



INFORMATION TECHNOLOGY

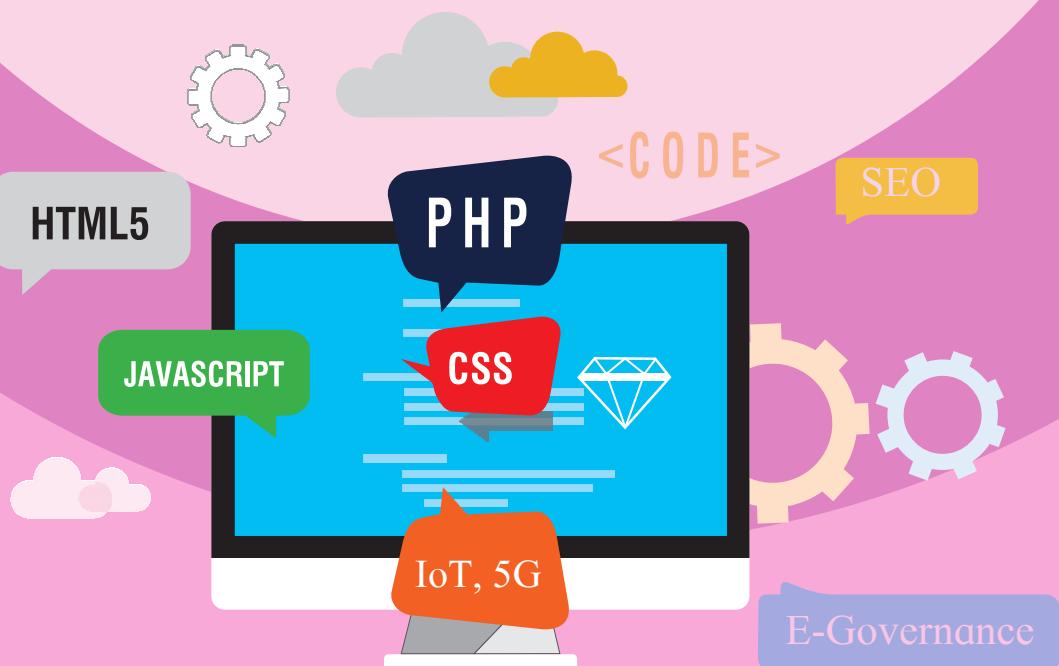
Standard Twelve
Science



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INFORMATION TECHNOLOGY

STANDARD - TWELVE (Science)



Maharashtra State Bureau of Textbook Production and
Curriculum Research, Pune.



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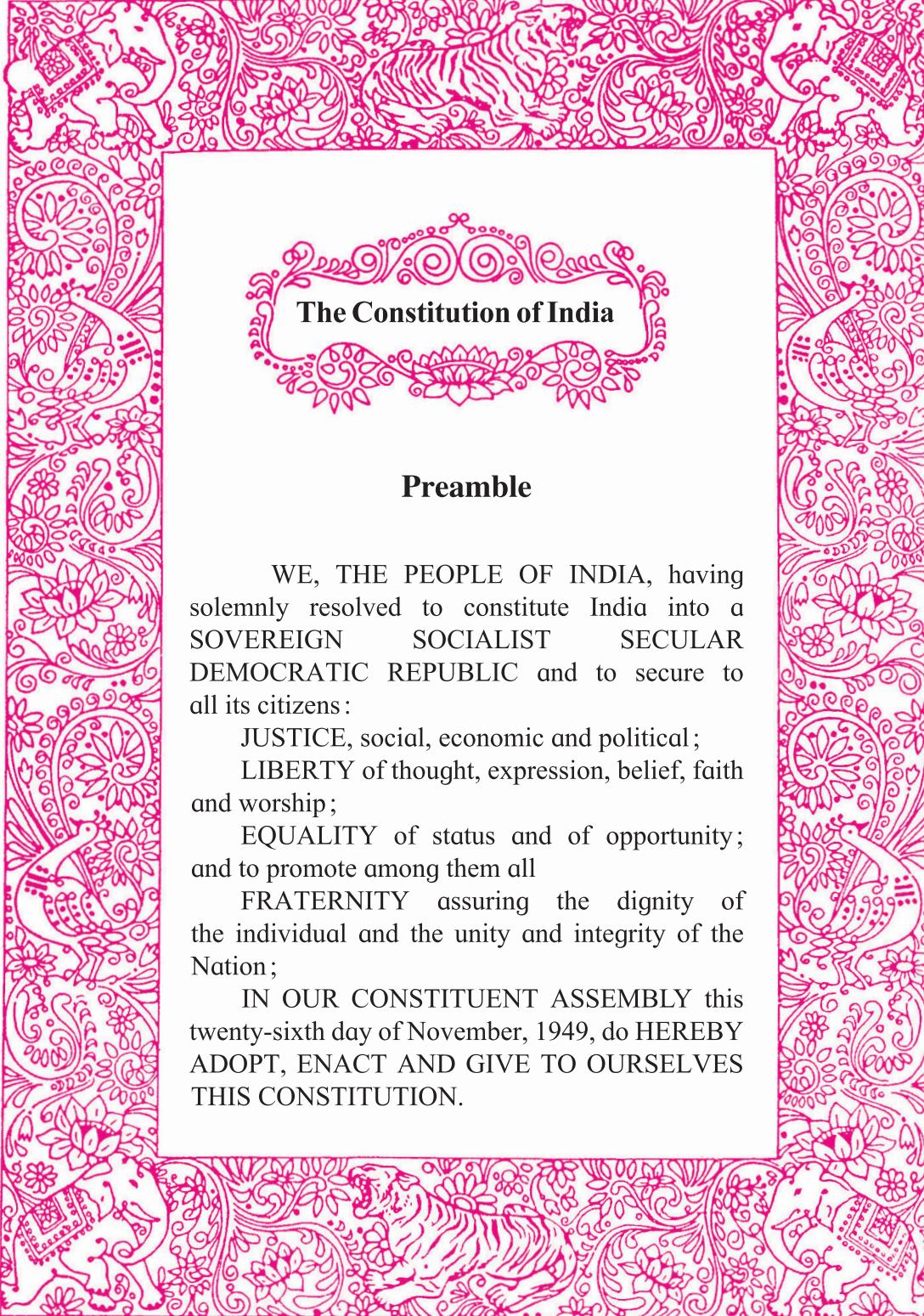
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The Constitution of India

Preamble

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a SOVEREIGN SOCIALIST SECULAR DEMOCRATIC REPUBLIC and to secure to all its citizens :

JUSTICE, social, economic and political ;

LIBERTY of thought, expression, belief, faith and worship ;

EQUALITY of status and of opportunity ; and to promote among them all

FRATERNITY assuring the dignity of the individual and the unity and integrity of the Nation ;

IN OUR CONSTITUENT ASSEMBLY this twenty-sixth day of November, 1949, do HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.

NATIONAL ANTHEM

Jana-gana-mana-adhināyaka jaya hē
Bhārata-bhāgya-vidhātā,

Panjāba-Sindhu-Gujarāta-Marāthā
Drāvida-Utkala-Banga

Vindhya-Himāchala-Yamunā-Gangā
uchchala-jaladhi-taranga

Tava subha nāmē jāgē, tava subha āsisa māgē,
gāhē tava jaya-gāthā,

Jana-gana-mangala-dāyaka jaya hē
Bhārata-bhāgya-vidhātā,

Jaya hē, Jaya hē, Jaya hē,
Jaya jaya jaya, jaya hē.

PLEDGE

India is my country. All Indians
are my brothers and sisters.

I love my country, and I am proud
of its rich and varied heritage. I shall
always strive to be worthy of it.

I shall give my parents, teachers
and all elders respect, and treat
everyone with courtesy.

To my country and my people,
I pledge my devotion. In their
well-being and prosperity alone lies
my happiness.

Foreword

Dear Students,

Congratulations to all of you for the successful completion of Std XI and welcome to the second year of Higher Secondary Education. The syllabus of Information Technology (**Science**) at Higher Secondary Level has been revised and implemented in view of the fact that computer is used currently as a tool for various applications, especially in the field of e-Banking, e-Commerce, e-Governance, etc. Higher studies and placements, at present, greatly demand human resources with adequate knowledge in computer applications and information technology.

The Information Technology aims to equip students the knowledge, skills and attitudes to become productive employees in the area of computer science and technology. In this course, you all will gain a perspective to become a successful entrepreneur in information Technology and allied sector. Scope of this textbook also provides you all with the foundation for higher studies. Information technology is one of the most significant growth catalysts for the Indian economy. I am sure after completion of HSC with IT, you will acquire skills and competence to enter in the upcoming job market.

In Class XI, the syllabus focused on the fundamentals of Computer, computer network, basics of website designing and some knowledge of database. Emphasis is also given to put a strong foundation to develop problem solving skills and create computer programs using JavaScript as a scripting language. You all are also familiar with web page designing and database concepts.

The syllabus of Class XII Information Technology (**Science**) is a continuation to that of Class XI. Hence the textbook designed in accordance with the syllabus, begins with some advance features of HTML5. It also has given vertical ladder to understand JavaScript thoroughly with loop statements. To become a full-fledged web developer with proper knowledge and understanding about server side scripting PHP with database connectivity is also an additional feature of this syllabus. Once you have developed a website it is necessary to optimize its ranking and therefore SEO is introduced in this book. One chapter is dedicated to new technologies like cloud computing, 5G, IoT and AI. The concepts such as E-commerce and E-Governance are the decisive concepts in today's world and knowledge about the same is must.

I hope this book will meet all the requirements for stepping to levels of higher education and pave the way to the peak of success. Each unit comprises of simple activities and demonstrations which can be done by you on your own.

It is sure if you carefully study the text and practice the laboratory exercises, you will develop confidence in working with website development, web hosting and analyzing, scripting and also update your knowledge with new and current technologies.



(Vivek Gosavi)

Director

Pune

Date : 21 February, 2020

Bharatiya Saur : 2 Phalgun 1941

Maharashtra State Bureau of Texbook
Production and Curriculum Research, Pune

For Teachers

Dear Teacher,

The subject Information Technology (**Science**) is an optional subject of the Higher Secondary Education. The content is developed in view of the fact that it should be useful to the students for their higher studies and they should be able to use computer as a tool. Besides, if somebody wishes a shift towards the IT field in higher education, the syllabus can cater to their needs. Although the field of IT continues to expand rapidly, it is not feasible to expand the size of the curriculum proportionately. As a result, the syllabus has been designed in such a manner to inculcate the current technical knowledge among the students.

The textbook on Information Technology (Science) is developed as per the approaches and methods used in recent era of internet and web. As the curriculum is activity-based, process-oriented and based on constructivism, it demands higher level proficiency and dedication from the part of the teachers for effective teaching.

This textbook takes two aspects into consideration - **knowledge domain and process domain**. The knowledge area of the curriculum of Class XII is a continuation to that of Class XI. The programming aspects to solve complex problems and handle complex data are introduced. Since we are in an era of Internet, a wide coverage is given to the contents required for designing web pages and developing web applications. It also enhances the knowledge of web hosting. The knowledge domain also initiates server side scripting using PHP. The emerging technologies such as Cloud computing, 5G, AI are also included to keep the students updated with current knowledge. The concepts such as E-commerce are also introduced and E-Governance. The knowledge about the same is must for today's generation.

The process domain gives importance to gain the Science and logical method and develop interest for deeper investigation. The SEO topic is introduced to encourage the students to design a perfect website by optimising and ranking the site at top on search engines. While transacting the concepts through activities, it should be ensured that the students are attaining the skills along with learning outcomes.

The Textbook IT (Science) is prepared by a team of practicing teachers under the guidance of a panel of subject experts. All possible efforts have been taken to make the books learner-friendly and interesting. There is no denying the fact that our teachers are resourceful and committed, and hence directions towards the right path can make the transaction of the curriculum most effective and productive.

Constructive criticism and creative suggestions for improvement of the book are most welcome.

**Information Technology
Subject Committee and Study Group
Textbook Bureau, Pune**

Competency Statements For Information Technology

Standard - XII (All Streams)

| Competency |
|--|
| Theory |
| <ol style="list-style-type: none">1. To create awareness and acquire knowledge about new technology.2. To acquire in-depth knowledge about technologies related to AI, IOT, 3D Printing, 5G.3. To enable the student to think and create interest in emerging technology from career point of view.4. To make students aware about concept of E-commerce.5. To acquire knowledge about scope of E-commerce.6. To create awareness about different E-commerce websites and discuss its features.7. To develop higher order logical skills based on basic knowledge acquired in 11th standard.8. To make students aware about HTML5's advanced tags while developing web page.9. To make students competent in scripting language to create dynamic web page.10. To acquire knowledge about concept of object. |
| Skill Oriented Practicals (SOP) |
| <ol style="list-style-type: none">1. To inculcate web designing skills using advance tags.2. To make students confident to create website.3. To develop skills for programming using DOM.4. To develop ability to create dynamic web pages using advance features.5. To develop ability to program for server side scripting.6. To develop skill to create simple PHP Program.7. To make student aware about connectivity with database.8. To develop skill in handling accounting package with advance feature.9. To make student competent to display and print different accounting report.10. To acquire skills in recording and manipulating audios.11. To make student skillful to mix audio.12. To acquire skills to record, create and manipulate video.13. To enhance the creative ability by mixing and fusion of the different media. |

INFORMATION TECHNOLOGY

STANDARD - TWELVE

(Science)

INDEX

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Skill Oriented Practicals (SOP)

| | | |
|----|-----------------------------|----|
| 1. | Advanced Web Designing | 91 |
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Let us learn

- Student can design the layout of web pages using CSS.
- Students can learn to design the website.
- Student can design the web form with validations.
- Students can learn concept of image map and Iframe (inline frame).
- The aim is to give the skills to create HTML WebPages, using HTML5 and CSS.

1.1 Advanced Web Designing

We have been introduced to basic terminologies related to creation of web pages. The Hypertext Mark-up Language (HTML) is an evolving language, with

different versions supporting different features. HTML5 is currently used because it supports mobile technology. The major browsers are Google Chrome, Mozilla Firefox, Microsoft Edge, Safari, Opera and Apple support the features of HTML5.

1.2 Forms in HTML5

In eleventh standard we have studied different controls related to form like text, radio, checkbox, submit, reset, select and textarea.

These controls are used to collect different kinds of user inputs, such as contact details like name, address, single or multiple options from group of options, as well as clearing and submitting data etc.

HTML5 has introduced additional form controls which can also be used for validation purpose.

HTML5 advanced <input> elements

HTML5 introduces a number of new input types.

| Input type | Description |
|-----------------------|--|
| <input type="color"> | Defines a color picker |
| <input type="number"> | Defines a field for entering a number |
| <input type="url"> | Defines a field for entering a URL. |
| <input type="image"> | Defines an image as a submit button. |
| <input type="date"> | Defines a date picker with the year, month and day |
| <input type="email"> | Defines a field for an e-mail address |

| Input type | Description |
|-------------------------------|--|
| <input type="month"> | Defines a month and year control in format is "YYYY-MM" |
| <input type="range"> | Define a range control. Default range is 0 to 100. |
| <input type="datetime-local"> | Defines a date picker that includes the year, month, day and time. |
| <input type="time"> | Defines a control for entering a time. |
| <input type="week"> | Defines a week and year control. |
| <input type="search"> | Defines a text field for entering a search string like a site search or Google search. |
| <input type="file"> | Defines a file-select field and a "Browse" button for file uploads. |
| <input type="tel"> | Used to define input fields that should contain a telephone number. |

Input Restrictions

A list of some common input restrictions is given below, few of which can be used for validation purpose.

| Attribute | Description |
|------------------|--|
| disabled | Specifies that an input field should be disabled. |
| max | Specifies the maximum value for an input field. |
| min | Specifies the minimum value for an input field. |
| pattern | Specifies a regular expression to check the input values. |
| read only | Specifies that an input field is read only (cannot be changed). |
| placeholder | This acts as a temporary label showing the purpose of a text field without requiring a label tag. |
| required | Specifies that an input field is required (must be filled out). |
| autocomplete | Specifies whether a form or input field should have autocomplete On or Off. |
| autofocus | Specifies that the input field should automatically get focus when the page loads. |
| height and width | Specifies the height and width of an <input type="image"> |
| multiple | Specifies that the user is allowed to enter more than one value in the <input> element. This works with input types like email and file. |

Some other useful attributes used with <input> are-

- 1. id :** This is used to identify the html element uniquely through the document object model.
- 2. class:** It is used to apply CSS style to the individual input element.

Examples :

```
<!DOCTYPE html> <html>
<head>
<title>Forms in html 5 </title></head>
<body>
<form> Name: <input type="text" autocomplete><br><br>
E-mail:<input type="email" name="email"><br><br>
Date of Inception: <input type="date" name="bday"><br><br>
Office time: <input type="time" name="usr_time"><br><br>
Number of years completed(between 1 and 100): <input type="number" min="1"
max="100"><br><br>
Office phone number: <input type="tel" name="phone" pattern="[0-9]{2}-[0-9]
{10}" required><br><br>
Add your homepage:
<input type="url" name="homepage"><br><br>
<input type="image" src="E:/submitbutton.png" alt="click here to submit" >
</form>
</body>
</html>
```

The output is as follows

| | |
|---|----------------------|
| Name: | <input type="text"/> |
| E-mail: | <input type="text"/> |
| Date of Inception: | <input type="text"/> |
| Office time: | <input type="text"/> |
| Number of years completed(between 1 and 100): | <input type="text"/> |
| Office phone number: | <input type="text"/> |
| Add your homepage: | <input type="text"/> |
| SUBMIT > | |



Do it Yourself

1. Use multiple attribute in <input>
2. Use pattern attribute in <input> and see the Output.

1.3 <meta> tag

The meta tag is a tag in html that describes some aspects of contents of a webpage. The HTML <meta> tag is used by search engines to search information

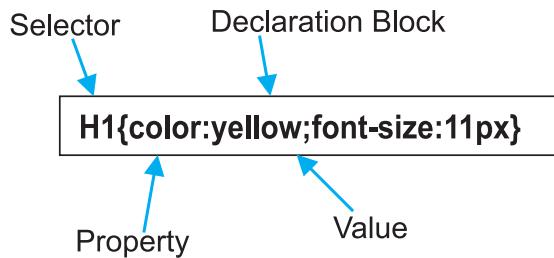
that is provided with the webpage. This is empty tag (singular tag) which carries information within its attributes. The <meta> tag is placed between the <head> and </head> tags. Metadata will not be displayed on the webpage.

Attribute of <meta> tag

| Attribute | Values | Description |
|------------|---|---|
| Name | The value of the name attribute can be related to any of the following- i) Author ii) Description iii) Keywords iv) copyright e.g. <meta name = "author" > | Specifies the Name of the metadata like the author, keywords or description. |
| Content | It can have any textual matter related to the name as in eg. i. <meta name = "author" content = "Balbharti"> ii. <meta name = "description" content = "Advance web designing"> iii. <meta name = "keywords" content = "html5, learn html5, list in html 5"> | Here content of author is balbharati. Here the value for content attribute specifies name of the topic advance web designing. Here the values for content attribute are given as keywords like html5 , learn html5 etc. |
| Charset | UTF-8, Big5 e.g <meta charset="UTF-8"> <meta charset="Big5"> | Specifies the character encoding used by the document, This is called a character encoding declaration. UTF-8 For Indian characters Big5 – for Chinese characters |
| http-equiv | refresh , set-cookie, content-type, expires, e.g. <meta http-equiv="refresh" content="5"> <meta http-equiv="set-cookies"> <meta http-equiv="content-type" content="text/html" charset="Big5"> <meta http-equiv="expires" content="userid=pqr; expires=Wednesday, 8-feb-2018 23:59:59 GMT;"> | Used for http response message headers. Here the page will get refresh after every 5 seconds. The browser sends the cookies back to the server. Specifies the character encoding for the document Here page session will get expire at specified date and time. |

Example:

```
<!DOCTYPE html>
<html>
    <head>
        <title>meta tag examples</title>
        <meta name = "authors" content = "Balbharti">
        <meta name = "description" content = "Advance web designing">
        <meta name = "keywords" content = "html5, learn html5, list in html5">
        <meta name="copyright" content = " copyright Balbharti All right Reserve">
    </head>
    <body>
        <p> Welcome to HTML5
    </p>
    </body>
</html>
```



Selector : Selector indicates the HTML element you want to style. It could be any tag like `<h1>`, `<body>` etc.

Declaration Block : The declaration block can contain one or more declarations separated by a semicolon. For the above example, there are two declarations:

1. `color : yellow;`
2. `font-size :11 px;`

Each declaration contains a property name and value, separated by a colon.

Property : A Property is a type of attribute of HTML element. It could be color, border etc.

Value : Values are assigned to CSS properties. In the above example, value "yellow" is assigned to color property.

`Selector{Property1: value1; Property2: value2}`

Types of CSS

There are three methods of implementing styling information to an HTML document.

1. **Inline CSS**
 2. **Embedded stylesheet or Internal CSS**
 3. **External CSS**
- 1. Inline stylesheet :** It uses the style attribute in the HTML start tag.

Inline CSS is used to apply CSS on a single line or element.

For example :

```
<p style="color:blue">Hello CSS</p>
```

2. Embedded stylesheet or internal CSS

CSS : This is used to apply CSS on a single document or page. It can affect all the elements of the page. It is written inside the style tag within head section of html.

For example :

```
<!DOCTYPE html>
<html>
<head>
<style>
h1 {color: Red;}
```

```
</style></head>
<body>
<h1>The internal style sheet is applied on this heading.</h1>
<p>This paragraph will not be affected.</p>
</body>
</html>
```

The output of above program is as follows-



CSS Properties

| Property | Use | Value | Example |
|------------------|--|---|---|
| Color | Changes the color of the text | Color name | h1 {color: maroon;} |
| Background-color | To set the background color in your webpage | Color name | body {background-color: yellow;} |
| Font-weight | Used to bold text | bold or 100, 200...900 | p {font-weight: 300;} |
| Font-style | Used to italicize text | Italic, oblique or normal | p {font-style: italic;} |
| Text-decoration | This property is used to add 1. strike-through marks 2. underline 3. overstrike 4. to remove underlines from links | 1. line-through 2. underline 3. overline 4. none | p {text-decoration: underline;} a {text-decoration: none;} |
| Text-align | This property is used to control the horizontal alignment of any block-level text that are paragraphs, tables and other elements | left, right, center or justify | h1 {text-align: center;} |
| Font-family | This is used to control the fonts | Font name | p {font-family: arial;} |

| Property | Use | Value | Example |
|------------------|---|---|---|
| Font-size | This property allows you to control the size of the font | px, in, mm, cm, pt | p{font-size:10px} |
| Letter-spacing | This helps in controlling the horizontal spacing between characters of text | px, in, mm, cm, pt | h1{letter-spacing: 5pt} |
| Padding | This property is used when you want to add padding (blank spaces) around the content of an element. | Pixel | h1{padding:30px} |
| Border | This property adds a border to a webpage element | Solid, double, groove, ridge, inset, outset, dotted or dashed | h1{border:green} |
| Background-image | To set an image as the background of your webpage | url("X") where X is the path of image file | body{background-image: url('background.jpg')} |
| Margin-Left | Sets margin area on the left side of the element. | px,pt,cm etc. | h1{margin-left:10px} |

3. External stylesheet : The external style sheet is generally used when you want to make changes on multiple pages. It facilitates to change the look of the entire web site by changing just one file. It uses the <link> tag on every page and the <link> tag should be put inside the head section.

