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Computer Science Class 9 Notes

Chapter 8

Web Development with HTML, CSS and JavaScript

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Chapter 8: Web Development with HTML, CSS and JavaScript

Web development is the process of creating websites and web applications using various programming languages and tools to design, build, and maintain them. This chapter covers the three main components of web development — front-end, back-end, and full-stack development — before diving into HTML (Hyper Text Markup Language), the standard language used to structure web page content, and CSS (Cascading Style Sheets), used to style and visually enhance that content.

The chapter walks through HTML's basic document structure and tags, creating content with headings, paragraphs, links, images, lists, tables, and comments, then covers CSS styling methods (inline, internal, external), fonts, colors, backgrounds, layouts (Grid, Flexbox, positioning), and animations/transitions. It closes with an introduction to JavaScript — variables, data types, functions, event handling, and interactive elements — along with essential testing and debugging techniques for web development.

Learning Objectives

- Understand the three main components of web development: front-end, back-end, and full-stack
- Apply HTML tags appropriately to create the basic structure of a web page
- Add text, images, links, lists, and tables to a web page using HTML
- Style HTML elements using CSS, including fonts, colors, backgrounds, and layouts
- Integrate CSS into HTML using inline, internal, and external methods
- Add simple animations and transitions to a web page using CSS
- Understand JavaScript syntax, variables, data types, and functions
- Handle events and user input with JavaScript to create interactive web pages

Key Concepts

8.1 Components of Web Development

Web development is the process of creating websites and web applications, using various programming languages and tools to design, build, and maintain them. It has three main components. Front-end Development focuses on what users see and interact with on a website, built using HTML (which structures content like headings, paragraphs, images, and links), CSS (which styles content, changing colors, fonts, and layout), and JavaScript (which adds interactivity, enabling forms, animations, and games).

Back-end Development manages the behind-the-scenes functionality of a website, including web servers (computers that store and deliver web pages to users), databases (which store and manage data like user information and content), and back-end programming languages like PHP, Python, and Ruby (which handle tasks such as processing forms and managing user logins). Full-Stack Development combines both: a full-stack developer creates the user interface for the front-end and also handles authentication and database interaction for the back-end — for example, building a complete login system from start to finish. The first website was created by Tim Berners-Lee in 1991 and is still accessible today.

8.2 Getting Started with HTML

HTML (Hyper Text Markup Language) is the standard language used to create web pages — think of HTML tags as building blocks, like LEGO pieces coming together to build a structure. HTML was created by Tim Berners-Lee in 1991 and has evolved through several major versions: HTML 1.0 (1991, simple text and links), HTML 2.0 (1995, more tags), HTML 3.2 (1997, tables and applets), HTML 4.0 (1997, multimedia support), HTML 4.01 (1999, minor improvements), and HTML5 (2014, the current version with better multimedia, graphics, and interactivity).

To start creating websites, two basic tools are needed: a text editor (such as Notepad++, Sublime Text, or Visual Studio Code) to write HTML code, and a web browser (such as Google Chrome, Mozilla Firefox, or Microsoft Edge) to view and

test the HTML files. A basic 'Hello, World!' HTML application is created by writing HTML code in a text editor, saving the file with a .html extension, and then opening it in a web browser to view the result.

8.3 HTML Basic Structure and Tags

A structured HTML document uses several essential elements: <!DOCTYPE html> tells the browser this is an HTML5 document; <html> is the root element of the page; <head> contains meta-information like the title; <title> sets the title shown in the browser tab; and <body> contains the visible content of the page, including elements like <h1> for a large heading and for a paragraph. Properly nested and well-organized elements help browsers interpret content correctly and ensure the page displays as intended.

The elements that make up an HTML document are called tags, and they are categorized into two types based on structure: Paired tags come in pairs, with an opening tag and a closing tag (e.g., ...), while Unpaired tags (also called self-closing tags) do not need a closing tag, such as <img> and
.

