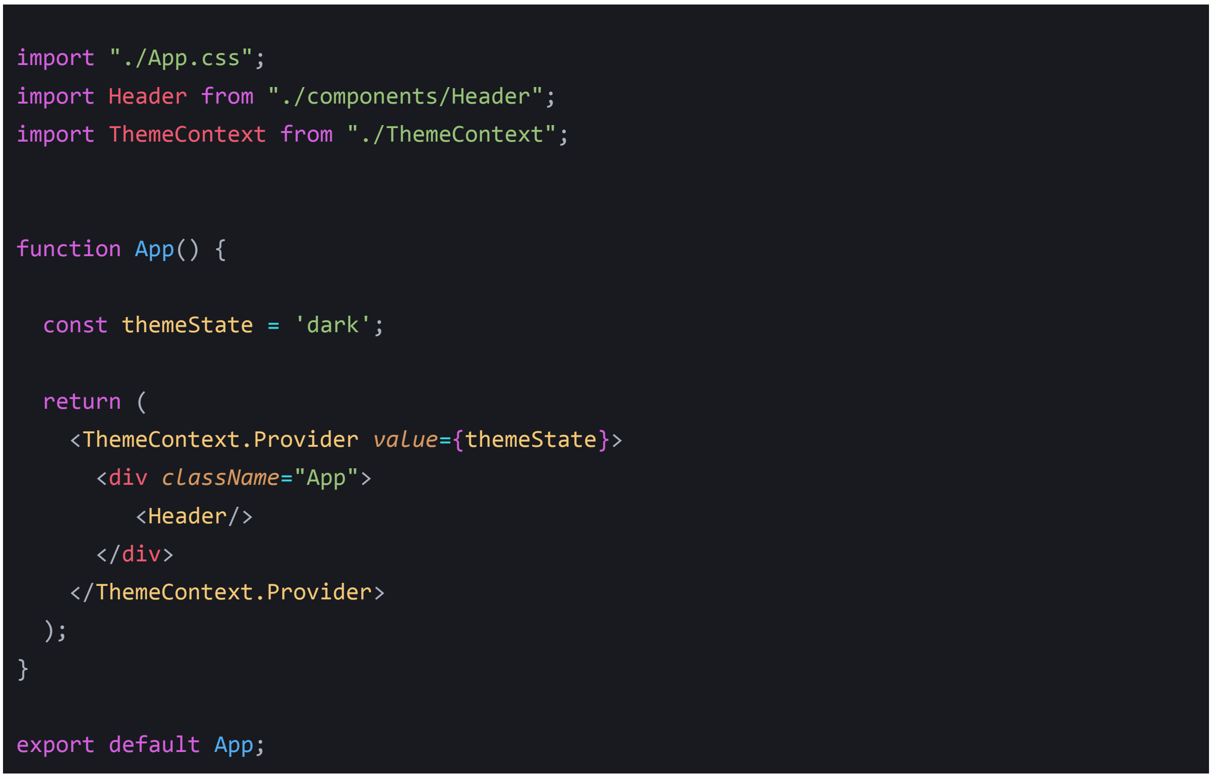


```
import { createContext } from "react";

const ThemeContext = createContext();

export default ThemeContext;
```

Then here **import** the **`createContest`** Hook to create context.

After creating **`ThemeContext`** import it to your Root component (App.js).

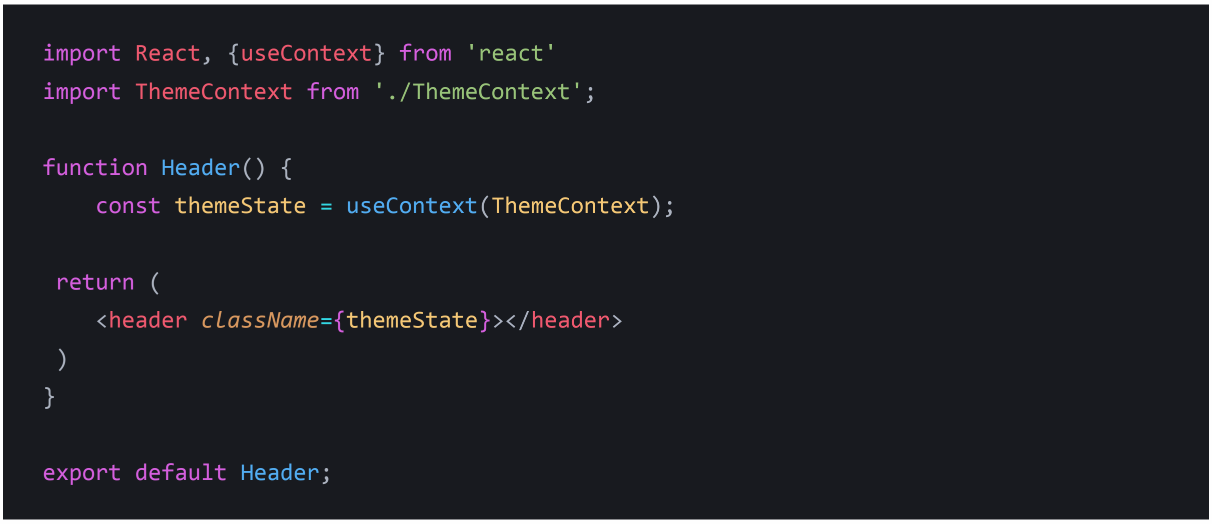
Here the **root component** provides the context data to its child components using the **`ThemeContext.Provider`**. The context value being provided as **`themeState`**, which value is set to the **'dark'**.



```
import "./App.css";
import Header from "./components/Header";
import ThemeContext from "./ThemeContext";


function App() {

  const themeState = 'dark';

  return (
    <ThemeContext.Provider value={themeState}>
      <div className="App">
         <Header/>
      </div>
    </ThemeContext.Provider>
  );
}

export default App;
```

The value **`prop`** is set to **`themeState`**, which means that any child component inside the **Provider** can access this value using the **`useContext`** hook.

Now we can access this value in the **Header component**.



```
import React, {useContext} from 'react'
import ThemeContext from './ThemeContext';

function Header() {
    const themeState = useContext(ThemeContext);

 return (
    <header className={themeState}></header>
 )
}

export default Header;
```

As you can see in the above code of Header component, I have imported the `` `useContext` `` **Hook** which is used to consume the **context data** from **`ThemeContext`**. The `` `themeState` `` variable now holds the value provided by the `` `ThemeContext.Provider` `` in the parent component.

useReducer Hook

The useReducer hook is used for managing more complex state logic in a component. It's similar to useState Hook. It allows you to write custom state logic.

