**Introduction**

|  |  |
| --- | --- |
| **Exercise – 8** | |
| Installation | Angular CLI as dependency in for creating/running angular applications. |
| Import | Angular libraries, Routers. |
| Objective | Define and add the private, public properties to typescript class |

**Lab Name : Building Web Applications with Angular**

**Learning Outcomes**

In this module, you will complete the following exercises:

* Implement OOP paradigms in angular classes using typescript

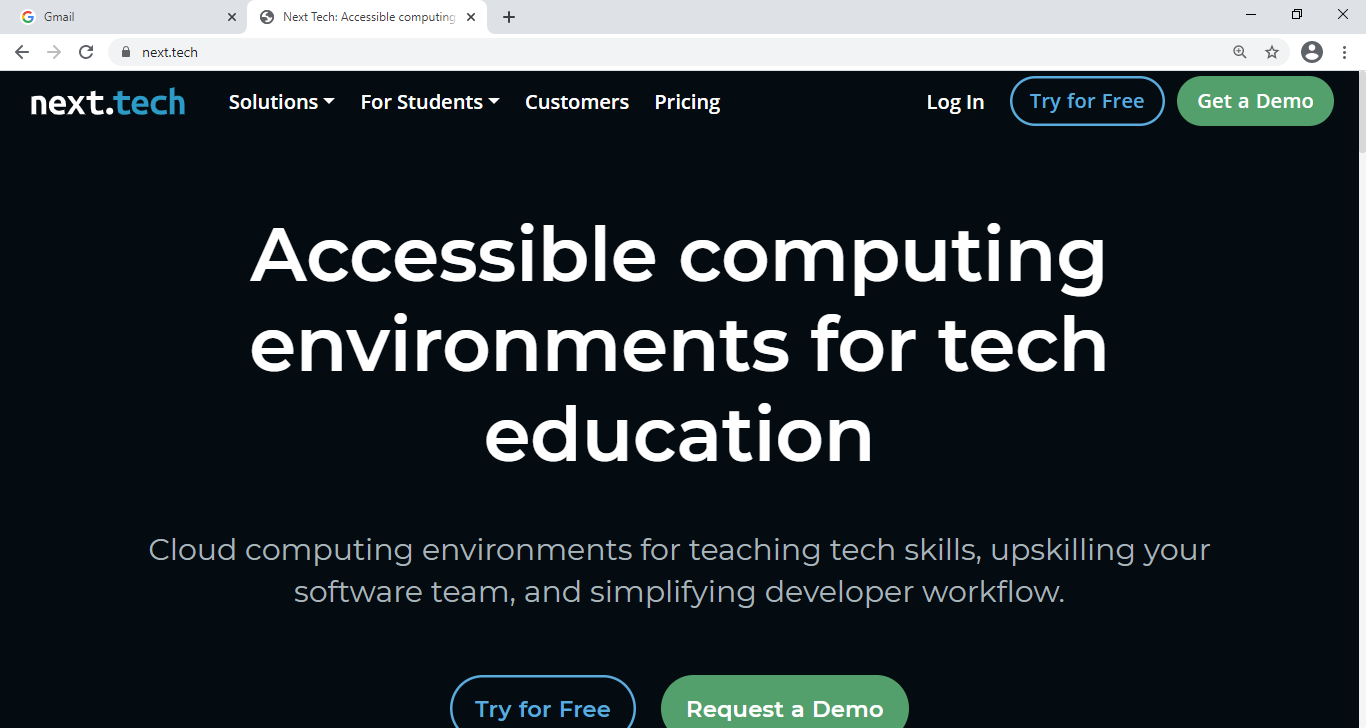
After completing this lab, you will be able to:

* Run a local development server and render a webpage where user can enter the input data and show the entered data as alert.
* Apply different access modifiers to the class variables in TypeScript.
* Bind class properties with the HTML templates according to the access level i.e., private/public/protected.
* Understand abstraction for modifying the value of class properties.