8.4 Creating Content with HTML

HTML content is the main information on a web page that users read and interact with, including text, images, videos, links, and other elements. Headings (<h1> to <h6>) define the structure and hierarchy of content — <h1> is used for the main title, while <h2> to <h6> are used for subheadings in decreasing importance; proper heading use also improves Search Engine Optimization (SEO) by helping search engines understand a page's structure. Paragraphs, created with the tag, organize text into readable blocks with space above and below.

Links, created with the <a> tag, connect one web page to another (including special 'mailto:' links that open an email program). Images, added using the <img> tag, make pages more attractive and require alternate text (alt) for accessibility. Lists can be Unordered (bulleted, using <ul> and <li>) or Ordered (numbered, using <ol> and <li>). Tables display data in a structured grid using <table>, and HTML Comments (written as <!-- comment -->) explain code, leave reminders, or temporarily disable code without being rendered by the browser.

8.5 Styling with CSS

CSS (Cascading Style Sheets) improves the visual appearance of web pages and user experience by controlling colors, fonts, layout, and overall design, separating content from presentation. A CSS rule consists of a selector (which specifies which HTML elements the styles apply to) and one or more declarations (property-value pairs), following the format: selector { property: value; } — for example, h1 { color: red; font-size: 24px; } sets all headings to red text at 24 pixels.

CSS can be integrated into HTML in three primary ways. Inline Styles add CSS directly to an individual element using the style attribute (e.g., <h1 style='color: blue;'>), which is quick but can clutter code. Internal Styles are included in the <head> section using a <style> tag, defining styles for the entire page. External Styles — the most efficient method for larger projects — use a separate CSS file linked via a <link> tag in the <head> section (e.g., <link rel='stylesheet' href='styles.css'>), keeping HTML clean and allowing easy updates across multiple pages.

8.6 Fonts, Colors, Backgrounds, and Layouts

CSS can style fonts using properties like font-family (e.g., Arial, sans-serif), font-size, font-weight (e.g., bold), and font-style (e.g., italic). Backgrounds can be styled using background-color (solid colors), background-image (an image as background), background-repeat (tiling small images), background-position (placing the image, e.g., center), and background-size (e.g., cover, to fill the entire page).

CSS also provides several tools for creating layouts. and <section> elements group content together for styling and positioning. CSS Grid arranges items into rows and columns using properties like display: grid and grid-template-columns. CSS Flexbox arranges items flexibly in a row or column using display: flex and justify-content. Positioning properties (position, top, left, right, bottom) place elements exactly where needed. Margins create space outside an element, while padding creates space inside it — together these make up the CSS box model.

8.7 CSS Animations, Transitions, and Introduction to JavaScript

CSS animations add movement and visual effects to a page. Keyframes (defined with @keyframes) specify the start and end points (and any intermediate steps) of an animation, such as changing a background color from red to yellow. The animation is then applied to an element using properties like animation-name and animation-duration, with additional control via animation-iteration-count (e.g., infinite) and animation-timing-function (e.g., linear). CSS Transitions make style changes smooth and gradual (rather than instant) by defining an initial style and then a changed style (commonly using the :hover state), specified with the transition property (e.g., transition: background-color 2s, width 2s).

JavaScript is a programming language used to make websites interactive and engaging, enabling animations, games, and responsive features that react to clicks or mouse movement — it was created in just 10 days by Brendan Eich in 1995. JavaScript code is placed inside <script> tags, for example alert('Hello!') displays a pop-up message. Variables store data using the var, let, or const keyword (e.g., var name = 'Athar';). JavaScript supports several core data types: String (text, e.g., 'Athar'), Number (integers and decimals, e.g., 15), Boolean (true or false), and Array (a collection of values, e.g., [90, 85, 88]).