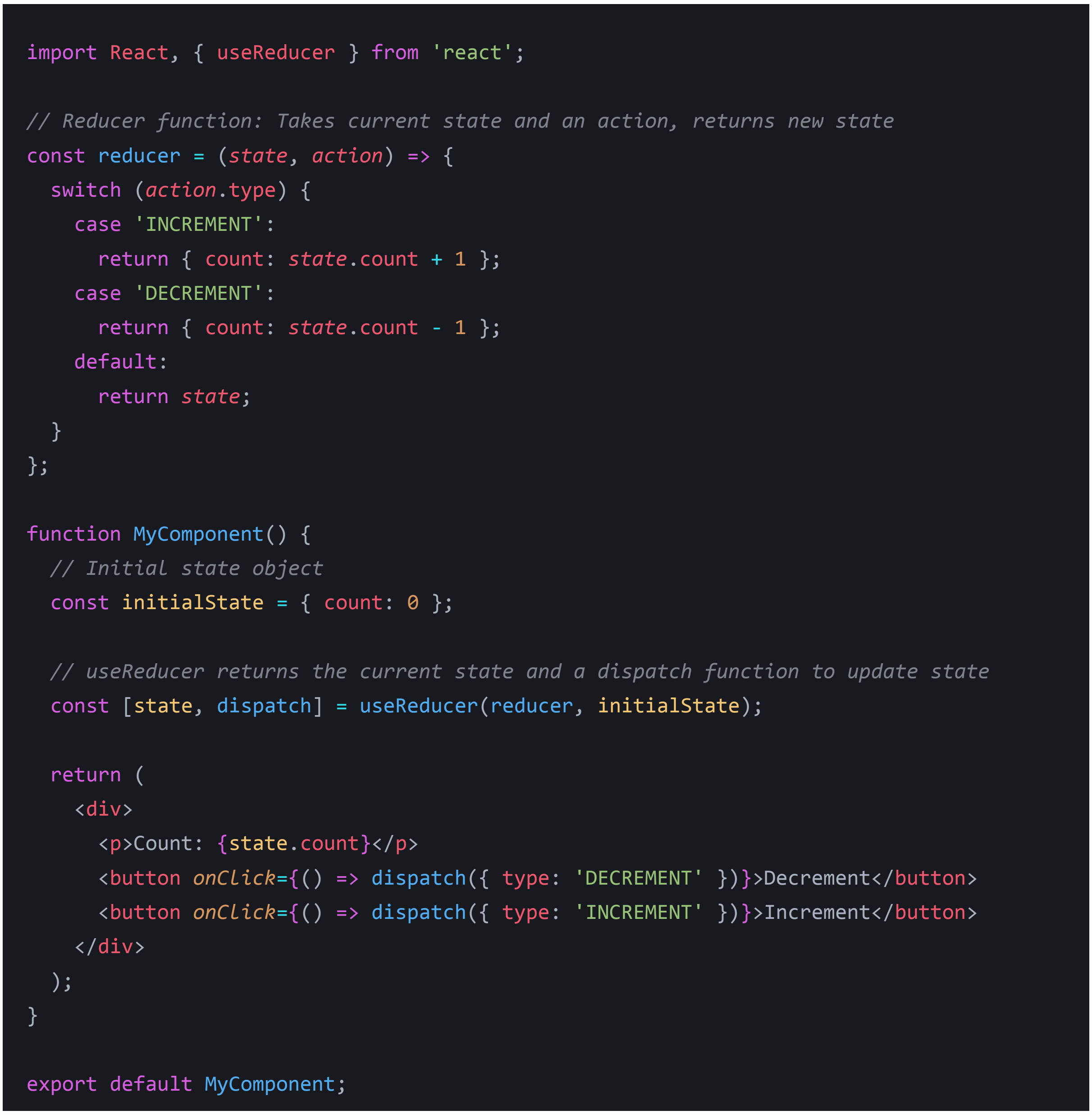
when you have complex state logic, changing more than 2-3 states in a function, then you have to use useReducer Hook.

Syntax of useReducer Hook

```
const [state, dispatch] = useReducer(reducer, initialState);
```

Example of using useReducer Hook:

To use useReducer Hook it obviously that we have to import it first.



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

// Reducer function: Takes current state and an action, returns new state
const reducer = (state, action) => {
  switch (action.type) {
    case 'INCREMENT':
      return { count: state.count + 1 };
    case 'DECREMENT':
      return { count: state.count - 1 };
    default:
      return state;
  }
};

function MyComponent() {
  // Initial state object
  const initialState = { count: 0 };

  // useReducer returns the current state and a dispatch function to update state
  const [state, dispatch] = useReducer(reducer, initialState);

  return (
    <div>
      <p>Count: {state.count}</p>
      <button onClick={() => dispatch({ type: 'DECREMENT' })}>Decrement</button>
      <button onClick={() => dispatch({ type: 'INCREMENT' })}>Increment</button>
    </div>
  );
}

export default MyComponent;
```

Step 1:
As you can see in the above code example, I have created a function called **`reducer`**.

Here the **`reducer` function** is defined outside the component. This function takes **two parameters:** the **current state** and an **action object**. It uses a **switch statement** to determine how the state should be updated based on the **action** type.

In this case, it handles **two types of actions: `'INCREMENT'`** and **`'DECREMENT'`**, updating the count property accordingly.

Step 2:

Inside the **`MyComponent`** function, an initial state object named **`` `initialState` ``** is defined. Initially the**`` `count` ``** value is set to **`0`**.

Step 3:

Here the **useReducer hook** takes two arguments: the **reducer** function and the **`initialState`** object.

It returns two values: the **state object** representing the **current `state`**, and the **`dispatch`** function which is used to send actions to the `reducer`.

Step 4:

In JSX, I have added two **`button`** elements. One button is labeled "Decrement" and it has an **`` `onClick` `` event handler** that dispatches an action of **type `'DECREMENT'`** to the reducer.

The second button is labeled "Increment" and it dispatches an action of type 'INCREMENT'.

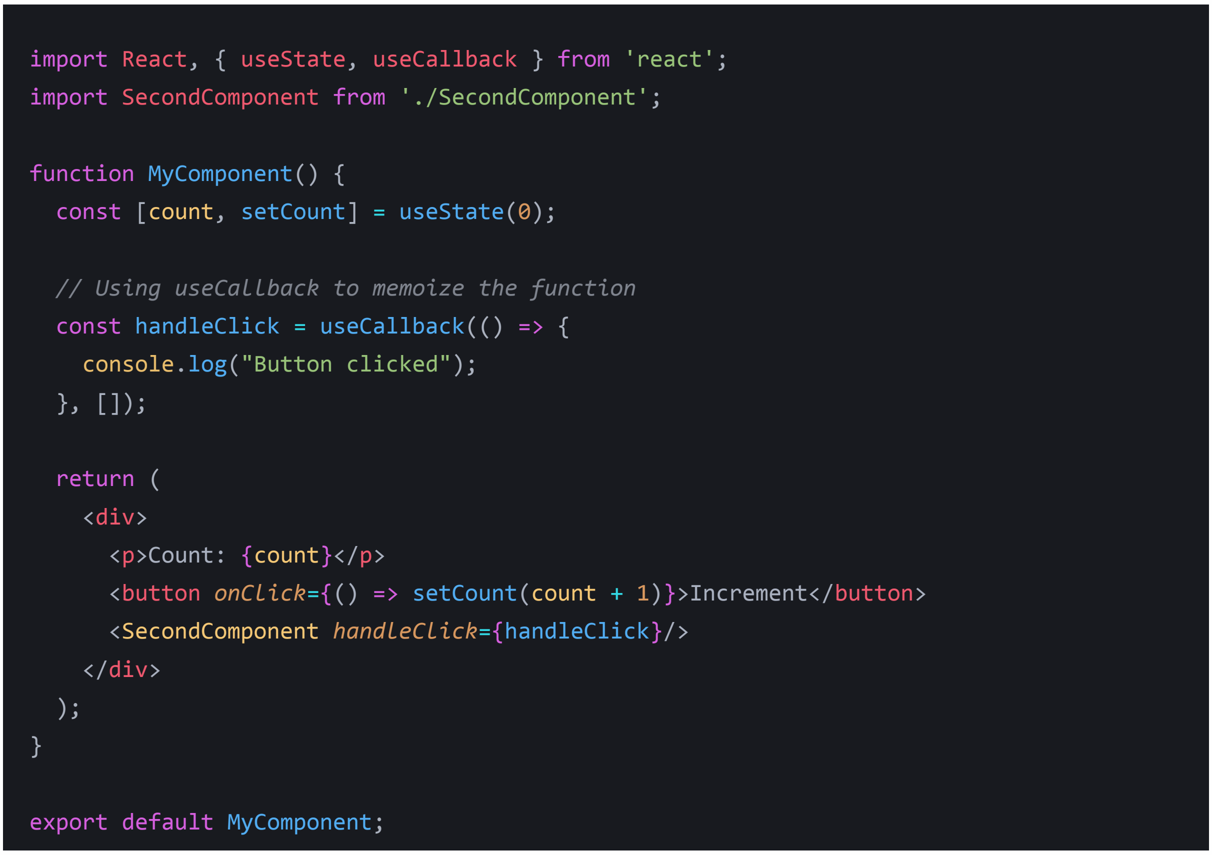
useCallback Hook

The useCallback Hook used to memoize functions in order to optimize performance, especially in scenarios where the function references are passed down to child components as props.

It helps in preventing unnecessary re-creation of functions on every render, which can lead to improved performance and reduced unnecessary re-renders.

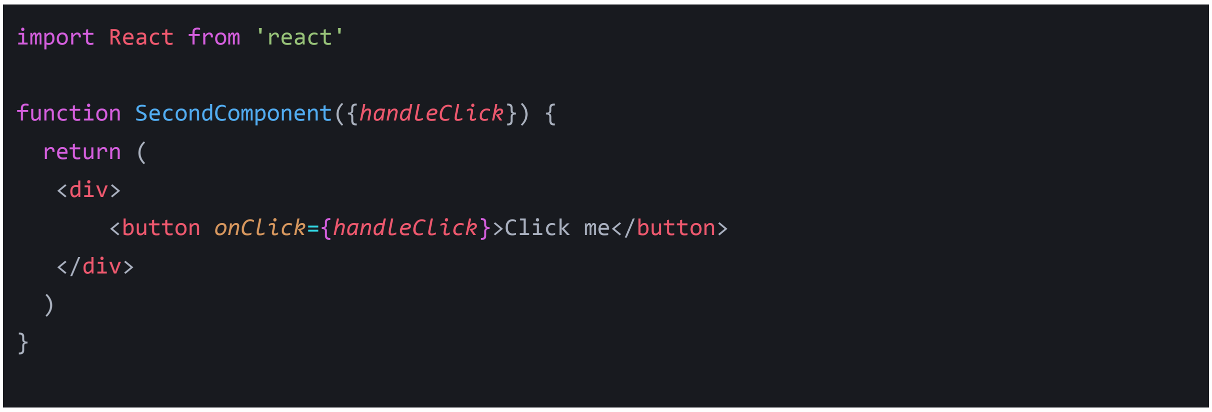
Example:

MyComponent.js



