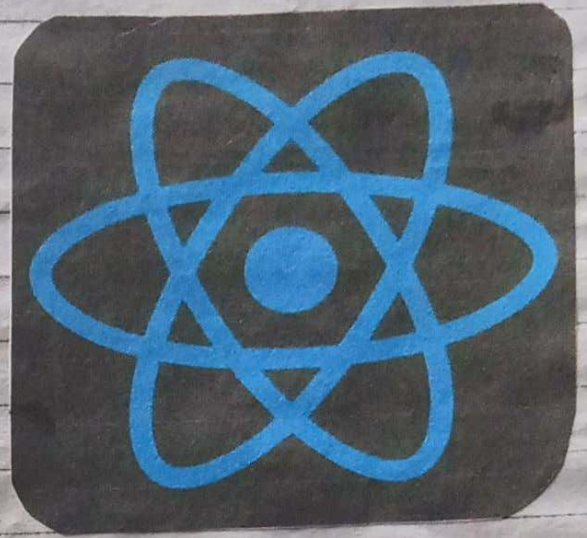


Master React.js



Zero to Advance



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Chapter → 1

Introduction to React.js

* What is React ?

— React is a JavaScript library used to building User Interface especially for Single page Application

— A library is a Collection of pre-written code that helps developers to do specific tasks faster.

— Instead of writing every thing from scratch, we use different function, classes and method provided by library.

* What is a JavaScript Library.

— A JavaScript library is a collection of pre-written JavaScript code that helps developers build websites or web apps faster and more efficiently.

— Instead of coding everything from scratch, you use ready-made function, classes or method from the library to save time and ~~and~~ reduce bugs.

— React is a JavaScript library that means it is built using JavaScript language and provide a collection of reusable JavaScript function, class and methods to help you build UI (User Interface) faster.

=> React provides ?

Feature	Description
Function	React offers utility function like :- React.createElement(), useState(), etc
Classes	Earlier, React used Class Components to manage state and life cycle method.
Methods	Life Cycle Method like ComponentDidMount(), ShouldComponentUpdate(), etc.
Hooks (Function)	Newer function approach using useState(), useEffect(), etc.

JSX	Syntax extension for writing HTML inside JavaScript.
Virtual Dom Engine	Written in JavaScript it updates UI efficiently by diffing element.

⇒ Why React Was Created

— Before React was Created,
Facebook was growing fast.

— Millions of people were using
it daily to Like posts,
Write Comments, Receive notification,
Chat in real time.

— That time Facebook was built
using PHP and traditional
JavaScript / JQuery.

— PHP and traditional JavaScript worked well in the early Day, but as Facebook became more Dynamic and interactive major problems started appearing

— Every Time Something Changed or update (like a message or a post, Commenting on a photo, Receiving a notification) the entire web page reloaded just for that small change!

— Because PHP and traditional JavaScript re-rendered the whole page not just the changed part.

⇒ For Example

— Let say you're scrolling Facebook in 2011. you see a post by your friend and you click "Like" on it.

— The Browser Send the request to update that one Like.

— The entire page Reload just to update that one Like.

— This felt slow, frustrating and use more internet Data.

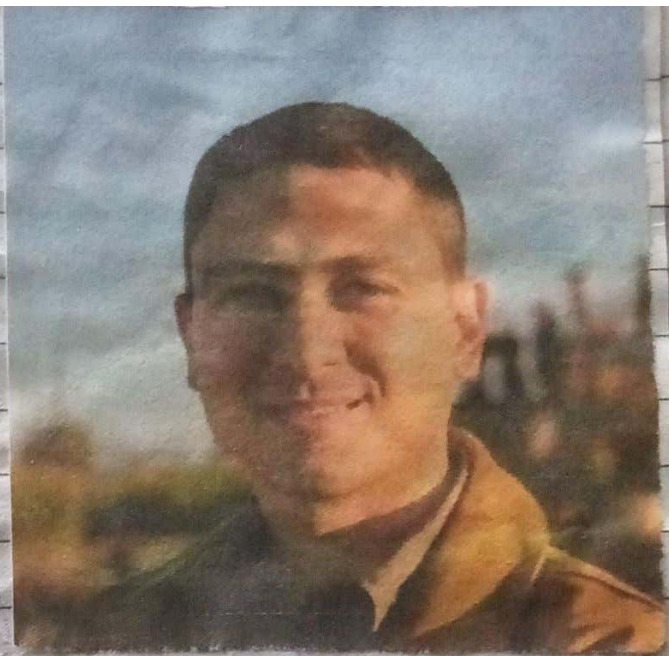
⇒ Who Created React?