8.8 JavaScript Functions, Events, and Debugging

Functions allow code to be reused to perform specific tasks, like mini-programs that can be run whenever needed. A simple function is declared with function greet() { alert('Hello!'); } and then called with greet();. Functions can also take parameters — for example, function addNumbers(a, b) { var sum = a + b; alert('The sum is: ' + sum); } takes two input values and uses them inside the function. JavaScript makes pages interactive by handling events — actions that occur when a user interacts with a page. Common HTML events include onclick (element clicked), onload (page/image finished loading), onmouseover (mouse moves over an element), onmouseout (mouse moves away), and onkeyup (a key is released). An event handler is a function that runs when a specific event occurs, such as calling a function when a button is clicked using the onclick attribute.

Testing and debugging are essential steps in web development to find and fix errors. Debugging techniques include using browser developer tools (e.g., console.log() to display debug messages and set breakpoints), carefully reading error messages, and checking code line-by-line for issues like missing semicolons or unmatched braces. Common issues include broken links, incorrect HTML structure (unclosed or improperly nested tags), and CSS issues (incorrect selectors or typos). Testing strategies include cross-browser testing (checking the page in Chrome, Firefox, Edge, etc.), responsive design testing (checking how the page looks on different screen sizes), and user testing (getting feedback from real users).

Important Definitions

What is HTML?

HyperText Markup Language, the standard language used to create and structure the content of web pages using tags.

What is CSS?

Cascading Style Sheets, a language used to style and visually enhance HTML content by controlling colors, fonts, layout, and design.

What is JavaScript?

A programming language used to make websites interactive and engaging, enabling features like animations, forms, and responsive user interactions.

What is front-end development?

The part of web development focused on what users see and interact with on a website, built using HTML, CSS, and JavaScript.

What is back-end development?

The part of web development that manages a website's behind-the-scenes functionality, including web servers, databases, and application logic.

What is a CSS selector?

The part of a CSS rule that specifies which HTML elements the accompanying style declarations will apply to.

What is an HTML tag?

An element that makes up an HTML document and defines the structure and content of a web page, either paired (with opening/closing tags) or unpaired (self-closing).

What is an event in web development?

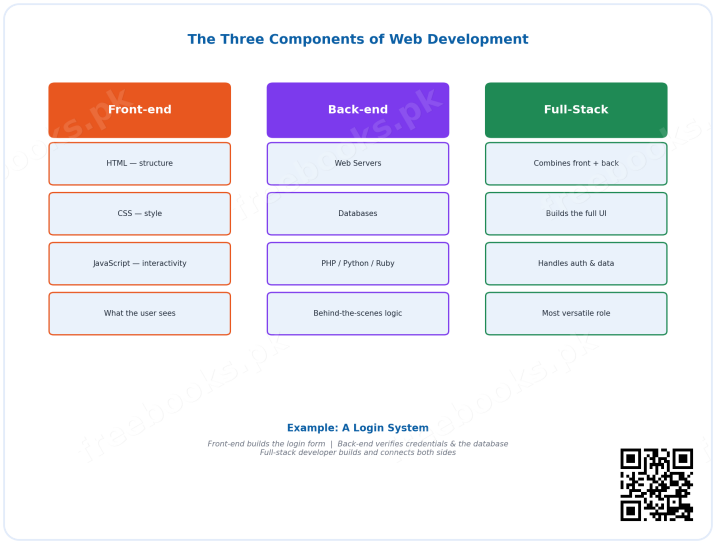
An action that occurs when a user interacts with a webpage, such as clicking a button, moving the mouse, or pressing a key, which can trigger JavaScript code.

Key Facts and Relations

Topic	Key Fact / Relation
3 components of web development	Front-end Development, Back-end Development, Full-Stack Development
5 essential HTML structure tags	<!DOCTYPE html>, <html>, <head>, <title>, <body>
2 types of HTML tags	Paired tags (e.g., ...) and Unpaired/self-closing tags (e.g., <img>,)
3 ways to integrate CSS	Inline (style attribute), Internal (<style> in <head>), External (linked .css file)
CSS box model (outside-in)	Margin, Border, Padding, Content
3 JS variable keywords	var, let, const
4 core JS data types	String, Number, Boolean, Array
5 common HTML events	onclick, onload, onmouseover, onmouseout, onkeyup