For example :

```
<!DOCTYPE html>
<html>
<head>
<link rel="stylesheet" type="text/css"
href="style.css">
</head>
<body>
<h1>This is a heading</h1>
</body></html>
```

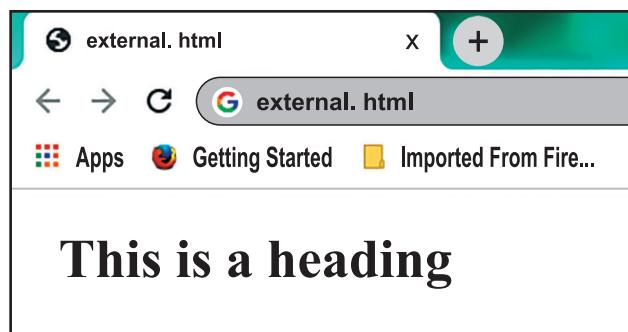
An external style sheet can be written in any text editor, and must be saved with a .css extension. The external css file should not contain any HTML tags.

Here is how the "style.css" file looks like:

Style.css

```
h1{color:navy;margin-left:20px}
```

The output is as follows

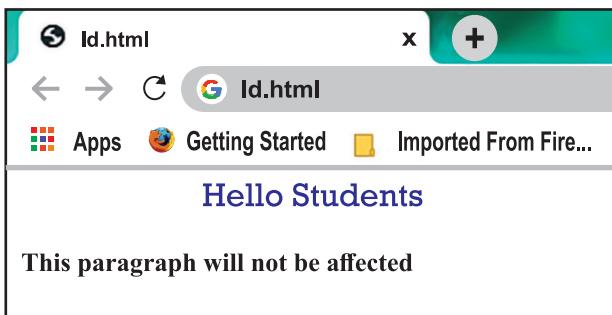


CSS Id Selector

The Id selector selects the id attribute of an HTML element to select a specific element. An id is always unique within the page so it is unique element. It is written with the hash character(#), followed by the id name.

```
<!DOCTYPE html>
<html>
<head>
<style>
#para1{text-align: center; color: blue}
</style>
</head>
<body>
<p id="para1">Hello Students</p>
<p>This paragraph will not be
affected.</p>
</body>
</html>
```

See the output as follows



CSS Class Selector

The class selector selects HTML elements with a specific class attribute. **It is used with a period character !** (full stop symbol) followed by the class name. **The Class selector is used when you want to change a group of elements within your HTML page.**

The class name should not start with number.

Let's take an example with a class "intro".

```
<!DOCTYPE html>
<html>
<head>
<style>
.intro{text-align:center;color:blue}
</style></head>
<body>
<h1 class="intro">This heading is blue
and center-aligned.</h1>
<p class="intro">This paragraph is
blue and center-aligned.</p>
</body>
</html>
```

The above code results as

This heading is blue and center-aligned.

This paragraph is blue center-aligned.

Class Selector for specific element

To specify only one specific HTML element should be affected then you should use the element name with class selector.

Let's see an example :

```
<!DOCTYPE html>
<html><head><style>
p.intro {text-align: center;color: blue}
</style></head>
<body>
<h1 class="intro">This heading is not
affected.</h1>
<p class="intro">This paragraph is
blue and center-aligned.</p>
</body></html>
```

The output is as follows

This heading is not affected
This paragraph is blue and center-aligned.

```
h1{ text-align:center;color:blue}  
h2{ text-align:center;color:blue}  
p {text-align:center;color:blue}
```

Universal Selector

The universal selector is used as a wildcard character. It selects all the elements on the Webpages.

```
<!DOCTYPE html>  
<html><head><style>  
* { color: green; font-size: 20px; }  
</style></head>  
<body>  
This css style will be applied on Entire page. It does not check tag or plain text<br>  
<h2>This css is applied to heading</h2>  
<p id="para1">it is applied to first paragaraph</p>  
<p>Also to second paragraph !</p>  
</body>  
</html>
```

Output :

This css style will be applied on Entire page. It does not check tag or plain text
This css is applied to heading
it is applied to first paragraph
Also to second paragraph !

As you can see, you need to define CSS properties for all the elements. It can be grouped as-

```
h1,h2,p{ text-align:center;color:blue}
```

Let's see full code as follows :

```
<!DOCTYPE html>  
<html>  
<head>  
<style>  
h1,h2,p{text-align: center; color: blue}  
</style>  
</head>  
<body>  
<h1>Hello Heading 1</h1>  
<h2>Hello Heading 2 (In smaller font)</h2>  
<p>This is a paragraph.</p>  
</body>  
</html>
```

Output :

Hello Heading 1

Hello Heading 2 (In smaller font)

This is a paragraph

Group Selector

The grouping selector is used to select all the elements with the same style definitions. It is used to minimize the code. Commas are used to separate each selector in grouping.

Let's see the CSS code without group selector.

Positioning in CSS

CSS helps to position the HTML elements. The position property is used to set position for an element. The element can be positioned using the top, bottom, left and right properties.

Syntax :

```
Selector{position:value;top:value;  
left:value;bottom:value;right:value}
```

Where values in positions are fixed, absolute, relative and values of top, bottom, left, right are in pixels

There are four types of positioning in CSS

1. Static Positioning : This is a by-default position for HTML elements. It is not affected by the top, bottom, left and right properties.

2. Fixed Positioning : This property helps to put the text fixed on the browser. The FIXED property forces an element into a fixed position relative to the browser window. The fixed element will not move, even when the page is scrolled.

Let's see the example :

```
<!DOCTYPE html>  
<html><head><style>  
p.fixed{position: fixed; top: 50px; right:  
5px; color: blue}  
</style></head>  
<body>  
<p>This is paragraph 1</p>  
<p>This is paragraph 2</p>  
<p>This is paragraph 3</p>  
<p class="fixed">This is the fix positioned text.</p>  
</body>  
</html>
```

Output :

The screenshot shows a browser window with the following content:

- This is a paragraph 1
- This is a paragraph 2
- This is a paragraph 3
- This is the fix positioned text.** (highlighted in blue)

3. Relative Positioning : The relative positioning property is used to set the element relative to its normal position.

4. Absolute Positioning : This property sets an element in a specific location and it is not affected by the flow of the page. This property positions the element at the specified coordinates relative to your screen top-left corner.

For example :

```
<!DOCTYPE html>  
<html><head><style>  
.first{position: relative; top: -10px;  
right: -10px;}  
h2{position: absolute;  
left: 100px; top: 150px}  
</style><body>  
<h1 class="first">This is heading 1  
</h1>  
<h2>This is heading 2</h2>  
</body></html>
```

Output :

The screenshot shows a browser window with the following content:

- This is heading 1**
- This is heading 2**

In above output the Level 1 headings with class="first" have a relative position 10 pixels above and 10 pixels to the right of its original position.

All level 2 headings will be positioned 100 pixels from the left of the browser window and 150 pixels from the top of the browser window.

Float Property

Float is a CSS property written in CSS file or directly in the style of an element. The float property defines the flow of content.

Following are the types of floating properties :

- 1. float : left :** This keeps the element float on left side of the container
- 2. float : right :** This keeps the element float on right side of container
- 3. float : none :** This is default property i.e. this shows the element as it is.

For example :

```
<!DOCTYPE html>
<html><head>
<title>Float Example</title></head>
<style>
  .float-left{float:left;font-size:20px;background-color:gold}
  .float-right{float: right;font-size:20px;background-color:gold}
</style>
<h2 class="float-left">Balbharati
</h2><p>This text rearranges itself to flow around the element that is floated left.
</p>
```

```
<h2 class="float-right">Balbharati
</h2>
<p>This text rearranges itself to flow around the element that is floated right. </p>
</body></html>
```

Output

Balbharati This text rearranges itself to flow around the element that is floated left.
This text rearranges itself to flow around the element that is floated right. Balbharati

Display property

The Display property in CSS defines how the components (div, hyperlink, heading, etc) are going to be placed on the web page. It specifies how the element is displayed. As the name suggests, this property is used to define the display of different parts of a web page.

Syntax :

Display : value;

Where values are :

Inline : It is used to display an element as an inline element.

Block : It is used to display an element as an block element. It starts on a new line, and takes up the whole width of the browser window.

Block-inline : This value is very similar to inline element but the difference is that you are able to set the width and height.

None : The element is completely removed.

Let's see an example

```
<!DOCTYPE html>
<html>
<head>
<style>
p {
display: inline;
}
</style>
</head>
<body>
<p>welcome to balbharti</p>
<p>Javascript</p>
<p>HTML5</p>
<p>CSS</p></body></html>
```

Output :



Example 2 :

```
<!DOCTYPE html>
<html lang="en">
<head>
<title>Example of CSS display</title>
<style type="text/css">
a {
display : block;
background-color:orange;
}
</style>
</head>
<body>
<p>
<a href="https://www.ebalbharti.in" >
Visit balbharti</a>
<br>
</p></body>
</html>
```

Output :

Visit balbharti

Based on the CSS properties studied so far, the representation of semantic tags displayed in 11th standard textbook can be coded as follows.

Example 1 :

Use of semantic tags and CSS.

```
<!DOCTYPE html>
<html>
<head>
<style>
header{background-color:pink;width:100%;height:20%}
nav{background-color:skyblue;width:100%;height:20%}
aside{background-color:grey;width:40%;height:42%;float:right}
section{background-color:lightyellow;width:60%;height:10%;float:left}
article{background-color:violet;width:60%;height:40%}
footer{background-color:orange;width:100%;height:10%}
</style>
</head>
<body>
<header>
<h1>HTML5 includes new semantics</h1>
<p>It includes semantic tags like header, footer, nav
<h1>Example of complete HTML5 Basics</h1>
<h2>The markup of the future under
```

HTML5 includes new semantics

It includes semantic tags like header, footer, nav

Example of complete HTML5 Basics

The markup of the future under development.

The nav element represents a section of navigation links. It is suitable for either site navigation or a table of contents.
<http://www.w3schools.com>
Balbharti website

Impressive Web Designing

The aside element is for content that is tangentially related to the content around it, and is typically useful for marking up sidebars.

Articles on: Article tag

The article element represents an independent section of a document, page or site. It is suitable for content like news or blog articles, forum posts or individual comments.

Other education based websites of state

State Board website
Pune university website

AC 2018 Balbharti.

development.

```
</h2></p></header>
<nav>The nav element represents a section of navigation links. It is suitable for either site navigation or a table of contents.<br>
<a href="/">http://www.w3schools.com</a><br>
<a href="http://www.ebalbharati.in">Balbharti website</a><br></nav>
<aside>
<h1>Other education based websites of State</h1>
<a href="http://mahahsscboard.ac.in">State Board website</a><br>
<a href="http://unipune.ac.in">Pune university website</a><br>
</aside>
<section>
<h1>Impressive Web Designing</h1>
<p>The aside element is for content that is tangentially related to the content around it, and is typically useful for marking up sidebars.</p>
</section>
<section>
<h1>Articles on: Article tag</h1>
</section>
<article>
<p>The article element represents an independent section of a document, page or site. It is suitable for content like news or blog articles,
```

forum posts or individual comments.

```
</p>
</article>
<footer>© 2018 Balbharti.</footer>
</body></html>
```

1.5 Ordered list or numbered list

The `` tag defines an ordered list. An ordered list can be numerical or alphabetical.

Attributes of `` tag-

| Attribute | Values | Description |
|-----------|----------------------|---|
| Type | "1" "/"a"/"I"/"i" | 1 is default value and other values specify the numbering type for the used items. |
| Reversed | Reversed | This attribute specifies that the items of the list are specified in the reverse order. |
| Start | Number | Specifies the starting number of the first item in an ordered list. |

```

<!DOCTYPE html>
<html><body>
<h3>List of Topics</h3>
<ol>
<li>Basics of IT</li>
<li>HTML 5</li>
<li>PostgreSQL</li>
</ol>
<h3>List of Topics start with series 50</h3>
<ol start="50">
<li>Basics of IT</li>
<li>HTML 5</li>
<li>PostgreSQL</li>
</ol></body></html>

```

Output :

List of Topics

- 1. Basics of IT
- 2. HTML 5
- 3. PostgreSQL

List of Topics start with series 50

- 50. Basics of IT
- 51. HTML 5
- 52. PostgreSQL

Example 2 :

```

<!DOCTYPE html>
<html>
<body>
<h3>List of Topics in reverse sequence</h3>
<ol reversed>
<li>Basics of IT</li>
<li>HTML 5</li>
<li>PostgreSQL</li>
</ol></body></html>

```

Output :

List of Topics in reverse sequence

- 3. Basics of IT
- 2. HTML 5
- 1. PostgreSQL

1.6 Unordered list or bulleted list

An unordered list created using the `` tag, and each list item starts with the `` tag. The list items in unordered lists are marked with bullets (small black circles), by default.

Example : 1

```

<!DOCTYPE html>
<html>
<head>
<title>Example of HTML Unordered List</title>
</head>
<body>
<h3>HTML Unordered List</h3>
<ul>
<li>Basics of IT</li>
<li>HTML 5</li>
<li>PostgreSQL</li>
</ul></body></html>

```

Output :

HTML Unordered List

- Basics of IT
- HTML 5
- PostgreSQL

Attributes of tag

| Attribute | Values | Description |
|---|--|---|
| Type = disc/ circle/square (use style (css) instead of type attribute in HTML5. Type attribute is supported by previous versions of HTML) | <p>style="list-style-type:disc" e.g <ul style="list-style-type:disc;"> style="list-style-type:circle" e.g <ul style="list-style-type:circle"> style="list-style-type:square" e.g <ul style="list-style-type:square"> style="list-style-type:none" e.g <ul style="list-style-type:none;"></p> | <p>Sets the list item marker to a bullet (default)</p> <p>Sets the list item marker to a circle</p> <p>Sets the list item marker to a square</p> <p>The list items will not be marked</p> |

Note : HTML5 does not support bullets, circle and square value of type attribute instead you use CSS style.

1.7 Definition list

To define a definition list <dl> tag is used. You can create items in definition list with the <dt> and <dd> tags. The <dt> tag is used to define the term whereas the <dd> tag is used to define the term's definition.

Type the following code

```
<!DOCTYPE html>
<html>
<head>
<title>definition List</title>
</head>
```

```
<body>
<h3>Example of HTML definition List</h3>
<dl>
<dt><b>Web</b></dt>
<dd>The part of the Internet that contains websites and web pages</dd>
<dt><b>HTML</b></dt>
<dd>A markup language for creating web pages</dd>
<dt><b>CSS</b></dt>
<dd>A technology to make HTML look better</dd>
</dl>
</body>
</html>
```

Output :

Example of HTML definition List

Web

The part of the Internet that contains websites and web pages

HTML

A markup language for creating web pages

CSS

A technology to make HTML look better

Nested list

List within another list either order list or unordered list is called nested list.

Examples : Single level nested list

```
<!DOCTYPE html>
<html>
<head>
<title>Example of HTML nested list</title>
</head>
<body>
<h3>HTML Nested List</h3>
<ol>
<li>Introduction to IT</li>
<li>Introduction to DBMS</li>
<ul style="list-style-type:circle">
<li>Definition of DBMS</li>
<li>applications of DBMS</li>
<li>Advantages of DBMS</li>
</ul>
<li>Postgresql</li>
</ol></body></html>
```

Output :

HTML Nested List

- 1. Introduction to IT
- 2. Introduction to DBMS
 - o Definition of DBMS
 - o applications of DBMS
 - o Advantages of DBMS
- 3. Postgresql

Multi level list :

```
<!DOCTYPE html>
<html>
<head>
<title>nested list</title>
</head>
<body>
<h3> Multi-level list Nested List</h3>
<ul>
<li>Daily computing</li>
<li>Web design</li>
<ol>
<li>html 5</li>
<li>hyperlink</li>
<li>Inserting Images</li>
</ol>
<li>Javascript</li>
<ul style="list-style-type:circle">
<li>conditional structure</li>
<ul style="list-style-type:square">
<li>If statement</li>
<li>If else statement</li>
<li>case statement</li>
</ul>
<li>loop statement</li>
</ul>
</li>
</ul>
</body>
</html>
```

Output :

Multi-level list Nested List

- Daily computing
- Web design
 - 1. html 5
 - 2. hyperlink
 - 3. Inserting Images
- Javascript
 - o conditional structure
 - If statement
 - If else statement
 - case statement
 - o loop statement

1.8 Inserting audio and video in HTML 5

HTML5 new specifications enables users to have a far more control over audio on webpages.

HTML5 features include native audio and video support without the need for Flash. HTML5 includes special elements (tags) allowing to include video and audio and to define controls.

Common Audio Formats :

mp3 : An audio format from MPEG(Moving / Motion Pictures Experts Group).

aac : Advanced Audio Coding, standard format on Iphone, youtube etc.

ogg : An Open container and free audio format.

<Audio> Tag

The <audio> element enables you to embed(or add) audio files on Webpages.

Declare the audio tag, and specify the source attribute with the Audio file location.

Syntax :

```
<audio src="sample.mp3" type="audio/mpeg" controls>
</audio>
```

Note: Autoplay, controls, muted are without any values.

Attributes of <audio> tag

| Attribute | Values | Description |
|-----------|--------|--|
| Autoplay | - | The audio will start playing as soon as it is ready |
| Controls | - | The audio controls should be displayed (i.e. play/pause button etc.) |
| loop | Value | The audio will start over again, every time it is finished |
| muted | - | This Specifies that the audio output should be muted |
| src | URL | Specifies the URL of the audio file |

Example :

```
<!DOCTYPE html>
<html>
<body>
<p>Audio Sample</p>
<audio controls>
<source src="test.mp3" type="audio/mp3">
</audio>
</body></html>
```

Output :



In previous code

The controls attribute is used to add audio controls such as play, pause, and volume.

The "source" element is used to specify the audio files which the browser may use.

Adding audio with multiple sources :

Multiple sources of audios are specified so that if the browser is unable to play the first source then it will automatically jump to the second source.

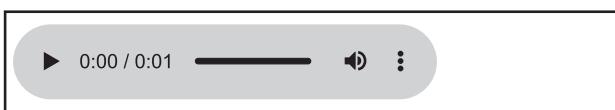
<source> tag

The <source> tag is used to specify multiple media resources for media elements.

Example :

```
<!DOCTYPE html>
<html>
<body>
<p>Audio Sample</p>
    <audio controls autoplay>
        <source src="test.mp3"
type="audio/mp3">
        <source src="test.ogg"
type="audio/ogg">
        <source src="test.opus"
type="audio/ogg">
    </audio>
</body>
</html>
```

Output :



<video> Tag

The HTML <video> tag is used to embed video into your web page, it has several video sources.

There are three different formats that are commonly supported by web browsers – .mp4, .Ogg and .WebM.

Syntax :

```
<video src="URL" controls></video>
```

Attributes of <video> tag :

| Attribute | Values | Description |
|-----------|--------|--|
| Src | URL | Defines link to video file |
| autoplay | - | Specifies that the video will start playing as soon as it is ready |
| controls | - | Specifies that video controls should be displayed (such as a play/pause button etc). |
| height | Pixels | Sets the height of the video player |
| loop | Value | Specifies that the video will start over again, every time it is finished |
| muted | - | Specifies that the audio output of the video should be muted |

| Attribute | Values | Description |
|-----------|-----------------------------------|---|
| poster | URL | Specifies an image to be shown while the video is downloading, or until the user hits the play button |
| preload | 1. auto 2. metadata 3. none | Specifies if and how the author thinks the video should be loaded when the webpage loads |
| width | Pixels | Sets the width of the video player |

The <source> tag is used to specify multiple media resources for video as well as audio media elements.

Example :

```
<!DOCTYPE html>
<html>
<body>
<video width="320" height="240"
controls>
<source src="movie.mp4"
type="video/mp4">
<source src="movie.ogg" type="video/
ogg">
Your browser does not support the
video tag.
</video></body></html>
```

Output :



1.9 Image map in HTML 5

An image with multiple hyperlinks is called an image map.

Image map is used to connect links to different regions on the webpage. An Image map is created by marking certain regions on an image clickable. These clickable regions are called as **hotspots**.

Image Maps are of two types; Client Side and Server Side. We will confine only to Client Side image map. The tags used to define client side image map are

1. ** : It is used to insert an image on a web page. To create a client side image map usemap attribute of is used with value which is preceded with a # symbol. The **usemap attribute acts as a pointer which indicates that the image is a client side image map.

2. <map> : It has only one attribute name. It specifies name of the image used for client side image map. The value of the name attribute is the value specified in usemap attribute of .

- 3) **<area>** - It defines specific clickable regions. A given **<map>** element can contain multiple **<area>** element within it. **<area>** is singular tag and **<map>** is paired.

Attributes of **<area>**:

| Attribute | Description |
|-----------|--|
| Href | Defines the URL to which the clickable region within the image-map navigates. |
| Shape | It can value rect, circle or poly. |
| coords | Specifies co-ordinates of the clickable regions on the image-map. Rect- specifies rectangular area with four co-ordinates. Circle-Defines a circular region. It requires three co-ordinates. Poly-Defines a polygon region with co-ordinates specifying each point on the polygon. It requires four co-ordinates. Default-Region covers the entire image. No co-ordinates are required |
| alt | Specifies extra information about clickable area. It is the alternative text to the clickable region. |

Example : Image Map with element **<map>** and **<area>**

```

<!DOCTYPE HTML>
<html>
<head><title>image map</title>
</head>
<body>
<h1>An example of Image Map
</h1>

<map name="imagemap">
<area href="http://www.google.com"
shape="rect" coords="0,0,93,65"
alt="google site"/>
<area href=" great_wall_china.html"
shape="circle" coords="118,140 ,40"
alt=" great wall of china"/>
<area href="http://mahahsscboard.
in" shape="poly" coords
="145,187,198,215,245,280,305"
alt="maharashtra stateboard site"/>
</map>
</body></html>
(In the above program great_wall_
china.html is a local file created on the
machine.)
```

1.10 INLINE FRAME IN HTML5

The **<iframe>** element creates an inline frame. Inline frames are often used in online advertising, where the contents of the **<iframe>** is an advertisement from an external party. HTML5 allows the incorporation to be seamless (no scrollbars, borders, margins etc).

