Week 4

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HTML

HTML stands for Hyper Text Markup Language

HTML is the standard markup language for Web pages

HTML elements are the building blocks of HTML pages

HTML elements are represented by <> tags

CSS

CSS stands for Cascading Style Sheets

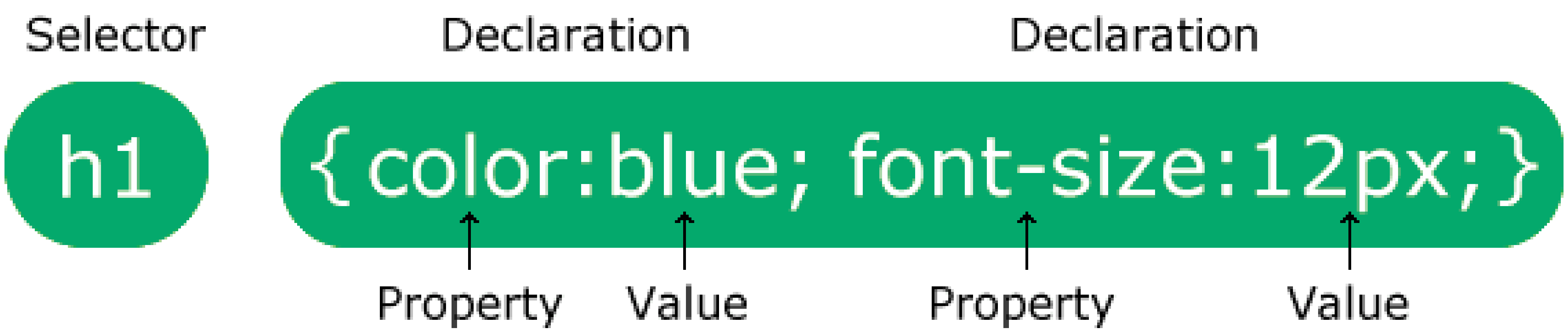
CSS describes how HTML elements are to be displayed on screen, paper, or in other media

CSS saves a lot of work. It can control the layout of multiple web pages all at once

External style sheets are stored in CSS files

CSS Syntax

A CSS rule consists of a selector and a declaration block.



The selector points to the HTML element you want to style.

The declaration block contains one or more declarations separated by semicolons.

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

Multiple CSS declarations are separated with semicolons, and declaration blocks are surrounded by curly braces.

```
<html><head>
<style>
body {
  background-color: lightblue;
}
h1 {
  color: white;
  text-align: center;
}
p {
  font-family: verdana;
  font-size: 20px;
}
</style>
</head>
<body>
<h1>My First CSS Example</h1>
<p>This is a paragraph.</p>
</body>
</html>
```

CSS Selectors

A CSS selector selects the HTML element(s) you want to style.

We can divide CSS selectors into five categories:

Simple selectors (select elements based on name, id, class)

Combinator selectors (select elements based on a specific relationship between them)

Pseudo-class selectors (select elements based on a certain state)

Pseudo-elements selectors (select and style a part of an element)

Attribute selectors (select elements based on an attribute or attribute value)

The CSS element Selector

The element selector selects HTML elements based on the element name.

```
<html><head>
<style>
p {
  text-align: center;
  color: red;
}
</style></head>
<body>
<p>Every paragraph will be affected by the style.</p>
<p id="para1">Me too!</p>
<p>And me!</p>
</body></html>
```

The CSS id Selector

The id selector uses the id attribute of an HTML element to select a specific element.

To select an element with a specific id, write a hash (#) character, followed by the id of the element.

```
<html><head>
<style>
#para1 {
  text-align: center;
  color: red;
}
</style>
</head>
<body>
<p id="para1">Hello World!</p>
<p>This paragraph is not affected by the style.</p>
</body></html>
```

The CSS class Selector

The class selector selects HTML elements with a specific class attribute.

To select elements with a specific class, write a period (.) character, followed by the class name.

```
<html><head><style>
.center {
  text-align: center;
  color: red;
}
</style>
```

```
</head>
<body>
<h1 class="center">Red and center-aligned heading</h1>
<p class="center">Red and center-aligned paragraph.</p>
</body></html>
```

The CSS Universal Selector

The universal selector (*) selects all HTML elements on the page.

```
<!DOCTYPE html>
<html><head>
<style>
* {
  text-align: center;
  color: blue;
}
</style></head>
<body>
<h1>Hello world!</h1>
<p>Every element on the page will be affected by the style.</p>
<p id="para1">Me too!</p>
<p>And me!</p>
</body></html>
```

The CSS Grouping Selector

The grouping selector selects all the HTML elements with the same style definitions.

Look at the following CSS code (the h1, h2, and p elements have the same style definitions):

```
<html>
<head>
<style>
h1, h2, p {
  text-align: center;
  color: red;
}
</style>
</head>
<body>
<h1>Hello World!</h1>
<h2>Smaller heading!</h2>
<p>This is a paragraph.</p>
</body>
</html>
```

Three Ways to Insert CSS

There are three ways of inserting a style sheet:

External CSS

Internal CSS

Inline CSS

External CSS

With an external style sheet, you can change the look of an entire website by changing just one file

Each HTML page must include a reference to the external style sheet file inside the <link> element, inside the head section.

```
<html>
<head>
<link rel="stylesheet" href="mystyle.css">
</head>
<body>
<h1>This is a heading</h1>
<p>This is a paragraph.</p>
</body>
</html>
```

mystyle.css

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

Internal CSS

An internal style sheet may be used if one single HTML page has a unique style.

The internal style is defined inside the <style> element, inside the head section.

```
<html>
<head>
<style>
body {
  background-color: linen;
}


h1 {
  color: maroon;
  margin-left: 40px;
}
</style>
</head>
<body>
<h1>This is a heading</h1>
<p>This is a paragraph.</p>
</body>
</html>
```

Inline CSS

An inline style may be used to apply a unique style for a single element.

To use inline styles, add the style attribute to the relevant element. The style attribute can contain any CSS property.

```
<html><body>
<h1 style="color:blue;text-align:center;">This is a heading</h1>
```

```
<p style="color:red;">This is a paragraph.</p>
</body>
</html>
```

What is JavaScript?

An object-oriented computer programming language commonly used to create interactive effects within web browsers.

JavaScript is **a text-based programming language used both on the client-side and server-side**.

Where HTML and CSS are languages that give structure and style to web pages, JavaScript gives web pages interactive elements that engage a user

JavaScript programs can be inserted almost anywhere into an HTML document using the <script> tag.

```
<html>
<body>
 <p>Before the script...</p>
 <script>
  alert( 'Hello, world!' );
 </script>
 <p>...After the script.</p>
</body>
</html>
```

JavaScript Can Change HTML Content

One of many JavaScript HTML methods is getElementById().

```
<html>
<body>
<h2>What Can JavaScript Do?</h2>
<p id="demo">JavaScript can change HTML content.</p>
<button type="button" onclick='document.getElementById("demo").innerHTML = "Hello JavaScript!"'>Click Me!</button>
</body>
</html>
```

JavaScript Statements

In a programming language, the list of programming instructions are called **statements**.