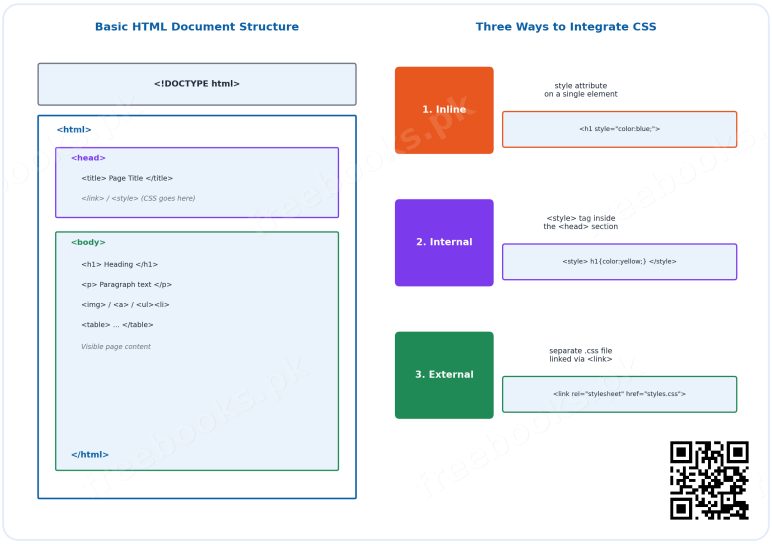
Diagrams

The Three Components of Web Development: A diagram comparing front-end, back-end, and full-stack development, showing the key technologies used in each



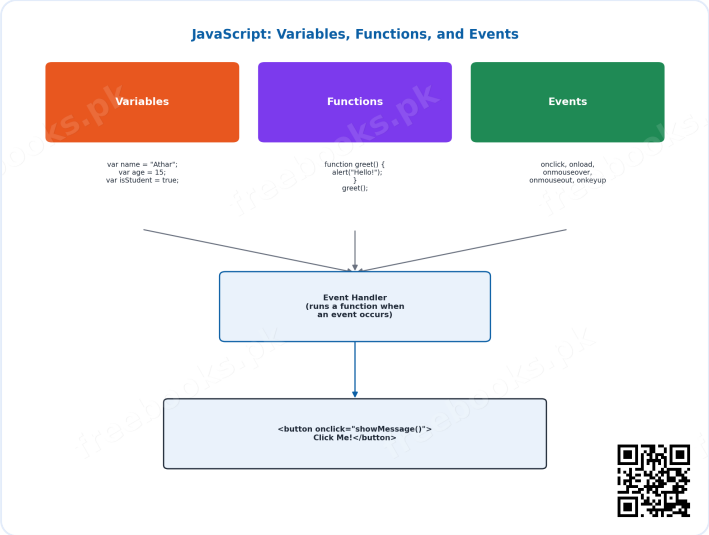
The Three Components of Web Development

HTML Document Structure and CSS Integration: A nested diagram of the basic HTML document structure (DOCTYPE, html, head, body) alongside the three ways to integrate CSS into HTML



HTML Document Structure and CSS Integration

JavaScript: Variables, Functions, and Events: A diagram showing how JavaScript variables, functions, and event handlers work together to make a web page interactive



JavaScript: Variables, Functions, and Events

Short Questions & Answers

What is the purpose of the <head> tag in HTML?

The <head> tag contains meta-information about the HTML document, such as its title, character encoding, and links to CSS files, which is not directly displayed as page content.

Explain the difference between an ordered list and an unordered list in HTML.

An ordered list (<ol>) displays items with sequential numbers, while an unordered list (<ul>) displays items with bullet points; both use the <li> tag for individual list items.

What are the three ways to apply CSS to an HTML document?

CSS can be applied using inline styles (the style attribute on an individual element), internal styles (a <style> tag in the <head> section), or external styles (a separate .css file linked with a <link> tag).