**Objectives**

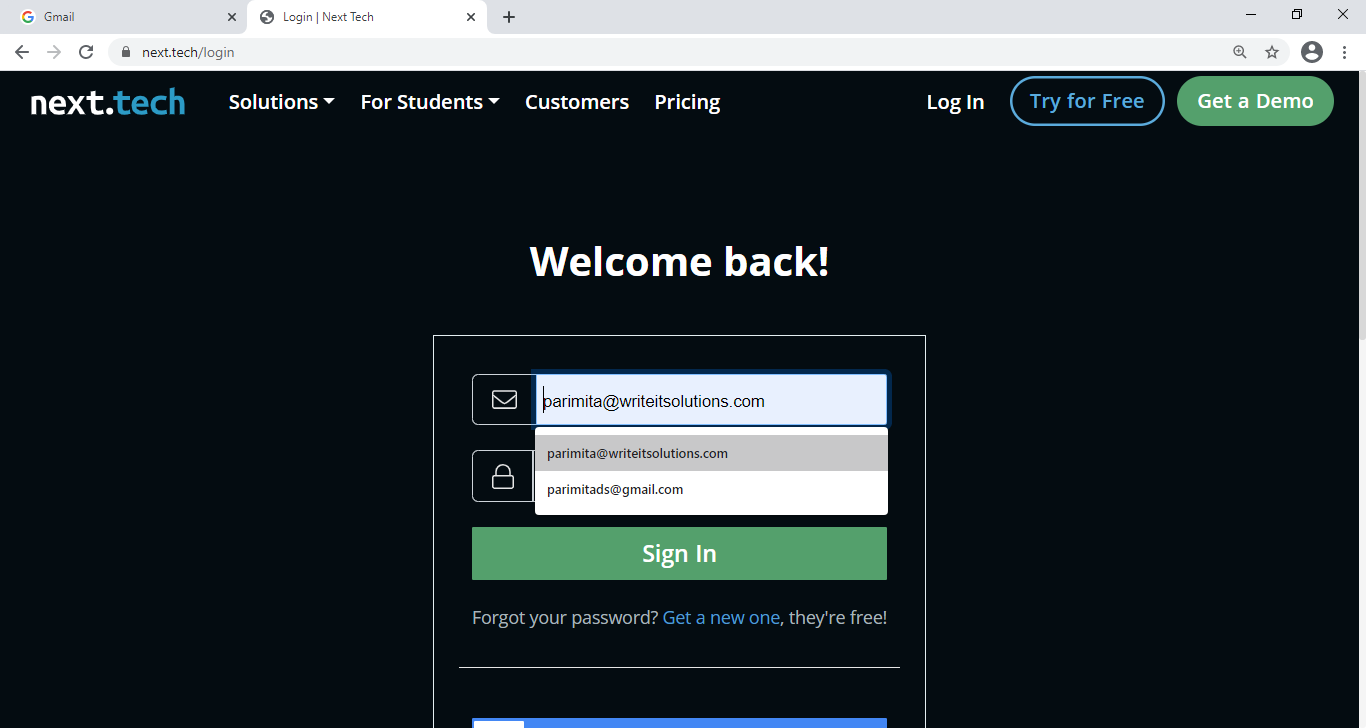
The following objectives are covered in this lab:

* 1.1 Creating and running a new angular based project
* 1.2 Accessing a local development server on local machine using angular-CLI..
* 1.3 Applying different access modifiers to define properties of a class.
* 1.4 Access protected properties of a class in HTML templates.