— React was Created by Jordan Walke a Software engineer at face book. in 2011.

— He was Working on the news feed backend — the System that Shows you posts from friends, pages and groups.

— His Job was to fetch and manage Data from Facebook's Server and display it to user in real-time.

— As Facebook grew the news feed became more Complex.



Jordan Walke

— Users were liking, commenting and scrolling through lots of posts.

— The Backend had to send new Data properly.

— But the frontend (User Interface) wasn't ready to handle the smoothly.

— Every time the User clicked Like, Comment etc → The whole page reloaded.

— This Caused Slow performance,
Bad User Experience, Difficult
Code to maintain, No Code
Reuse.

— The Jordan think why are
we refreshing the entire
UI when only one small
part changes?

— Then He got an Idea What
if we just update only
the parts that actually
changed on the screen.

— He Realized that Directly
Working with the Real Dom
was Slow and inefficient.

— So he thought of creating
something faster and
Smarter!

— Instead of updating the real Dom every time, Jordan built something called the Virtual Dom.

— A lightweight copy of the real Dom that stores in memory.

— The Virtual Dom is a light weight JavaScript object that copy the structure of Real Dom.

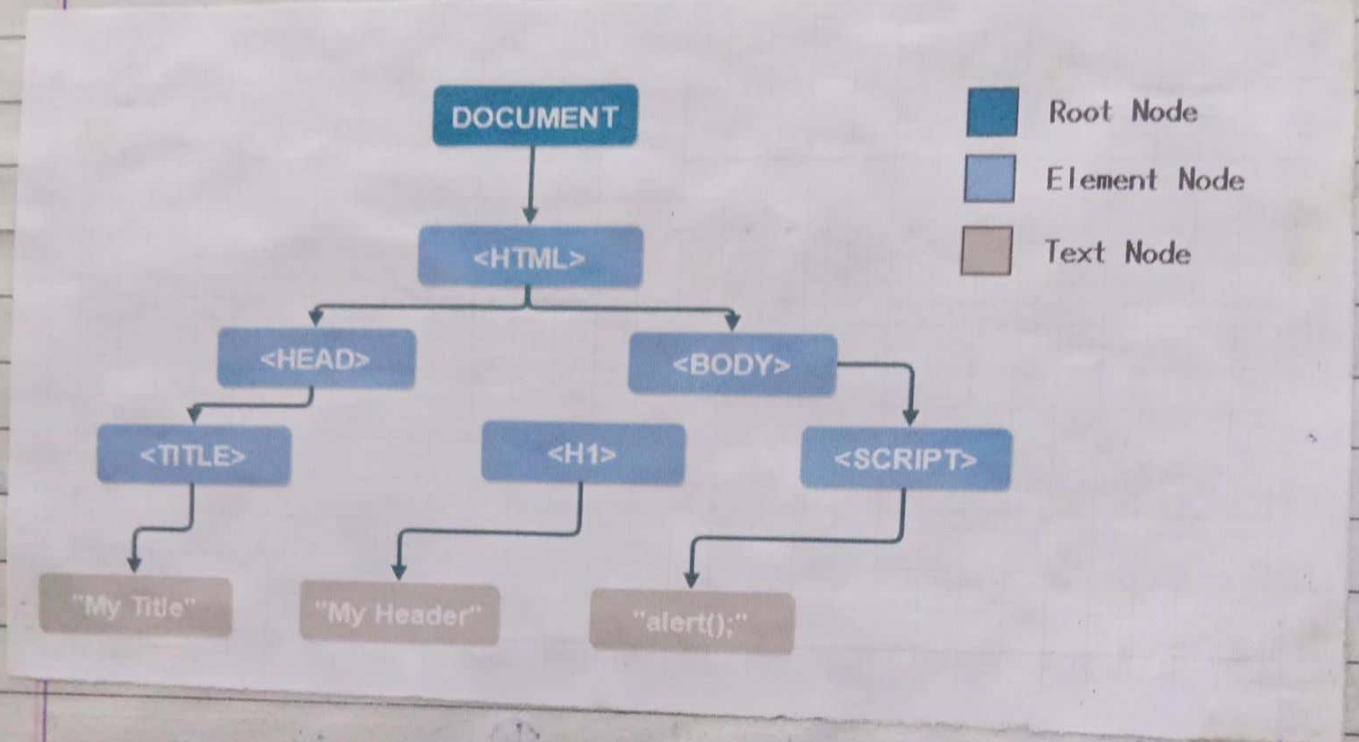
* Real Dom Vs Virtual Dom.