How can you include JavaScript in an HTML file?

JavaScript can be included directly within a <script> tag in the HTML document, or linked from an external file using <script src='script.js'></script>.

Describe the syntax for creating a hyperlink in HTML.

A hyperlink is created using the <a> tag with an href attribute specifying the destination, for example: Visit Example.com.

What is the function of the tag in HTML?

The tag is a generic container used to group HTML content together so it can be styled or positioned as a unit using CSS.

What is the use of the <table> tag in HTML?

The <table> tag is used to display data in a structured grid format of rows and columns, using <tr> for rows, <td> for data cells, and <th> for header cells.

Explain the box model in CSS.

The CSS box model describes how every HTML element is structured as nested boxes: the content in the center, surrounded by padding (space inside the border), then a border, and finally margin (space outside the border, between elements).

Long Questions & Answers

Discuss the fundamental differences between HTML, CSS, and JavaScript in the context of web development.

HTML, CSS, and JavaScript together form the three foundational core technologies that are used to build essentially all of the various different websites that exist across the modern World Wide Web, and even though these three particular technologies are generally very closely and tightly integrated together in practice when actually building any given real-world website, each one of these three technologies nevertheless still serves its own particular distinct underlying purpose and consequently plays its own particular distinct specific role within the overall combined process of web development as a whole. HTML, which stands for HyperText Markup Language, is specifically and primarily responsible for structuring the actual underlying content of a given web page, in much the same general way that a skeleton provides the basic underlying structural framework for a human body; HTML makes use of a wide range of different specific tags in order to properly define various different distinct types of content elements, including headings, paragraphs, images, links, lists, and tables, and without HTML a web browser would ultimately have no way of correctly knowing how the various different individual pieces of a page's overall content should actually be structured, organized, or properly displayed to the end user. CSS, which stands for Cascading Style Sheets, is instead specifically

and primarily responsible for controlling the overall visual appearance and specific presentation of that same underlying HTML content, in much the same general way that skin, clothing, and makeup determine the outward visual appearance of a human body; CSS allows a given web developer to properly control numerous different visual aspects of a page, including colors, fonts, spacing, layout, and various different animations, all while still keeping the underlying page content itself, as defined in the separate HTML, kept entirely and cleanly separate from its own particular visual presentation. JavaScript, meanwhile, is instead specifically and primarily responsible for adding genuine interactivity and dynamic behavior to an otherwise static web page, in much the same general way that a nervous system allows a human body to actually sense things and subsequently respond to them; JavaScript allows a given web developer to properly respond to various different specific user actions, such as button clicks, form submissions, or mouse movements, and dynamically update the page's content or overall appearance in direct response to those particular actions, all without requiring the entire page to be completely reloaded from scratch. Taken together as a complete, unified whole, these three particular core technologies working together in combination allow web developers to properly build websites that are simultaneously well-structured (through HTML), visually appealing (through CSS), and genuinely interactive (through JavaScript), which together represent the three essential defining qualities of any successful, well-built modern website.

Explain the process of creating a responsive web page using CSS, with the help of examples and explanations.

Creating a properly responsive web page essentially means specifically designing that particular web page in such a way that it will continue to display correctly, and will also continue to remain fully and comfortably usable, across a genuinely wide range of different possible screen sizes and different specific devices, ranging all the way from large desktop computer monitors down through to considerably smaller mobile phone screens, and CSS specifically provides web developers with several different particular tools and specific techniques that can be used together in order to properly achieve this particular kind of desired responsive behavior. One especially important foundational technique used for building responsive web pages involves the specific use of flexible, relative