Attributes of <iframe> :

| Attribute | Values | Description |
|-----------|-----------|--|
| Src | URL | Specifies the address of the document to embed in the <iframe> |
| Height | Pixel | Specifies the height of an <iframe> |
| Width | Pixels | Specifies the width of an <iframe> |
| Name | Text | Specifies name of an <iframe> |
| srdoc | HTML_code | Specifies the HTML content of the page to show in the <iframe> |

For example :

```
<!DOCTYPE html>
<html>
<body>
<h2>HTML Iframes</h2>
<p>This is the example of iframes.</p>
<iframe src="xyz.html" height="200"
width="300"></iframe>
</body>
</html>
```

Output :

HTML Iframes

This is the example of iframes.

This page is displayed in an iframe

1.11 Website Hosting

In this chapter we have seen how to create a website. But just creating of a website is not sufficient. One has to make the website available on the Internet. These web pages are to be stored in the web servers that are connected to the Internet, to be made available to others.

What is web hosting?

Web hosting is the service of providing storage space. The website is made available on the Internet with the help of web hosting.

What is Web Host?

The companies that provides web hosting services are called web hosts. Web hosts own and manage web servers. These web servers offer uninterrupted Internet connectivity.

Types of Web hosting :

Types of web hosting are

- Shared hosting :** It is cost effective. It gives domain name to your website.
- Free hosting :** There are some hosting websites which provide you free hosting of the website for limited period of time.
- Dedicated hosting :** These are paid hosting servers for large websites.

Note : You can buy your own web server space, but it is the most expensive way to publish your website. Though it is very expensive, but it gives you a lot of control over your website.

For information purpose only

Prerequisites for Free Web Hosting :

1. Three to Four pages website having first or Home Page named as index.html.
2. Computer with internet connection.
3. Gmail id with password.
4. Need to toggle between two websites <https://www.000webhost.com/> and <http://my.freenom.com>
5. Have to acquire free web space from web server named 000webhost.com.
6. Have to acquire domain name for your website from my.freenom.com.
7. Park the website domain address with free server website i.e. with 000webhost.com.

Redirect the domain free server name to the domain website i.e. with my.freenom.com.

Steps to Acquire free webspace :

1. Open the website <https://www.000webhost.com/>
2. Click on free signup Login with your email id and password
3. verification email will be send to your email
4. open your email and click on "verify email"
5. Click on "Get Started"
6. From My Website page click on "+Create New site" button
7. Type your website name and any password
8. e.g. website name as :- it-xi-textbook
9. From File Manager box select "Upload" option to upload your web pages. Home page of the website must be named as "index.html" (Select all

webpages including image, audio files etc) and click on "Logout"

10. Your website is ready with the sub domain as 000webhostapp.com e.g.it-xi-textbook.000webhostapp.com

Acquire Domain Name :

1. Open the website <https://my.freenom.com>
2. From Use social sign in Click on "sign in" Login with your gmail id and give password
3. Click on "Services" --> Register a New Domain
4. Type your website name and click on "check availability" button
5. Choose any domain(e.g. .tk,.ml.cg etc) and click on "Get it now" if available click on "CheckOut" button
6. Set the free period to host the website, click on "Continue" button
7. From Review &Checkout page if the Total Due is \$0.00 then only select terms and conditions
8. Click on "Complete Order" button e.g. it-xi-textbook.tk
9. From Order Confirmation Screen click on "Click here to go to Client Area" button

Park the website domain :

Go to <http://www.000webhost.com> website perform the following steps first

1. Select "MyWebsite"--> "Manage Website" -->dashboard-->Tools--> Set Web Address
2. Click on "+Add domain" button then select radio button Park domain and then click on "Next" button

3. Type the site URL acquired by you from Freenom.com e.g. it-xi-textbook.tk. (Remember don't give http or / or any special character)
4. Then click on "Park domain" button.
5. You may see domain status as "pending" for sometime. Once it is through from the 000webhost side you can see the domain status as "parked".
6. Configure your domain's DNS provider to point to the ns01.000webhost.com and ns02.000webhost.com as your nameservers.

Redirect the domain to free server :

Now follow the final steps given below through my.freenom.com website

1. Sign in to my.freenom.com click on "Services"-->

2. "My Domains"-->"Manage Domain"
3. From Domain details screen click on "Management Tools" --> "Nameservers"
4. Change the radio button to "Use custom nameservers (enter below)" and type the NameServer1 as "NS01.000WEBHOST.COM" and NameServer2 as "NS02.000WEBHOST.COM"
5. Click on "Change Nameservers" button
6. Logout from the my.freenom.com
7. Type the website address in the browser's address bar to view your website
8. The website can also be seen from your mobile. Hosting is done.

Summary

- Html5 has introduced new types in <Input> like number, date, Tel, email, search, URL, range, month, week, color.
- Few attributes of <Input> can be used for validation purpose.
- <meta> is used by search engines to search information that is provided with the webpage. It is inserted in the <head>
- CSS- Cascading Style Sheet describes how HTML elements are to be displayed on screen, paper, or in other media.
- CSS syntax Selector{Property1: value1; Property2: value2}
- The tag defines an ordered list. An ordered list can be numerical or alphabetical.
- An unordered list created using the tag, and each list item starts with the tag. The list items in unordered lists are marked with bullets (small black circles), by default.
- To insert Audio and Video in a web page, <audio> and <video> are used which specifies the source with the file location.
- An image with multiple hyperlinks is called an image map. The usemap attribute acts as a pointer which indicates that the image is a client side image map.
- The <iframe> element creates an inline frame.

Exercise

Q 1. Fill in the blanks.

1. The.....element is a starting element in an HTML, it indicates that document type definition being used by the document.
2. The.....is a tag in html that describe some aspects of contents of a webpage.
3. The tag defines an.....
4. An unordered list created using the.....tag
5. The.....element creates an inline frame.
6.tag is used to specify video on an HTML document.
7. If a web developer wants to add the description to an image he must use attribute of tag.
8. The..... property is used to set position for an element.
9. The float property defines the.....of content.
10.is used with elements that overlap with each other.

Q2. State whether the following statement is True or False

1. HTML is an Object Oriented Programming Language.
2. Charset is used for character encoding declaration.
3. An unordered list can be numerical or alphabetical.
4. Multilevel list can be created in HTML 5.
5. Srccode specifies the HTML content of the page to show in the <iframe>
6. The ‘controls’ attribute is not used to add play, pause, and volume.
7. .cs is the extension of CSS file

Q.3. Choose Single correct answer from the given options.

1.element used to create a linking image
 - a)
 - b) <td>
 - c) <map>
 - d) <usemap>
2. Thetag is used to embed audio files on Webpages.
 - a) <sound>
 - b) <audio>
 - c) <video>
 - d) <embedded>

3. A programmer wants to define range for age between 18 to 50, he will use a form with following appropriate control.
 - a) number
 - b) compare
 - c) range
 - d) Textboxes

4.character is used to create id in CSS.
 - a) %
 - b) \$
 - c) @
 - d) #

Q 4. Choose Two correct answers from the given options.

1. List within another list either.....list or.....list is called nested list.
 - a) multilevel
 - b) order
 - c) unordered
 - d) general
 - e) cascading

2. Image maps are of two typesand
 - a) Network side
 - b) Client Side
 - c) Computer side
 - d) Server Side
 - e) n-compting

3. A CSS rule set contains.....and.....
 - a) Set
 - b) selector
 - c) post
 - d) declaration
 - e) block

4. Client-side image map can be created using two elements and.....
 - a) <area>
 - b) <image>
 - c) <usemap>
 - d) <map>
 - e) <server>

Q.5. Choose Three correct answers from the given options.

1. Attributes of <area> tag is.....
 - a) href
 - b) src
 - c) coords
 - d) data
 - e) alt
 - f) usemap

2. Attributes used with iframe are.....
 - a) srcdoc
 - b) name
 - c) att
 - d) src
 - e) href
 - f) loop

3. Following are the Form controls.....
 - a) email
 - b) search
 - c) label
 - d) video
 - e) tel
 - f) audio

4. Attributes used with <audio> tag.....
 - a) autoplay
 - b) href
 - c) controls
 - d) cntrl
 - e) loop
 - f) bgsound

5. CSS types are , and

 - a) internal
 - b) external
 - c) control
 - d) inline
 - e) loop
 - f) style

6. Positioning types in CSS are.....

 - a) Static
 - b) fixed
 - c) absolute
 - d) position
 - e) dynamic
 - f) nested

7. Types of floating properties are.....,.....,.....

 - a) left
 - b) zero
 - c) right
 - d) all
 - e) none
 - f) dock

Q. 6. Match the pair

- | A | B |
|------------------------|-----------------------------|
| 1) | a) Client side image map |
| 2) usemap | b) CSS Property |
| 3) color | c) bulleted list |
| 4) | d) Image as a submit button |
| 5) <Input type =image> | e) inserts an image |

Q.7. Programs.

- 1) Write a program using html with following CSS specification-

1. The background colour of the company name should be in green.

2. The text colour of the company name should be red.

3. The heading should be large with font "comic sans ms"

4. The description of the company should be displayed in blue color in a paragraph.

- 2) Write Html5 code with CSS as follows-

1. To create form to accept name, age, email address, from the user.

2. Create a submit button to send the data.

3. The heading of the form should have a background colour and a different font style.

- 3) Write Html5 code with CSS as follows-

1. Create ordered list with names of tourist Cities.

2. Create unordered list with tourist places of those cities.

3. Divide the list into two sections left and right by using CSS.



Let us learn

- Definition of SEO
- Types of SEO
- Techniques of SEO
- SEO-Page content
- SEO- Keywords
- SEO-Social Book marking
- SEO-SMO

2.1 Introduction

SEO stands for Search Engine Optimization. SEO is a technique used for: designing and developing a website to rank high in search engine results. It is a subset of search engine marketing. Thus SEO is useful in increasing the number of visitors to a website.

There are many strategies and techniques adopted to optimize the

webpage. This chapter introduces few ways at the beginners level.



Do you know?

Search Engine is an online program or software that helps users to search for information on world wide web. Examples of Search Engine include Google, Yahoo and Bing

2.2 Types of SEO - There are two types of optimization

- **On-Page SEO :** It includes Provision of good content, good keywords selection, putting keywords on correct places, giving appropriate title to every page etc.
- **Off-Page SEO :** It includes link building, increasing link popularity by submitting open directories, search engines, link exchange etc.

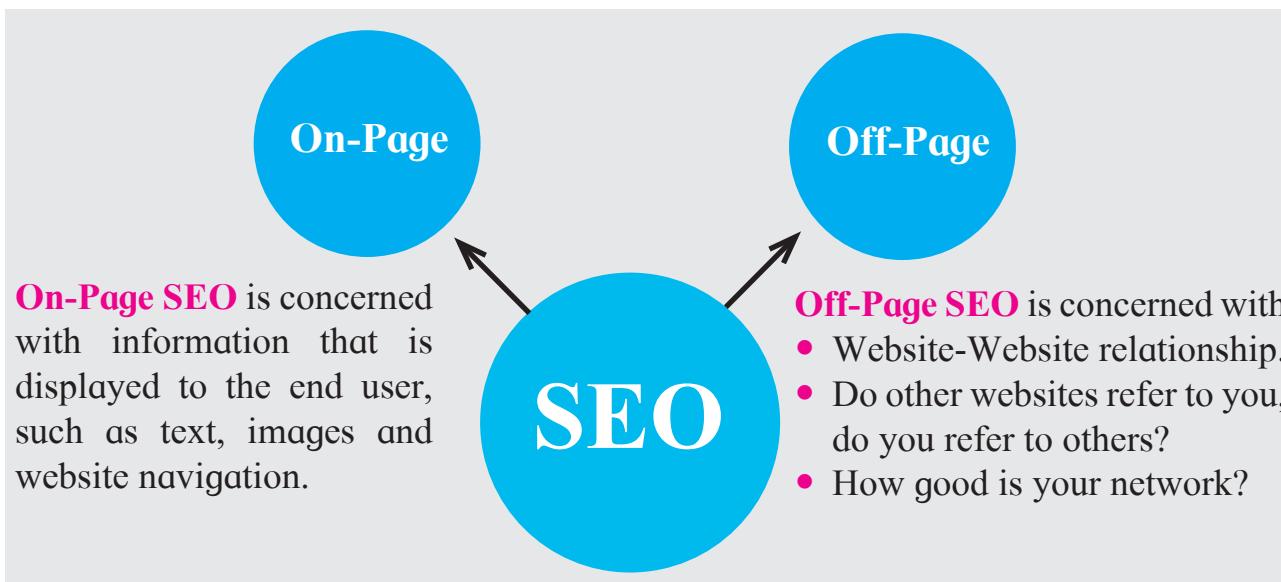


Fig 2.1: Types of SEO

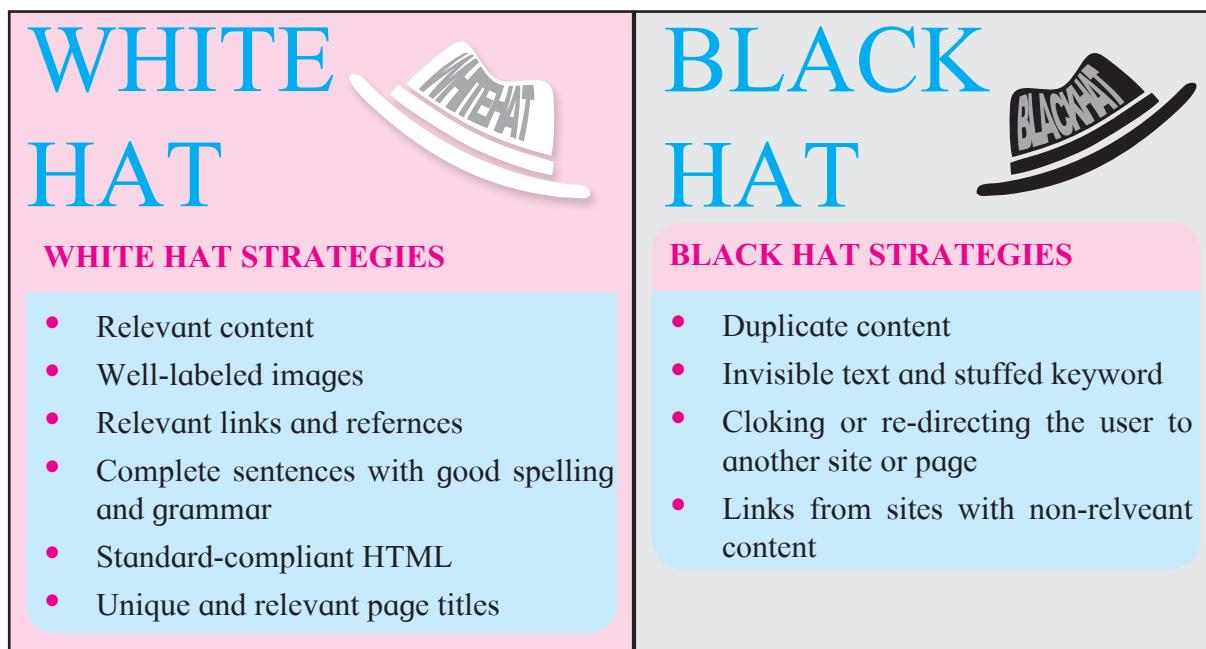
2.3 Techniques of SEO

These are classified into two broad categories:

- **White Hat SEO :** Techniques that search engines recommends as apart of good design.

- **Black Hat SEO :** Techniques that search engines do not approve. The techniques used for optimizing the website are manipulative.

Refer the following strategies and differences in short about Black Hat and White Hat techniques—



2.4 Optimizing Website

There are various sections of a website which can be optimised for better SEO.

Some of the ways to optimize the webpage for SEO

1. SEO : Page structure optimization

- Html programs should start with `<!doctype html>`.
- If it is singular tag eg`` it should be self enclosed like this-``
- Order of tags should be proper. Most of the time recently opened tag will be closed first.

• It is recommended to use

- **<TITLE>** : Title is the first thing that user notices in search result list while using google for searching. Contents should be up to 60 characters (spaces included)
- **Meta-description Tag** : While creating a web page, Meta description should be used to boost your On-Page SEO. Meta Description should be between 70 and 160 characters (spaces included)

- **Heading Tags** : The page should include proper heading tags from `<h1>` to `<h6>` wherever required.
- **Image Tags with ALT attribute** : The alt attribute gives information about the image, so even if the image does not download, it can make the viewers understand the image related information.

Examples of optimized Webpages

Example 1 :

```
<!doctype html>
<html>
<head><title> Page structure with appropriate order of opening and closing tags</title>
</head>
<body>
<h1> Let us understand SEO</h1>
<p>Webpage optimization helps for higher ranking in search engines.
<b>There are number of ways to opimize the pages.<i>Even the Social media plays an important role!!!</i>
</b>
</p>
</body></html>
```

Note : In the above example check the ordering of `<p>`, `` and `<i>`. The innermost tag ends first, followed by the outermost tag. The other basic tags also follow a proper ordering as per the HTML structure.

Example 2 :

```
<!doctype html>
<html>
<head><title> Meta tag and Image tag </title>
<meta name = "description" content = "statue of liberty">
<meta name = "keywords" content = "alt, optimization of image">
<meta name = "image" content = "statue of liberty">
</head><body>
<h1> Let us understand Meta and Image for optimization </h1>
<p>
<img src ="statue of liberty.jpg" alt="Statue of liberty image"/>
</p>
</body></html>
```

Note : In the above example meta tag is used with important and valid keywords related to that image, like the image source as statue of liberty and from the view of optimisation of `` tag.

2. SEO Keywords

SEO keywords are the important words and phrases related to the developed website content. A list of keywords. Need to be carefully chosen to optimize the search. Keyword Research and Analysis is an important part of the Search Engine Optimization (SEO) as well as "Search Engine Marketing".

For "Search Engine Marketing", one can pay for certain keywords.

There are various online Keyword Planner tools (such as Google AdWords Keyword Planner) to shortlist keywords. This is more useful to compare the cost of various keywords, if the website designer opts for Paid Search Engine Marketing.

3. SEO Social Bookmarking

Social bookmarking is a powerful tool in promoting a website. It is very useful for Off-Page SEO optimization.



Did you know?

Modern browsers support bookmark features. For example, you can save the bookmark in the browser by clicking the star icon next to the URL in Google Chrome.

Bookmarks are website links that are stored for future references. They are very useful specially when Web pages with long URLs are not easy to remember. Bookmarking service allows you to save, organize and share bookmarks with other users. that etc. External links are the important SEO factors to rank a website higher in the search engine. With Social bookmarking, you can quickly create high-quality backlinks.

4. SEO-Social Media Optimization (SMO)

It deals with enhancing the website's ranking, using interactive communities like facebook, twitter, blogs, forums and so on. When these communities have

links to the created website it builds familiarity and trust about the website.

5. SEO-Backlinks

Backlinks are links on one website that, when clicked, take the user to another site. Backlinks are especially valuable for SEO because they contribute to the overall strength and value of the content. They also represent a "vote of confidence" from one site to another. In short, backlinks to your website are a signal to search engines that others are interested to know about the contents form your website.

6. Other factors for SEO

- **Speed of the website :** While creating a website, attention is given on the design, content and as many visuals as possible. However, all But this can slow down the website and obstruct usability.
- **Mobile friendly :** Website's mobile friendliness has become a ranking factor for Google. Hence, it is very important to ensure that the created website is mobile friendly 'for maximum' exposure and to improve the websites ranking.



Do you know?

In Google chrome you can check if your site is mobile friendly by right-clicking anywhere on the page and clicking "Inspect." There is an icon at the left of "Elements" called "Toggle device toolbar" which changes the page to mobile mode when clicked.

- **Creating Robots.txt :** This file tells search engine which pages you want to exclude from indexing. For example, if you do not want a certain page or image being indexed, then you can restrict that page from being indexed.

2.5 SEO Audit

An SEO Audit helps to find out what could be done to improve ranking on search engines, so that consumers could find the website with greater ease. It analyses the websites health.

Get a Free SEO Audit in 3 Minutes

Check your website's overall SEO health and get a detailed report identifying any issues we find.

Website *

Submit

Fig 2.2 : Search bar in SEO Audit tool



Fig 2.3 : Homepage of SEOptimer

Eg-Seomator, SEOptimer are few free SEO audit tools available on net.

SEOptimer is a free SEO Audit Tool that will perform a detailed SEO Analysis. It provides clear and actionable recommendations that can be taken to improve your online presence.