⇒ What is the DOM

— DOM stands for Document Object Model.

— It's a tree like structure created by the browser to represent your HTML.

Dom



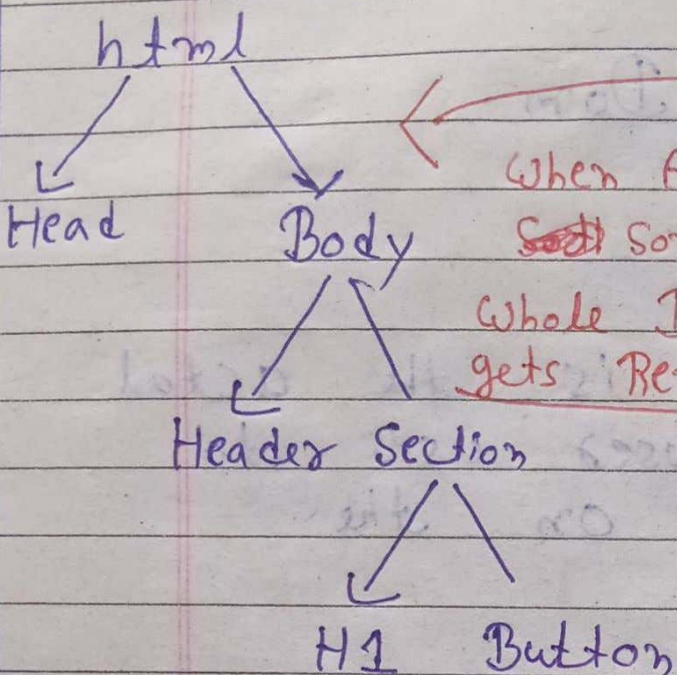
— Dom ~~to~~ turns your HTML into a tree like structure. So JavaScript can easily find and update any part of the page.

* What is Real Dom.

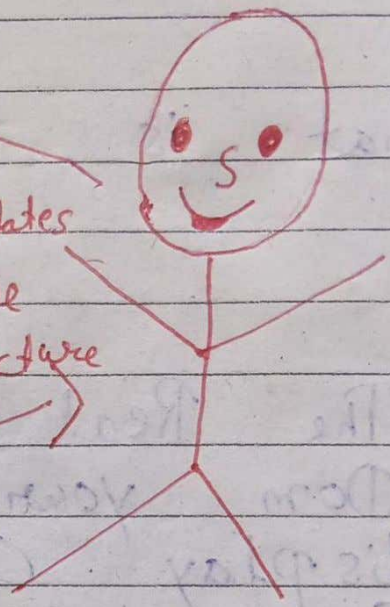
- The Real DOM is the actual Dom your browser uses to display Content on the Screen.
- When you make Changes using JavaScript or JQuery the whole DOM is re-render or recalculated, which slows performance.
- When you open a website the browser reads your HTML and build a tree-like Structure called the DOM tree.
- Every tag (like `<div>`, `<p>`, `<button>`) becomes a node in that tree.

Abhishek
~~Abhishek~~

Madam
Date _____
Page _____



When Abhishek updates
~~some~~ something the
whole DOM Structure
gets 'Rendered'.



— Met Abhishek a web Developer
He Create a Basic web
page:

— Now he wants to change
the `<h1>` inside the section.