*Figure1 : To access the sandbox.*

**LOGIN :**



*Figure2: Go to login and Give Username and Password.*

**EXERCISE - 1**

* **TASK – 1: Creating an angular application.**

**1. Step- 1: Launch Angular environment by clicking on Launch Angular sandbox.**

**CLICK THE MY Launchpad:**

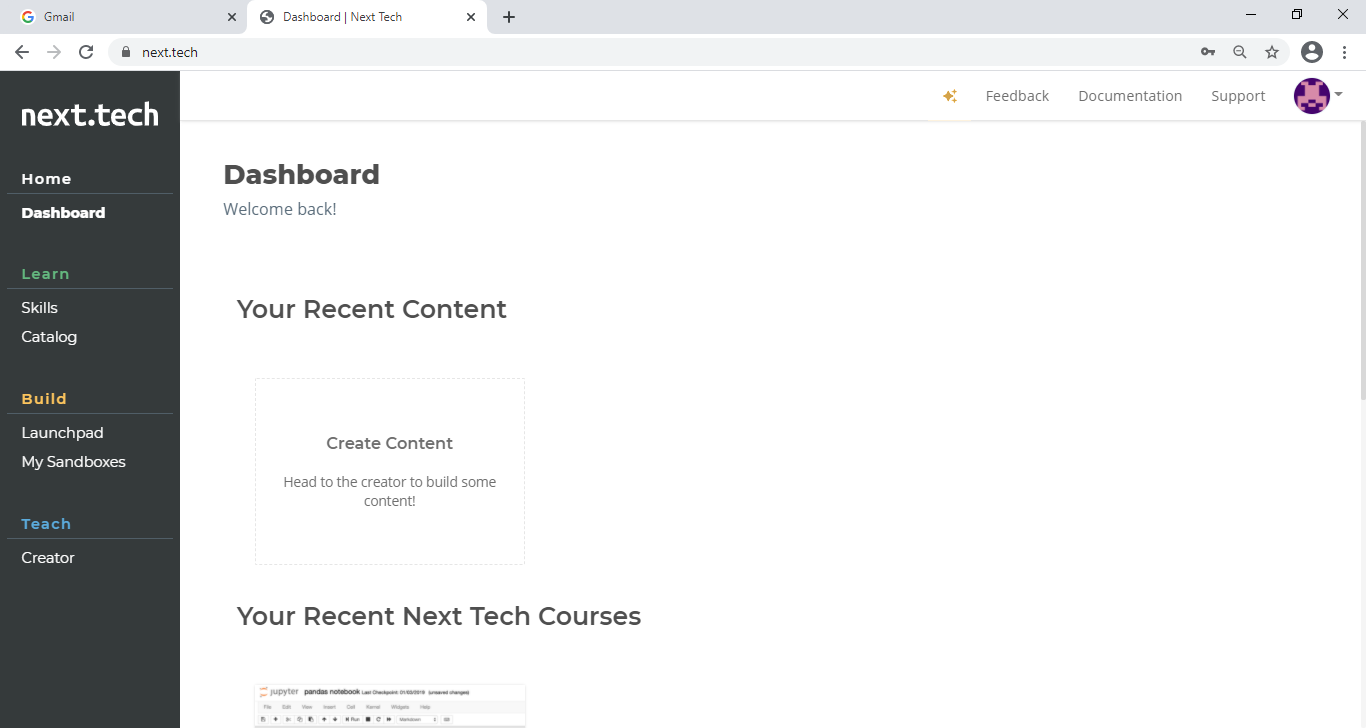
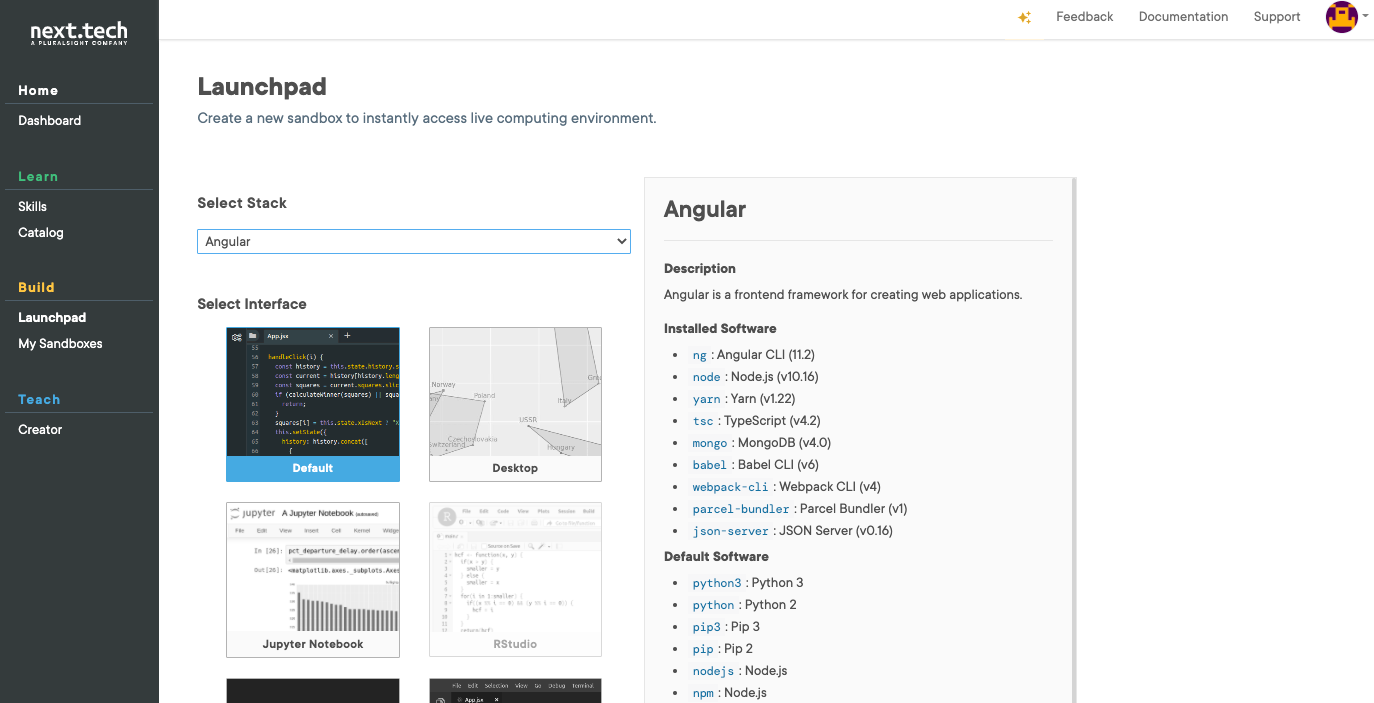
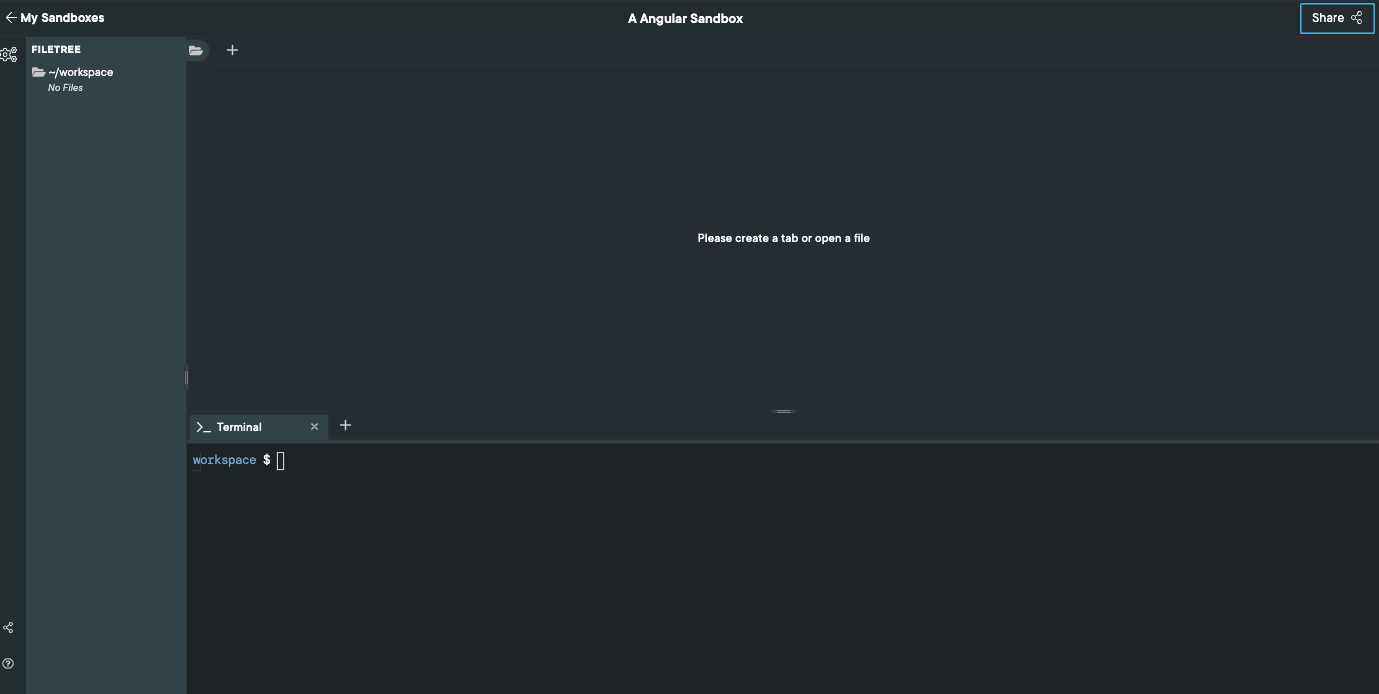