The URL are as follows-

<https://seomator.com/free-seo-audit-tool>

<https://www.seoptimer.com/>

The following figures display the SEO analysis using SEOptimer website

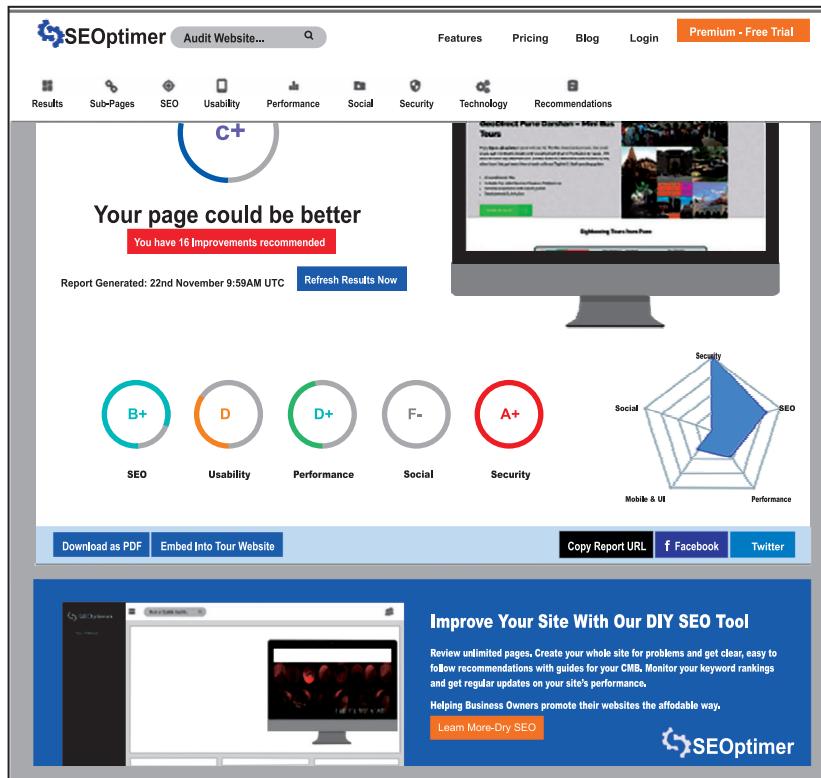


Fig 2.4 : Overall Analysis using SEOptimer

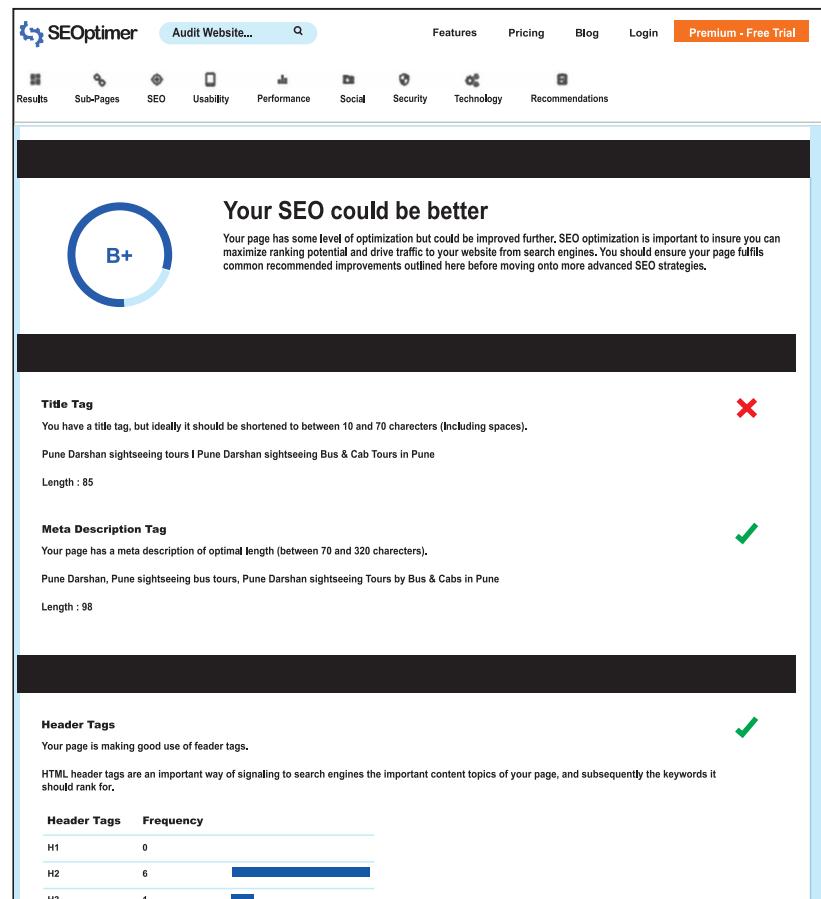


Fig 2.5 : Detailed Analysis of SEOptimer

Audit Results of SEOptimizer will have following details

- Overall Ranking of the site
- Recommendations for improvements
- Search Engine Optimization
- Usability of the website
- Performance of website
- Social links
 - Connected social accounts
- Security parameters
 - SSL Enabled
 - HTTPS Redirect
 - Email Privacy
- Header content recommendations
 - Title and Meta description
- Body Content
 - Header Tags
 - Body content recommendations
 - Keyword Consistency
 - Amount of content in the pages
- Links
 - Number of backlinks
 - Broken links
 - Friendly links
 - On page links
- Technology list which is used in the website



Did you know?

- *Crawling is a process by which search engines crawler/spiders/bots scan a website and collect details about each page: titles, images, keywords, other linked pages etc.*
- *Organic search results are the listings on a search engine results page (SERP) that appear because of factors such as relevance to the search term and valid search engine optimization (SEO) efforts rather than because of search engine marketing (SEM) or trickery.*

Summary

- SEO stands for Search Engine optimization .
- Apart from the Content of the website being the king of Optimization there are many other factors to improve the ranking .
- Keywords used in <title>,<meta> and heading levels play key role. Use of proper order of tags and structure, is equally important.
- with alt attribute also contributes to Optimization .
- Social media links and backlinks are also major factors to optimise the webpage.
- Apart from this mobile friendliness, speed also rank the websites higher.
- A SEO Audit tools like SEOptimer and SEOmator are the tools to determine the health of the website.

Exercise

Q.1 Fill in the blank.

1. The full form of SEO is _____.
2. _____ are links on one website that, when clicked, take the user to another site.
3. One of the optimization factor to improve images is by using _____ attribute.
4. An _____ helps to find out what you can be done to improve ranking on search engines, so that consumers can find the website with greater ease.
5. The _____ files tells search engine which pages you want to exclude from indexing.

Q.2. Match the following.

A

B

- | | |
|-------------------------------|------------------------------|
| 1. Image optimization | a) meta tag |
| 2. Links to Twitter, facebook | b) SEO technique |
| 3. description about author | c) alt attribute |
| 4. White hat Strategy | d) Social media optimization |

Q.2. Choose correct answers from the following. (2 correct)

1. The page content optimization can be done by using keywords in
 - a)
 - b)<title>
 - c)<hr>
 - d)<meta>
 - e)<input>
2. Other factors to rank the website higher are
 - a) Desktop friendly
 - b) Speed of the website
 - c) Creating robots. txt
 - d) No backlinks
 - e) No external links.

Q.3. Answer briefly.

1. Define SEO. State types of SEO.
2. Which are the different SEO techniques?
3. Explain in short White Hat technique.
4. Explain in short Black hat technique.
5. Explain in short SEO Keyword search.
6. Explain any two Page content optimization points.
7. Explain how could you optimize images.



Let us learn

- Features of JavaScript, difference between client side scripting and server side scripting.
- Looping structures.
- DOM Objects and window object in JavaScript.
- Inbuilt objects such String, Math, Array, Date and Number with its properties and Methods.
- Simple JavaScript programs to do validations and user interaction.

3.1 Introduction

There is variety of scripting languages used to develop dynamic websites. JavaScript is an interpreted scripting language. An interpreted language is a type of programming language that executes its instructions directly and freely without compiling machine language instructions in previous program. Program is a set of instructions used to produce various kinds of outputs. JavaScript was initially created to "make webpages alive". The programs in this language are called scripts.

3.1.1 Features of JavaScript :

- JavaScript is light weight scripting language because it does not support all features of object oriented programming languages.

- No need of special software to run JavaScript programs
- JavaScript is object oriented scripting language and it supports event based programming facility. It is case sensitive language.
- JavaScript helps the browser to perform input validation without wasting the user's time by the Web server access.
- It can handle date and time very effectively.
- Most of the JavaScript control statements syntax is same as syntax of control statements in other programming languages.
- An important part of JavaScript is the ability to create new functions within scripts. Declare a function in JavaScript using function keyword.
- Software that can run on any hardware platform (PC, Mac, SunSparc etc.) or software platform (Windows, Linux, Mac OS etc.) is called as platform independent software. JavaScript is platform independent scripting language. Any JavaScript-enabled browser can understand and interpreted JavaScript code. Due to different features, JavaScript is known as universal client side scripting language.

There are two types of scripting : Server side scripting and Client side scripting.

Client-side Scripting : In this type, the script resides on client computer (browser) and that can run on the client. Basically, these types of scripts are placed inside an HTML document.

Server-side Scripting : In this type, the script resides on web server. To execute the script it must be activated by client then it is executed on web server.

3.1.2 Difference between Server side scripting and client side scripting

1. Server-side scripting is used at the backend, where the source code is not visible or hidden at the client side (browser). On the other hand, client-side scripting is used at the frontend which users can see from the browser. So Server-side scripting is more secure than client-side scripting.
2. When a server-side script is processed it communicates to the server. As against, client-side scripting does not need any server interaction.
3. The client-side scripting language involves languages such as HTML5, JavaScript etc. In contrast, programming languages such as PHP, ASP.net, Ruby, ColdFusion, Python, C# etc. are server side scripting languages.
4. Server-side scripting is useful in customizing the web pages and implements the dynamic changes in the websites. Conversely, the client-side scripts are generally used for

validation purpose and effectively minimize the load to the server.

5. Special software (web server software) is required to execute server-side script, whereas client side scripts requires web browser as an interface.



Do you know?

There are some popular framework / libraries.

- **Angular JS :** It is a javascript based open source frontend web framework developed mainly for single page application.
- **Vue JS :** It is javascript based framework for building interactive user interface (UI). It can be easily integrated with other projects and libraries.
- **React :** It consists of javascript libraries for building UI for single page application and mobile application.

3.2 Switch case and Looping Structures

Previous year we have learnt different basic syntax of javascript such as variable declaration, if structure, function etc. Let us learn some extra features:

3.2.1 Switch Case statement

JavaScript has a built-in multiway decision statement known as Switch. The switch statement test the value of given expression against a list of case values and when match is found, a block of statement associated with that case is executed. There should not be duplicity

between the cases. The value for the case must be similar data type as the variable in switch. The default statement is not mandatory.

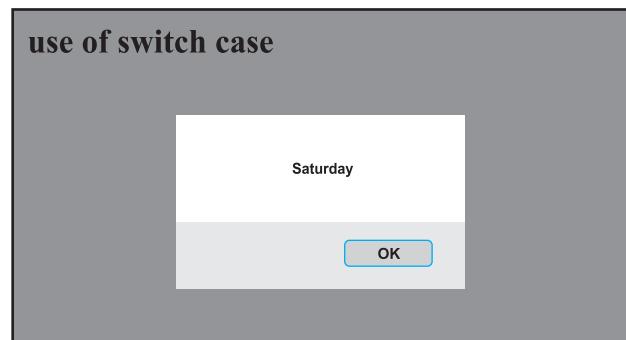
Syntax :

```
switch(expression)
{
    case value1:
        statement block 1;
        break;
    case value2:
        statement block 2;
        break;
    .....
    case value n:
        statement block n;
        break;
    default:
        statement block ;
}
```

Program :

```
<!DOCTYPE html>
<head><title>Javascript Program
</title></head>
<body>
<h1> use of switch case </h1>
<script type="text/javascript">
var day=6;
switch(day)
{
case 1: alert("Monday"); break;
case 2: alert("Tuesday"); break;
case 3: alert("Wednesday"); break;
case 4: alert("Thursday"); break;
case 5: alert("Friday"); break;
case 6: alert("Saturday"); break;
case 7: alert("Sunday"); break;
default: alert("Invalid day");
}
</script></body></html>
```

Output :



Note : 'language' attribute of <Script> is replaced by 'type' attribute in all the programs as it is standardised.

3.2.2 Looping Statement

While creating programming logic, we need to execute some statements repeatedly. Iteration refers to the execution of statement or a group of statements of code for a fixed number of times or till the condition is satisfied. The condition should be boolean condition. Some commonly used JavaScript looping statements are:

1. for.....loop

This loop executes statements as long as condition becomes true, control comes out from the loop when condition becomes false. Benefit of for-loop is that it combines initialization, condition and loop iteration (increment or decrement) in single statement.

Syntax :

```
for(initialization;condition;iteration)
{
    statement block;
}
```

Initialization is assigning initial value to the variable, which executes only once, and then the condition is checked. Loop will execute statements in statement block till the condition is true. When condition becomes false control is transferred out of the loop and it will execute remaining program. Iteration means increment or decrement value of a running variable.

Example :

```
for(i=1;i<=5;i++)
{
    document.writeln(i);
}
```

Output:

1
2
3
4
5

```
for(i=5;i>=1;i--)
{
    document.writeln(i);
}
```

Output:

5
4
3
2
1

2. While.....loop

This loop executes statements as long as the condition is true. As soon as condition becomes false control comes out of the loop.

Syntax:

```
initialization;
while(condition)
{
    statement block;
}
```

The statement within the loop may be a single line or a block of statements. If the statement within loop is a single line then the curly parenthesis is optional. Here loop will be executed repeatedly as long as the condition is true. Note that if

condition always true then loop would be executed infinitely so after some execution condition becomes false.

Example :

```
var i=1
while(i<=5)
{
    document.writeln(i);
    i=i+1;
}
```

Program for loop

```
<!DOCTYPE html>
<head><title>Table-I</title>
<script type="text/javascript">
function display()
{
    var i,a;
    a=form1.t1.value
    for(i=1;i<=10;i++)
    {
        document.write(a*i + "<br/>");
    }
}
</script></head>
<body>
<form name="form1">
Enter number to display table:-
<input type="text" name="t1">
<input type="button" value=" Display
Table" onClick="display()">
</body>
</html>
```

Output :

| 19 |
|-----|
| 38 |
| 57 |
| 76 |
| 95 |
| 114 |
| 133 |
| 152 |
| 171 |
| 190 |



Do it yourself

Find syntax of do.....while() loop and difference between while() and do...while() loop.

Break and continue statements

Break statement is used to jump out of loop. It is used to make an early exit from a loop. When keyword break is encountered inside the loop, control automatically passes to the next statement after the loop.

Sometimes in looping it may be necessary to skip statement block and take the control at the beginning for next iteration. This is done by using '**continue**' statement in JavaScript.

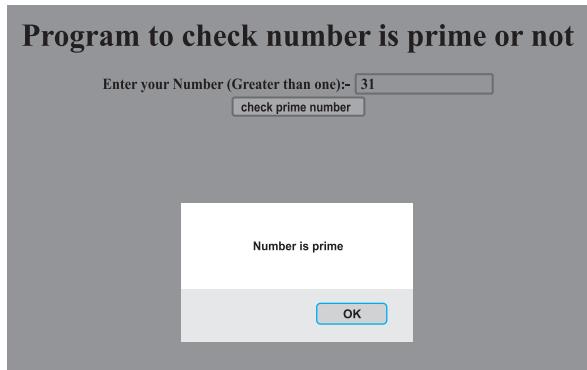
Program :

```
<!DOCTYPE html>
<html><head><title>Prime number</title>
<script type="text/javascript">
function display()
{
    var a,ans;
    a=parseInt(form1.t1.value);
    ans=1;
    for(i=2;i<a;i++)
    {
        if(a%i==0)
        {
            ans=0;
            break;
        }
    }
    if(ans==1)
        alert("Number is prime");
    else
        alert("Number is not prime");
}
</script></head>
<body>
<h1 align="center"> Program to check number is prime or not </h1>
<form name="form1" style="text-align:center">
Enter your Number (Greater than one):-<input type="text" name="t1"> <br>
    <input type="button" value="check Prime number" onClick="display()">
</body></html>
```

Output :

Program to check number is prime or not

Enter your Number (Greater than one):-



3.3 Objects in JavaScript

JavaScript is an object based scripting language. Almost everything is an object in JavaScript. A JavaScript object is an entity having state (properties) and behavior (methods). An object can group data together with functions needed to manipulate it. Look around you, you will find many examples of real world objects. Such as table, board, television, bicycle, shop, bus, car, monitor etc. All these tangible things are known as objects. Take an example of car object. It has properties like name, model, weight, color etc. and methods like start, stop, brake etc. All cars have same properties but contain different values from car to car. All cars have same methods but perform differently.

| Object | Properties | Methods |
|--------|--------------------|-------------|
| car | car.name=Ferrari | car.start() |
| | car.model=F430 | car.drive() |
| | car. weight=1517kg | car.brake() |
| | car.color=red | car.stop() |

Properties and methods of object's are accessed with '!' operator. JavaScript supports 2 types of objects built-in objects and user defined objects.

1. Built in objects such as Math, String, Array, Date etc.
2. JavaScript gives facility to create user defined objects as per user requirements. The 'new' keyword is used to create new object in JavaScript.

e.g.

d= new Date();

// 'd' is new instance created for Date object.

DOM (Document Object Model) :

When HTML document is loaded into a web browser, it becomes a document object. It defines logical structure of document. The way in which HTML document content is accessed and modified is called as Document Object Model. It is programming interface for HTML and XML (Extensible Markup Language) documents.

The standardization of DOM was founded by W3C (World Wide Web Consortium) which works for standardization of web technologies. According to W3C :

"The W3C Document Object Model (DOM) is a platform and language-neutral interface that allows programs and scripts to dynamically access and update the content, structure, and style of a document."

Following diagram shows hierarchy of DOM object:

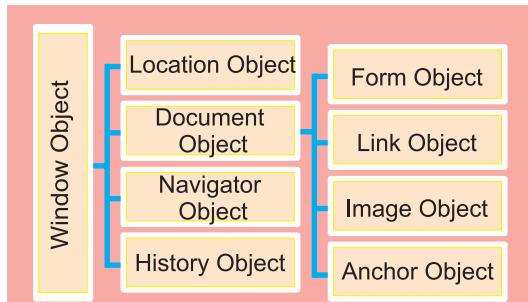


Fig. 3.1 Document Object Model

Following are some of the predefined methods and properties for DOM object.

| Property | Description |
|------------------|--|
| head | Returns the <head> element of the document |
| title | Sets or returns title of the document. |
| URL | Returns full URL of the HTML document. |
| body, img | Returns <body>, elements respectively. |
| Method | Description |
| write() | Writes HTML expressions or JavaScript code to a document. |
| writeln() | Same as write(), but adds a newline character after each statement. |
| getElementById() | There are many ways of accessing form elements, of which the easiest is by getElementById() method. In which id property is used to find an element. |

The innerHTML Property

The innerHTML property is useful for getting html element and changing its content. The innerHTML property can be used to get or change any HTML element, including <html> and <body>.

```

<!DOCTYPE html>
<html>
<head>
<script type="text/javascript">
function changeText3()
{
var style=<h2 style= 'color:green'>;
var text="Welcome to the HTML5 and
Javascript";
var closestyle=</h2>;
document.getElementById('para').
innerHTML =style+text+closestyle;
}
</script></head>
<body style="background-
color:cyan">
<h1 align="center">
<p id="para">Welcome to the site</p>
<input type="button"onclick="
"changeText3()" value="click this
button to change above text">
</h1>
</body>
</html>
  
```

Output :



Window Object :

At the very top of the object hierarchy is the window object. Window object is parent object of all other objects. It represents an open window in a browser. An object of window is created automatically by the browser. Window object represents an open window in a browser. An object of window is created automatically by the browser. Following table shows some of the methods and properties for window object.

| Property | Description |
|--------------|---|
| name | Sets or returns the name of a window. |
| location | Returns the Location object for the window. |
| document | Returns the Document object for the window. |
| status | Sets or returns the text in the status bar of a window. |
| closed | Returns a Boolean value indicating whether a window has been closed or not. |
| Method | Description |
| alert() | Displays the alert box containing message with ok button. |
| confirm() | Displays the confirm dialog box containing message with ok and cancel button. |
| prompt() | Displays a dialog box to get input from the user. |
| open() | Opens the new window. |
| close() | Closes the current window. |
| blur() | Removes focus from the current window. |
| focus() | Sets focus to the current window. |
| print() | Prints the content of current window. |
| setTimeout() | Calls a function or evaluates an expression after a specified number of milliseconds. |

Program :

```
<!DOCTYPE html>
<html>
<head>
<title>Window Opener and Closer
</title>
<script type="text/javascript">
function makeNewWindow()
{
var newwin=window.open();
newwin.document.write("<h1>This is
new window</h1>");
newwin.document.body.style.
backgroundcolor="skyblue";
}
</script></head>
<body><form>
<input type="button" value="Create
New Window"
onClick="makeNewWindow()">
</form></body>
</html>
```

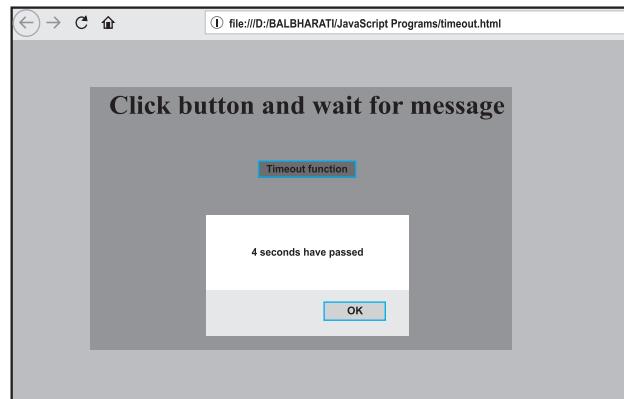
Program :

```
<!DOCTYPE html>
<html>
<head>
<script type="text/javascript">
function sampleFunction()
{
window.setTimeout(next(), 4000);
}
function next()
{
alert("4 seconds have passed");
}
</script></head>
<body style="background-color:cyan">
<h1 align="center">
Click button and wait for message
</h1>
<input type="button" value="Timeout
function"
onClick="sampleFunction()">
</body>
</html>
```

Output :



Output :





Do it yourself

1. Write JavaScript program to display status "Hi this is status property" in status bar of window.
2. Write JavaScript program to set three different background color to webpage on onClick, onmousemove and onmouseover events of button object.

3.4 JavaScript Event

Events are actions done by the user or an application that occurs on the webpage. In previous year we studied different keyboard events (onKeypress, onKeyDown, onkeyup) and mouse events (onClick, onMousemove, onMouseout, onMouseover). Similarly there are some more events used with form objects.

Input and other object Events:

| Event handler | Description |
|---------------|--|
| onblur | It occurs when user leaves field or losses focus of an element. |
| onfocus | It occurs when an element gets focus. |
| onchange | It occurs when user changes content of an element or selects dropdown value. E.g. for textbox, password, select box, textarea etc. |
| onselect | It occurs when user selects some text of an element. |
| onsubmit | It occurs when user clicks submit button. |
| onreset | It occurs when user clicks reset button. |
| onload | It occurs when page/image has been loaded. |
| onunload | It occurs when document/page has been unloaded or closes. |

3.5 JavaScript Built-in Objects

JavaScript has several built-in or core language objects. These built-in objects are available regardless of window content and operates independently of whatever page browser has loaded. These objects provide different properties and methods that are useful while creating live web pages.