— He Write this JavaScript

```
document.querySelector("Section h1")  
.innerText = "Hello Abhishek";
```


— Only that `<h1>` text inside `<section>` will change. The Browser scans the entire Dom tree again ~~and~~ and Re-Render or rebuilt the entire Structure.

— So even if Abhishek just want to update a few words in `<h1>` the Browser performs a costly and slow update process behind the scenes.

⇒ How Real DOM Works

- ① Browser Reads your HTML and Build the DOM Tree.
- ② If you Change Something
- ③ Browser Re-Render the whole DOM Even though only the `<H1>` changed the browser checks the entire tree - `<body>`, `<header>`, `<footer>` - again.

④ It recalculates Styles and layout

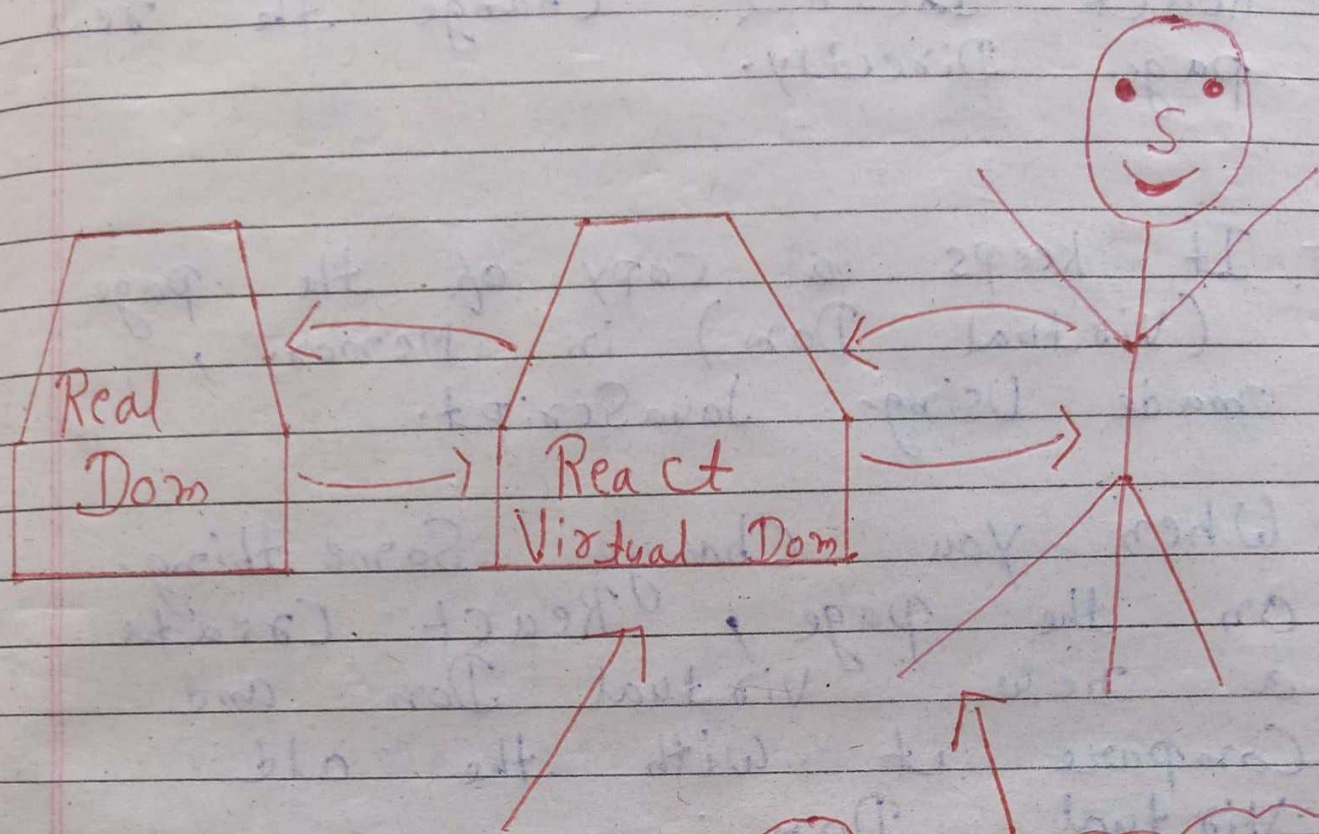
⑤ It Update the Screen even for part that didn't change.