```
import React, { useState, useCallback } from 'react';
import SecondComponent from './SecondComponent';

function MyComponent() {
  const [count, setCount] = useState(0);

  // Using useCallback to memoize the function
  const handleClick = useCallback(() => {
    console.log("Button clicked");
  }, []);

  return (
    <div>
      <p>Count: {count}</p>
      <button onClick={() => setCount(count + 1)}>Increment</button>
      <SecondComponent handleClick={handleClick}/>
    </div>
  );
}

export default MyComponent;
```

SecondComponent.js



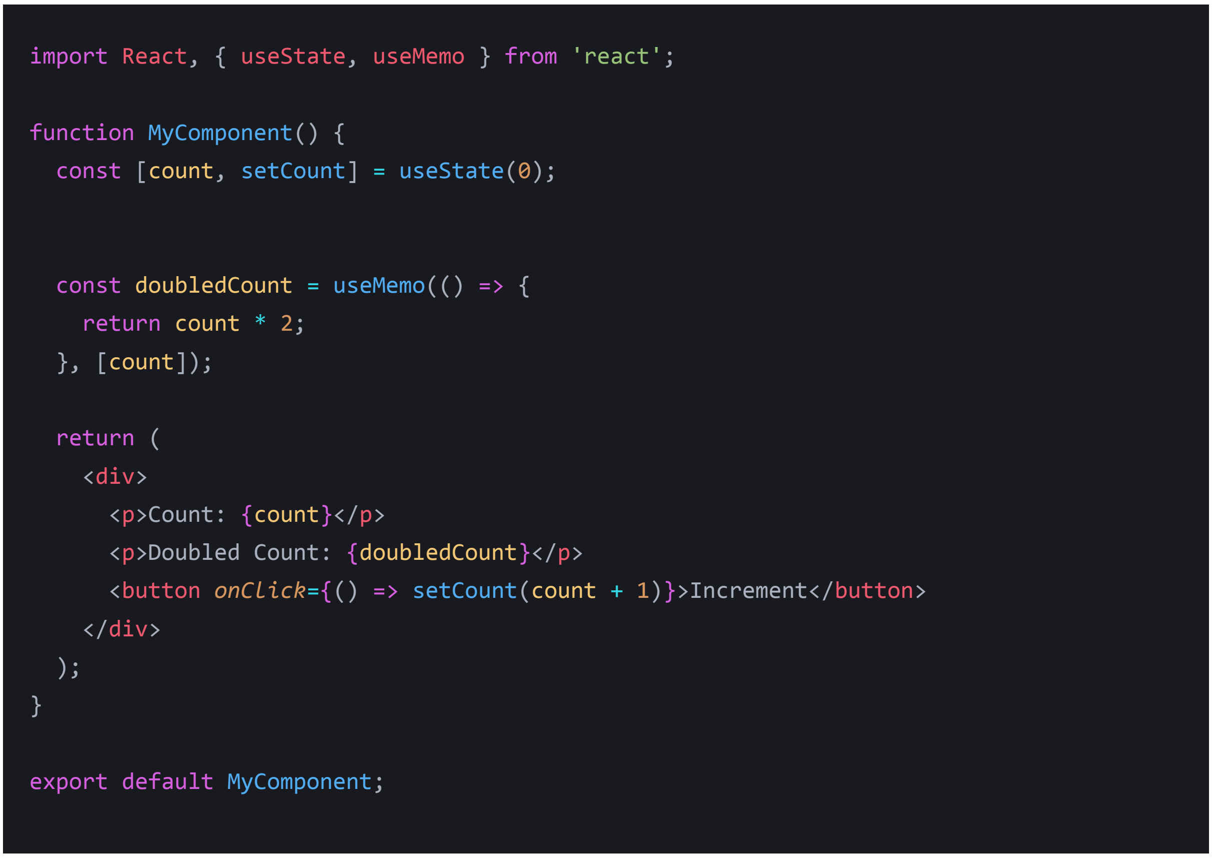
```
import React from 'react'

function SecondComponent({handleClick}) {
  return (
   <div>
       <button onClick={handleClick}>Click me</button>
   </div>
  )
}
```

```
export default SecondComponent;
```

The **`useCallback`** and **`useMemo`** Hooks are similar. The main difference is that **`useMemo`** returns a **memoized value** and **`useCallback`** returns a **memoized function**.

useMemo Hook

useMemo Hook returns a memoized value that can be particularly helpful for optimizing performance when dealing with expensive calculations or computations that don't need to be re-evaluated on every render.



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

function MyComponent() {
  const [count, setCount] = useState(0);


  const doubledCount = useMemo(() => {
    return count * 2;
  }, [count]);

  return (
    <div>
      <p>Count: {count}</p>
      <p>Doubled Count: {doubledCount}</p>
      <button onClick={() => setCount(count + 1)}>Increment</button>
    </div>
  );
}

export default MyComponent;
```

Here in the above example, the **useMemo hook** is used to memoize the result of a computation.

In this case, the computation is simply **doubling the value** of the **`` `count` `` state**. The function inside **useMemo** returns the computed value, **`count * 2`**.

The dependency array **`[count]`** specifies that the computation should be re-evaluated whenever the **`` `count` `` state** changes.

React Router

React Router is a standard and most popular library for routing in React. It is used to manage navigation and rendering different components as pages based on the URL.

React Router provides a set of components and functions, which makes it easy to create a dynamic single-page app in React.

If you want to understand it more detailed, Then:

As you do page routing in regular **HTML**, you have a ***`index.html`*** which is your **Home page** and ***`contact.html`*** which is your **Contact page**, then when you navigate from home page to contact page, the **URL** is something like this:

`yourdomain.com/contact.html`

And, the browser reloads every time when you navigate from one page to another page, that's why it works very slow.

But when you use React, **page navigation is super fast**, because the **browser does not reload** every time when you navigate page to page. Also the **URL** looks like this:

`yourdomain.com/contact`

So let’s see How you can use React Router and implement the Routing feature in React.

Installation of React Router

To install react-router in your react app, write the following command and run this in your terminal.

```
npm install react-router-dom
```

Importing React Router

After installing the react-router-dom, import the necessary components from it.

Import these in the **App.js** file.

```
import { BrowserRouter as Router, Routes, Route } from "react-router-dom";
```

Components in React Router

As you can see in the above code example, I have imported **Three components** of React Router from ***react-router-dom***.

Here the **BrowserRouter** component is the **primary component** of the React Router, It is used to set up routing in the react app.

Here I have imported the ***`BrowserRouter as Router`***, like instead of writing **BrowserRouter** everywhere you can use the **Router**, it's just the way to give it a **shorter name**. This will make your code more concise, behavior will be the same, only we give a name different to keep our code clean.

Apart from this, we have imported two more components from *react-router-dom*, that are **Routes** and **Route**.

Here the **Routes component** will contain all the routes, and the **Route component** will define different routes and associate them with specific components.