String Object :

String is used to store zero or more characters of text within single or double quotes. String object is used to store and manipulate text.

| Property | Description |
|---------------|--|
| length | Returns the number of characters in a string |
| Method | Description |
| charAt() | Returns the character at the specified position (in Number). |
| indexOf() | Returns the index of the first occurrence of specified character in given string, or -1 if it never occurs, so with that index you can determine if the string contains the specified character. |
| lastIndexOf() | Returns the index of the last occurrence of specified character in given string. |
| substr() | Returns the characters you specified: (14,7) returns 7 characters, from the 14th character. |
| substring() | Returns the characters you specified: (7,14) returns all characters between the 7th and the 14th. |
| trim() | The trim() method removes whitespace from both sides of a string |
| toLowerCase() | Converts a string to lower case |
| toUpperCase() | Converts a string to upper case |

Example :

```
var str="Information Technology";
document.write ("length of string is :-" + str.length);
document.write ("Substring is :-" + str.substr (12,10));
```

Output :

```
Length of string is :-22
Substring is :- Technology
```

Math Object :

The built-in Math object includes mathematical constants and functions. You do not need to create the Math object before using it. Following table contains list of math object methods: e.g. var x=56.899; alert(Math.ceil(x));

| Method | Description |
|---------|---|
| abs(x) | Returns the absolute value of a number. |
| cbrt(x) | Returns the cube root of a number. |
| ceil(x) | Returns the next integer greater than or equal to a given number (rounding up). |

| Method | Description |
|----------------|--|
| floor(x) | Returns the next integer less than or equal to a given number (rounding down). |
| max(x, y, ...) | Returns the highest-valued number in a list of numbers. |
| min(x, y, ...) | Returns the lowest-valued number in a list of numbers. |
| pow(x, y) | Returns the base to the exponent power, that is, x^y . |
| random(x) | Returns a random number between 0 and 1 (including 0, but not 1). |
| sqrt(x) | Returns the square root of a number. |



Do it yourself

1. Write event driven JavaScript program to take number as user input and find its square root and cube root.

Date Object :

The date object is used to create date and time values. It is created using new keyword. There are different ways to create new date object.

```
var currentdate=new Date();
var currentdate=new Date(milliseconds);
var currentdate=new Date(dateString);
var currentdate=new Date(year,month,day,hours,minute,seconds,milliseconds);
```

| Method | Description |
|---------------|---|
| getDate() | Returns the day of the month (from 1-31) |
| getDay() | Returns the day of the week (from 0-6) |
| getFullYear() | Returns the year (four digits). |
| getHours() | Returns the hour (from 0-23). |
| getMinutes() | Returns the minutes (from 0-59). |
| getMonth() | Returns the month (from 0-11). |
| getSeconds() | Returns the seconds (from 0-59). |
| getTime() | Returns the number of milliseconds since midnight Jan 1, 1970. |
| now() | Returns the number of milliseconds since midnight Jan 1, 1970. |
| setDate() | Sets the day of the month of a date object. |
| setFullYear() | Sets the full year of a date object. |
| setHours() | Sets the hours of a date object. |
| setMinutes() | Set the minutes of a date object. |
| setMonth() | Sets the month of a date object. |
| setSeconds() | Sets the seconds of a date object. |
| setTime() | Sets a date to a specified number of milliseconds after/before Jan 1, 1970. |

Number Object :

It helps us to work with numbers. Primitive values (like 34 or 3.14) cannot have properties and methods, but with JavaScript it is available with primitive values.

| Property | Description |
|--------------|---|
| MIN_VALUE | Returns the largest minimum value. |
| MAX_VALUE | Returns the largest maximum value. |
| NaN | It represents ‘Not a Number’ value. |
| Method | Description |
| isInteger() | It determines whether the given value is a Integer |
| parseFloat() | It converts the given string into a floating point number. |
| parseInt() | It converts the given string into a integer number. |
| toFixed() | It returns the string that represents a number with exact digits after a decimal point. |

Array Object :

An array is an object that can store a collection of items. JavaScript arrays are used to store multiple values in single variable. An array is a special variable which can hold more than one value at a time. Arrays become really useful when you need to store large amounts of data of the same type. You can create an array in JavaScript as given below.

```
var fruits=["Mango","Apple","Orange","Grapes"];
OR
```

```
var fruits=new Array("Mango","Apple","Orange","Grapes");
```

You can access and set the items in an array by referring to its indexnumber and the index of the first element of an array is zero. arrayname[0] is the first element, arrayname[1] is second element and so on.

```
e.g. var fruitname=fruits[0];
document.getElementById("demo").innerHTML=fruits[1];
```

| Property | Description |
|--------------|---|
| index | The property represents the zero-based index of the match in the string |
| length | Reflect number of elements in array. |
| Method | Description |
| concat() | Joins two or more arrays, and returns a copy of the joined arrays |
| copyWithin() | Copies array elements within the array, to and from specied positions. |

| Method | Description |
|---------------|--|
| find() | Returns the value of the first element in an array that satisfies a test in testing. |
| forEach() | Calls a function for each array element. |
| indexOf() | Search the array for an element and returns its position. |
| isArray() | Checks whether an object is an array. |
| pop() | Removes the last element of an array, and returns that element. |
| push() | Adds new elements to the end of an array, and returns the new length. |
| reverse() | Reverses the order of the elements in an array. |
| sort() | Sorts the elements of an array. |

Program Using array object :

```

<!DOCTYPE html>
<html><head>
<title>use of array methods</title>
</head>
<body style="color:blue;background-color:pink;font-size:30px">
<script type="text/javascript">
var city = ['Pune', 'Kolhapur', 'Mumbai', 'Nashik', 'Latur', 'Nagpur'];
document.write("Original array elements are <br>");
document.write(city);
document.write("<br><br>Copy elements at end to the beginning <br>");
document.write(city.copyWithin(0, 3));
city = ['Pune', 'Kolhapur', 'Mumbai', 'Nashik', 'Latur', 'Nagpur'];
document.write("<br><br>Copy elements at the beginning to the end<br>");
document.write(city.copyWithin(3, 0));
city = ['Pune', 'Kolhapur', 'Mumbai', 'Nashik', 'Latur', 'Nagpur'];
document.write("<br><br>Copy first 3 elements to middle<br>");
document.write(city.copyWithin(2, 0, 3));
city = ['Pune', 'Kolhapur', 'Mumbai', 'Nashik', 'Latur', 'Nagpur'];
document.write("<br><br>Adding an element to an array<br>");
document.write(city.push('Kokan'));
document.write(city);
document.write("<br><br>Reversing an array element <br>");
document.write(city.reverse());
</script> </body></html>

```

Output :

Original array elements are
Pune,Kolhapur,Mumbai,Nashik,Latur,Nagpur

Copy elements at end to the beginning
Nashik,Latur,Nagpur,Nashik,Latur,Nagpur

Copy elements at the beginning to the end
Pune,Kolhapur,Mumbai,Pune,Kolhapur,Mumbai

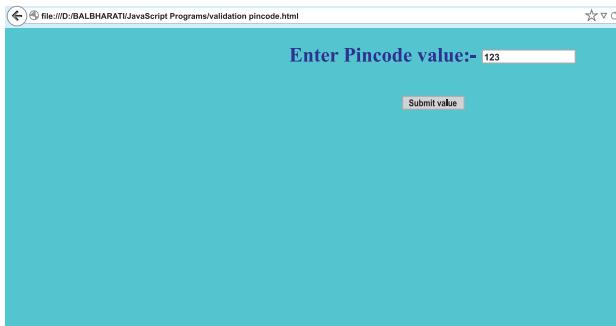
Copy first 3 elements to middle
Pune,Kolhapur,Pune,Kolhapur,Mumbai,Nagpur

Addind an element to an array
7Pune,Kolhapur,Mumbai,Nashik,Latur,Nagpur,Kokan

Reversing an array element
Kokan,Nagpur,Latur,Nashik,Mumbai,Kolhapur,Pune

Validation program in JavaScript :

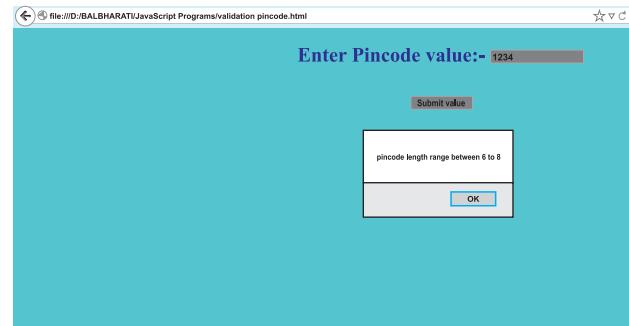
```
<!DOCTYPE html>
<html><head><title>Pincode Validation</title></head>
<body style="color:blue;background-color:cyan"><form name="form1">
<h1 align="center">
Enter Pincode value:-<input type="text" name="t1"><br><br>
<input type="button" value="Submit value" onClick="validate()"></h1>
<script type="text/javascript">
function validate()
{
    var pincode; pincode=form1.t1.value;
    if(pincode.length==0)
    {
        alert("please check, enter value");
        form1.t1.focus();
    }
    else if(Number.isInteger(pincode))
    {
        alert("please, enter integer number only");
        form1.t1.focus();
    }
    else if(pincode.length<6||pincode.length>8)
    {
        alert("pincode length range between 6 to 8");
        form1.t1.focus(); }
    else
        alert("Pincode is accepted");
}
</script> </body></html>
```



File:///D:/BALBHARATI/JavaScript Programs/validation pincode.html

Enter Pincode value:- 123

Submit value



File:///D:/BALBHARATI/JavaScript Programs/validation pincode.html

Enter Pincode value:- 1234

pincode length range between 6 to 8

OK

Note : isInteger() is supported by version Mozilla Firefox 16 and higher.



Do it yourself

1. Find more Math object methods useful for trigonometric functions.
2. Write JavaScript Program to create simple calculator using JavaScript Math object.

Summary

- JavaScript is light weight scripting language. It is platform independent language.
- There are two types of scripts; client side script and server side scripts. Client side scripts reside on client machine and server side script resides on web server.
- JavaScript provide ‘switch...case’ as multi way decision statement.
- For....loop, while...loop and do...while are commonly used looping structures in JavaScript.
- DOM (Document Object Model) is a programming interface for HTML and XML documents. It defines logical structure of document.
- Window object is parent object of all other objects hence its methods can be used without specifying it.
- JavaScript is event based language support objects events such as onBlur, onFocus, onChange, onSelect, onSubmit, onLoad, onUnload, onResize etc.
- JavaScript supports built-In objects such as Date, String, Math, Number and array etc. These objects contain number of properties and methods that are useful while creating interacting web pages.

Exercise

Q.1 Fill in the blanks.

1. -----script resides on server computer.
2. ----- statement is used to jump out of loop.
3. ----- defines logical structure of document.
4. ----- property of window object returns Boolean value indicating whether window is closed or not.
5. ----- event occurs when an element loses its focus.

Q.2. State whether given statement is true or false.

1. JavaScript is case sensitive language.
2. Math.ceil() function is used to return the nearest integer less than or equal to given number.
3. MAX_VALUE property of number object returns smallest possible value.
4. getDay() method of Date object returns month in number.
5. onKeydown event occurs when user moves mouse pointer.

Q.3. Multiple choice questions. Select one correct answer.

1. JavaScript is ----- language.
 - a) Compiled
 - b) Interpreted

- c) Both a and b
- d) None of the above
2. Select correct method name of String object-----.
 - a) charAt()
 - b) characterAt()
 - c) valueAt()
 - d) lengthAt()
3. ----- method displays message box with Ok and Cancel button.
 - a) Confirm()
 - b) Alert()
 - c) both a and b
 - d) None of these
4. We can declare all types of variables using keyword -----.
 - a) var
 - b) dim
 - c) variable
 - d) declare
5. Trace output of following JavaScript code.

```
var str="Information  
Technology";  
document.write  
(str.lastIndexOf("o"));  
a) 18  
b) 19  
c) 20  
d) 21
```

Q.4. Multiple choice questions. Select two correct answer.

1. Valid two methods of Date object are ----- and -----.
 - a) setTime()
 - b) getValidTime()
 - c) getTime()
 - d) setValidTime()

- Properties of document object are ----- and -----.
 - URL
 - title
 - name
 - status
- and ----- are event / event handler used with text object in JavaScript.
 - onBlur
 - onMove
 - onFocus
 - onAction

Q.5 Multiple choice questions. Select three correct answers.

- Select three correct methods of window object-----
 - write()
 - alert()
 - writeln()
 - close()
 - open()
 - charAt()
- JavaScript features are -----, ----- and -----.
 - supports event based facilities
 - is platform dependent language
 - case insensitive scripting language
 - provide inbuilt objects
 - can handle date and time effectively
 - requires special software to run
- Inbuilt objects in JavaScript are -----, ----- and -----.
 - Time
 - Date
 - Inheritance
 - Array
 - Number
 - function

Q.6 Explain the following.

- What are similarities and differences between client side scripting and server side scripting.
- Briefly explain features of JavaScript.
- Explain switch.....case conditional statement in JavaScript with example.

Q.7 Write event driven JavaScript program for the following.

- Display Addition, multiplication, division and remainder of two numbers, which were accepted from user.
- Display number sequence from 100 to 150 in following format.
(100 101 102.....150)
- Find and display factorial of given number.
- Accept any string from user and count and display number of vowels occurs in it.

Q.7 Match the following.

| A | B |
|---------|---|
| ceil() | Writes HTML expression or javascript code to a document. |
| floor() | Sets focus to current window. |
| write() | Removes white spaces from both sides of string. |
| focus() | Returns next integer greater than or qual to to given number. |
| trim() | Returns the next integer less than or equal to given number. |



Let us learn

Different Emerging Technologies.

- Basics of Internet Of Things (IOT).
- Basics of cloud computing.
- Introduction to Artificial Intelligence (AI).
- Introduction to 5G.

4.1 IoT (Internet of Things)

The Internet of things (IoT) is the network of physical devices, vehicles, home appliances, and other items embedded with electronics, software, sensors, actuators, and connectivity. Which enables these things to connect, collect and exchange data, creating opportunities for more direct integration of the physical world into computer-based systems, resulting in efficiency improvements, economic benefits. This reduces human efforts.

IOT involves extending Internet connectivity beyond standard devices, such as desktops, laptops, smartphones and tablets, to any range of traditionally dumb or non-internet-enabled physical devices and everyday objects. Embedded with technology, these devices can communicate and interact over the Internet, and they can be remotely monitored and controlled.

Advantages :

- **Efficient resource utilization :** If we know the functionality and the way that how each device works, we definitely increase the efficient resource utilization as well as monitor natural resources.
- **Minimize human effort :** As the devices of IoT interact and communicate with each other and do lot of task for us, then they minimize the human effort.
- **Time saving :** As it reduces the human effort then it definitely saves out time. Time is the primary factors in automation which can save through IOT platform.
- **Enhance Data Collection :** IoT devices can collect data from environment like weather, sound, pollution etc. This data then can be used to take decisions.
- **Improve, security :** IoT based security systems can make home or office environment secure.

Disadvantages :

- **Privacy :** Even without the active participation on the user, the IoT system provides substantial personal data in maximum detail.
- **Complexity :** The designing, developing, maintaining and enabling

the large technology to IoT system is quite complicated.

Applications of IoT :

- Smart lighting - Illumination of light is controlled on the basis of day light.
- Smart thermostats - Allows users to schedule, monitor and remotely control home temperatures.
- Smart locks and garage-door openers - Password based or facial recognition based doors and locks.
- Smart security cameras – Security cameras that can identify known and unknown person and raise alarm, in case of security threat.
- Smart traffic signals – Signal that can adjust their timing to accommodate commutes and holiday traffic and keep cars moving.

4.2 Cloud Computing

Cloud computing is a model for enabling, convenient on-demand network access to a shared pool of computing resources like network, servers, storage, applications and services released with service provider interaction.

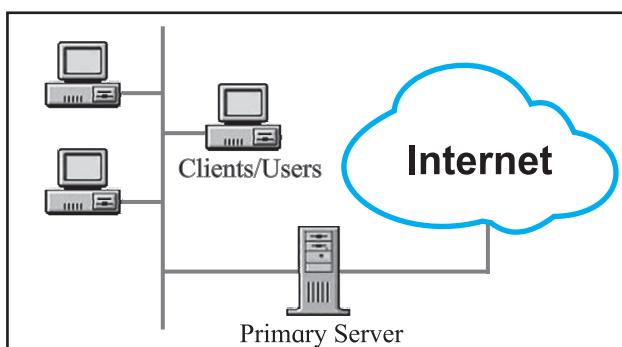


Fig. 4.1 : Cloud Computing

Models of Cloud computing :

There are three primary service models of cloud computing that are Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS).

Infrastructure as a service (IaaS)

IaaS gives users access to storage, networking, servers and other computing resources via the cloud. While the user is still responsible for managing their applications, data, middleware, etc. IaaS provides automated and scalable environments that provide a high degree of control and flexibility for the user.

Key features :

- Instead of purchasing hardware outright, users pay for IaaS on demand.
- Infrastructure is scalable depending on processing and storage needs.
- Enterprises saves the costs of buying and maintaining their own hardware.

Examples : Amazon web services (AWS) ec2, Microsoft Azure VM, Google Compute Engine (GCE)

Platform as a service (PaaS)

A service provider offers access to a cloud-based environment in which users can develop, manage and deliver applications. In addition to storage and other computing resources, users are able to use a suite of prebuilt tools to develop, customize and test their own applications.

Key features :

- PaaS provides a platform with tools to test, develop and host applications in the same environment.
- Enables organizations to focus on development without having a worry about underlying infrastructure.
- Providers manage security, operating systems, server software and backups.
- Facilitates collaborative work even if teams work remotely.



Do it yourself

Find example of Paas

Software as a service (SaaS)

A service provider delivers software and applications through the internet. Users do not install applications on their local devices. Instead, the applications reside on a remote cloud network accessed through the web or an API.

Key features :

- SaaS vendors provide users with software and applications via a subscription model.
- Users do not have to manage, install or upgrade software; SaaS providers manage this.
- Data is secure in the cloud; equipment failure does not result in loss of data.
- Use of resources can be scaled depending on service needs.
- Applications are accessible from

almost any internet-connected device, from virtually anywhere in the world.

Examples : Google's G suite, GitHub, SAP, Slack, Dropbox.

Types of Cloud Computing :

There are three basic types of deployment of cloud computing that are Public, Private and Hybrid.

Public Cloud :

In public cloud, all the services and supporting infrastructure are managed off-site over the internet and shared across multiple users. Public cloud are more efficient and inexpensive than private and hybrid cloud solutions.

Examples : Amazon AWS, Microsoft Azure, Google Cloud Platform.

Private cloud :

As the name suggests private cloud provides I.T services through the internet or a private network to selected users rather than to general public. All the data is protected behind the firewall. Private cloud solutions are preferred for enhanced security and privacy by the users.

Hybrid Cloud :

Hybrid cloud environments combines both Public and Private cloud elements. The clouds in a Hybrid environment communicate over an encrypted connection and allow for the portability of data and applications. Hybrid cloud allows greater flexibility as compared to that of public and private cloud solutions.

Benefits of Cloud Computing :

Cost saving : Cloud computing solutions are inexpensive than the actual overall Infrastructure set up for the I.T services.

Reliable : Cloud computing solutions are more reliable than In-house I.T infrastructure.

Mobility : Cloud computing solutions are more portable because user can access data anytime, anywhere as required.

4.3 AI (Artificial Intelligence)

Artificial intelligence (AI) is an area of computer science that emphasizes on creation of intelligent machines that work and react like humans.

AI is different from robotics, but related to some extent, in which machines sense their environment, perform calculations and do physical tasks either by themselves or under the direction of people.

AI has some sub fields like-

- Machine learning automates analytical model building, to find hidden insights in data without being programmed to look for something in particular or draw a certain conclusion.
- Neural networks imitate the brain's array of interconnected neurons, and relay information between various units to find connections and derive meaning from data.
- Deep learning utilizes really big neural networks and a lot of computing power to find complex patterns in

data, for applications such as image and speech recognition.

- Cognitive computing is about creating a "natural, human-like interaction", including using the ability to interpret speech and respond to it.
- Computer vision employs pattern recognition and deep learning to understand the content of pictures and videos, and to enable machines to use real-time images to make sense of what's around them.
- Natural language processing involves analyzing and understanding human language and responding to it.

Advantages of Artificial Intelligence :

Reduction in human error : Computers if programmed properly with artificial Intelligence gives 100% accuracy as compared to task performed by human as there is always a chance for human mistakes.

Digital Assistance : Some of the highly advanced organizations use digital assistants to interact with users which saves the need for human resources. Example- chatbot

Faster Decisions : Using AI alongside other technologies, we can make machines take decisions faster than a human and carry out actions quicker.

Daily Applications : Daily applications such as **Apple's Siri, Window's Cortana, Google's OK Google** are frequently used

in our daily routine whether it is for searching a location, taking a selfie, making a phone call, replying to a mail and many more.

Disadvantages of AI :

High Costs of Creation- As the machines used in AI based environments are very complex and high in price, it increases the cost for overall set up.

Unemployment- As AI is replacing the majority of the repetitive tasks and other works with robots. This will reduce human interference but cause a major problem in the employment standards.

4.4 5G

5G is the fifth generation of cellular network technology.

5G is the next generation of wireless communications. It is expected to provide Internet connections that are multiple times faster than 4G LTE (Long Term Evolution). 5G technology may use a variety of spectrum bands, including millimeter wave (mmWave) radio spectrum, which can carry very large amounts of data at a short distance. The drawback of the higher frequencies is that they are more easily obstructed by the walls of buildings, trees and other foliage, and even changes in the weather.

The new 5G networks will be able to transmit very large amounts of data—but only a few blocks at a time. 5G networks are digital cellular networks, in which the service area covered by providers is divided into small geographical areas called cells.

5G can support up to a million devices per square kilometer, compared to 4G.

Features of 5G are shown in fig. 4.2

Applications :

- 1) Online 5G Games.
- 2) Automated Vehicles.
- 3) Virtual Classrooms.

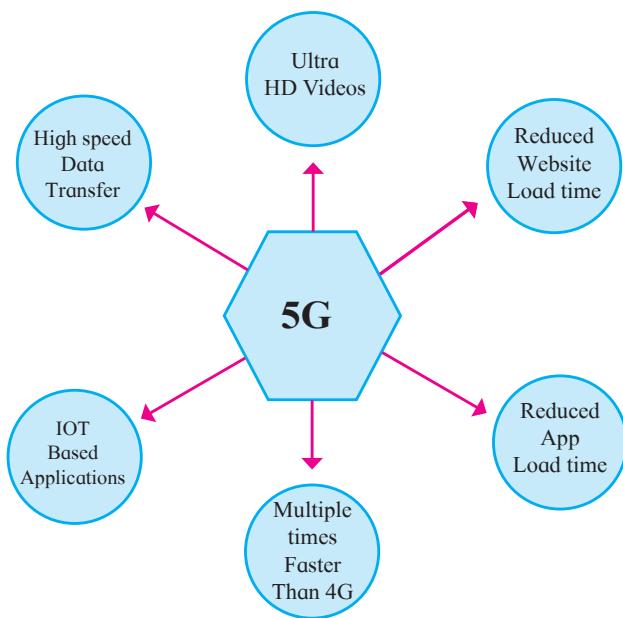


Fig. 4.2 : Features of 5G



Do it yourself

Find out various technologies used in smart cities

Summary

- IOT stands for Internet of Things.
- With the help of applications based on IOT various social and critical problems can be solved. for e.g. Traffic problem, Air pollution, water pollution.
- AI Stands for Artificial Intelligence.
- With the help of AI we can approach higher accuracy and privacy.
- 5G is the fastest method of data transfer.

Exercise

Q.1 Fill in the blanks.

1. IOT is Referred as
2. Smart Home is the application of Technology.
3. Amazon is the service provider.

Q.2. Match the pair.

| 'A' | 'B' |
|----------------------|--------------------------|
| 1) Smart city | a) Software as a Service |
| 2) Amazon web server | b) Platform as a Service |
| 3) PaaS | c) Cloud computing |
| 4) SaaS | d) IOT |

Q.3. State whether the given statement is True or False.

1. PaaS provides a platform with tools to test, develop and host applications in the same Environment.

.....

2. Cloud computing means to store and access data and programs over the internet.

.....

Q.4 Explain the followings.

1. Give some applications of IOT.
2. Explain in detail about cloud computing.
3. Explain models of cloud computing.
4. Give brief idea about AI.
5. Explain the concept of 5G.