* What is Virtual DOM?

— Virtual Dom (VDOM) is a copy of the Real DOM that lives in memory, not in the browser.

— Virtual Dom is not provided by the Browser, it's created by libraries like React.

— React Uses it to make things faster.



Copy
of

Real Dom

Instead of updating
the real Dom Directly.
React Update the copy
of Real Dom called
the Virtual Dom. It
Compare Changes and
Update only that part
in Real Dom.

- When you Click a Button, type in a box or Scroll the page - you are using the Real Dom.
- This is What the browser Shows you on the Screen.

— React doesn't change the real page directly.

— It keeps a copy of the page (Virtual Dom) in memory, made using JavaScript.

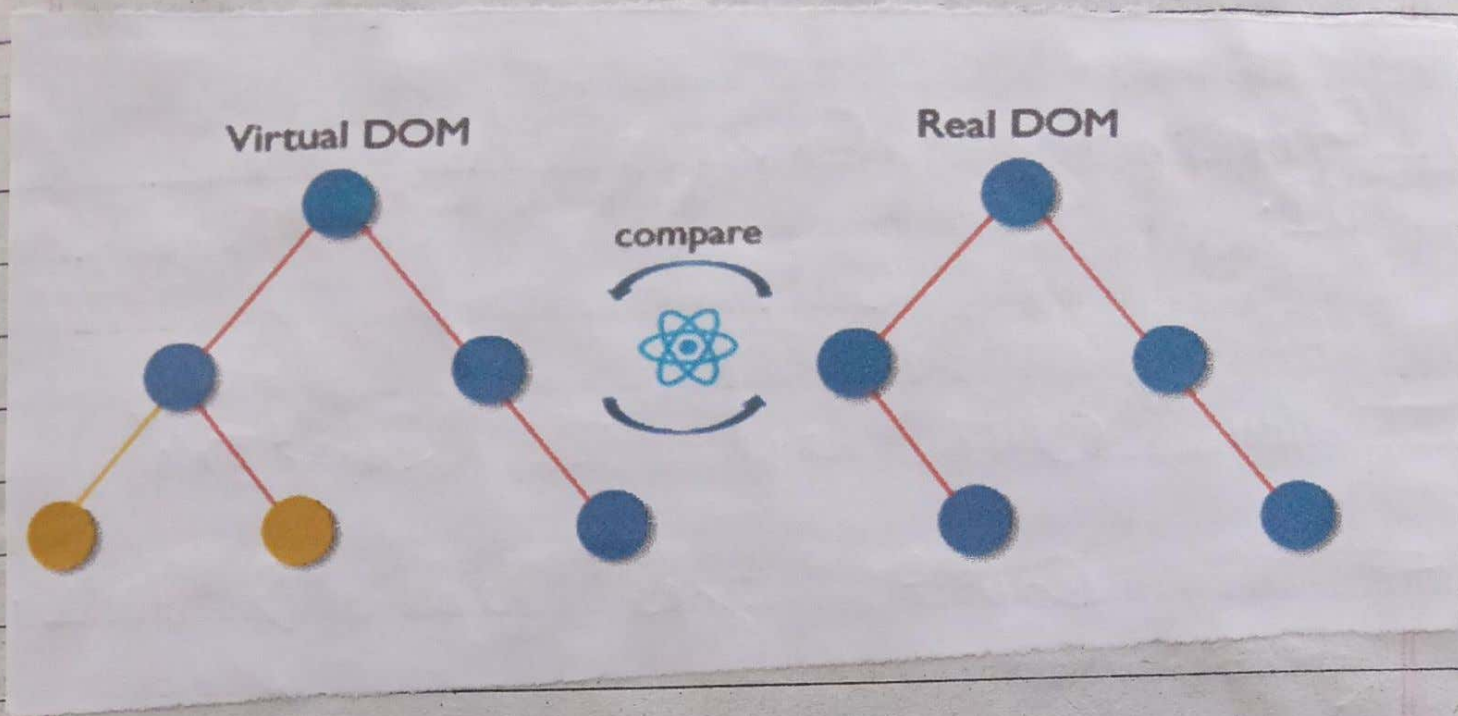
— When you change something on the page, React creates a new Virtual Dom and compares it with the old Virtual Dom.