Routing Example - Static Routing

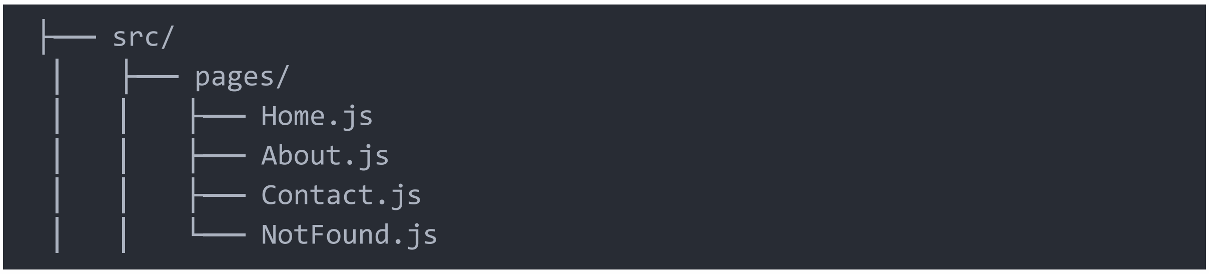
Step 1

Before going further, let's create some components for your react app.

In the ***`src`*** folder create another folder named pages, then inside this, create **Four new files**:

1. **`Home.js`** - as Home page/main index page.
2. **`About.js`** - as About page.
3. **`Contact.js`** - as Contact page.
4. **`NotFound.js`** - as 404 not found page.

Folder structure will be something like this.



```
├── src/
│   ├── pages/
│   │   ├── Home.js
│   │   ├── About.js
│   │   ├── Contact.js
│   │   └── NotFound.js
```

I have added **h1 elements** in each component for displaying the Title text.

Home.js

```
import React from 'react'

function Home() {
  return (
    <h1>Home - Welcome</h1>
  )
}

export default Home;
```

About.js

```
import React from 'react'

function About() {
  return (
    <h1>About Page</h1>
  )
}

export default About;
```

Contact.js

```
import React from 'react'

function Contact() {
  return (
    <h1>Contact Page</h1>
  )
}

export default Contact;
```

NotFound.js

```
import React from 'react'

function NotFound() {
  return (
    <h1>404 - Not Found</h1>
  )
}

export default NotFound;
```

Step 2

Then come to your `App.js` file. Here **import** all the components from the `src/pages` directory which you have made previously. **Delete all the JSX elements we inserted earlier.**

Then inside the ***div*** JSX element. Add the **Router** component, then inside the Router component, **Routes** component is used to define the different routes and their associated components.

Then **Route** components are used to define **individual routes**.

The `index` keyword is used to indicate the default route. Each Route has a `path` and an `element` prop.

- The `path` **prop** defines the **URL** path associated with the route.
- The `element` **prop** specifies the component that should be rendered when the route is matched.

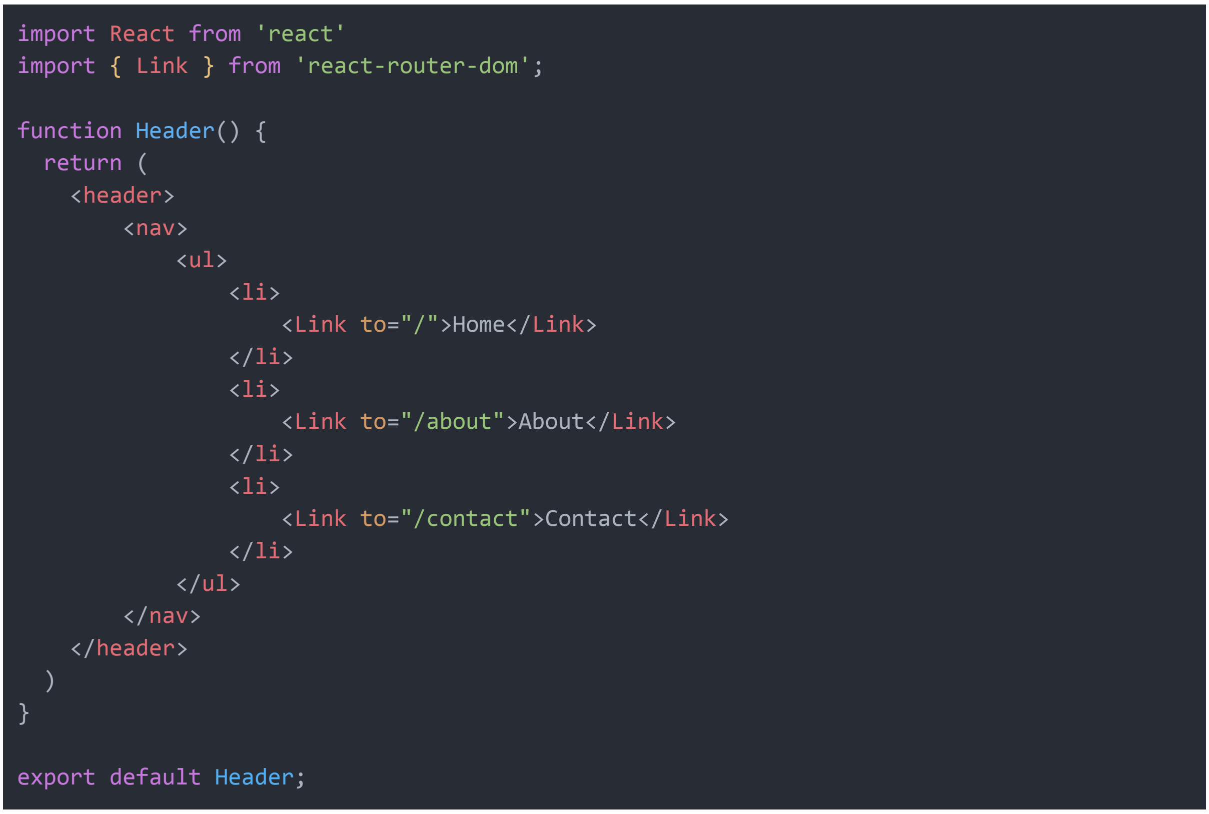
The last Route with `path="*"` acts as a "**catch-all**" route, It will render the **NotFound**(404 page) component when any of these defined components would not match.

The final code is below:

```
//App.js

import "./App.css";
import React, { useEffect, useState } from "react";
import { BrowserRouter as Router, Routes, Route } from "react-router-dom";
import Home from "./pages/Home";
import About from "./pages/About";
import Contact from "./pages/Contact";
import NotFound from "./pages/NotFound";

function App() {
  return (
    <div className="App">

      <Router>
        <Routes>
          <Route index path="/" element={<Home/>} />
          <Route path="/about" element={<About/>} />
          <Route path="/contact" element={<Contact/>} />
          <Route path="*" element={<NotFound/>} />
        </Routes>
      </Router>

    </div>
  );
}
export default App;
```

Step 3

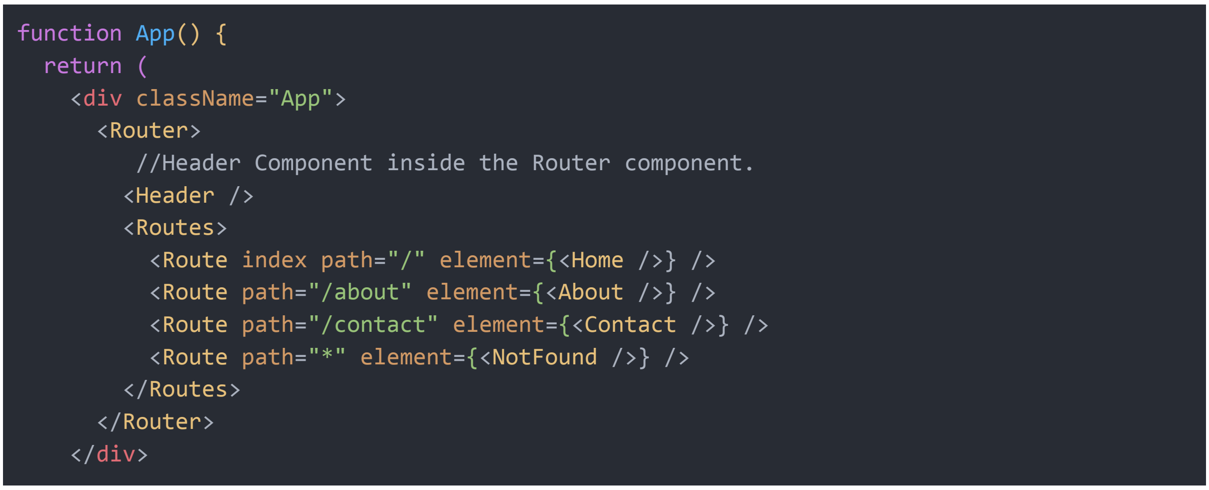
Then create a **Header Component** (***`Header.js`***) inside the `` `***src/components***` `` folder. Basically we will create a header navbar with navigation links.



```
import React from 'react'
import { Link } from 'react-router-dom';

function Header() {
  return (
    <header>
        <nav>
            <ul>
                <li>
                    <Link to="/">Home</Link>
                </li>
                <li>
                    <Link to="/about">About</Link>
                </li>
                <li>
                    <Link to="/contact">Contact</Link>
                </li>
            </ul>
        </nav>
    </header>
  )
}

export default Header;
```

As you can see in the above code, I have imported the `` `**Link**` `` component from ***react-router-dom***, it allows you to create links to different routes in your React Web App without the `` `**<a></a>**` `` tag.