Figure3: Select Launchpad.



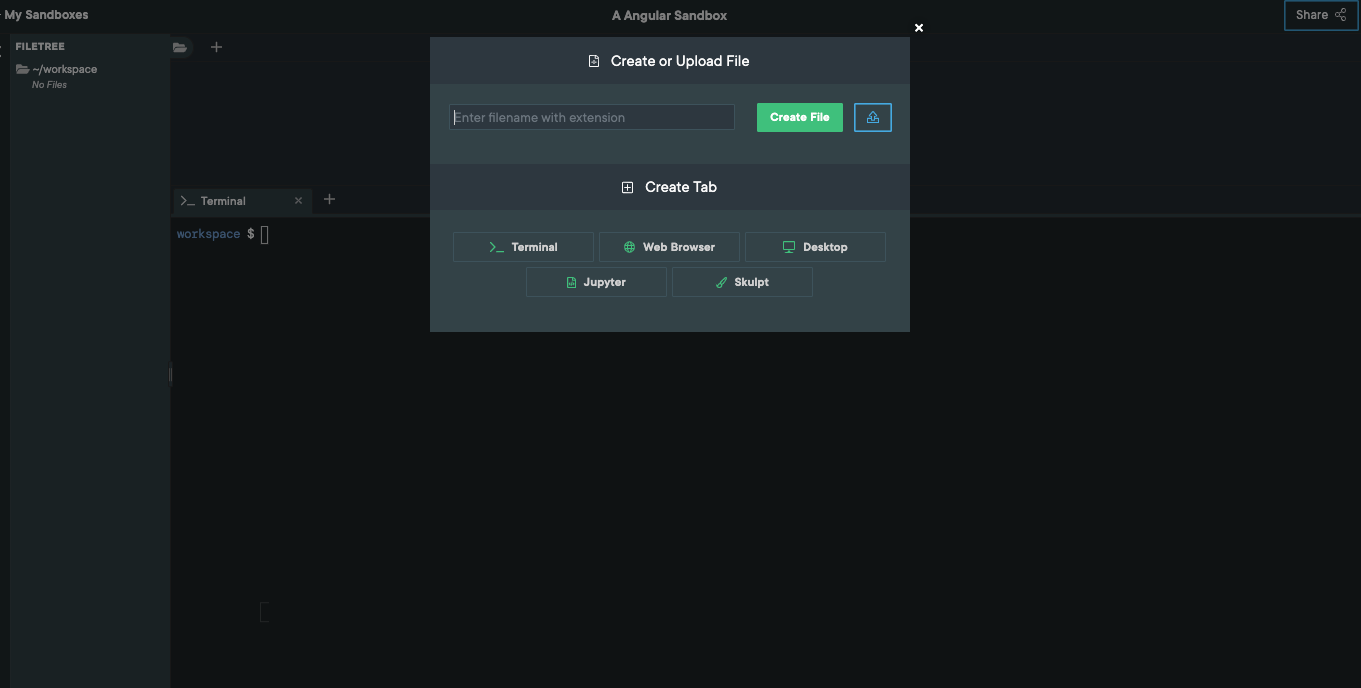
*Figure 4: Select Angular stack as environment as launch a stack.*



*Figure 5: We are provided with an Angular Sandbox as above.*

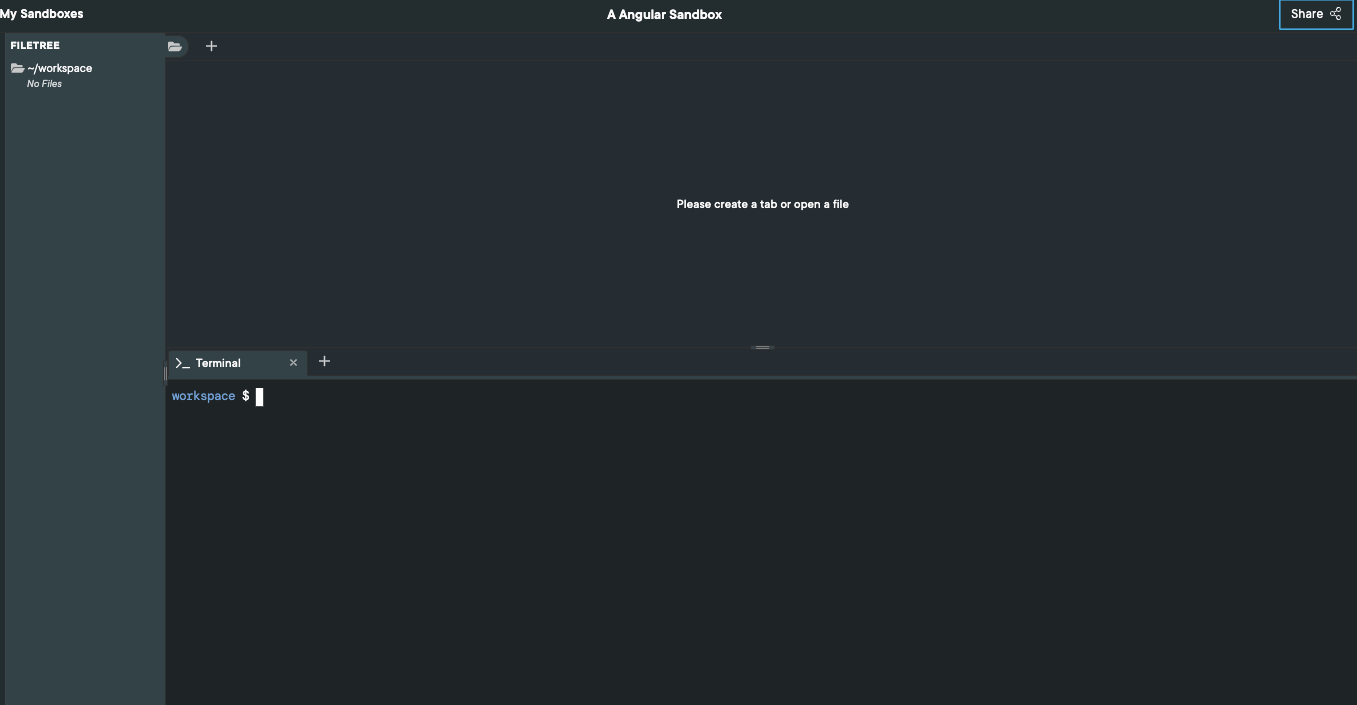
**2. Step- 2: Check the angular-cli and its available commands in terminal using “ng” command.**