A JavaScript program is a list of programming statements**.**

JavaScript statements are composed of: Values, Operators, Expressions, Keywords, and Comments.

Comments

Single line comments start with //

Multi-line comments start with /* and end with */

Variables

Variables are containers for storing data (storing data values).

In this example, x, y, and z, are variables, declared with the var keyword:

```
var x = 5;
var y = 6;
```

Declaring a JavaScript Variable

Using var

Using let

Using const

```
<html>
<body>
<h1>JavaScript Variables</h1>
<p>In this example, x, y, and z are variables.</p>
<p id="demo"></p>
<script>
var x=5;
var y = 6;
var z = x + y;
document.getElementById("demo").innerHTML ="The value of z is: " + z;
</script>
</body>
</html>
```

Practice:

```
<script>
var x = 5;
var y = 6;
var z = x + y;
document.getElementById("demo").innerHTML ="The value of z is: " + z;
</script>
```

Practice:

```
<script>
```

```
const price1 = 5;
const price2 = 6;
let total = price1 + price2;
document.getElementById("demo").innerHTML ="The total is: " + total;
</script>
```

Constants: Variables defined with const cannot be Redeclared and cannot be Reassigned.

```
const PI = 3.14;
```

Data types

DataTypes	Description	Example
String	represents textual data	'hello', "hello world!" etc
Number	an integer or a floating-point	3, 3.234, 3e-2 etc.
BigInt	an integer with arbitrary precision	900719925124740999n , 1n etc.
Boolean	Any of two values: true or false	true and false
undefined	a data type whose variable is not initialized	let a;
null	denotes a null value	let a = null;

Symbol	unique and immutable	let value = Symbol('hello');
Object	key-value pairs of collection of data	let student = { };

Interaction

alert

This one we’ ve seen already. It shows a message and waits for the user to press “ OK”

```
<script>
 alert('HI there'); // with specified content
 alert(); // without any specified content
</script>
```

prompt

The function prompt accepts two arguments:

```
<script>
// prompt example
let age = prompt('How old are you?');

alert(`You are ${age} years old!`);
</script>
```

confirm

The syntax:

result = confirm(question);

The function confirm shows a modal window with a question and two buttons: OK and Cancel.

```
<script>
// confirm example
let isHappy  = confirm('Are you Happy?');
alert(`You are ${isHappy}`);
</script>
```

Types of JavaScript Operators

There are different types of JavaScript operators:

Arithmetic Operators

Assignment Operators

Comparison Operators

Logical Operators

Conditional Operators

Type Operators

Comparisons

Operator	**Meaning**
<	less than
>	greater than

Operator	Meaning
<=	less than or equal to
>=	greater than or equal to
==	equal to
!=	not equal to

Control flow

Control flow in JavaScript is how your computer runs code from top to bottom. It starts from the first line and ends at the last line, unless it hits any statement that changes the control flow of the program such as loops, conditionals, or functions.

Functions

A JavaScript function is a block of code designed to perform a particular task.

A JavaScript function is executed when "something" invokes it (calls it).

```
<html>
<body>
<script>
function msg(){
alert("hello! this is message");
}
</script>
<input type="button" onclick="msg()" value="call function"/>
</body>
</html>
```

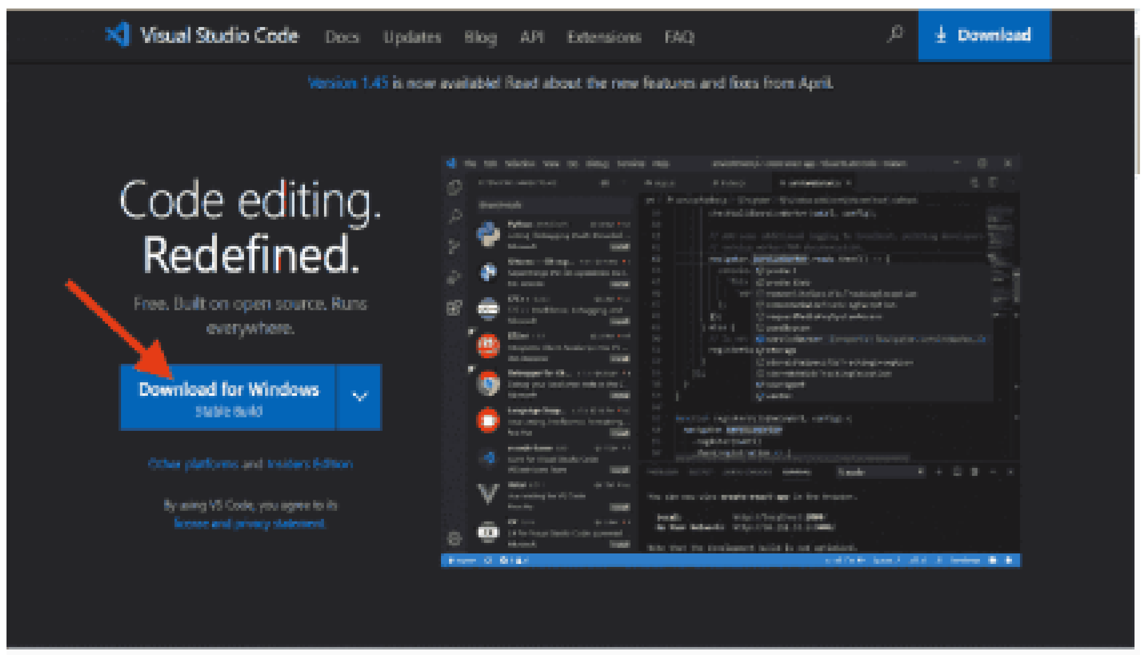
```
<html>
<body>
<script>
function getcube(number){
alert(number*number*number);
}
</script>
<form>
<input type="button" value="click" onclick="getcube(4)"/>
</form>
</body>
</html>
```

Setting Up the Environment and Tools for front end development

Installing VS Code

VS Code is a free code editor that runs on Windows, Mac and Linux.

Download VS Code from https://code.visualstudio.com/.