Let us learn

- Features of PHP
- PHP variables, datatypes
- PHP Array, String function and user-defined functions
- PHP form handling
- PHP connectivity with database server

5.1 Introduction to PHP

PHP (Hypertext Preprocessor) is a widely-used open source general-purpose scripting language. It is especially suited for web development and can be embedded into HTML.

- PHP runs on various platforms (Linux, Unix, Mac OS X, Windows etc.).
- PHP is compatible with almost all servers used today (For eg. XAMMP, Apache, NGINX, lighttpd).
- PHP supports a wide range of databases.
- PHP is free and one can download it from the official PHP resource: www.php.net.
- PHP is easy to learn and runs efficiently on the server side.

5.2 Server Side Scripting

A server is a computer system that serves as a central repository of data and

programs and is shared by the clients. The server-side environment that runs a scripting language is termed web server. A user's request is fulfilled by running a script directly on the web server to generate dynamic HTML pages. This HTML is then sent to the client browser. It is usually used to provide interactive web sites that interfaces with databases or other data stores on the server.

Few Programming languages for server-side programming are :

- 1) PHP
- 2) Java and JSP
- 3) Python

PHP mainly focuses on server-side scripting, which is used to collect form data, generate dynamic page content, or send and receive cookies. There are three things to make this work : the PHP parser a web server and a web browser. You need to run the web server, with a connected PHP installation. You can access the PHP program output with a web browser, viewing the PHP page through the server. Note : PHP hides the code from the user.

5.3 Features of PHP

PHP is most popular and frequently used world wide server-side scripting language and the main reason of popularity is :

- **Simple :** It is very simple and easy to use, as compared to other scripting languages.
- **Interpreted :** It is an interpreted language, i.e. there is no need for compilation.
- **Faster :** It is faster than other scripting language e.g. JSP and ASP.
- **Open Source :** Open source means you need not pay for use of PHP. You can freely download and use.
- **Platform Independent :** PHP code will be run on every platform, Linux, Unix, Mac OS X, Windows.
- **Case Sensitive :** PHP is case sensitive scripting language while declaration of variables and its use in the program. In PHP, all keywords (e.g. if, else, while, echo, etc.) classes, functions, and user-defined functions are NOT case-sensitive.
- **Error Reporting :** PHP have some predefined error reporting constants to generate a warning or error notice.
- **Real-Time Access Monitoring :** PHP provides access logging by creating the summary of recent accesses for the user.
- **Loosely Typed Language :** PHP supports variable usage without declaring its data type. It will be taken at the time of execution Based on the type, data has its value. Since the data types are not set in a strict sense,

we can do things like adding a string to an integer without causing an error.

5.4 First sample code of PHP

A PHP file normally contains HTML tags, and some PHP scripting code. The PHP code is usually enclosed in special start and end processing instructions <?php and ?> that allow us to move into and out of "PHP mode." Even it allows to embed HTML code within PHP code.

All the PHP files have extension ".php". A PHP script can be placed anywhere in the html document. For e.g. : PHP program to display the text "Hello World!" on a web page. **Note that 'echo' is used to display text on web page.**

Program 5.1:

```
<!DOCTYPE html>
<html>
<body>
<h1>My First PHP Page</h1>
<?php
echo "Hello World!";
?>
</body>
</html>
```

Output 5.1:



Note : The PHP code is embedded with HTML tags using <?php and ?>.



Do you know?

Popular PHP Frameworks

- 1. Laravel :** It is used to build robust web application with MVC support. It simplifies task such as caching, security, authentication and many more.
- 2. Symfony :** It is used for fast app development due to reusable components. It provides many app building blocks like Form management etc..

How to execute PHP program :

1. Type the above program and save it as "first.php" using any text editor (for e.g. notepad, gedit).
2. Create folder with your name in /var/www/html. (for e.g. balbharati)

Note : Create folder in servers root directory. In case of Linux the path of root directory is var/www/html. In case of windows the path is C:/XAMPP/htdocs.

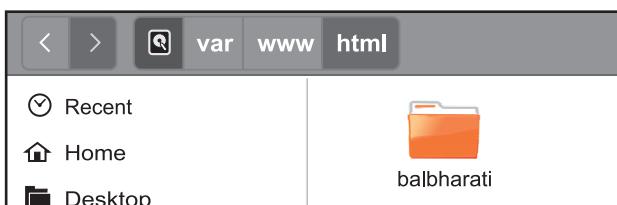


Fig 5.1: Folder created on web server

3. Save the 'first.php' file in balbharati folder.



Fig 5.2: first.php in server directory

4. Go to browser and type "http://localhost/balbharati/" in URL bar. Click on 'first.php'.

Index of /balbharati

| Name | Last modified | Size | Description |
|----------------------------------|------------------|------|-------------|
| Parent Directory | | | |
| first.php | 2018-11-15 11:03 | 153 | |

Apache/2.4.18 (Ubuntu) Server at localhost Port 80

Fig 5.3: List of files on server directory

My first PHP page

Hello World!

Fig 5.4 : Output of first.php program

PHP Case Sensitivity :

In PHP, the variable names are case sensitive. However keywords (e.g. if, else, break, for, while, echo etc.), function and class names are case insensitive.

For e.g. : The echo keyword is case insensitive in the program 5.2.

Program 5.2:

```
<?php
ECHO "Hello World!<br>";
echo "Hello World!<br>";
EcHO "Hello World!<br>";
?>
```

Output 5.2:

```
Hello World!  
Hello World!  
Hello World!
```

Note : In above example, HTML tag
 is enclosed in echo output string.

PHP Variables :

Variable is a symbol or name that stands for a value. Variables are used for storing values such as numeric values, characters, character strings, or memory addresses, so that they can be used in any part of the program.

Rules for declaring PHP Variable :

- A variable starts with the \$ sign, followed by the name of the variable
- A variable name must start with a letter or the underscore character
- A variable name cannot start with a number
- A variable name can only contain alpha-numeric characters and underscores (A-z, 0-9, and _)
- Variable names are case-sensitive (\$age and \$AGE are two different variables)

There are three different variable scopes in PHP:

- local
- global
- static

A variable declared **outside** a function

has a GLOBAL SCOPE and can only be accessed outside a function (variable \$a). And a variable declared **within** a function has a LOCAL SCOPE and can only be accessed within that function (variable \$b).

Program 5.3:

```
<?php  
$a = 20;  
$c = 15;  
function myFunction(){  
$b = 10;  
global $c;  
echo "<p> value of 'a' inside function  
is : $a </p>";  
echo "<p> value of 'b' inside function  
is : $b </p>";  
echo "<p> value of 'c' inside function  
is : $c </p>";  
}  
  
myFunction();  
echo "<p> value of 'a' outside function  
is : $a </p>";  
echo "<p> value of 'b' outside function  
is : $b </p>";  
?>
```

Output 5.3:

```
value of 'a' inside function is :  
value of 'b' inside function is : 10  
value of 'c' inside function is : 15  
value of 'a' outside function is : 20  
value of 'b' outside function is :
```

We can access a global variable \$c from within a function using

"global" keyword before the variables (inside the function).

Note : PHP also stores all global variables in an array called `$GLOBALS[index]`. The index holds the name of the variable

When a function is executed, then all of its variables are deleted. In some cases, if we want a local variable not to be deleted then the use of "static" keyword is must.

Program 5.4:

```
<?php
function myCount(){
static $c = 0; // Static Keyword
echo $c;
$c++;
}
echo "Output of myCount() with use of
'static' keyword : <br>";
myCount();
echo "<br>";
myCount();
echo "<br>";
myCount();
?>
```

Output 5.4:

Output of myCount() with use of "static" Keyword:
0
1
2

PHP Data Types:

Variables can store data of different types and PHP supports the following data types :

- 1) String 2) Integer 3) Float 4) Boolean
- 5) Array 6) NULL

e.g. : One can check the data-type of variable using `var_dump()` method in PHP.

Program 5.5:

```
<?php
echo "<br> -- String --<br>";
$x = "Hello World !";
echo var_dump($x);
echo "<br> -- Decimal --<br>";
$x = "1234";
echo var_dump($x);
?>
```

Output 5.5:

-- String --
string(12)" Hello world! "
--Decimal--
int(1234)

`var_dump()` gives different output for each type of data type. It gives the length of string for 'string' data type, it gives actual digit for 'integer' data type and true/false for 'boolean' data type.

5.4.5 Comments in PHP

Comments are the statements in PHP code, which are not visible in the output of the program. It is ignored during execution. A Single-line comment is possible if one adds `//` or `#` before a statement in PHP. A multi-line comment is possible with `/*` and `*/`.

Note :

- 1) PHP Operators are similar to JavaScript Operators.
- 2) Accepting value from the user at runtime is possible through HTML Form and is covered in section 5.8

Control structures in PHP :

1. If statement in PHP : if statement allows programmer to make decision, based on one or more conditions; and execute a piece of code conditionally.

Syntax :

```
if(condition)
{
    block of statement;
}
```

2. If-else statement in PHP : if-else statement allows programmer to make decision based on either this or that conditions.

Syntax :

```
if(condition)
{
    Statement;
}
else
{
    Statement;
}
```

Program 5.6:

```
<?php
$marks=80;
if($marks>=60)
{ echo"you passed with first class";
}
else
{ echo"you can do better";
}
?>
```

Output 5.6:

```
you passed with first class
```

3. Loop Structure in PHP : Loops are used to execute the same block of code repeatedly as long as a certain condition is satisfied.

For eg : 'For loop' in PHP

Syntax :

```
for(initialisation;condition;incrementation
or decrementation)
{
    Statement;
}
```

Program 5.7:

```
<?php
for($i=1;$i<=5;$i++)
{
    echo"The number is".$i."<br>";
}
?>
```

Output 5.7:

```
The number is:1
The number is:2
The number is:3
The number is:4
The number is:5
```

Use of foreach loop : This loop works only on arrays, and is used to loop through each key/value pair in an array.

Syntax :

```
foreach ($array as $value) {
    code to be executed;
}
```

Note : Use of '!' in PHP. It is used for concatenation purpose.

Following are the few predefined functions in PHP to manipulate string.

| Function | Description |
|------------------|--|
| strlen() | Returns the length of a string (i.e. total no. of characters) |
| str_word_count() | Counts the number of words in a string |
| strrev() | Reverses a string |
| strpos() | Searches for a specific text within a string and returns the character position of the first match and if no match is found, then it will return false |
| str_replace() | Replaces some characters with some other characters in a string |
| substr() | Returns a part of a string |
| strtolower() | Converts a string to lowercase |
| substr_count() | Counts the number of times a substring occurs in a string |
| ucwords() | Converts the first character of each word in a string to uppercase |
| trim() | Removes whitespace and other predefined characters from both sides of a string |

Table 5.1: Pre-defined functions for string manipulation.

Example : The program below shows few string manipulation functions.

5.5 PHP String Functions

A string is series of characters. The real power of PHP comes from its functions. A function is a block of statements that can be used repeatedly in a program. PHP has many built-in functions that can be called directly to perform a specific task.

Output 5.8:

```
String : Textbooks produced by Balbharati are also published in pdf format.
String Length : 67
String Word Count : 10
Reverse String : .tamrof fdp ni dehsilbup osla era itarahblaB yb decudorp skoobtxeT
Return position of string search : 22
Replace string: Textbooks produced by State Board are also published in pdf format.
```

Program 5.8:

```
<?php
$str="Textbooks produced by Balbharati
are also published in pdf format. ";
echo "<br>String: ".$str;
echo "<br>";
echo "<br>String Length : ".strlen($str);
echo "<br>";
echo "<br>String Word Count
: ".str_word_count($str);
echo "<br>";
echo "<br>Reverse String : ".
strrev($str);
echo "<br>";
echo "<br>Retrun position of string
search : ".strpos($str,"Balbharati");
echo "<br>";
echo "<br>Replace string :
".str_replace("Balbharati","State
Board",$str);
?>
```

5.6 PHP Arrays

An array is a special variable, which can hold more than one value at a time. An array stores multiple values in one single variable:

Create an Array in PHP :

In PHP, the `array()` function is used to create an array.

Syntax :

```
$a = array( values )
```

In PHP, there are three types of arrays:

- **Indexed arrays** - Arrays with a numeric index
- **Associative arrays** - Arrays with named keys
- **Multi-dimensional arrays** - Arrays containing one or more arrays

Indexed arrays :

The index can be assigned automatically (index always starts at 0).

Syntax :

```
$a = array( value1, value2, ..., value n)
```

Program 5.9:

```
<?php  
$subjects = array("English", "Hindi",  
"Marathi");  
echo "I like ".$subjects[0].",  
".$subjects[1]." and ".$subjects[2];  
echo "<br> Count : ".count($subjects);  
?>
```

Output 5.9:

```
I like English, Hindi and Marathi.  
Count : 3
```

In above example, we store subject in an array at following index location.

```
$subjects[0] = "English";  
$subjects[1] = "Hindi";  
$subjects[2] = "Marathi";
```

The `count()` function is used to return the length of an array:

Note : An array can hold many values under a single name, and you can access the values by referring to an index number.

PHP Associative Arrays :

Associative arrays are arrays that use named keys instead of index to identify record/value. Let us see how to create associative array.

Syntax :

```
$a = array( key1 => value1, key2  
=>value2, ...,key n=> value n)
```

Program 5.10:

```
<?php  
$student_mark =  
array("English"=>"75",  
"Hindi" =>"64",  
"Marathi"=>"88");  
echo "You have scored ".$student_  
mark['English']."' in English .";  
?>
```

Output 5.10:

```
You have scored 75 in English.
```

In above example, the values of 'student_mark' array are stored in following way:

```
$student_mark['English'] = "75"  
$student_mark['Hindi'] = "64"  
$student_mark['Marathi'] = "88"
```

Instead of index location, we can refer values with the help of keys. Here 'English' refers to a key & value is '75'. " \Rightarrow " is used to associate key & value.

PHP Multi-dimensional Arrays :

A multidimensional array is an array containing one or more arrays. PHP can handle multiple levels of multidimensional array.

Use of foreach loop in an array

Program 5.11:

```
<?php  
$subjects = array("English","Hindi",  
"Marathi");  
foreach ($subjects as $value) {  
echo "$value <br>";  
}  
?>
```

Output 5.11:

| |
|---------|
| English |
| Hindi |
| Marathi |

In above example we have used 'foreach' loop where for every loop iteration, the value of the current array element is assigned to '\$value' and the array pointer is moved by one, until it reaches the last array element.

5.7 PHP User Defined Functions

A function is a block of statements that can be used repeatedly in a program. It will not execute immediately when a page loads but will be executed by a call to the function. Along with built-in PHP

functions, we can always create our own functions. A user-defined function declaration starts with the word function.

Syntax :

```
function functionName() {  
    code to be executed;  
}
```

Note : A function name can start with a letter or underscore (not a number). Function names are NOT case-sensitive.

Program 5.12:

```
<?php  
function writeMsg(){  
echo "This is user-defined function";  
}  
writeMsg(); //call the function  
?>
```

Output 5.12:

| |
|-------------------------------|
| This is user-defined function |
|-------------------------------|

PHP Function Arguments :

Information can be passed to functions through arguments. An argument is just like a variable. Arguments are specified after the function name, inside the parentheses. The following example has a function with arguments (\$rollno and \$name):

Program 5.13:

```
<?php  
function Student($rollno, $name){  
echo "Roll No is $rollno and Name is  
$name <br>";  
}  
Student(1,"Ashwini");  
Student(2,"Raj");  
Student(3,"Sonam");  
?>
```

Output 5.13:

```
Roll No. is 1 and Name is Ashwini  
Roll No. is 2 and Name is Raj  
Roll No. is 3 and Name is Sonam
```

Note : String is written in double quotes.

Returning Value :

To let a function return a value, use the return statement:

Program 5.14:

```
<?php  
function sum(int $x, int $y) {  
    $z = $x + $y;  
    return $z;  
}  
echo "5 + 10 = " . sum(5, 10) . "<br>";  
echo "7 + 13 = " . sum(7, 13) . "<br>";  
echo "2 + 4 = " . sum(2, 4);  
?>
```

Output 5.14:

```
5 + 10 = 15  
7 + 13 = 20  
2 + 4 = 6
```

5. 8 PHP Form Handling

A simple HTML form with two input fields and a submit button:

Program 5.15.1:

```
<html>  
<body>  
<form action="welcome.php"  
method="post">  
Name: <input type="text"  
name="name"><br>  
E-mail: <input type="text"  
name="email"><br>  
<input type="submit">  
</form>  
</body>  
</html>
```

Output 5.15.1:

```
Name:   
E-mail:   

```

When the user fills out the form above and clicks the submit button, the form data is sent for processing to a PHP file named "welcome.php". The form data is sent with the HTTP POST method.

The code for "welcome.php" looks like this:

Program 5.15.2:

```
<html>  
<body>  
Welcome  
<?php echo $_POST["name"]; ?> <br>  
Your email address is:  
<?php echo $_POST["email"]; ?>  
</body>  
</html>
```

Output 5.15.2:

```
Welcome balbharti Your email address  
is: balbharti@balbharati.in
```

`$_POST["email"]` helps us to get the data of form field whose name attribute is email. And the output is displayed as shown in output 5.15.2.

Lets understand another example with HTTP GET method.

Program 5.16.1:

```
<html>
<head>
<title>BMI Calculator</title>
</head>
<body>
<form method="get"
action="bmioutput.php">

Weight (kg): <input name="weight"
id="weight" type="text" /> <br/>
Height (cm): <input name="height"
id="height" type="text" /> <br/>

<input name="submit" id="submit"
value="Calculate" type="submit" />

</form>
</body>
</html>
```

Output 5.16.1:

| | |
|--|----------------------------------|
| Weight (Kg) : | <input type="text" value="70"/> |
| Height (Kg) : | <input type="text" value="165"/> |
| <input type="button" value="Calculate"/> | |

bmioutput.php

Program 5.16.2:

```
<?php
$height = $_GET["height"];
$weight = $_GET["weight"];
$heightInMs = $height/100;
$bmi = $weight/
($heightInMs*$heightInMs);

if($bmi < 18.5)
{
    $message = "You are underweight.";
}
else if($bmi >=18.5 && $bmi <= 24.9)
{
    $message = "Congrats!!! You have
normal weight.";
}
else if($bmi >24.9 && $bmi <=29.9)
{
    $message = "You are overweight.";
}
else
{
    $message = "Be careful!!! You are
obese.";
}

echo $message;
echo "<br> BMI : ".$bmi;
?>
```

Output 5.16.2:

**You are over weight.
BMI : 25. 711662075298**

Once you click on 'Calculate' button, the output is displayed as shown above.

The PHP superglobals `$_GET` and `$_POST` are used to collect form-data.

The same result could also be achieved using the HTTP GET method. Just replace POST with GET. Let us understand the difference between GET and POST Method.

GET vs POST :

Both GET and POST are treated as `$_GET` and `$_POST` superglobals, which means that they are always accessible, regardless of scope. It can be accessed from any function, class or file without having to do anything special.

`$_GET` is an array of variables passed via the URL parameters.

`$_POST` is an array of variables passed via the HTTP POST method.

When to use GET?

- Information sent from a form with the GET method is visible to everyone (all variable names and values are displayed in the URL).
- GET also has limits on the amount of information to send. However, because the variables are displayed in the URL, it is possible to bookmark the page. This can be useful in some cases.
- GET may be used for sending non-sensitive data.
- GET should NEVER be used for sending passwords or other sensitive information!

When to use POST?

- Information sent from a form with the POST method is invisible to everyone (all names/values are embedded within the body of the HTTP request).
- POST has no limits on the amount of information to send.
- Moreover POST supports advanced functionality such as support for multi-part binary input while uploading files to server.
- The variables are not displayed in the URL so it is not possible to bookmark the page.

Form connectivity with Database :

Note : Ensure you have configured 'php.ini' file before PHP & Database connectivity.

Example : Create an admission form for the registration of the college student. We have already studied HTML form creation in previous chapter and database creation in DBMS chapter. Now create "college" database and create table "student" with following fields in this Postgres SQL database.

| | |
|------|--------|
| Name | gender |
|------|--------|

Now write following code in 'admission.php' file.

Program 5.17:

```
<!DOCTYPE html>
<head lang="en">
<title>Home</title>
<meta name="viewport" content="width=device-width, initial-scale=1">
</head>
<body>
<h1> Student Admission Form</h1>
<form method="post" >
<label> First Name </label>
<input type="text" name="name" id="id_name" maxlength="30" required
placeholder="Enter your Name" />
<br>
<label> Gender </label>
<input type="radio" name="gender" id="id_gender" value="male"> Male
<input type="radio" name="gender" id="id_gender" value="female"> Female
<input type="radio" name="gender" id="id_gender" value="other"> Other
<br>
<input type="submit" name="submit" id="submit" value="Submit" />
</form>
</body>
</html>
<?php
$servername = "pgsql:host=localhost;dbname=college";
$username = "postgres";
$password = "postgres";
$conn = new PDO($servername,$username , $password);

if(isset($_POST['submit']))
{
$name=$_POST["name"];
$gender=$_POST["gender"];
$sql = "INSERT INTO student (name, gender) VALUES ('".$name."','".$gender."')";
$conn->exec($sql);
echo "New record created successfully";
}
?>
```

Output 5.17:

Student Admission Form

First Name

Gender Male Female Other

In above example, PHP Data Object class, i.e. PDO(), helps us to connect PHP code with almost any database server. It doesn't account for database-specific syntax, and one can switch database simply by switching the connection string in many instances. It provides database access layer providing a uniform method of access to multiple databases.

1) Create database connection object

```
$conn = new  
PDO($servername,$username,  
$password);
```

In our example, we connect PHP with PostgreSQL server. The above statement creates connectivity object '\$conn' with three parameters as shown below:

1. Server host name or IP address and Database name
2. Database username
3. Database password

2) SQL statement and its execution

```
$sql = "INSERT INTO student  
(name, gender) VALUES  
('".$name."','".$  
".$gender."');
```

The above statement creates SQL

string to insert values in the table named 'student'.

```
$conn -> exec($sql);
```

In the above statement '`->`' is used to execute SQL statement using \$conn as connectivity object.

Note : iset() method in PHP is used to check whether variable has value or not, this help us to know if the button is clicked or not.

The above program is used to insert data from the user into the database. Now let us understand how to fetch the data from database and display as a webpage. The next program uses PDO exception. PDO exceptions are used to handle errors, which means anything you do with PDO should be wrapped in a try/catch block. The part of code which may be erroneous can be put in try{} block and the code to handle the error can be place in catch{} block.

PDO exception class is used to throw errors due to database connectivity. '\$e' is the object of PDO and using `getMessage()`, we can print the error message for database connectivity. `prepare($sql)` is the secure way to execute SQL queries using any programming language whereas `fetchAll()` method is used to get all the records from the given table and store in \$result variable.

`$conn -> null` is to close the database connectivity object.

Note : For database connectivity you may use any other database such as mysql, .maliadb etc.