— This process is called Diffing.

— React checks what has changed? (Maybe just a button, a heading or a comment box).

— Once React finds the difference, it only updates that part in the Real Dom, not the whole page.

— This makes updates faster, smoother, and less costly than using Real Dom.



=> How Virtual DOM Works

① Initial Render

- When your React app loads, React creates
- The Real DOM (rendered in the browser) and Virtual DOM (a JavaScript object looks like the Real DOM)
- React converts this Virtual DOM into Real DOM and shows it in the Browser.

② Some thing Changes in the UI.

— You Click the "Add Button."

— The Count goes from 0 to 1.

③ New Virtual DOM Created

— React Create a new Copy¹ of the Virtual Dom with Count 1.

④ Virtual DOM Compared (Diffing)

— React Compares Old Virtual DOM with the new one.

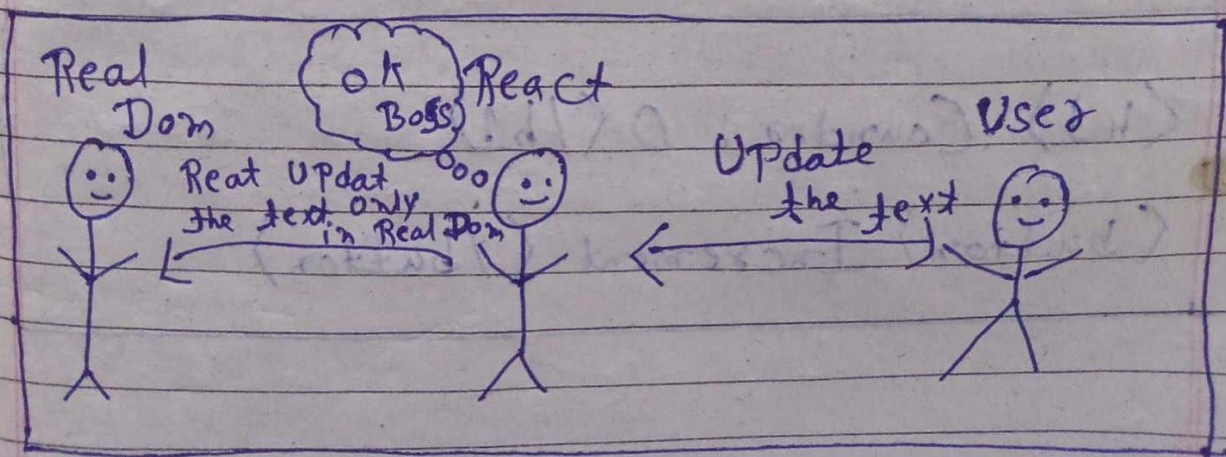
— This is Called the Diffing Algorithm.

⑤ React Find the Changes:

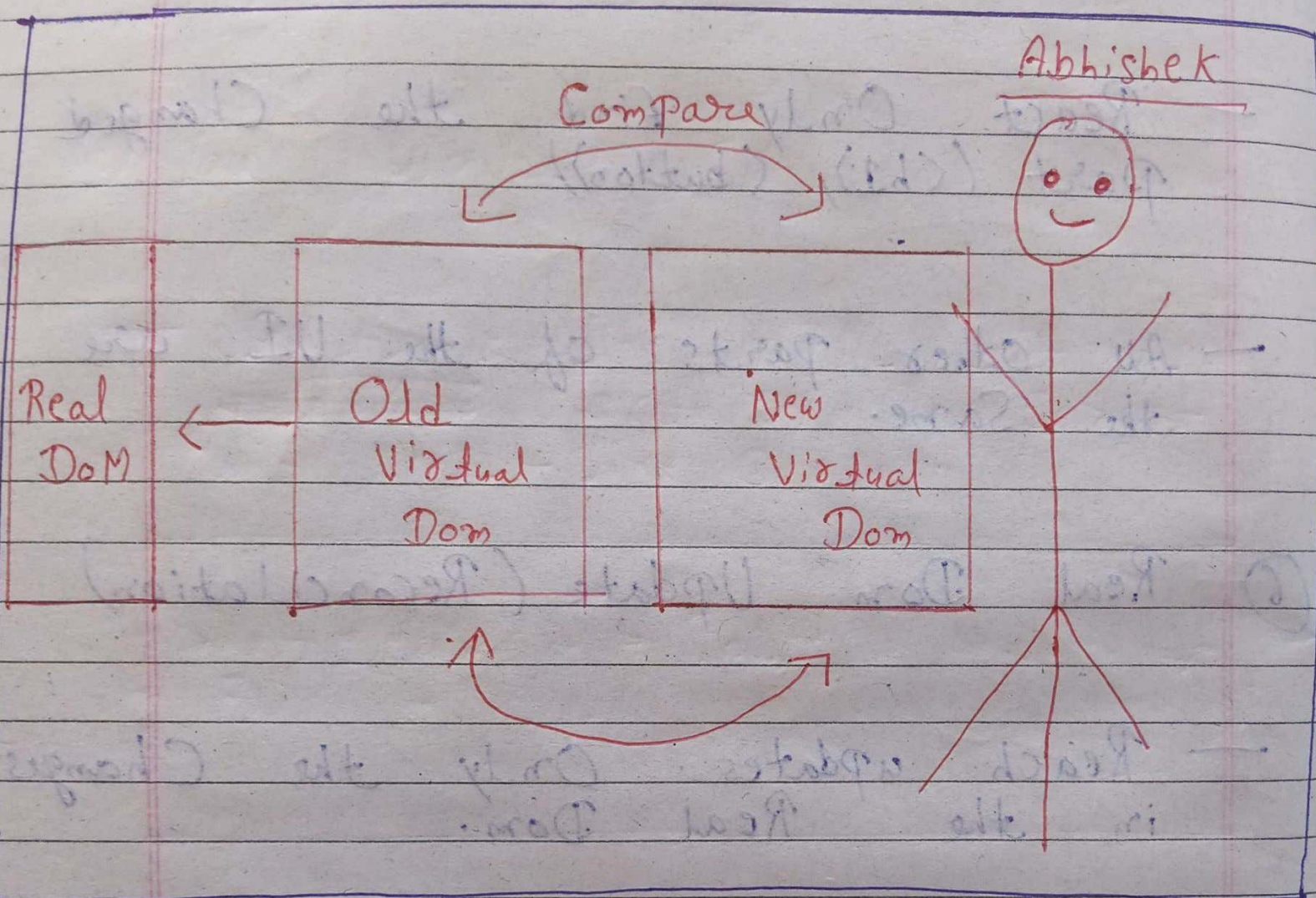
- React Only find the Changed part (<h1>, <button>)
- All other parts of the UI are the Same.

⑥ Real Dom Update (Reconciliation)

- React updates Only the Changes in the Real Dom.
- No Reload, no repaint of full Page, just a small smart update.



⇒ Abhishek Example



— Abhishek is a web Developer.
He Built a Simple React app that Shows a Counter.

```
<h1>Counter: 0</h1>
```

```
<button>Increment</button>
```


— Abhishek Click the Increment button.

— The Counter goes from 0 to 1.

— React creates a new Virtual Dom with this updated Content.

<h1> Counter : 1 </h1>

— React Compare the new Virtual DOM with the previous Virtual DOM.

— It finds that only the text in <h1> Changed.

— React updates Only the <h1> in the real DOM, nothing else.

=> How React Works

① You Write JSX

- JSX looks like HTML, but it's ~~but it's~~ actually JavaScript with XML-like Syntax.

```
const element = <h1>Hello World </h1>
```

- This is Not Valid JavaScript.
The browser can't understand it directly.

② Babel Converts JSX to JavaScript

- Babel is a tool that translates JSX into JavaScript.

// Babel converts the JSX above into this.

```
const element = React.createElement("h1", null, "Hello");
```

— Now it's valid JavaScript that the browser understands.