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Version 1.45 is now available! Read about the new features and fixes from April.
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Redefined.
Free. Built on open source. Runs everywhere.
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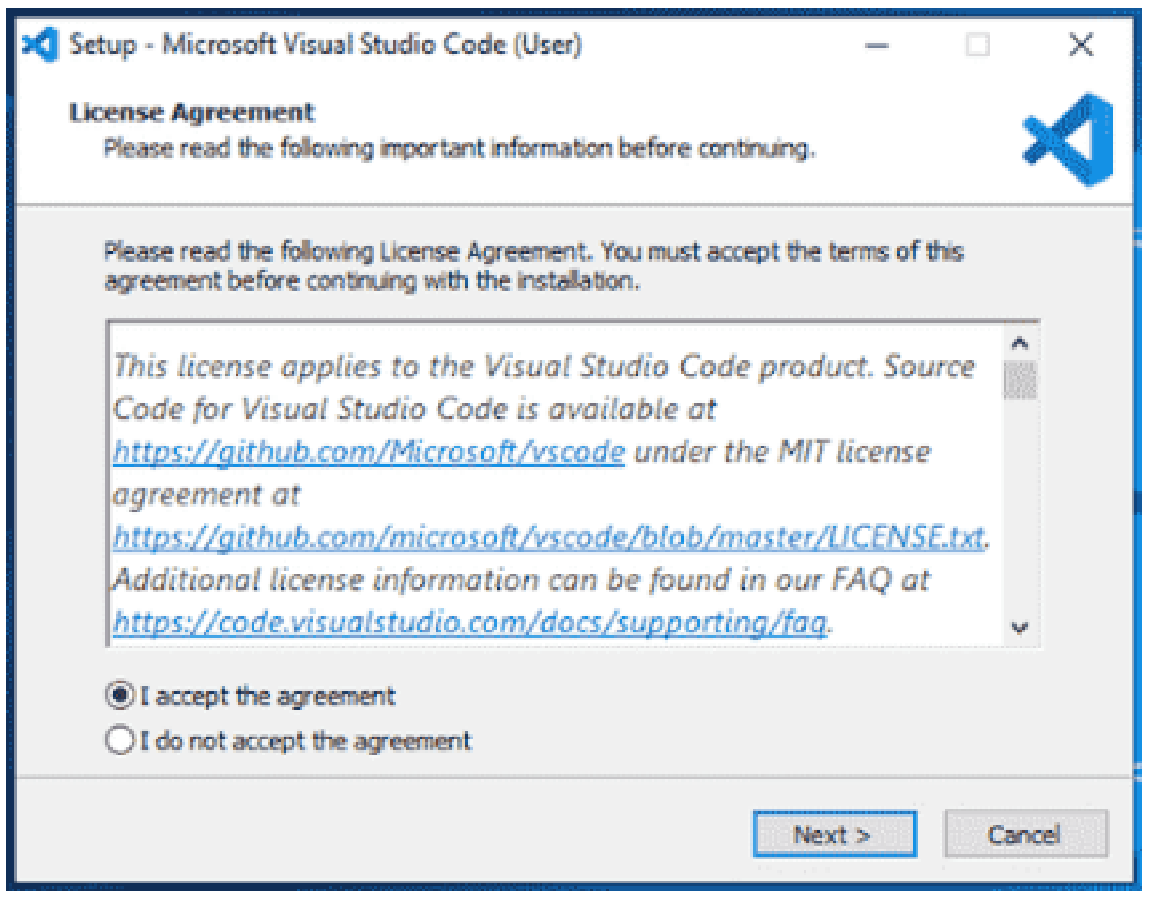
By using VS Code, you agree to its
license and privacy statement.

Install Visual Studio Code by opening the downloaded setup file and following the prompts.

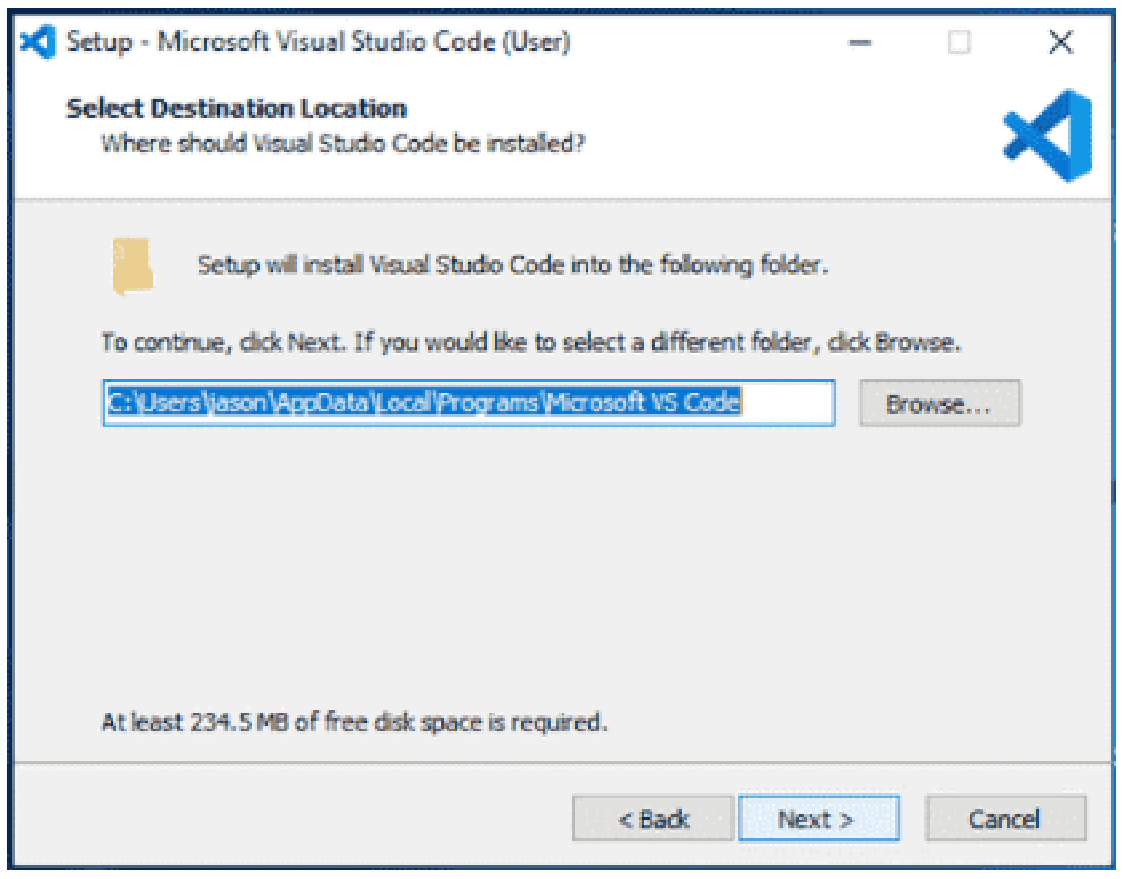


License Agreement
Please read the following important information before continuing.

Please read the following License Agreement. You must accept the terms of this agreement before continuing with the installation.

This license applies to the Visual Studio Code product. Source Code for Visual Studio Code is available at https://github.com/Microsoft/vscode under the MIT license agreement at https://github.com/microsoft/vscode/blob/master/LICENSE.txt. Additional license information can be found in our FAQ at https://code.visualstudio.com/docs/supporting/faq.