Click on “+” icon in the bottom and choose “terminal” from the pop-up menu.



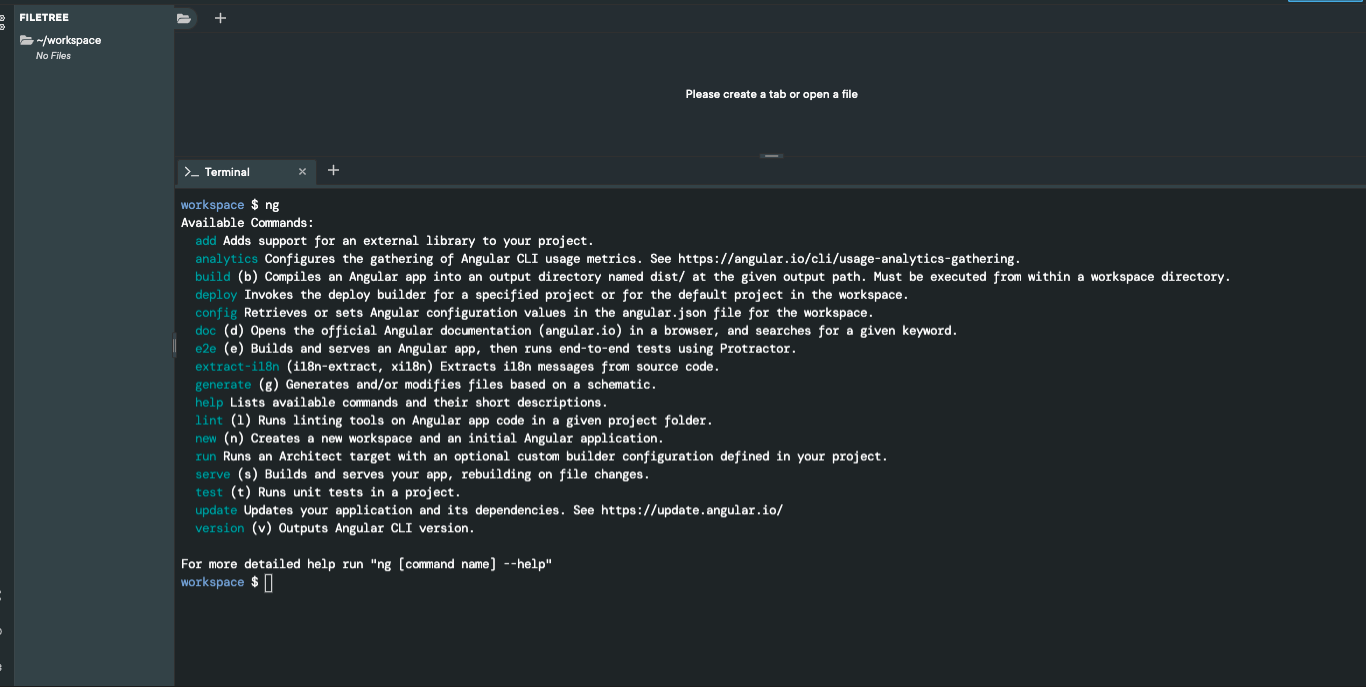
*Figure 6: Click on “+” icon and choose terminal from pop-up menu as option.*

A window with terminal as tab is displayed at bottom as below.

**

*Figure 7: On choosing the terminal, a new terminal window is displayed/opened as in image.*

Enter “ng” in the terminal tab to list available commands with angular-cli in terminal.