Then import this **Header component** in your **root component** (`` `***App.js***` ``) and render inside the `` `**Router**` `` component, so that this **Header Component will display in every route**. Code example given below:



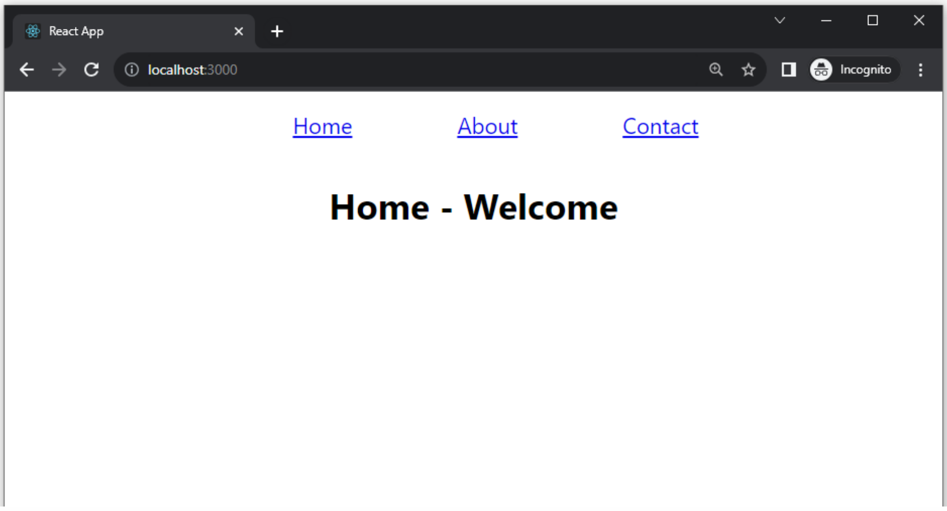
```
function App() {
  return (
    <div className="App">
      <Router>
         //Header Component inside the Router component.
        <Header />
        <Routes>
          <Route index path="/" element={<Home />} />
          <Route path="/about" element={<About />} />
          <Route path="/contact" element={<Contact />} />
          <Route path="*" element={<NotFound />} />
        </Routes>
      </Router>
    </div>
  );
}
```

Final code of your Root Component (`App.js`):

```
//App.js

import "./App.css";
import React, { useEffect, useState } from "react";
import { BrowserRouter as Router, Routes, Route } from "react-router-dom";
import Home from "./pages/Home";
import About from "./pages/About";
import Contact from "./pages/Contact";
import NotFound from "./pages/NotFound";
import Header from "./components/Header";

function App() {
  return (
    <div className="App">
      <Router>
        <Header />
        <Routes>
          <Route index path="/" element={<Home />} />
          <Route path="/about" element={<About />} />
          <Route path="/contact" element={<Contact />} />
          <Route path="*" element={<NotFound />} />
        </Routes>
      </Router>
    </div>
  );
}

export default App;
```

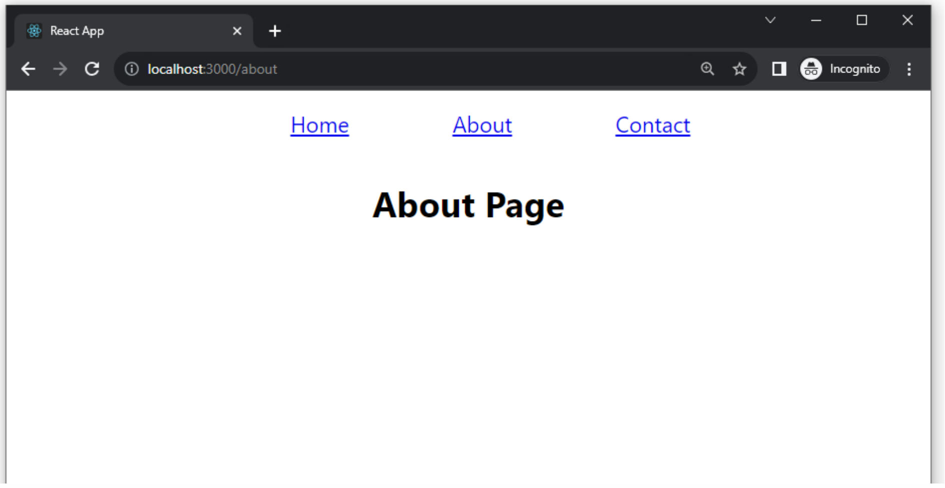
Output

This is the output of the **Home route** or Home page.



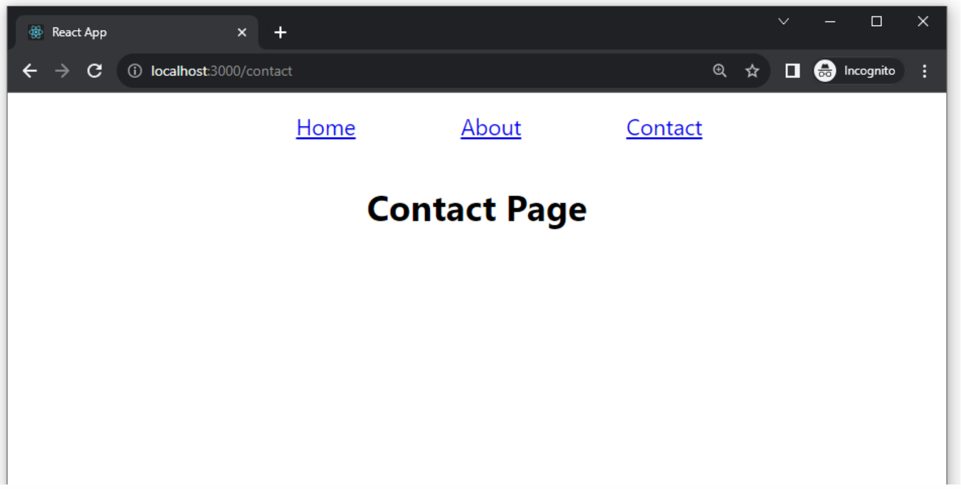
Home - Welcome

This is the output of the **About route** or About page. URL - ***`http://localhost:3000/about`***



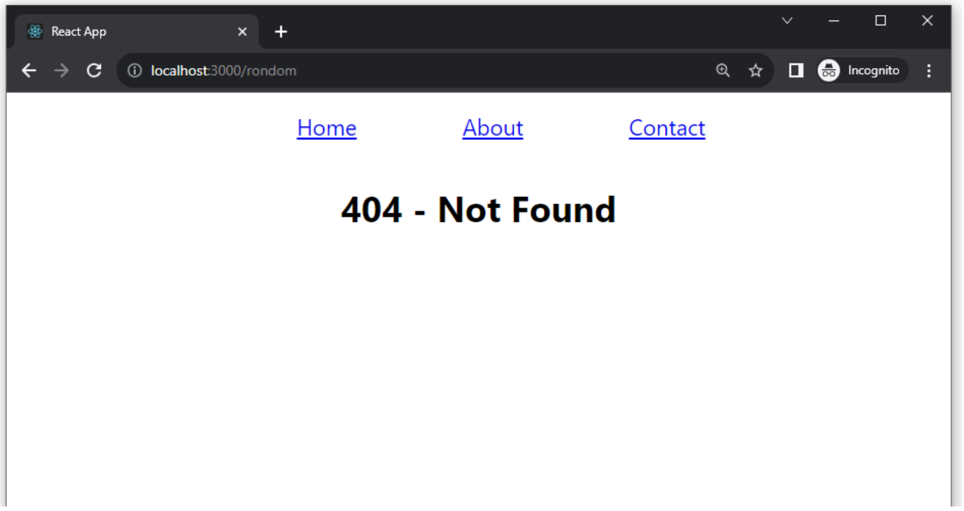
About Page

This is the output of the **Contact route** or Contact page. URL - **`http://localhost:3000/contact`**



Contact Page

404 Error - Not Found page will show, when you try to access a **URL** that doesn't correspond to any of the defined routes in your React application.