● I accept the agreement
○ I do not accept the agreement



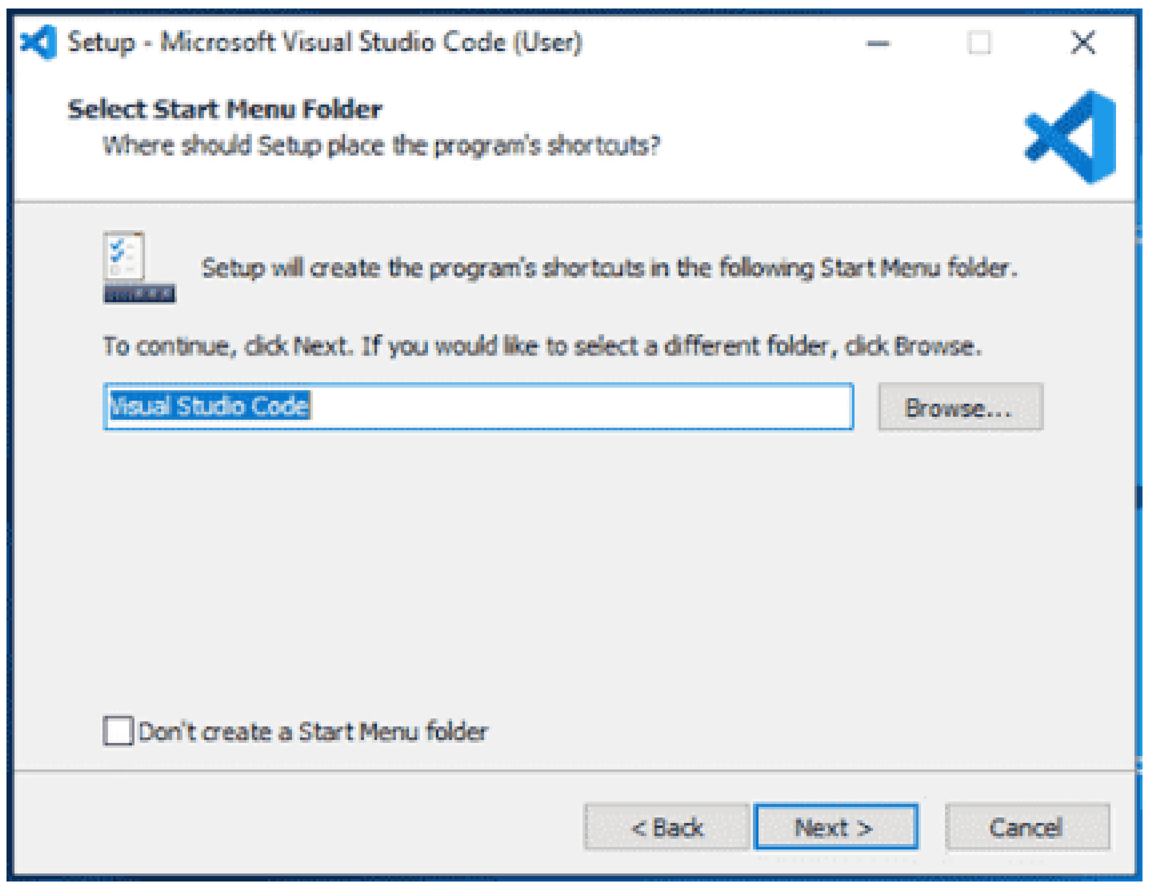
Select Destination Location
Where should Visual Studio Code be installed?

Setup will install Visual Studio Code into the following folder.

To continue, click Next. If you would like to select a different folder, click Browse.

C:\Users\jason\AppData\Local\Programs\Microsoft VS Code

At least 234.5 MB of free disk space is required.



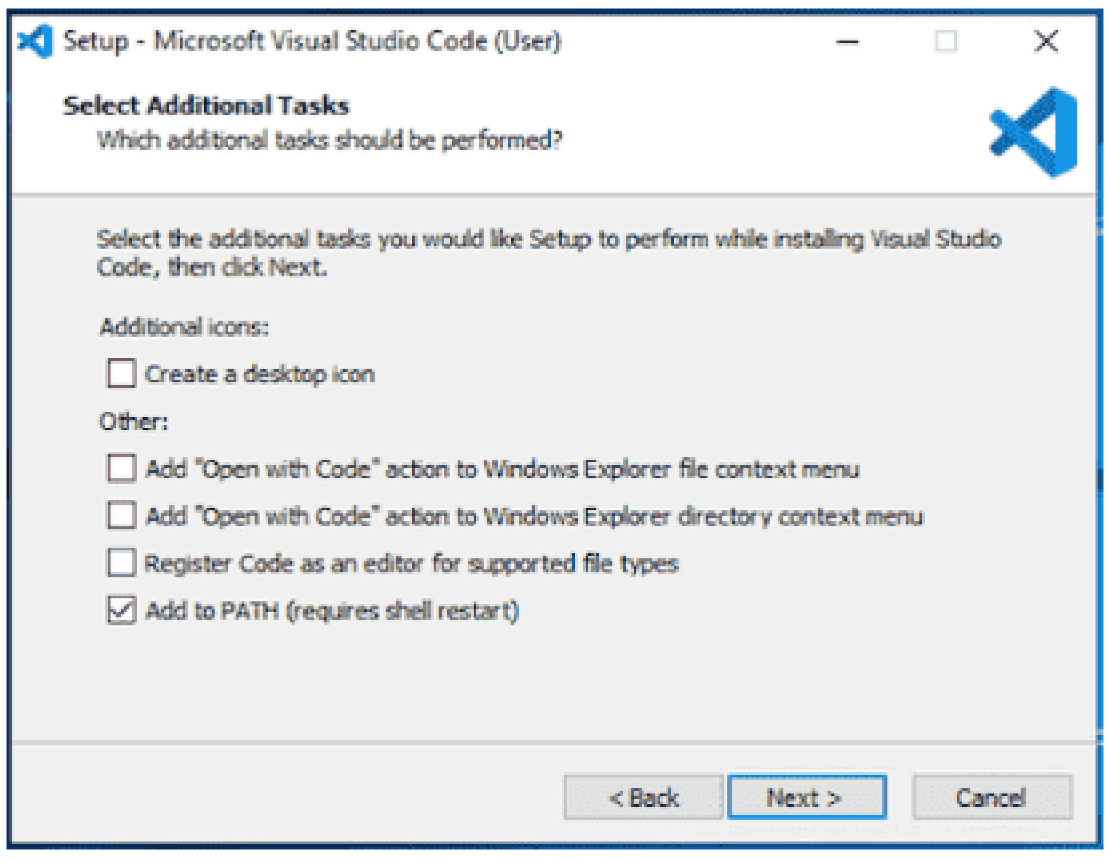
Select Start Menu Folder
Where should Setup place the program's shortcuts?

Setup will create the program's shortcuts in the following Start Menu folder.

To continue, click Next. If you would like to select a different folder, click Browse.