③ React Creates "a Virtual Dom"

— React uses `React.createElement()` to build a Virtual DOM (a light weight JS object that mimics the real DOM structure in memory)

```
Virtual DOM = {  
  type: "h1",  
  props: {  
    children: "Hello World"  
  }  
}
```


— This is stored in memory not shown on the screen yet.

④ React DOM Renders it to the Real DOM

— React uses `ReactDOM.createRoot()` and `.render` to display the content in your browser.

```
ReactDOM.createRoot(document.getElementById("root")).render(element)
```

— Now you see Hello World on the screen.

⑤ When Data Changes, React Does Re-rendering.

— When a state or prop changes (like a user types or clicks a button).

— React creates a new Virtual

— Compares it with the old Virtual DOM

— Finds the changes.

— Updates only the changed part in the real DOM.

Chapter - 1 Practice Set

* Short Answer

Q1:- Why was React Created?

Q2:- Who Created React and Where?

Q3:- What is the main purpose of React?

Q4:- What is the difference between React and traditional JS libraries like JQuery?

Q5:- What is Virtual Dom?

Q6:- What is React Dom and how is it different from React?

Q7:- What problem did Facebook face before React?

Q8:- How does React improve performance?

Q9:- What does React.createElement() do?

Q10:- What is JavaScript Library?

* Fill in the Blanks

Q1:- React is a JavaScript used to build UI.

Q2:- React was Created by _____ at Facebook.

Q3:- React uses _____ DOM to update only the changed parts.

Q4:- ~~The~~ The Real Dom is _____ to manipulate directly.

Q5:- React DOM.render() connects React components to the _____ DOM.

Q6:- Before React, Facebook used _____
and JQuery.

Q7:- The process of Comparing
old and new Virtual Dom
is called _____.

Q8:- The process of updating the
real DOM after diffing
is _____.

Q9:- _____ is used to Convert
JSX into regular JavaScript.

Q10:- React application are made up
of _____ Components.

* Multiple Choice Question

Q1:- What is React?

(a) A backend library ☐ (b) A CSS framework ☐

(c) A JavaScript library for UI ☐

(d) A Data Base ☐

Q2:- What is the main reason React is fast?

(a) Backend Rendering ☐

(b) Server Caching ☐

(c) Virtual DOM ☐

(d) AJAX ☐

Q3:- JSX Stands for

(a) JavaScript XML ☐

(b) Java Source Extension ☐

(c) Java Styled XML ☐

(d) JavaScript XHTML ☐

Q4:- React was originally built to improve

(a) Data fetching ☐

(b) Page load SEO ☐

(c) User Interface performance ☐

(d) Image rendering ☐

Q5:- Which of these is Not a ~~feature~~ feature of React?

(a) Virtual DOM ☐

(b) Component Based Architecture ☐

(c) Built in DataBase ☐

(d) JSX ☐

Q6:- React DOM is used for

(a) Styling Components ☐

(b) Running backend Code ☐

(c) Rendering to the DOM ☐

(d) Debugging ☐

Q7:- What does React use to detect changes in UI?

(a) Shadow DOM ☐

(b) Real DOM ☐

(c) DOM observers ☐

(d) Virtual DOM ☐

Q8:- Which tool converts JSX to browser readable JS?

(a) Web pack ☐

(b) Babel ☐

(c) NPM ☐

(d) VITE ☐

Q9:- Which one is fast for large UI updates?

(a) Real DOM ☐

(b) Virtual DOM ☐

Q10 :- What happens after Virtual DOM diffing?

- (a) Repainting whole UI ☐
- (b) Rebuilding entire HTML ☐
- (c) Reconciliation to real DOM ☐
- (d) AJAX Reload ☐

* Long Answer

Q1 :- What is the difference between real DOM and Virtual DOM?

Q2 :- Can the Virtual DOM be accessed directly via browser DevTools?

Q3 :- What makes React "declarative"?

Q4 :- What is a SPA (Single Page Application)?

Q5:- Why not use real DOM directly for large apps?

Q6:- What is "reconciliation" in React?

Q7:- Is Virtual DOM part of JavaScript.

Q8:- What's the role of Babel in React?

Q9:- What's the first method called in React to render UI on screen?