404 - Not Found

Dynamic Routing in React

Dynamic routing in React refers to the process of creating routes that can handle variable or dynamic parts in the URL. You can build more flexible and data-driven web apps using the dynamic routing feature in ReactJs, where different content is displayed based on the parameters in the URL.

Importance of Dynamic Routing than Static Routing

As we have learned earlier about the **Static Routing Method in React**.

Suppose, You are building an e-commerce web app, you have 100 products and you want to display each product's details as a specific product page based on their unique URLs.

Like if you want to see the details of **product no.1** then you would access the URL https://yourdomain/product/1

So, for this you would have to manually create 100 routes and components for each product page. Like this:

```
import { BrowserRouter as Router, Routes, Route } from "react-router-dom";
import Product1 from "./pages/Product1";
import Product2 from "./pages/Product2";
import Product3 from "./pages/Product3";
import Product4 from "./pages/Product4";
//...up to Product100

function App() {
  return (
    <div className="App">
      <Router>
        <Routes>
          <Route path="/product/1" element={<Product1/>} />
          <Route path="/product/2" element={<Product2/>} />
          <Route path="/product/3" element={<Product3/>} />
          <Route path="/product/4" element={<Product4/>} />
          {/* ...more routes up to Product100 */}
        </Routes>
      </Router>
    </div>
  );
}

export default App;
```

No doubt this method will work fine, but hard to maintain and it's not an efficient approach to do like this.

So, that's why React provides us with the Dynamic Routing feature. Let's see how you can simplify this process using Dynamic Routing?

Building a Dynamic Routing structure

Using Dynamic Routing, you can create a single route for all products, then you can fetch the content dynamically based on the URL parameters.

Let’s build step by step:

Step 1:

First create a component inside the src/pages called Product.js, it will be our single component for all the products.

Then import this component in the Root Component (App.js), like this:

```
import Product from "./pages/Product";
```

Then create a new Route inside the Routes component in App.js, like this:

```
 <Routes>
   {/* dynamic route for products  */}
   <Route path="/product/:productId" element={<Product/>} />
 </Routes>
```

In the above code example,

- ***`path="/product/:productId"`*:** This sets the URL pattern for the route. It uses a dynamic parameter **`:productId`** which indicates that the route can match URLs like **`/product/35`**, where **35** is the actual **productId**.

Step 2:

Edit your **`Product.js`** Component, like this:

```
import React from 'react'
import { useParams } from 'react-router-dom';

function Product() {
  const { productId } = useParams();
  return (
    <div>
        <h1>Product {productId}</h1>
        <p>This is the product about {productId}.</p>
    </div>
  )
};

export default Product;
```

In the above code of `` `Product.js` ``, as you can see, I have imported the `` `useParams` `` hook from ***react-router-dom***.

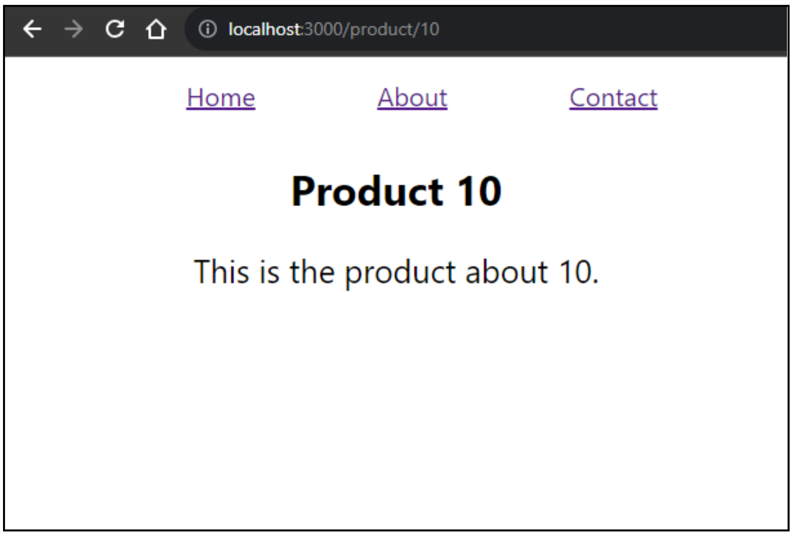
Then **`` `const { productId } = useParams();` ``:** This line uses the `` `useParams` `` hook to extract the **`productId`** parameter from the **URL**. Here the `` `useParams` `` **hook** returns an **object** containing all the **URL parameters** specified in the route.

In this case, we are destructuring the `` `productId` `` parameter from that **object**.

Then also I used that `` `productId` `` in the JSX elements.

Let's see the output:

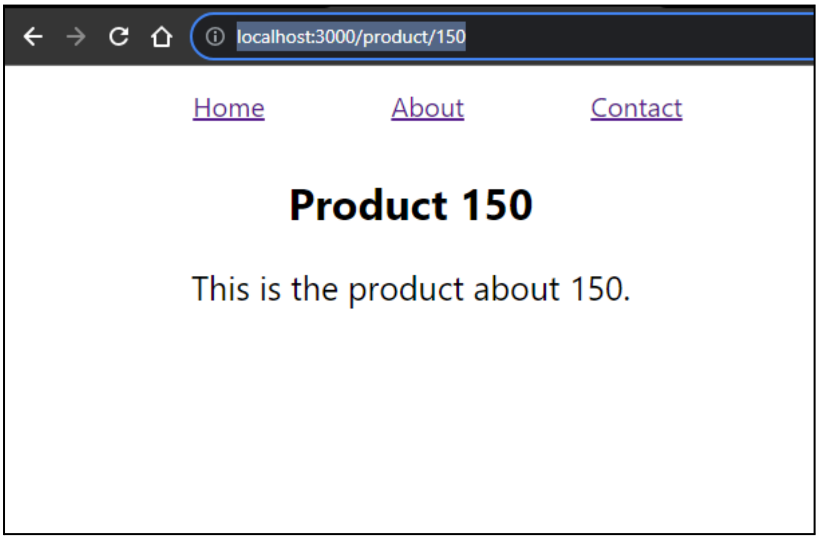
Output when you access the URL - **`/product/10`**



Product 10

This is the product about 10.

You can now get details of the product no.100 or 1000, by just adding the `` `productId` `` parameter in the URL.