Visual Studio Code

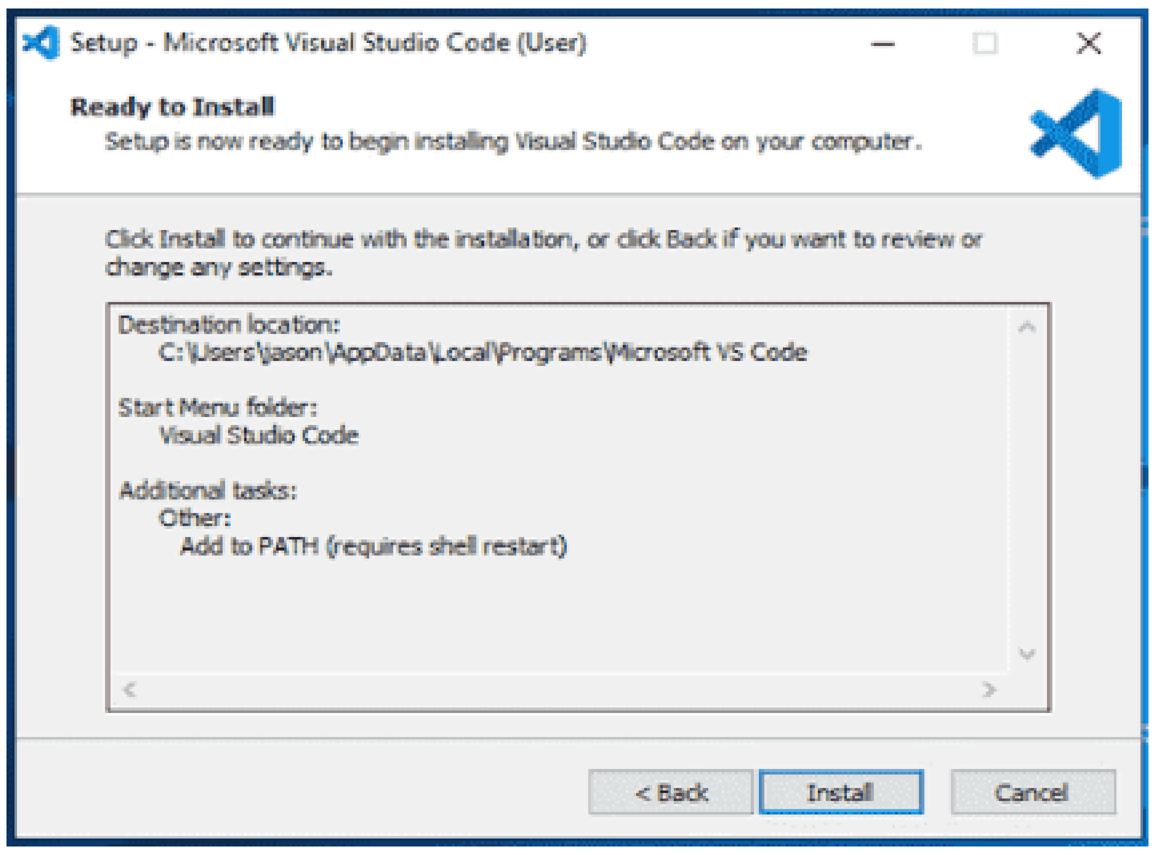
□ Don't create a Start Menu folder



Select Additional Tasks
Which additional tasks should be performed?

Select the additional tasks you would like Setup to perform while installing Visual Studio Code, then click Next.

Additional icons:
□ Create a desktop icon
Other:
□ Add "Open with Code" action to Windows Explorer file context menu
□ Add "Open with Code" action to Windows Explorer directory context menu
□ Register Code as an editor for supported file types
☑ Add to PATH (requires shell restart)



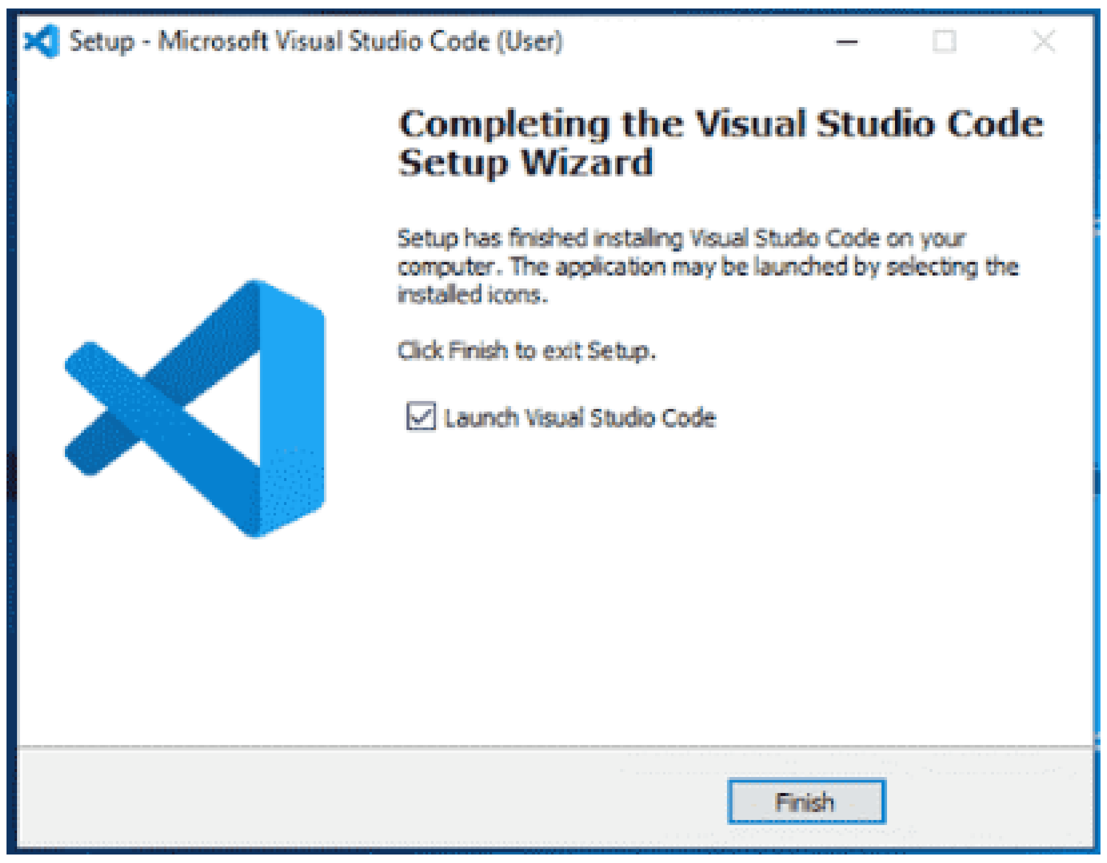
Ready to Install
Setup is now ready to begin installing Visual Studio Code on your computer.

Click Install to continue with the installation, or click Back if you want to review or change any settings.

```
Destination location:
    C:\Users\jason\AppData\Local\Programs\Microsoft VS Code

Start Menu folder:
    Visual Studio Code

Additional tasks:
    Other:
      Add to PATH (requires shell restart)
```



Completing the Visual Studio Code Setup Wizard

Setup has finished installing Visual Studio Code on your computer. The application may be launched by selecting the installed icons.