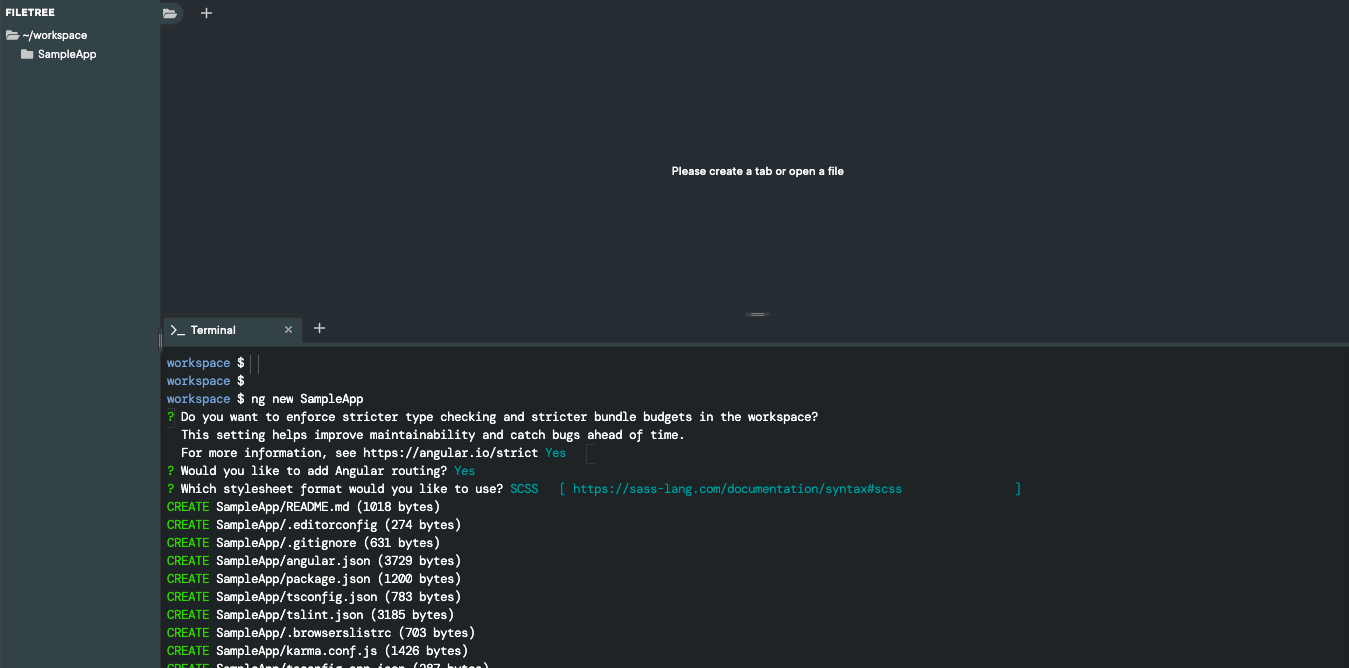


*Figure 8: List all the available commands of with “ng” i.e., angular-cli*

**3. Step- 5: create a new application using command “ng new <** **application\_name>”**

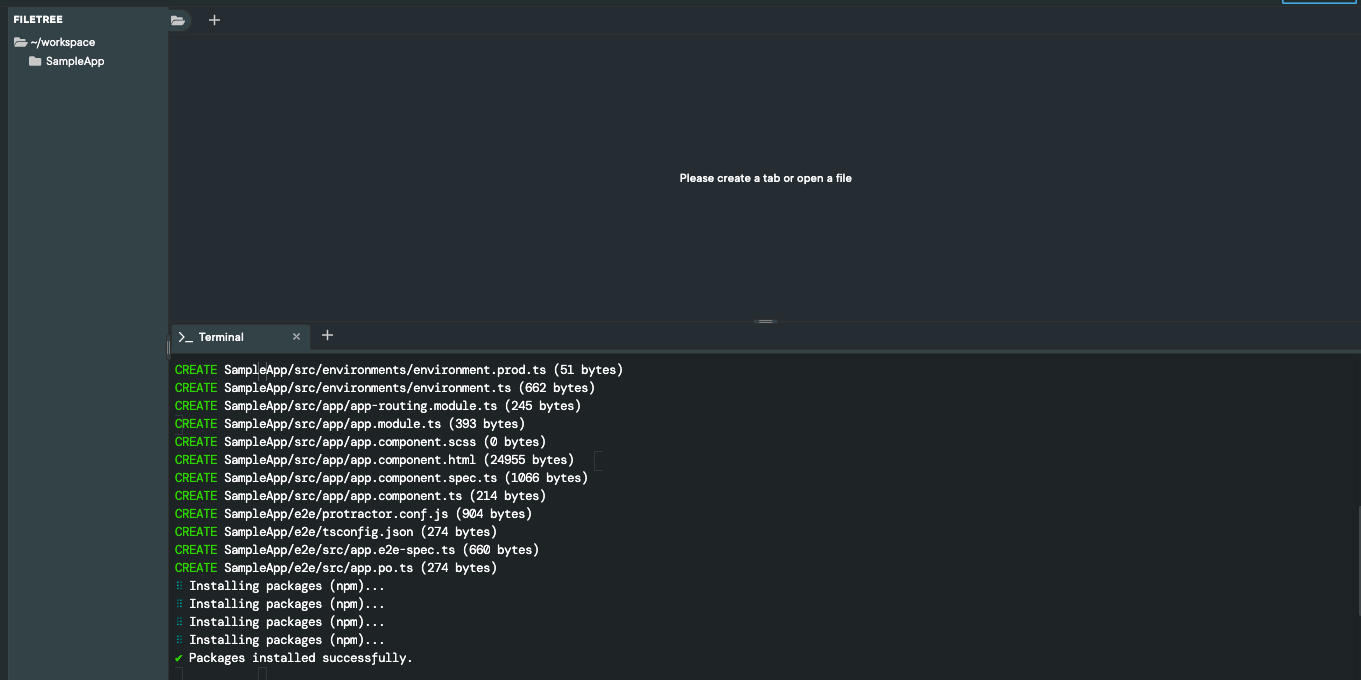
Enter the below command in the terminal window followed by choosing the options prompted in terminal.