Product 150

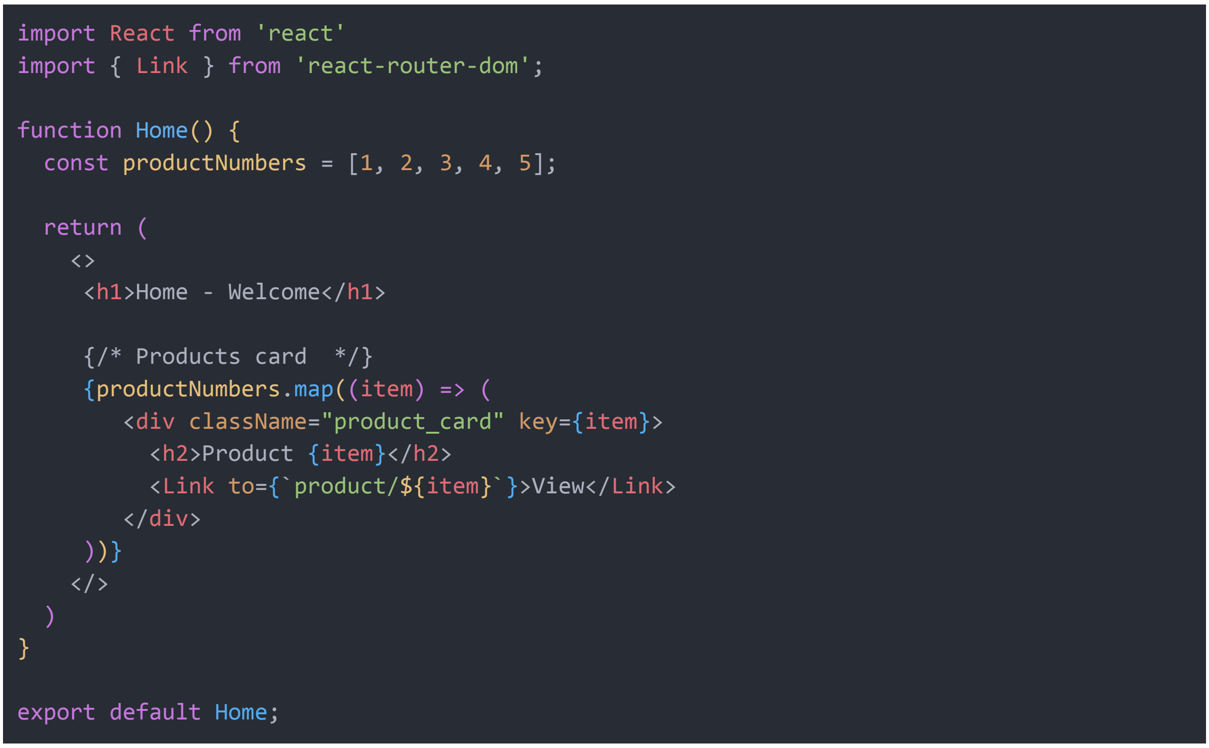
This is the product about 150.

Additional Step:

This step will be the bonus for you.

So, come to the Home component (Home.js), here we will build some product cards to showcase all the products in the Home page and will add navigation links in every card.

So that when the user wants to know about the details of any specific product, then he will navigate to the page of that individual product by clicking on the link which will be in that specific product card.



```
import React from 'react'
import { Link } from 'react-router-dom';

function Home() {
  const productNumbers = [1, 2, 3, 4, 5];

  return (
    <>
     <h1>Home - Welcome</h1>

     {/* Products card  */}
     {productNumbers.map((item) => (
        <div className="product_card" key={item}>
          <h2>Product {item}</h2>
          <Link to={`product/${item}`}>View</Link>
        </div>
     ))}
    </>
  )
}

export default Home;
```

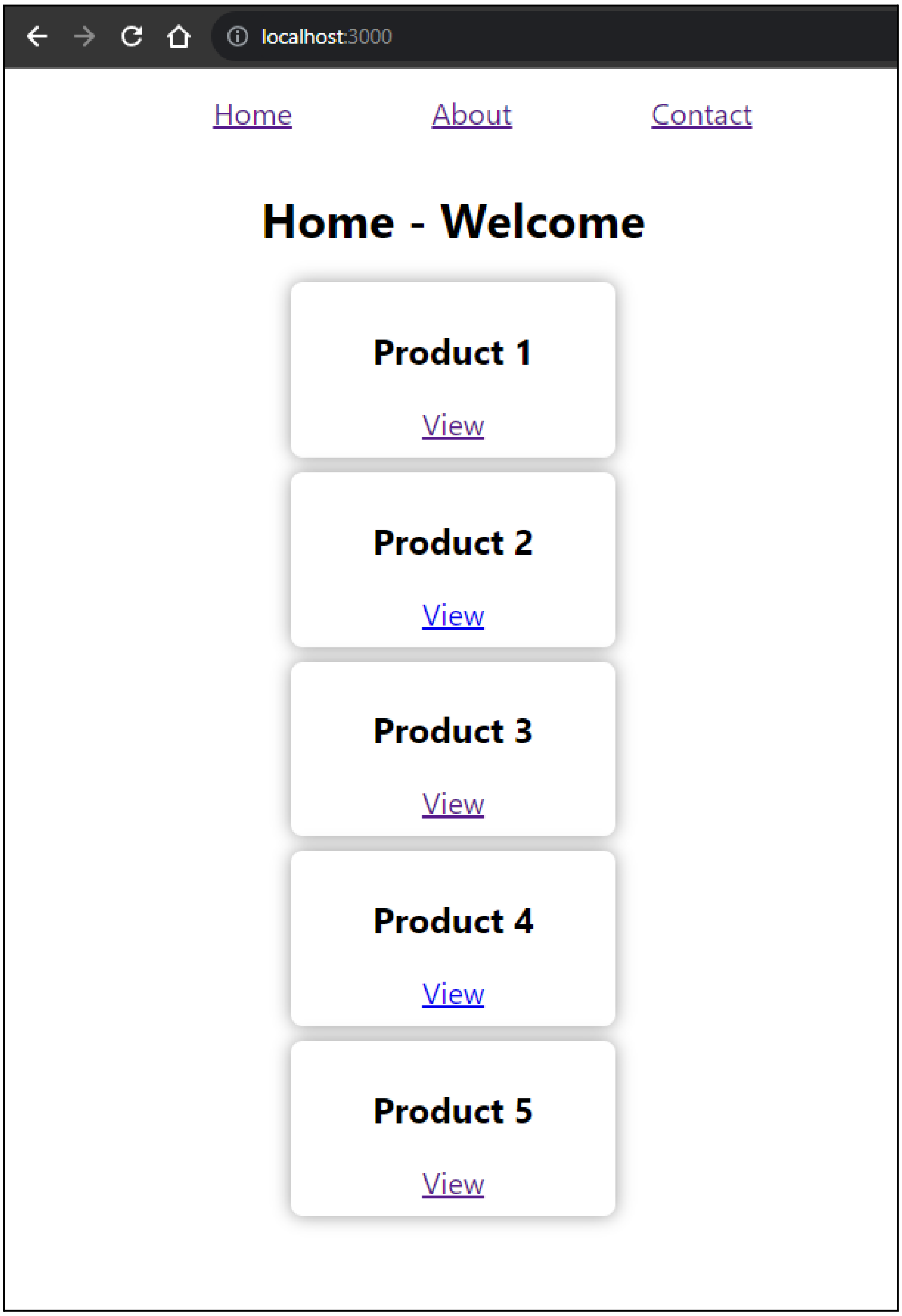
In the above code I have defined an array named **`productNumbers`** containing a list of product numbers as **product ID** which will be used as **`productId` parameter**.

Then I used the **`map()`** method to iterate over each item in the ***`productNumbers`*** array and create a set of product cards. Here **Five cards** will be rendered as the Array contains **Five items**.

I have taken an **argument** in the **`map()`** function called **`item`** as **`currentValue`**.

Then I have created navigation links using the ***`Link`*** component. It will be dynamically generated based on the **`item`** value. This will lead to URLs like `/product/1`, `/product/2`, and up to `/product/5`.

After adding some CSS and styling the cards, the output will be:



Home About Contact

Home - Welcome

Product 1

View

Product 2

View

Product 3

View

Product 4

View

Product 5

View

Now you can click on the view link, to navigate that specific product page.

Okay, I hope you have understood all the things about this topic.