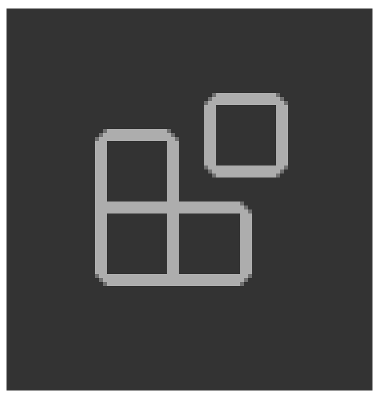
Click Finish to exit Setup.

☑ Launch Visual Studio Code

VS Code extensions

VS Code extensions let you add languages, debuggers, and tools to your installation to support your development workflow. VS Code's rich extensibility model lets extension authors plug directly into the VS Code UI and contribute functionality through the same APIs used by VS Code.

Bring up the Extensions view by clicking on the Extensions icon in the Activity Bar on the side of VS Code or the View: Extensions command (Ctrl+Shift+X)



JSON

JSON stands for JavaScript Object Notation

JSON is a text format for storing and transporting data

JSON is "self-describing" and easy to understand

JSON is a lightweight data-interchange format

JSON is plain text written in JavaScript object notation

JSON is used to send data between computers

JSON is language independent

Why Use JSON?

The JSON format is syntactically similar to the code for creating JavaScript objects.

JavaScript program can easily convert JSON data into JavaScript objects.

JSON data can easily be sent between computers, and used by any programming language.

JavaScript has a built in function for converting JSON strings into JavaScript objects:

JSON.parse()

JavaScript also has a built in function for converting an object into a JSON string:

JSON.stringify()

JSON Syntax Rules

JSON syntax is derived from JavaScript object notation syntax:

Data is in name/value (key/value) pairs: A name/value pair consists of a field name (in double quotes), followed by a colon, followed by a value

"name":"John"

Data is separated by commas

Curly braces hold objects

Square brackets hold arrays

JSON Values

In JSON, *values* must be one of the following data types:

a string

a number

an object

an array

a boolean

null

Practice: <html>

<body>

<h2>Access a JavaScript object</h2>

```
<p id="demo"></p>
<script>
const myObj = {name:"John", age:30, city:"New York"};
document.getElementById("demo").innerHTML = myObj.name;
or
document.getElementById("demo").innerHTML = myObj["name"];
</script>
</body>
</html>
```

JSON.parse()

A common use of JSON is to exchange data to/from a web server.

When receiving data from a web server, the data is always a string.

Parse the data with JSON.parse(), and the data becomes a JavaScript object.

Practice:

```
<html>
<body>
<h2>Creating an Object from a JSON String</h2>
<p id="demo"></p>
<script>
const txt = '{"name":"John", "age":30, "city":"New York"}'
const obj = JSON.parse(txt);
document.getElementById("demo").innerHTML = obj.name + ", " + obj.age;
</script>
</body>
</html>
```

Array as JSON

When using the JSON.parse() on a JSON derived from an array, the method will return a JavaScript array, instead of a JavaScript object.

Practice:
```
<html>
<body>
<h2>Parsing a JSON Array.</h2>
<p>Data written as an JSON array will be parsed into a JavaScript array.</p>
<p id="demo"></p>
<script>
const text = '[ "Ford", "BMW", "Audi", "Fiat" ]';
const myArr = JSON.parse(text);
document.getElementById("demo").innerHTML = myArr[0];
</script>
</body>
</html>
```

JSON.stringify()

A common use of JSON is to exchange data to/from a web server.

When sending data to a web server, the data has to be a string.

Convert a JavaScript object into a string with JSON.stringify().

Practice:
```
<html><body>
<h2>Create a JSON string from a JavaScript object.</h2>
<p id="demo"></p>
<script>
const obj = {name: "John", age: 30, city: "New York"};
const myJSON = JSON.stringify(obj);
document.getElementById("demo").innerHTML = myJSON;
```

```
</script>
</body></html>
```

JavaScript Objects

Objects are variables too. But objects can contain many values.

The values are written as **name:value** pairs (name and value separated by a colon).

Practice: <script>

```
// Create an object:
const person = {
  firstName: "John",
  lastName: "Doe",
  age: 50,
  eyeColor: "blue"
};
// Display some data from the object:
document.getElementById("demo").innerHTML =person.firstName + " is " + person.age + " years old.";
or
document.getElementById("demo").innerHTML =person["firstName"] + " " + person["age"];
</script>
```

Object Properties

The **name:values** pairs in JavaScript objects are called **properties**

Accessing Object Properties

objectName.propertyName

or

objectName["propertyName"]

Object Methods

Objects can also have **methods**.

Methods are **actions** that can be performed on objects.

Methods are stored in properties as **function definitions**.

Property	Property Value
firstName	John
lastName	Doe
age	50
fullName	function() {return this.firstName + " " + this.lastName;}

```
const person = {
  firstName: "John",
  lastName : "Doe",
  id     : 5566,
  fullName : function() {
    return this.firstName + " " + this.lastName;
  }
};
```

Note: this refers to the **person object**.

Accessing Object Methods

objectName.methodName()

Practice:
```
<script>
// Create an object:
const person = {
  firstName: "John",
  lastName: "Doe",
  id: 5566,
  fullName: function() {
    return this.firstName + " " + this.lastName;
  }
};
// Display data from the object:
document.getElementById("demo").innerHTML = person.fullName();
</script>
```

Constructors: A **constructor** in Java is a special method that is used to initialize objects

Practice:
```
<script>
// Constructor function for Person objects
function Person(first, last, age, eye) {
  this.firstName = first;
  this.lastName = last;
  this.age = age;
}
// Create a Person object
const myFather = new Person("John", "Doe", 50, "blue");
// Display age
document.getElementById("demo").innerHTML =
"My father is " + myFather.age + ".";
</script>
```

JavaScript Object Accessors

Getters and setters allow you to get and set object properties via methods.

This example uses a lang property to get the value of the language property:

Practice: <script>

```
// Create an object:
const person = {
  firstName: "John",
  lastName: "Doe",
  language: "en",
  get lang() {
    return this.language;
  }
};
// Display data from the object using a getter:
document.getElementById("demo").innerHTML = person.lang;
</script>
```

Practice: <script>

```
// Create an object:
const person = {
  firstName: "John",
  lastName: "Doe",
  language: "NO",
  set lang(value) {
    this.language = value;
  }
};
// Set a property using set:
person.lang = "en";
// Display data from the object:
document.getElementById("demo").innerHTML = person.language;
</script>
```

Prototype

All JavaScript objects inherit properties and methods from a prototype.