Program 5.18:

```
<!doctype html>
<html> <body>
<h1>Display data</h1>
<?php
$servername = "pgsql:host=localhost;
dbname=college";
$username = "postgres";
$password = "postgres";
try
{
$conn = new
PDO($servername,$username ,
$password);
}
catch (PDOException $e)
{
echo "connection error".
$e->getMessage();
}
try
{
$sql1 = "select * from student";
$sqlp=$conn->prepare($sql1);
$sqlp->execute();
$result=$sqlp->fetchAll();
echo "Name -- Gender";
foreach($result as $row)
{
echo $row["name"]."--";
echo $row["gender"]." ";
echo "<br>";
}
}
catch (PDOException $e)
{
echo "connection error".
$e->getMessage();
}
$conn=null;
?>
</body></html>
```

Output 5.18 :

Display data

Name -- Gender
raj -- male
mahika -- female
meenal -- female

Cookies and session in PHP :

Cookies :

A cookie is a small text file that the server sends on the user's computer. It is used to identify user or its machine and track activities created on the user computer. When browser requests server page, cookies are sent along with the request. PHP can be used both to create and retrieve cookie values.

Eg. Cookies store visited page on browser to optimise search.

Session :

This is used to store user information on server to track user activites. It helps web application to maintain user information on all the pages.

Eg. If you login to gmail account, the session help us to access youtube account also.

Note : For database connection use username and password values which you have given at the time of postgres installation.

Program 5.17 and 5.18 uses username as 'postgres' and password as 'postgres' while programming.

Summary

- PHP is widely-used open source server-side programming language which runs on various platforms.
- PHP is a script executed on server which generate dynamic HTML pages.
- The PHP code can also be embedded with HTML tags using <?php and ?>.
- PHP is case sensitive only at time of variable declaration and not-case sensitive for other keywords.
- PHP variable start with \$ sign followed by name of variable which must start with a alpha-numeric characters or underscore character.
- PHP variable has three different scopes namely : local, global and static.
- PHP supports String, Integer, Float, Boolean, Array and NULL data types.
- Three types of Arrays are Indexed array, Associative array and Multi-dimensional array.
- PHP supports ‘foreach’ loop to iterate easily.
- String functions are used to manipulate strings.
- A function is a block of statements that can be used repeatedly in a program.
- Information can be passed to functions through arguments.
- Form is used to collect information from user and process or store in database.
- Form data can be submitted by GET or POST method.
- The PHP superglobals \$_GET and \$_POST are used to collect form-data.
- \$_GET is an array of variables passed via the URL parameters and are visible to everyone.
- \$_POST is an array of variables passed via the HTTP POST method and are invisible to others.
- GET has limits on the amount of information to send whereas POST has no limits on the amount of information to send.
- GET should NEVER be used for sending sensitive information.
- PDO- PHP Data Object helps us to connect PHP code in uniform method of access to multiple databases.
- Cookies are sent along when browser requests server pages.
- Session helps web application to maintain user information on all the pages.

For information purpose only

PHP LAMP Install

How To Install Apache, PHP and php-pgsqlstack on Ubuntu 18.04

A "LAMP" stack is a group of open-source software that is typically installed together to enable a server to host dynamic websites and web apps. His term is actually an acronym which represents the Linux operating system, with the Apache web server. The site data is stored in a MySQL database, and dynamic content is processed by PHP.

Open Terminal and type following commands

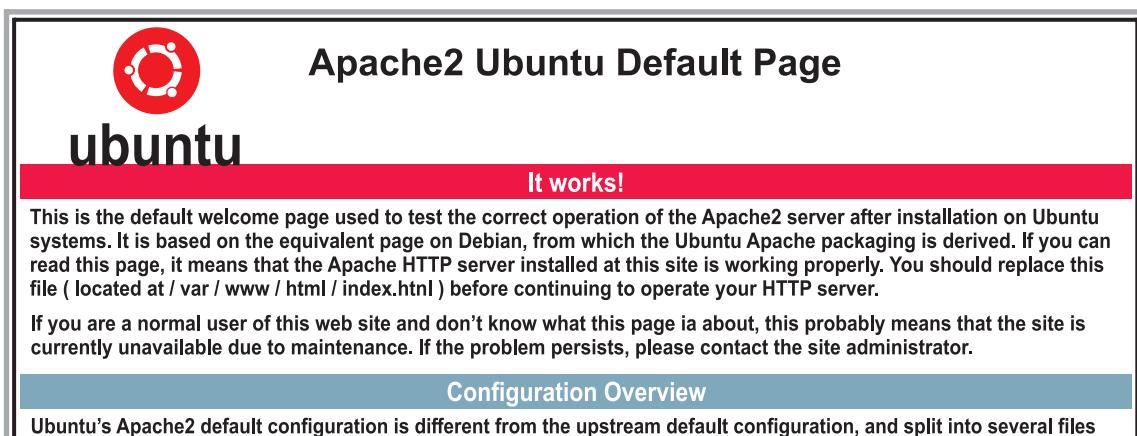
Step 1 : Installing Apache

```
$ sudo apt update  
$ sudo apt install apache2
```

To verify the installation, type following statement in the browser address bar.

http://your_server_ip or <http://localhost>/

If you get following page, its installed successfully.



Step 2 : Installing connector for php-pgsql

```
$ sudo apt install php-pgsql
```

This command, too, will show you a list of the packages that will be installed, along with the amount of disk space they'll take up. Enter Y to continue.

Step 3 : Installing PHP

```
$ sudo apt install php libapache2-mod-php
```

After this, restart the Apache web server in order for your changes to be recognized. Do this by typing:

```
$sudo systemctl restart apache2
```

Step 4 : Testing PHP Processing on your Web Server

In order to verify PHP installation, you create a very basic PHP script called mydemo.php.

Now go to /var/www/html/. Create the file at that location. The file should contain following statement.

File Name : mydemo.php

```
<?php  
echo"Hurray !!! First PHP Program is working";  
?>
```

Now go to browser and type following line in the address bar.

http://your_server_ip/mydemo.php or <http://localhost/mydemo.php>

Step 5 : To configure Apache server for postgresql

For Ubuntu

Open 'php.ini' file located at /etc/php/x.x/apache2/php.ini and add the line below at the end of file.

extension=pgsql.so

How To Install XAMPP on Window

Step 1 : Download and install XAMPP from <https://www.apachefriends.org/download.html>

Step 2 : Testing PHP Processing on your Web Server

In order to verify PHP installation, you create a very basic PHP script called mydemo.php.

Now go to C:\XAMPP\htdocs\. Save the above mydemo.php file at this location. The file should contain following statement.

File Name : mydemo.php

```
<?php  
echo"Hurray !!! First PHP Program is working";  
?>
```

Now go to browser and type following line in the address bar.

http://your_server_ip/mydemo.php or <http://localhost/mydemo.php>

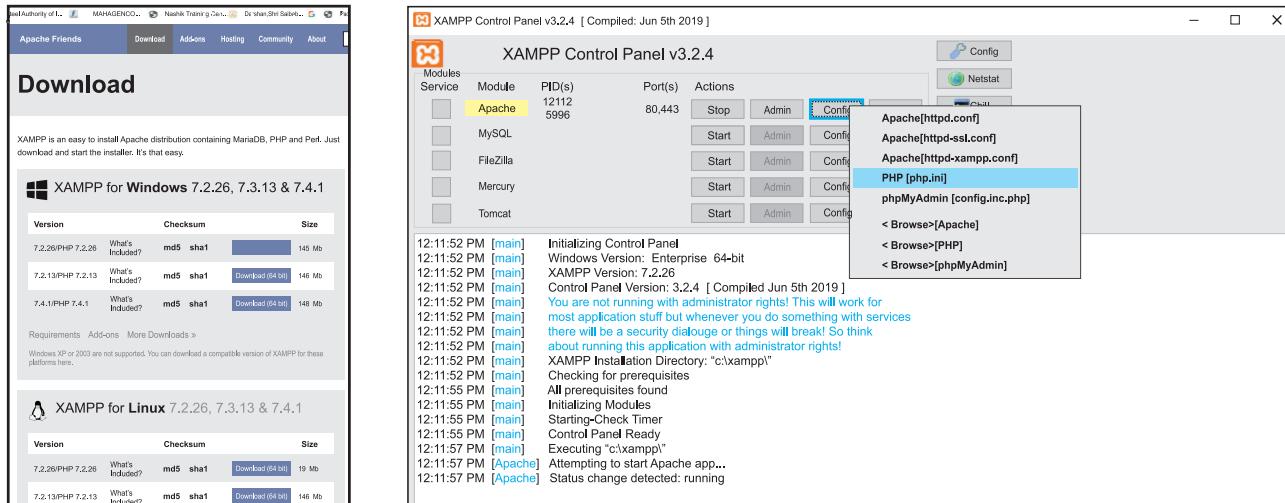
Note : your_server_ip is the actual IP address of your server machine which is in digits.

Step 3 : To configure Apache server for postgresql

Open 'php.ini' file located at C:\xampp\php\php.ini or click on 'config' button on the XAMPP Apache control panel.

Now add the line below at the end of file.

```
extension=php_pqsql.dll  
extension=php_pdo_pgsql.dll
```



Exercise

Q.1 Fill in the blanks.

1. PHP is _____ side scripting language.
2. PHP is _____ language i.e. there is no need for compilation.
3. A variable starts with _____ sign followed by variable name.
4. An _____ is a variable, which can hold more than one value at a time.
5. Information can be passed to functions through _____.

Q.2. State True/False.

1. PHP is platform dependent scripting language.
2. \$_POST is an array of variables passed via the URL parameters.
3. A Function is a block of statements that can be used repeatedly in a program.
4. PHP cannot be embedded along with HTML tags.
5. GET should NEVER be used for sending sensitive information.

Q3. Multiple Choice Question.

(1 correct)

1. The program file of PHP have _____ extension.
 a) .asp b) .php
 c) .js d) .txt
2. A variable declared _____ a function has global scope.
 a) outside b) anywhere
 c) inside d) none
3. The _____ function returns a part of a string.
 a) trim() b) ucwords()
 c) substr() d) strpos()

Q4. Multiple Choice Question.

(2 correct)

1. The _____ & _____ are valid datatype in PHP.
 a) Double b) Varchar
 c) Integer d) Array
 e) BigInt
2. Single line comment in PHP is possible using _____, _____.
 a) // b) /* */
 c) # d) <!-- -->
 e) \$

Q5. Multiple Choice Question.

(3 correct)

1. In PHP, three types of arrays are _____, _____, _____.
 a) Indexed b) Simple
 c) Associative
 d) Multidimensional
 e) Complex f) General

2. The scope of variable can be _____.

- a) local
- b) global
- c) universal
- d) static
- e) final
- f) outside

Q6. Brief Questions.

- 1) Explain any two features of PHP?
- 2) What are the rules to declare variable in PHP?
- 3) What is server side scripting?
- 4) List the supported datatypes in PHP.
- 5) Explain any two string manipulation function.

Q7. Write Programs for the following.

- 1) Write a PHP code which calculates square of any number using form.
- 2) Write a PHP code to count no. of words in the given string.
- 3) Create a website with two PHP webpage in which each webpage is connected.

The first page of the website contains two form fields for taking ‘name’ and ‘password’ from users. On onclick event, details of forms should be displayed on second webpage.



Let us learn

- E-Commerce – concept, advantages, disadvantages and types.
- E-Commerce Trade cycle.
- Various Payment modes.
- Common forms of E-Commerce.
- Electronic Data Interchange.
- E-Governance-concept, advantages and types.
- Various security measures.

6.1 Introduction

E-Commerce stands for Electronic Commerce. Before moving to the concept of E-Commerce, let's first, understand what is commerce?

Commerce is an important part of a business. In simple words, commerce is nothing but buying and selling of goods. That means when we buy a product or service from others or sell a product or

service to others then it is called as commerce.

One of the most popular activity on the Web is shopping. E-Commerce became possible in 1991 when the Internet was opened to commercial use. Since that date thousands of businesses have taken up residence at websites. History of e-commerce is a history of a new, virtual world which is evolving according to the customer advantage.

6.2 Definition of E-Commerce

“E-Commerce can be broadly defined as the process of buying and selling of goods or services using an electronic medium such as Internet.”

E-commerce is also referred as a paperless exchange of business information using EDI, E-mail, Electronic fund transfer etc.



Difference between Traditional Commerce and E-Commerce :

| Traditional Commerce | E-commerce |
|--|---|
| Traditional commerce focuses on the exchange of products and services through personal interactions so it is manual. | E-commerce trading activities are online via the internet and can be considered automatic. |
| Traditional commerce is limited to business hours, mostly during the day. | E-commerce is 24X7, it can be done anytime day and night. |
| As far as consumer interactions are concerned, traditional commerce provides face to face interaction. | E-commerce can be termed as screen to face interaction. |
| Traditional commerce is limited to a particular geographical location. | E-commerce is global and has no physical limitation. |
| Modes of payment in traditional commerce include cash, cheques and credit cards. | In E-commerce modes of payments are bank transfer, credit card, e-wallet, mobile payment and many more. |
| Goods and delivery of services is instant with traditional commerce. | In E-commerce delivery of goods or services takes some time. |
| Traditional Commerce's scope is local. | E-commerce's scope is global. |

Advantages of E-Commerce :

- **Global scope :** E-commerce provides the sellers with a global reach. Now sellers and buyers can meet in the virtual world, without barrier of place (geography).
- **Electronic transaction :** E-commerce reduces the paper work and significantly lower the transaction cost. E-Commerce enables the use of credit cards, debit cards, smart cards, electronic fund transfer via bank's website and other modes of electronic payment.
- **Cost Saving:** E-commerce application provides users with more options to compare and select the cheaper and better option. It helps in reducing the cost of searching a product. E-commerce has enabled rural areas to access services and products, which are otherwise not available to them.
- **Anytime shopping :** One other great advantage is the convenience. A customer can shop 24×7. The website is functional at all times, it does not have working hours like a shop.
- **No intermediaries :** Electronic commerce also allows the customer and the business to be in touch directly, without any intermediaries. This allows for quick communication and transactions.
- **Public services :** E-commerce helps the government to deliver public

services such as healthcare, education, social services at a reduced cost and in an improved manner.

Disadvantages of E-Commerce :

- **Setup Cost :** The setup of the hardware and the software, the training cost of employees, the constant maintenance and upkeep are all quite expensive.
- **Physical presence :** This lack of a personal touch can be a disadvantage for many types of services and products like interior designing or the jewellery business.
- **Security :** Security is another area of concern. Credit card theft, identity theft etc. remain big concerns with the customers.
- **Goods Delivery :** There may arrive some problem with fulfilment of order. Even after the order is placed there can be problems with shipping, delivery, mix-ups etc. This leaves the customers unhappy and dissatisfied.

Types of E-Commerce :

The most common participants in e-Commerce are business, administration, government and consumer. The primary e-Commerce types are as follows:

- **Business - to - Consumer (B2C) :** In B2C model, business sells its products directly to a customer. A customer can view the products shown on the website. The customer can choose a product and order the same. The website will then send a

notification to the business organization via email and the organization will dispatch the product/goods to the customer. These B2C businesses are online retailers. Example : Amazon, Flipkart etc.

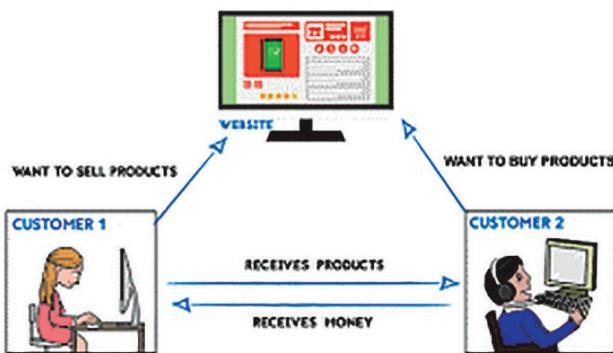


- **Business - to - Business (B2B) :** In B2B model, business sells its products to an intermediate buyer who then sells the product to the final customer. As an example, a wholesaler places an order from a company's website and after receiving the consignment, sells the product to the final customer who comes to buy the product at one of its retail outlets. Example : Tata communications (network provider).



- **Consumer - to - Consumer (C2C) :** In C2C model, consumer helps

consumer to sell their assets like residential property, cars, motorcycles etc., or rent a room by publishing their information on the website. Website may or may not charge the consumer for its services. Example OLX, Quikr, online auction.



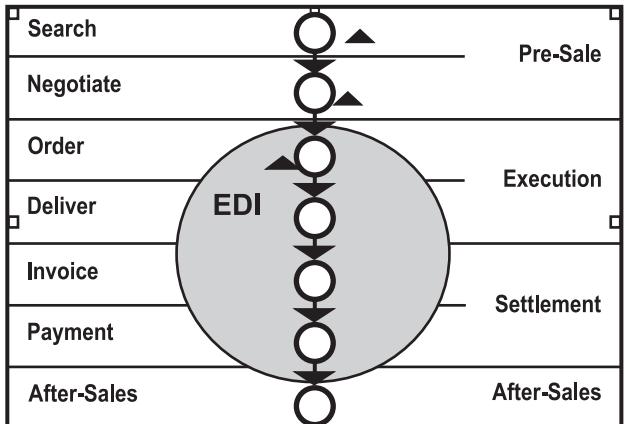
- **Consumer - to - Business (C2B) :** In this model, consumers have products or services of value that can be consumed by businesses. For example, the comparison of interest rates of personal loan/car loan provided by various banks via websites. A business organization who fulfills the consumer's requirement within the specified budget, approaches the customer and provides its services. For e.g. - A blog can be written by an author for a business to improve sale of products, ebay.



6.3 E-Commerce Trade Cycle

A trade cycle is the series of exchanges, between a customer and supplier that take place when a commercial exchange is executed. A general trade cycle consists of following phases:

- **Pre-Sales :** It consist of two steps like Search and Negotiate. Customer search for required website for product to be purchased. In Negotiate step customer find a supplier who offers good quality product at cheaper price and then customer agrees the terms forwarded by supplier.
- **Execution :** This phase consist of Order and Delivery. Customer sends an order for the selected product and after processing the order, customer receives delivery of the product.
- **Settlement :** This phase consist of Invoice (if any) and Payment. Invoice means customer will receive a bill for purchased product and after confirmation of received product, customer will pay for the same.
- **After-Sales :** This phase consists of warranty and After Sale Services. In warranty period, customer will get all maintenance services for free or at minimum cost. After sale services means customer will do complaints (if any) about the performance of product and get maintenance service from the supplier.



Trade Cycle

6.4 Modes of Payment



1. Credit Cards : Credit cards are the most common way for customers to pay online. Merchants can reach out to an international market with credit cards, by integrating a payment gateway into their business.

2. Mobile Payments : Mobile payments offer a quick solution for customers to purchase on e-commerce websites. Mobile payments are also commonly used on donation portals, browser games and social media networks such as dating sites where customer can pay by scanning a barcode on an app on mobile. Examples are apps like BHIM, UPI, Paytm, Google Pay, Paypal,..etc.

3. Bank Transfers : Bank transfer is used when money is sent from one bank account to another. Transferring

money from bank account is usually fast and safer than withdrawing and paying in cash because every transaction will be authenticated by checking customer's banking credentials. Example : NEFT, IMPS etc.

4. E-wallets : E-wallet is a type of electronic card which is used for transactions made online through a computer or a smartphone. E-wallet is a type of pre-paid account in which a user can store money for any future online transaction. An E-wallet is protected with a password. Examples are State Bank Buddy, Paytm Wallets...



Do it yourself

Find out some more payment modes used in E-Commerce.

6.5 Forms of E-Commerce

Some common forms of E-Commerce are as follows.

- M-commerce (Mobile commerce) :** M-Commerce is the buying and selling of goods and services through wireless handheld devices such as smartphones and tablets. As a form of e-commerce, m-commerce enables users to access online shopping platforms without needing to use a desktop computer. Some of application of M-Commerce are mobile banking, ticket booking, E-bill payment, online auctions, stock market trading.



- **Social Commerce :** Social commerce is a form of electronic commerce that involves social media, online media that supports social interaction. It enables shoppers to get advice from trusted individuals, find goods and services and then purchase them. The social networks that spread this advice have been found to increase the customer's trust in one retailer over another. Social commerce is the use of networking websites such as Facebook, Instagram and Twitter as vehicles to promote and sell products and services. The success of a social commerce campaign is measured by the degree to which consumers interact with the company's marketing through retweets, likes and shares.



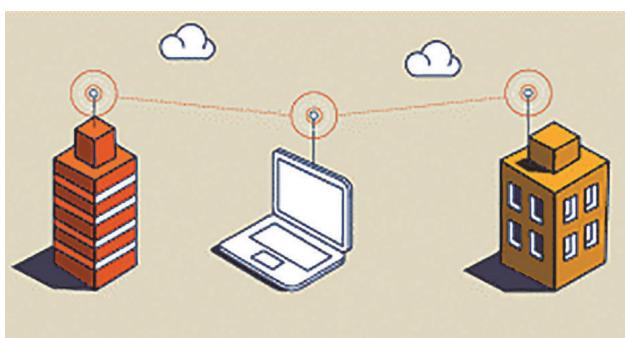
6.6 E-Commerce Technology

Electronic commerce draws on

technologies such as mobile commerce, electronic funds transfer, supply chain management, Internet marketing, online transaction processing, electronic data interchange(EDI), inventory management systems and automated data collection systems. Let's see one of the common E-commerce technology i.e EDI.

Electronic Data Interchange (EDI) :

EDI is the electronic interchange of business information using a standardized format; a process which allows one company to send information to another company electronically rather than on paper. Business entities conducting business electronically are called trading partners. Many business documents can be exchanged using EDI, two most common documents are purchase orders and invoices. It is computer-to-computer interchange of strictly formatted documents via telecommunications or physically transported on electronic storage media.



6.7 E-Governance

It signifies the implementation of information technology in the government processes and functions so as to cause simple, moral, accountable and transparent governance. The basic purpose of e-governance is to simplify

processes for all, i.e. government, citizens, businesses etc. at National, State and local levels. Hence, E-governance delivers SMART government. (S-Simple, M-Moral, A-Accessible, R-Responsive, T-Transparent Government)

Advantages of E-governance :

- Reduced corruption
- High transparency
- Increased convenience
- Direct participation of constituents
- Reduction in overall cost.
- Expanded reach of government

Types of E-Governance :

E-Governance is of 4 types depending on the specific types of services.



1. Government-to-Citizen (G2C)

The Government-to-citizen refers to the government services which enable citizens to get access to wide variety of public services. Most of the government services fall under G2C. It helps the ordinary people to reduce the time and cost to conduct a transaction. A citizen can have

access to the services anytime from anywhere. Furthermore, Many services like license renewals and paying tax are essential in G2C. It also focuses on geographic land barriers.

2. Government-to-Business (G2B)

The Government to business is the exchange of services between Government and Business organizations. G2B provides access to relevant forms needed to comply. The G2B also consists of many services exchanged between business sectors and government. It aims at eliminating paper work, saving time, cost and establish transparency in the business environment, while interacting with government.