layout tools such as CSS Flexbox and CSS Grid, rather than instead relying on more old-fashioned, rigid, fixed-pixel-based layouts; for example, a given CSS Flexbox container that has specifically been set to use the particular property declaration 'display: flex' together with 'justify-content: space-between' will automatically and dynamically rearrange and properly reflow its various individual child elements in direct response to the specific available width of the containing browser window, entirely without requiring the original web developer to have to manually specify a large number of separate individual fixed pixel widths for each different possible specific screen size in advance. A second especially important technique used for building responsive web pages involves the specific use of what are generally referred to as CSS media queries, which specifically allow a given web developer to apply certain particular sets of CSS styling rules only when certain particular defined conditions happen to actually be true, such as, for example, only whenever the overall available browser window width happens to actually be smaller than some specific defined threshold value, such as 600 pixels; through the use of a media query along these general lines, a given website's overall navigation menu, for instance, could then be specifically configured to automatically switch over from being displayed as a full, wide horizontal menu bar on larger desktop screens, over to instead being displayed as a considerably more compact, collapsed 'hamburger' style menu icon whenever it is instead being properly viewed on a considerably smaller mobile phone screen. A third especially important and closely related technique used for building responsive web pages involves the specific use of relative sizing units, such as percentages or the specific 'vw' (viewport width) and 'vh' (viewport height) units, rather than instead relying on fixed absolute pixel values, since elements that have specifically been sized using this kind of relative unit will then automatically and dynamically scale themselves in direct proportion to the size of the overall containing screen or browser window, rather than remaining permanently fixed at one single specific absolute pixel size regardless of the actual screen size being used. By properly and thoughtfully combining these several particular different complementary techniques together as a whole — namely flexible layout tools such as CSS Grid or CSS Flexbox, targeted conditional media queries, and relative proportional sizing units — a given web developer is ultimately then able to successfully create a single, unified web page that will nevertheless still continue to look genuinely good and

remain fully usable across an extremely wide overall range of different possible devices and different specific screen sizes, entirely without ever actually needing to build and separately maintain multiple entirely different, fully separate versions of that same underlying web page.

Write a JavaScript function that changes the background color of a web page when a button is clicked, and explain how it works.

In order to properly create a JavaScript function that will successfully change the overall background color of a given web page whenever a particular button on that page happens to actually be clicked by the user, a given web developer specifically needs to combine together three separate closely related components: first, an actual HTML button element that the user will actually be able to directly click on; second, a JavaScript function that contains the specific code needed to properly perform the desired background color change; and third, some specific mechanism used to properly connect that particular button to that particular function so that clicking the button will then correctly and reliably trigger the function to actually run. The complete required HTML markup for this particular example would specifically include a button element written as: <button onclick='changeColor()'>Change Background Color</button>, where the particular 'onclick' attribute used here specifically instructs the web browser to automatically call a specific JavaScript function named 'changeColor' as soon as that particular button is ever actually clicked by the user. The corresponding required JavaScript function itself would then specifically be written as: function changeColor() { document.body.style.backgroundColor = 'lightblue'; }, and breaking this particular function down further, the 'function changeColor()' portion specifically declares a brand new function named 'changeColor' that does not require any input parameters, while the single line of code contained within that function's own body, namely 'document.body.style.backgroundColor = "lightblue";', specifically works by first accessing the 'body' element of the overall current HTML document through use of the built-in 'document.body' object, then subsequently accessing that particular body element's own 'style' property (which specifically represents all of the various different CSS styling properties that are directly associated with that specific element), and finally specifically setting that particular style object's own 'backgroundColor' property equal to the specific value 'lightblue', which then in turn causes the visible

background color of the entire page to immediately and correctly change to a light blue color as soon as the function itself actually runs. When the specific button element is then actually clicked by the user, the web browser will automatically and correctly execute this particular JavaScript function in direct response, and the browser will then subsequently and correctly re-render the overall page with its now properly newly updated background color, all without ever actually needing to reload the entire page again from scratch — and this particular general technique of dynamically modifying element style properties directly through JavaScript in direct response to specific user-triggered events represents one of the most genuinely fundamental and most frequently used core techniques that is used throughout the whole of modern interactive web development.