The prototype property allows you to add new methods to objects constructors:

Practice:

```
<script>
function Person(first, last, age, eye) {
  this.firstName = first;
  this.lastName = last;
}
Person.prototype.nationality = "English";
const myFather = new Person("John", "Doe", 50, "blue");
document.getElementById("demo").innerHTML =
"The nationality of my father is " + myFather.nationality;
</script>
```

ES6

ECMAScript (**European Computer Manufacturers Association Script**) is a scripting language based on JavaScript

ECMAScript 2015 was the second major revision to JavaScript.

ECMAScript 2015 is also known as ES6 and ECMAScript 6.

Arrow functions

Arrow functions allows a short syntax for writing function expressions.

You don't need the function keyword, the return keyword, and the **curly brackets**.

Practice:

```
<script>
const x = (x, y) => x * y;
document.getElementById("demo").innerHTML = x(5, 5);
</script>
```

Template strings

Template Literals use back-ticks (``) rather than the quotes ("") to define a string:

Practice: <script>

```
let text = `Hello world!`;
document.getElementById("demo").innerHTML = text;
</script>
```

Interpolation

Template literals provide an easy way to interpolate variables and expressions into strings.

The method is called string interpolation.

The syntax is:

${...}

Variable Substitutions

Template literals allow variables in strings:

Practice:

```
<script>
let firstName = "John";
let lastName = "Doe";
let text = `Welcome ${firstName}, ${lastName}!`;
document.getElementById("demo").innerHTML = text;
</script>
```

JavaScript Object Prototypes

All JavaScript objects inherit properties and methods from a prototype.

Prototype Inheritance

All JavaScript objects inherit properties and methods from a prototype:

Date objects inherit from Date.prototype

Array objects inherit from Array.prototype

Person objects inherit from Person.prototype

The Object.prototype is on the top of the prototype inheritance chain:

Date objects, Array objects, and Person objects inherit from Object.prototype.

Adding Properties and Methods to Objects

Sometimes you want to add new properties (or methods) to all existing objects of a given type.

Sometimes you want to add new properties (or methods) to an object constructor.

Using the **prototype** Property

The JavaScript prototype property allows you to add new properties to object constructors:

Practice:
```
<script>
function Person(first, last) {
  this.firstName = first;
  this.lastName = last;
}
Person.prototype.nationality = "English";
const myFather = new Person("John", "Doe");
document.getElementById("demo").innerHTML =
"The nationality of my father is " + myFather.nationality;
</script>
```

The JavaScript prototype property also allows you to add new methods to objects constructors:

Practice:
```
<script>
function Person(first, last, age, eye) {
  this.firstName = first;
  this.lastName = last;
  this.age = age;
  this.eyeColor = eye;
}
Person.prototype.name = function() {
  return this.firstName + " " + this.lastName
};
const myFather = new Person("John", "Doe", 50, "blue");
```

```
document.getElementById("demo").innerHTML ="My father is " + myFather.name();
</script>
```

The Spread (...) Operator

The ... operator expands an iterable (like an array) into more elements:

Practice: <script>

```
const cars1 = ["Saab", "Volvo", ..."BMW"];
const cars2 = ["Fiat", "Toyota"];
const combined = [cars1, ...cars2];
document.getElementById("demo").innerHTML = combined;
</script>
```

Map

Creating a Map from an Array

A Map holds key-value pairs where the keys can be any datatype.

A Map remembers the original insertion order of the keys.

A Map has a property that represents the size of the map

How to Create a Map

You can create a JavaScript Map by:

Passing an Array to new Map()

Create a Map and use Map.set()

new Map()

You can create a Map by passing an Array to the new Map() constructor:

Practice: <script>

```
// Create a Map
```

```
const fruits = new Map([
  ["apples", 500],
  ["bananas", 300],
  ["oranges", 200]
]);
document.getElementById("demo").innerHTML = fruits.get("apples");
</script>
```

Map.set()

You can add elements to a Map with the set() method:

Practice:

```
<script>
// Create a Map
const fruits = new Map();
// Set Map Values
fruits.set("apples", 500);
fruits.set("bananas", 300);
fruits.set("oranges", 200);
document.getElementById("demo").innerHTML = fruits.get("apples");
</script>
```

Map Methods

Method	Description
new Map()	Creates a new Map object
set()	Sets the value for a key in a Map

get()	Gets the value for a key in a Map
clear()	Removes all the elements from a Map
delete()	Removes a Map element specified by a key
has()	Returns true if a key exists in a Map
forEach()	Invokes a callback for each key/value pair in a Map
entries()	Returns an iterator object with the [key, value] pairs in a Map
keys()	Returns an iterator object with the keys in a Map
values()	Returns an iterator object of the values in a Map

Property	**Description**
size	Returns the number of Map elements

JavaScript Set

A JavaScript Set is a collection of unique values.

Each value can only occur once in a Set.

A Set can hold any value of any data type.

How to Create a Set

You can create a JavaScript Set by:

- Passing an Array to new Set()
- Create a new Set and use add() to add values

Create a new Set and use add() to add variables

The new Set() Method

Pass an Array to the new Set() constructor:

```
<script>
// Create a Set
const letters = new Set(["a","b","c"]);
// Display set.size
document.getElementById("demo").innerHTML = letters.size;
</script>
```

Create a Set and add literal values:

```
<script>
// Create a Set
const letters = new Set();
// Add Values to the Set
letters.add("a");
letters.add("b");
letters.add("c");
// Display set.size
document.getElementById("demo").innerHTML = letters.size;
</script>
```

Create a Set and add variables:

```
<script>
const letters = new Set();    // Create a Set
```

```
// Create Variables
const a = "a";
const b = "b";
const c = "c";
// Add the Variables to the Set
letters.add(a);
letters.add(b);
letters.add(c);
// Display set.size
document.getElementById("demo").innerHTML = letters.size;
</script>
```

Practice:<script>

```
// Create a new Set
const letters = new Set(["a","b","c"]);
// Add a new Element
letters.add("d");
letters.add("e");
// Display set.size
document.getElementById("demo").innerHTML = letters.size;
</script>
```

Set Methods

Method	Description
new Set()	Creates a new Set
add()	Adds a new element to the Set

delete()	Removes an element from a Set
has()	Returns true if a value exists
clear()	Removes all elements from a Set
forEach()	Invokes a callback for each element
values()	Returns an Iterator with all the values in a Set
keys()	Same as values()
entries()	Returns an Iterator with the [value,value] pairs from a Set

Property	**Description**
size	Returns the number elements in a Set

What is meant by TypeScript?

TypeScript is a syntactic superset of JavaScript which adds static typing.

This basically means that TypeScript adds syntax on top of JavaScript, allowing developers to add types.

TypeScript being a "Syntactic Superset" means that it shares the same base syntax as JavaScript, but adds something to it.

Why TypeScript?

TypeScript uses compile time type checking. Which means it checks if the specified types match **before** running the code, not **while** running the code

JavaScript is better suited for small-scale applications, while TypeScript is better for larger applications.