3. Government-to-Government (G2G)

The Government-to-Government refers to the interaction between different government departments, organizations and agencies. In G2G, government agencies can share the same database using online communication. The government departments can work together. In conclusion, G2G services can be at the local level or the international level. Likewise, it provides safe and secure inter-relationship between domestic or foreign government.

4. Government-to-Employee (G2E)

The Government-to-Employee is the internal part of G2G sector. Furthermore, G2E aims to bring employees together and improvise

knowledge sharing. Similarly, G2E provides online facilities to the employees like applying for leave, reviewing salary payment record and checking the balance of holiday. The G2E sector provides human resource training and development. So, G2E is also the relationship between employees, government institutions and their management.

Some effective examples of successful implementation of E-Governance projects are e-Mitra project (Rajasthan), e-Seva project (Andhra Pradesh), CET (Common Entrance Test).



Do you know?

Digital India is a campaign launched by the Government of India in order to make Government's services available to citizens electronically. Digital India was launched by the Prime Minister of India Narendra Modi on 1 July 2015 with an objective of connecting rural areas with high-speed Internet networks and improving digital literacy.

Some of the facilities provided through this initiative are Bharat net, digital locker, e-education, e-health, e-sign, e-shopping and national scholarship portal.

UMANG (Unified Mobile Application for New-age Governance) Mobile App: It is a Government's all-in-one single unified secure multi-platform, multi-lingual, multi-service freeware mobile app for accessing over 1,200 central and state government services through smart phones, feature phones, tablets

and desktops. It include services like AADHAAR card, DigiLocker, Bharat Bill Payment System, PAN, EPFO services, PMKVY services, AICTE, CBSE. It also provides utilities like bills payments, education, job search, tax, business, health, agriculture, travel, Indian railway tickets bookings, birth certificates, e-District, e-Panchayat, police clearance, passport, other utility services from private companies and much more.

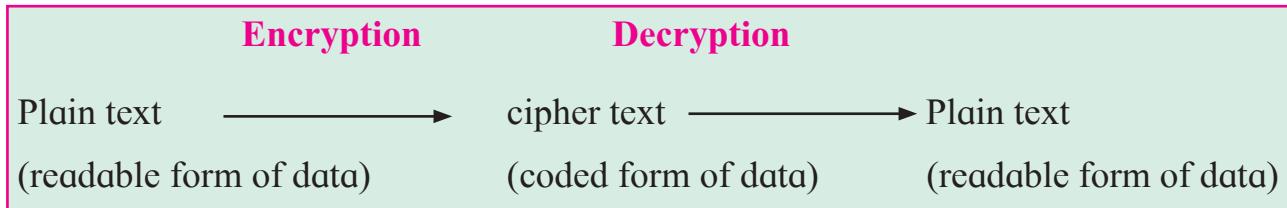
6.8 Security Measures in E-Commerce

E-Commerce security refers to the principles which guide safe electronic transactions, allowing the buying and selling of goods and services through the Internet.

A) Encryption : Encryption is widely used on the internet to protect user information being sent between a browser and a server. This includes passwords, payment information and other personal information that should be considered private. The process consists of two processes as encryption and decryption. Encryption converts Plain text (readable form of data) into Cipher Text (coded form of data) means non-readable form of data. Decryption is exactly opposite process of encryption. It converts Cipher text into Plain text.

Encryption is of two types-

1. Symmetric
(Shared Secret Encryption)
2. Asymmetric
(Public-Key Encryption)



B) Digital Signature : A digital signature is also known as an electronic signature. A digital signature guarantees the authenticity of an electronic document or message in digital communication and uses encryption technique (asymmetric cryptography) to provide proof of original and unmodified documentation. Digital signatures are used in e-commerce, software distribution, financial transactions. This is the direct transfer of information between two partners.

C) Digital Certificate : A Digital Certificate is an electronic "password" that allows a person, organization to exchange data securely over the Internet using the public key infrastructure (PKI). Digital Certificate is also known as a public key certificate or identity certificate. In this information is transferred between two authorized partners who have digital certificates issued by some supreme authority.



Do it yourself

Visit Maharashtra Government website, view various Government Resolutions (GR) and observe the digital signature of various authorities.

Summary

- Buying and selling of goods or services on internet is called as E-Commerce.
- Common types of E-Commerce are B2C, B2B, C2C and C2B.
- When any business transaction takes place, it completes one trade cycle. Trade cycle consist of phases like presale, execution, settlement and after sale etc.
- In E-Commerce commonly used payment modes are credit card, mobile payment, bank transfer, e-wallet etc.
- Some common forms of E-Commerce are M-Commerce, social commerce.
- Electronic Data Interchange (EDI) is one of the most important technology for paperless exchange of information.
- E-Governance is the implementation of information technology in the government processes and functions.
- Types of E-Governance are G2C, G2B, G2G and G2E.
- In E-Commerce confidential information can be protected by using encryption, digital signature and digital certificate.

Exercise

Q.1 Fill in the blanks.

1. E-Commerce's scope is
.....
2. A customer can do shoppingonline using type of E-Commerce.
3. The phase consist of Order and Delivery.
4. E-wallet is a type of account in which a user can store his/her money for any future online transaction.
5. EDI is exchange of information.

6. The type of e-governance refers to the government services which enable citizens to get access to wide variety of public services.

7. The e-governance which provides safe and secure inter-relationship between domestic or foreign government is

Q.2 State True/False.

1. C2C type of E-commerce deals with Business and Customer.
2. The lack of a personal touch can be a disadvantage for many types of services and products in E-commerce.

3. Checking the balance of holiday is an example of G2C.
4. E-commerce provides more options to compare and select the cheaper and better options.
5. M-commerce can be used through desktop computer.

Q.3 Multiple Choice Question. (1 correct answer)

1. Invoice and payment are included inphase of trade cycle.
 - a) Presale
 - b) execution
 - c) settlement
 - d) After sale
2. License renewal is an example of e-governance.
 - a) G2C
 - b) G2B
 - c) G2G
 - d) G2E

Q.4 Multiple Choice Question. (2 correct answer)

1. Encryption consist of two processes.....and
 - a) encryption
 - b) signature
 - c) decryption
 - d) digitization
 - e) security
2. Social commerce is a subset of electronic commerce that involves social media like ... &
 - a) Facebook
 - b) Instagram
 - c) gmail
 - d) whatsapp
 - e) software

Q.5 1) Match the following.

| A | B |
|----------|----------|
|----------|----------|

- | | |
|--|--------------------------------------|
| 1. M-commerce | a) Coded form of data |
| 2. Cipher Text | b) B2B |
| 3. EDI | c) E-bill payment |
| 4. Wholesaler-to | d) Paperless exchange of information |
| 5. License renewal | e) G2G services |
| 6. Online facility | f) G2C to employees like leave |
| 7. Government agencies share same database | g) G2E |

Q.6 Answer in brief.

1. Explain phases of trade cycle.
2. Explain M-Commerce.
3. Describe process of encryption.
4. What is E-governance.
5. List out advantages of E-commerce.
6. Which are the different types of e-governance?
7. State two examples of G2E services.
8. Write any four advantages of e-governance.



SKILL ORIENTED PRACTICALS (SOP)

Note :

Students should file minimum 12 skill sets from the SOPs as follows-

- **Advanced Web Designing** - Any 05
- **JavaScript** - Any 04
- **Server side scripting** - Any 03

1. Advanced Web Designing

SOP 1 : Creation of website using HTML5

Create a website using HTML5 and CSS using any 4 CSS properties. Write a code for 2 separate pages having different file names such as first page as Index.html and second page as page2.html. Use any theme such as college profile or company profile etc. Every page must contain proper Meta information and design web page as follows-

- 1) The index page must contain a heading which is highest among other text on pages and must be at centre of the page. There must be a paragraph which introduces general information about the theme chosen must have at least 3 physical style tags and one image with alternate text. This page must be connected to other two pages with proper navigational links.
- 2) The 2nd page must contain the feedback or enrolment form related with theme chosen with features of HTML5. The form must contain text element and email address of the company or person. Include the submit button.

SOP 2 : Create a webpage using HTML and CSS code to design a web page as the layout displayed below.

The top section will display the heading , ‘Tourist places’ in header. The section on the left has list of cities. The right hand side displays tourist places of any one of the city .

Use Inline style sheet in the top section to display background color for the text ‘Tourist places’. Use internal stylesheet for the left and right section with background color and font styles.

| Tourist places | |
|--|---|
| City 1. Pune 2. Bangalore 3. Hyderabad 4. Delhi | Tourist places in Pune <ul style="list-style-type: none">• Shanivarwada• Kelkar Museum• Sinhgad fort |

SOP 3 : Create a website using HTML and CSS code to design webpages as follows -

The first webpage will accept the name of the traveller, date of travel , telephone number . It also has submit button as an image .

The second webpage has information about the name of transporter, time , seat no and destination displayed one below the other in the form of unordered list as

Name of transporter – Air Asia

Time - 09:30 am

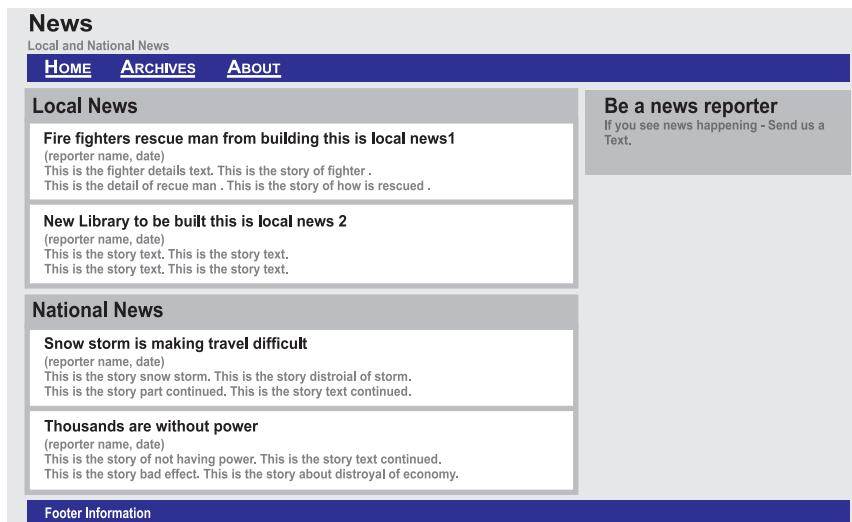
Seat no – B39

Destination - Delhi

Both pages should be interlinked. Create external stylesheet with relevant tags.

SOP 4 : Creation of website using HTML5 and CSS.

Create a webpage as given layout use <nav>,<header>,<footer>,<aside>,<article> with CSS.



SOP 5 : Use of Audio on web pages using HTML5.

Create a webpage named audio.html to set an audio file in web page with controls such that it uses HTML5 elements. The audio file must play as soon as the webpage loads in browser and it will start over again, every time when it is completed.

Create another webpage named audio1.html which provides multiple source file formats for the same audio file that plays a sound automatically with controls. The browser should display the message with appropriate attribute, when audio file is not supported by browser. The code must incorporate the list of sound files formats (like wav, MP3 or ogg etc).

SOP 6 : Use of video on web pages using html5.

Create a webpage named video.HTML to display a video file on web page and plays automatically with controls. The dimension of video area should be 150 * 150 pixels.

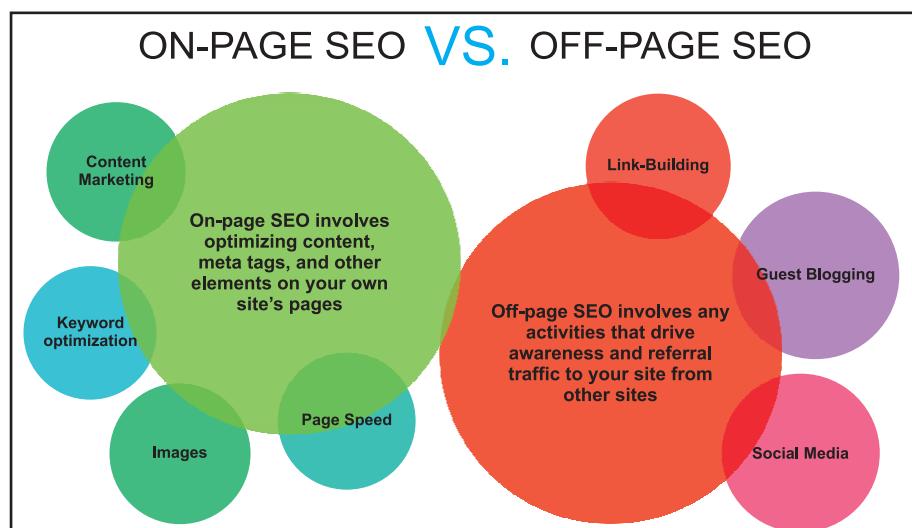
Create another webpage which provide multiple source file formats for the same audio file that plays a sound automatically with controls. The dimension of video area should be 100*100 pixels. The browser should display the message with appropriate attribute when audio file is not supported by browser. The code must incorporate the list of video files formats (like webM, MP4 or ogg etc).

SOP 7 : Navigation on an image using Client side image Mapping in web page using html 5.

➤ Create a webpage named imagemap.html with an inserted image having jpeg, png or gif extension. Create 3 different shapes (like rectangle, circle and polygon) which do not overlap. Note the co-ordinates making use of Ms-Paint/GIMP/IrfanView/Pinta. Each shape should be mapped or navigate with a different URL that should navigate to a local webpage.

SOP 8 : Use of SEO methodology to improvise the website.

- Select a website.
- Use an appropriate SEO software and list out the page optimization requirements.
- Write down at least 4 suggestions to optimise the web pages.
- Write importance of SEO.



2. Javascript

SOP 1 : Create a web page in HTML having a white background and two Button Objects. Write code using JavaScript such that when the mouse is placed over the first button object without clicking, the color of the background of the page should change after every ___ seconds. There should at least be 7 different and visibly distinct background colors excluding the default color. When the second button object is clicked, appropriate message should be displayed in Browsers status bar.

Create another web page using JavaScript where the background color changes automatically after every ___ seconds. This event must be triggered automatically after the page gets loaded in the browser. There should at least be 7 different and visibly distinct background colors. When the page is unloaded, the appropriate alert message should be displayed.

SOP 2 : **Create JavaScript program for the following form validations. Make use of HTML5 properties to do the following validations :**

- 1) Name, address, contact number and email are required fields of the form.
- 2) Address field should show the hint value which will disappear when field gets focus or key press event.
- 3) Telephone number should be maximum 10 digit number only.
- 4) Email field should contain valid email address, @ should appear only once and not at the beginning or at end. It must contain at least one dot(.)
- 5) Make use of pattern attribute for email to accept lowercase, uppercase alphabets, digits and specified symbols.

The form is titled "Information Form". It contains the following fields:

- Your Name:
- permanent address:
- Address:
- Contact:
- E-mail:
-

SOP 3 : **Create event driven JavaScript program for the following. Make use of appropriate variables, JavaScript inbuilt string functions and control structures.**

- To accept string from user and count number of vowels in the given string.

SOP 4 : Create event driven JavaScript program for the following. Make use of appropriate variables, JavaScript inbuilt string functions and control structures.

- To accept string from user and reverse the given string and check whether it is palindrome or not.

SOP 5 : Create event driven JavaScript program to convert temperature to and from Celsius, Fahrenheit.

Formula: $c/5 = (f-32)/9$

[where c=Temperature in Celsius and f=Temperature in Fahrenheit.]

Output format : 40 Celsius=104 Fahrenheit

45 Fahrenheit = 7.22222222 Celsius

SOP 6 : Create JavaScript program which compute the average marks of students. Accept six subject marks of student from user. Calculate average marks of student which is used to determine the corresponding grades.

| Range | Grade |
|-----------|-------|
| 35 to 60 | F |
| 61 to 70 | D |
| 71 to 80 | C |
| 81 to 90 | B |
| 91 to 100 | A |

SOP 7 : Write a JavaScript function to get difference between two dates in days. Create a page in HTML that contains input box to accept date from user. The input boxes should be used by users to enter their date of birth in the format dd-mm-yyyy. Do not make use of any dropdown boxes.

Example :

```
date_diff_indays('04/02/2019', '11/04/2019');
date_diff_indays('01/01/2020', '31/01/2019');
```

Output :

66

-30



3. Server-Side Scripting (PHP)

SOP 1 : Write a PHP program to check if a person is eligible to vote or not. The program should include the following-

- Minimum age required for vote is 18.
- Use PHP functions.
- Use Decision making statement.

SOP 2 : Write a PHP function to count the total number of vowels (a,e,i,o,u) from the string. Accept a string by using HTML form.

SOP 3 : Write a PHP program to perform the following operations on an associative array.

- Display elements of an array along with their keys.
- Display the size of an array.
- Delete an element from an array from the given index.

SOP 4 : Write a PHP program to save marks of English, Hindi, Marathi, Maths and Information Technology in an array. Display marks of individual subject along with total marks and percentage.

SOP 5 : Write a PHP program to save marks of English, Hindi, Marathi, Maths and information technology in an array for 5 students and display totals marks and percentage of each students using ‘foreach’.

SOP 6 : Write a program using PHP to calculate Electricity bill by accepting the limits.

- For first 100 units - Rs. 4
- For next 100 units - Rs. 5
- For next all units - Rs. 6

SOP 7 : Write a PHP Program to insert a roll number and student name in a database (use postgresql data to create database). Accept roll number and name from the user.





Career Opportunities

Cloud Computing Engineers

Basic Requirements :

Cloud engineers typically have at least a bachelor's degree in computer science or information technology. Those in the field often have years of software development experience, working with a variety of programming languages such as Java, Angular JS, C++, and Python.

Cloud computing engineers define, design, build, and maintain systems and solutions leveraging systems and infrastructure managed by cloud providers such as Amazon Web Services (AWS) and Microsoft Azure. Following are some of job roles in the cloud computing domain.

- Cloud Architect
- Cloud Consultant
- Cloud Product and Project Manager
- Cloud Services Developer
- Cloud Software and Network Engineer
- Cloud System Administrator
- Cloud System Engineer

Computer Network Specialists

Basic Requirements :

Computer network specialists and analysts define, design, build, and maintain a variety of data communication networks and systems. They typically have a bachelor's degree in computer

science or a related field. Some also have a master's degree in business administration (MBA), with a focus on information systems. Network related jobs and projects. The job profiles are as-

- Computer and Information Research Scientist
- Computer and Information Systems Manager
- Computer Network Architect
- Computer Systems Analyst
- Computer Systems Manager
- IT Analyst
- IT Coordinator
- Network Administrator
- Network Architect
- Network and Computer Systems Administrator
- Network Engineer
- Network Systems Administrator
- Senior Network Architect
- Senior Network Engineer
- Senior Network System Administrator
- Telecommunications Specialist

Computer Support Specialist

Basic Requirements :

The computer user support specialist must be knowledgeable about the functioning of a computer system. Some of the employers appoint the technicians

on the basis of an associate's degree or postsecondary classes, while others prefer the applicants to have a bachelor degree.

Computer support specialists and network administrators help computer users and organizations. Some of these workers support computer networks by testing and evaluating network systems and ensuring that the day-to-day operations work. Others provide customer service by helping people with their computer problems. Some require a bachelor's degree, while others need an associate degree or post-secondary classes. They work as-

- Customer Support Administrator
- Customer Support Specialist
- Desktop Support Manager
- Desktop Support Specialist
- Help Desk Specialist
- Help Desk Technician
- IT Support Manager
- IT Support Specialist
- IT Systems Administrator
- Senior Support Specialist
- Senior System Administrator
- Support Specialist
- Systems Administrator
- Technical Specialist
- Technical Support Engineer
- Technical Support Specialist

Database Administrator

Basic Requirements :

Many employers prefer database

administrators with at least a bachelor's degree in computer science or a related field. In some cases, a master's degree is required for higher-level positions. A bachelor's degree program is a 4-year program and is a prerequisite to a 2-year master's degree program.

Database administrators help store and organize data for companies and/or customers. They protect the data from unauthorized users. Some work for companies that provide computer design services. Others work for organizations with large database systems, such as educational institutions, financial firms and more. They can be employed as-

- Data Center Support Specialist
- Data Quality Manager
- Database Administrator
- Senior Database Administrator

Information Technology Leadership

Basic Requirements :

Obtain a bachelor's degree in computer science or information technology. Develop IT and leadership experience in a variety of IT roles, from entry-level support positions to IT manager. Most IT director positions require 10 years of experience. Earn your master's degree.

Leadership in IT draws from candidates with strong technology backgrounds and superior management skills. They have experience in creating and implementing policies and systems to meet IT objectives, and the ability to budget the time and funds necessary.

- Chief Information Officer (CIO)

- Chief Technology Officer (CTO)
- Director of Technology
- IT Director
- IT Manager
- Management Information Systems Director
- Technical Operations Officer

Information Security Specialist

Basic Requirements :

Hiring managers for IT security specialist positions generally require at least an undergraduate degree (associate or bachelor) in information security, computer information systems, network security, computer science or a related field of study.

The increased incidence of security breaches and the associated danger of identity theft has enhanced the importance of protecting data on commercial and governmental sites. Information securities analysts help defend an organization's computer network and computer systems. The job roles offered to them are-

- Information Security
- Security Specialist
- Senior Security Specialist

Software/Application Developer

Basic Requirements :

Most computer software development jobs require bachelor's degrees in computer science or software engineering. These programs have significant math requirements that include a sequence in calculus, differential equations, and

linear algebra. A sequence in physics is also required.

Software developers design, run, and test various computer programs and applications. Application Developers create new applications and code solutions. They usually have a bachelor's degree in computer science or a related field. They also have strong programming skills, so can be employed as-

- Application Developer
- Applications Engineer
- Associate Developer
- Computer Programmer
- Developer
- Java Developer
- Junior Software Engineer
- .NET Developer
- Programmer
- Programmer Analyst
- Senior Applications Engineer
- Senior Programmer
- Senior Programmer Analyst
- Senior Software Engineer
- Senior System Architect
- Senior System Designer
- Senior Systems Software Engineer
- Software Architect
- Software Developer
- Software Engineer
- Software Quality Assurance Analyst
- System Architect

- Systems Software Engineer
- Mobile Application Developer

Web Developer

Basic Requirements :

Many employers prefer prospective Web developers to hold a bachelor's degree in computer science or a related field. Coursework often includes programming, database management, mathematics, Web design and networking.

Web developers design, create, and modify websites. They are responsible for maintaining a user-friendly, stable website that offers the necessary

functionality for their client's needs. Some jobs require a bachelor's degree, while others need an associate degree, including classes in HTML, JavaScript, or SQL. This education can help to get employment as-

- Front End Developer
- Senior Web Administrator
- Senior Web Developer
- Web Administrator
- Web Developer
- Webmaster
- UX Designer

Professional certificate courses like RHCE, ORACLE, software testing etc. can be done to enhance the career opportunities.



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