Multiple Choice Questions (MCQs)

Which HTML tag is used to define the root element of an HTML page? (A) <body> (B) <head> (C) <html> (D) <title>

Correct answer: (C) <html>. The <html> tag is the root element that wraps all the content of an HTML page, including the <head> and <body> sections.

What does CSS stand for? (A) Cascading Style Sheets (B) Computer Style Sheets (C) Creative Style Sheets (D) Colorful Style Sheets

Correct answer: (A) Cascading Style Sheets. CSS stands for Cascading Style Sheets, the language used to style and format HTML content.

Which of the following tags is used to create a hyperlink in HTML? (A) <link> (B) <a> (C) <href> (D) <nav>

Correct answer: (B) <a>. The <a> (anchor) tag, combined with the href attribute, is used to create a hyperlink in HTML.

Which property is used to change the background color in CSS? (A) color (B) background-color (C) bgcolor (D) background

Correct answer: (B) background-color. The background-color property is used in CSS to set the background color of an element.

Which HTML attribute is used to define inline styles? (A) class (B) style (C) font (D) styles

Correct answer: (B) style. The style attribute is used to apply CSS styling directly to an individual HTML element (inline styling).

Which of the following is the correct syntax for a CSS rule? (A) selector {property: value;} (B) selector: {property=value;} (C) selector {property=value} (D) selector: {property: value;}

Correct answer: (A) selector {property: value;}. A CSS rule follows the format: selector { property: value; } — curly braces enclose declarations, and a colon separates property from value.

In JavaScript, which markup is used for single-line comments? (A) /* */ (B) // (C) <!-- --> (D) #

Correct answer: (B) //. JavaScript uses // for single-line comments and /* */ for multi-line comments.

How do you include JavaScript in an HTML document? (A) <script src='script.js'></script> (B) <java src='script.js'></java> (C) <js src='script.js'></js> (D) <code src='script.js'></code>

Correct answer: (A) <script src='script.js'></script>. JavaScript is included in an HTML document using the <script> tag, either with a src attribute pointing to an external file or with inline code.

Which HTML tag is used to create an unordered list? (A) (B) (C) (D) <list>

Correct answer: (B) . The <ul> tag creates an unordered (bulleted) list, with individual items defined using <li> tags.

**Which tag is used to display a horizontal line in HTML? (A)
 (B) <hr> (C) <line> (D) <hline>**

Correct answer: (B) <hr>. The <hr> tag is used to display a horizontal rule (line) that visually separates content on a web page.

Quick Revision Summary

- 3 components of web development: Front-end (HTML/CSS/JS), Back-end (server/database/language), Full-stack (both)
- HTML structure: <!DOCTYPE html>, <html>, <head>, <title>, <body>; tags are Paired ( ) or Unpaired (<img>)

- HTML content: Headings (h1-h6), Paragraphs (p), Links (a), Images (img), Lists (ul/ol/li), Tables (table/tr/td/th), Comments (<!-- -->)
- 3 ways to integrate CSS: Inline (style attribute), Internal (<style> in head), External (linked .css file)
- CSS box model (outside-in): Margin, Border, Padding, Content
- CSS layout tools: Grid (rows/columns), Flexbox (flexible row/column), Positioning (position/top/left)
- JavaScript basics: variables (var/let/const), 4 data types (String, Number, Boolean, Array), functions, events (onclick, onload, etc.)
- Debugging: browser dev tools + console.log(), reading error messages, checking code line-by-line

Exam Tips

- Remember the 3-layer analogy: HTML = skeleton (structure), CSS = skin/clothes (style), JavaScript = nervous system (interactivity)
- Paired vs unpaired tags: if content goes inside the tag, it needs a closing tag (text); if it's self-contained, it doesn't (<img>,
)
- For CSS integration questions, remember: Inline = fastest but messiest, External = cleanest for large sites
- CSS box model order from inside out: Content → Padding → Border → Margin
- JavaScript variables: use quotes for Strings, no quotes for Numbers and Booleans
- Common exam trap: onclick, onload, onmouseover are HTML event attributes that trigger JavaScript functions