TypeScript is better than JavaScript in terms of language features, reference validation, project scalability, collaboration within and between teams, developer experience, and code maintainability.

Setting up development environment for TypeScript

Pre-requisite to install TypeScript

1. Text Editor or IDE
2. Node.js Package Manager (npm)
3. The TypeScript compiler

Ways to install TypeScript

There are two ways to install TypeScript:

1. Install TypeScript using Node.js Package Manager (npm).
2. Install the TypeScript plug-in in your IDE (Integrated Development Environment).

Install TypeScript using Node.js Package Manager (npm)

Step-1 Install Node.js. It is used to setup TypeScript on our local computer.

To install Node.js on Windows, go to the following link: **https://www.javatpoint.com/install-nodejs**

To verify the installation was successful, enter the following command in the Terminal Window.

```
node -v
npm -v
```

Step-2 Install TypeScript. To install TypeScript, enter the following command in the Terminal Window.

```
npm install typescript –save-dev        //As dev dependency
npm install typescript -g               //Install as a global module
or
npm install -g typescript
npm install typescript@latest -g        //Install latest if you have an older version
```

Step-3 To verify the installation was successful, enter the command **$ tsc -v** in the Terminal Window.

Install Live server

```
npm install -g live-server
```

Create and run first program in TypeScript

open command prompt

go to d: drive(any drive)

d:\>mkdir typescript

d:\>cd typescript

d:\typescript> npm install typescript –save-dev

open visual studio code

file-open folder-choose typescript folder from d:

create new file- save it as types.ts(any name.ts)

Write the below code and save it

```
console.log("Hello World");
```

go to command prompt and compile the program

tsc types.ts

run the program

node types.js

Observe the output

Basic Types

Built-in Data Type	keyword	Description
Number	number	It is used to represent both Integer as well as Floating-Point numbers
Boolean	boolean	Represents true and false
String	string	It is used to represent a sequence of characters
Void	void	Generally used on function return-types

Built-in Data Type	keyword	Description
Null	null	It is used when an object does not have any value
Undefined	undefined	Denotes value given to uninitialized variable
Any	any	If variable is declared with any data-type then any type of value can be assigned to that variable

Example

```
let a: null = null;
let b: number = 123;
let c: number = 123.456;
let d: string = ‘  Geeks’  ;
let e: undefined = undefined;
let f: boolean = true;
console.log(a);
console.log(b);
console.log(c);
console.log(d);
console.log(e);
console.log(f);
let a: any = null;
let b: any =123;
let c: any = 123.456;
let d: any = ‘ Geeks’ ;
let e: any = undefined;
let f: any = true;
```

Control flow statement

TypeScript control statements:

1. If Statement
2. If else statement
3. if else if statement

TypeScript If Statement:

If statement is used to execute a block of statements if specified condition is true.

```
if(condition){
 //Block of TypeScript statements.
}
```

TypeScript If Else Statement:

If else statement is used to execute either of two block of statements depends upon the condition. If condition is true then if block will execute otherwise else block will execute.

```
if(condition){
//Block of TypeScript statements1.
}else{
 //Block of TypeScript statements2.
}
```

TypeScript If Else If Statement:

If else statement is used to execute one block of statements from many depends upon the condition. If condition1 is true then block of statements1 will be executed, else if condition2 is true block of statements2 is executed and so on. If no condition is true, then else block of statements will be executed.

```
if(condition1){
 //Block of TypeScript statements1.
}else if(condition2){
//Block of TypeScript  statements2.
} . . . else if(conditionn){
 //Block of TypeScript statementsn.
}else{
 //Block of TypeScript statements.
}
```

Example

```
var num:number = 2;
if(num==1){
console.log("TypeScript Statement 1");
}
else if(num==2){
console.log("TypeScript Statement 2");
}
```

```
else if(num==3){
console.log("TypeScript Statement 3");
}
else{
console.log("TypeScript Statement n");
}
```

TypeScript - for Loops

1. for loop
2. for..of loop
3. for..in loop

for Loop

The for loop is used to execute a block of code a given number of times, which is specified by a condition.

```
for (first expression; second expression; third expression ) {
   // statements to be executed repeatedly
}

for (let i = 0; i < 3; i++) {
  console.log ("Block statement execution no." + i);
}
```

for...of Loop

TypeScript includes the for...of loop to iterate and access elements of an array, list, or tuple collection.

```
let arr = [10, 20, 30, 40];
```

```
for (var val of arr) {
  console.log(val); // prints values: 10, 20, 30, 40
}
```

for...in Loop

Another form of the for loop is for...in. This can be used with an array, list, or tuple.

```
let arr = [10, 20, 30, 40];
for (var index in arr) {
  console.log(index); // prints indexes: 0, 1, 2, 3
  console.log(arr[index]); // prints elements: 10, 20, 30, 40
}
```

TypeScript - while Loop

The while loop is another type of loop that checks for a specified condition before beginning to execute the block of statements. The loop runs until the condition value is met.

```
while (condition expression) {
   // code block to be executed
}

let i: number = 2;
while (i < 4) {
   console.log( "Block statement execution no." + i )
   i++;
}
```

do..while loop

The do..while loop is similar to the while loop, except that the condition is given at the end of the loop. The do..while loop runs the block of code at least once before checking for the specified condition.

```
do {
// code block to be executed
}
while (condition expression);
```

```
let i: number = 2;
do {
   console.log("Block statement execution no." + i )
   i++;
} while ( i < 4)
```

Functions

In TypeScript, functions can be of two types: named and anonymous.

Named Functions

A named function is one where you declare and call a function by its given name.

```
function display() {
   console.log("Hello TypeScript!");
}
display(); //Output: Hello TypeScript
```

Functions can also include parameter types and return type.

```
function Sum(x: number, y: number) : number {
   return x + y;
}
Sum(2,3); // returns 5
```

Anonymous Function

An anonymous function is one which is defined as an expression.

This expression is stored in a variable.

So, the function itself does not have a name.

These functions are invoked using the variable name that the function is stored in.

```
let display = function() {
   console.log("Hello TypeScript!");
};
display (); //Output: Hello TypeScript!
```

An anonymous function can also include parameter types and return type.

```
let Sum = function(x: number, y: number) : number
{
   return x + y;
}
Sum(2,3); // returns 5
```

Function Parameters

Parameters are values or arguments passed to a function. In TypeScript, the compiler expects a function to receive the exact number and type of arguments as defined in the function signature.

```
function Greet(greeting: string, name: string ) : string {
   return greeting + ' ' + name + '!';
}
Greet('Hello','Steve');
```

Default Parameters

TypeScript provides the option to add default values to parameters.

```
function Greet(name: string, greeting: string = "Hello") : string {
   return greeting + ' ' + name + '!';
}
Greet('Steve');//OK, returns "Hello Steve!"
```

Modern UI technologies

1. React
2. Angular
3. Flutter
4. Vue.js
5. JQuery
6. Emberjs
7. Semantic UI

8 **Backbonejs**

9. Foundation

10. Svelte