Data Fetching from API in React

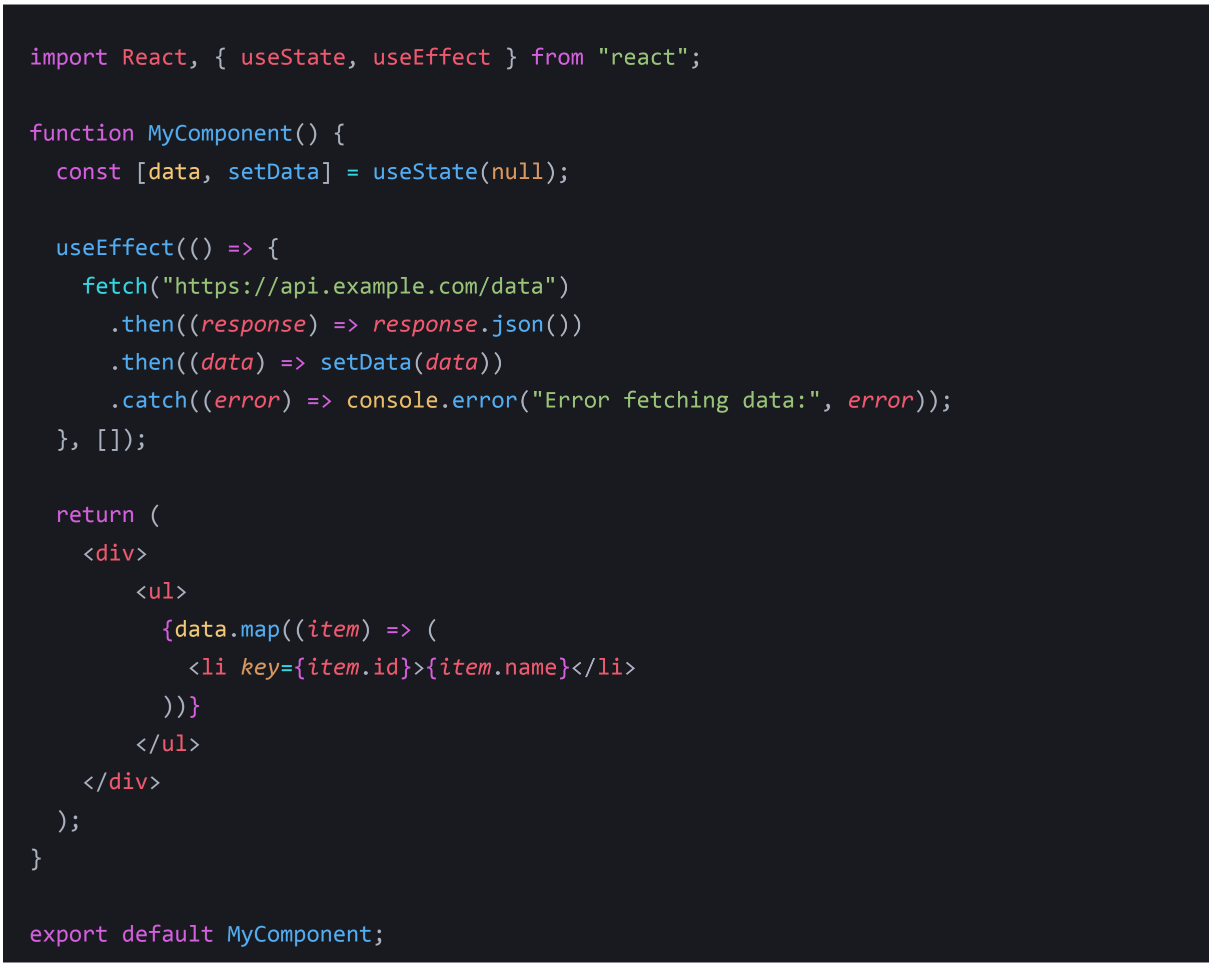
Data fetching is a common task in React applications, and there are several approaches and libraries you can use to fetch data from an API.

Using the fetch API method

The fetch API is built into modern browsers and allows you to make **HTTP requests** very easily. It returns a Promise that resolves to the response from the server.

To make a simple GET request with fetch we just need to include the URL endpoint to which we want to make our request. We will make this request once our React component has mounted.

Let’s see the example:



```
import React, { useState, useEffect } from "react";

function MyComponent() {
  const [data, setData] = useState(null);

  useEffect(() => {
    fetch("https://api.example.com/data")
      .then((response) => response.json())
      .then((data) => setData(data))
      .catch((error) => console.error("Error fetching data:", error));
  }, []);

  return (
    <div>
        <ul>
          {data.map((item) => (
            <li key={item.id}>{item.name}</li>
          ))}
        </ul>
    </div>
  );
}

export default MyComponent;
```

Here the **useEffect hook** is used to perform data fetching when the component mounts. It runs the provided function as a side effect. In this case, it fetches data from the **URL** **`"https://api.example.com/data"`**. When the response is received, it's converted to **JSON** and the **`setData`** function is called to update the **`data` state**. The empty dependency array **`[]`** ensures that this effect runs only once when component mounts.

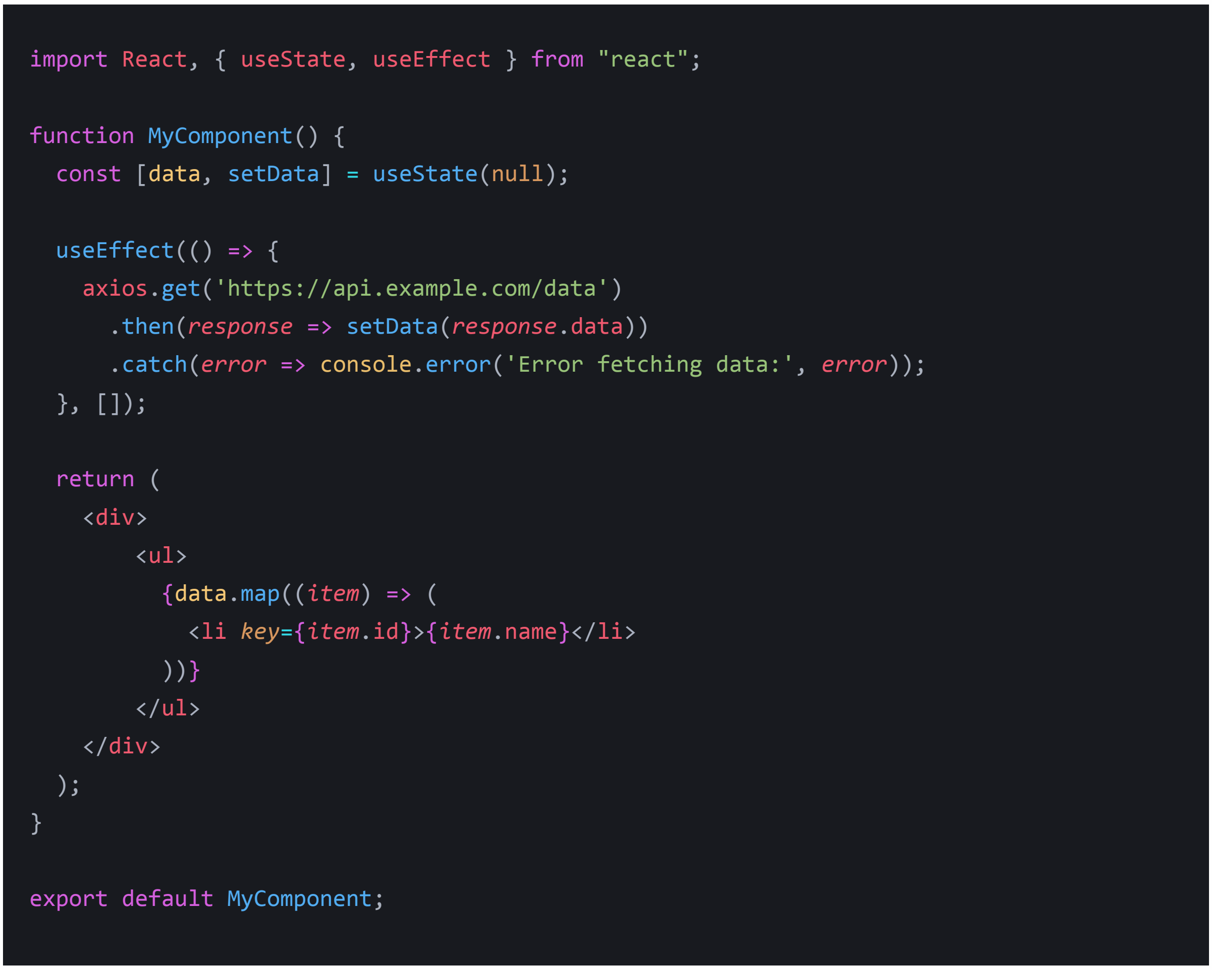
Using Axios

Axios is a popular third-party library for making **HTTP requests**. It provides a simpler and more convenient way to handle network requests compared to the fetch API.

So first install **Axios** using **`npm`**. By running this command in terminal:

```
npm install axios
```

Then you can use Axios to fetch data from an API like this:



```
import React, { useState, useEffect } from "react";

function MyComponent() {
  const [data, setData] = useState(null);

  useEffect(() => {
    axios.get('https://api.example.com/data')
      .then(response => setData(response.data))
      .catch(error => console.error('Error fetching data:', error));
  }, []);

  return (
    <div>
        <ul>
          {data.map((item) => (
            <li key={item.id}>{item.name}</li>
          ))}
        </ul>
    </div>
  );
}

export default MyComponent;
```