ng new SampleApp



*Figure 9: Creating a new application using “ng new SampleApp” command where “SampleApp” is the name of the application in context.*

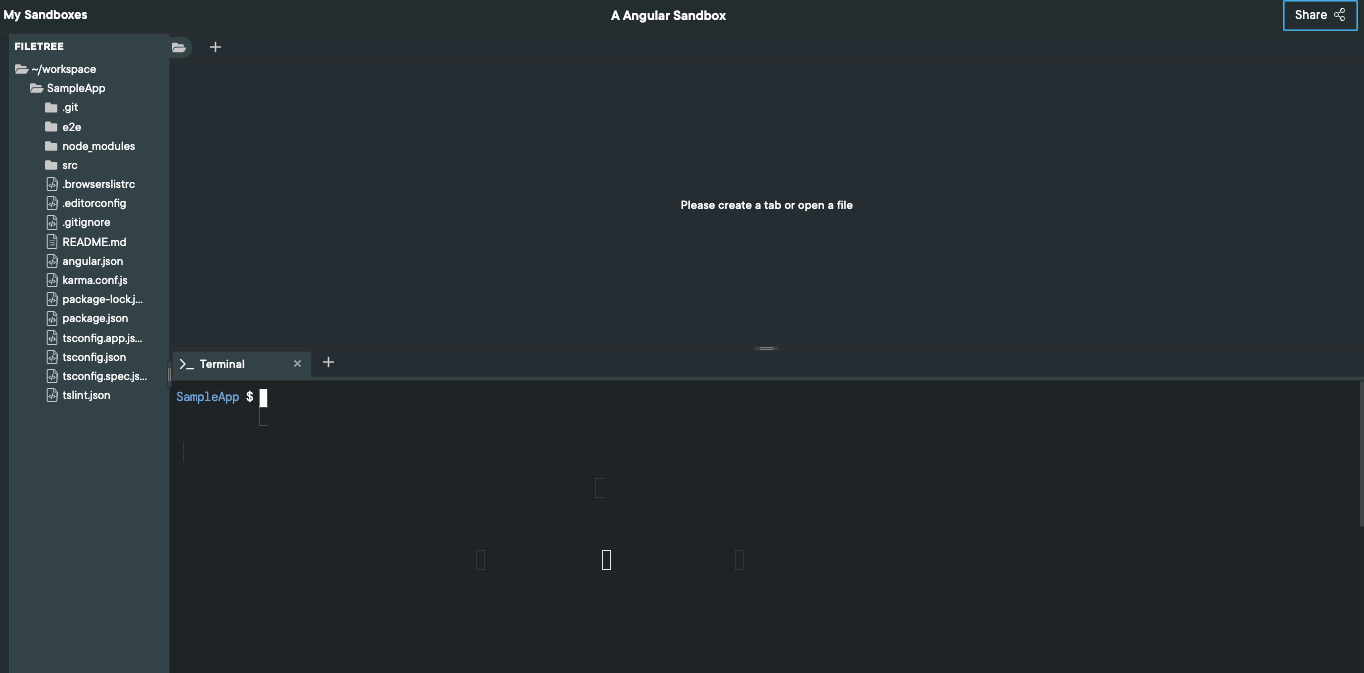
If no error, new application is created under the directory named as <application\_name> provided in above step as below.



*Figure 10: Successful creation of angular application using angular-cli in terminal.*

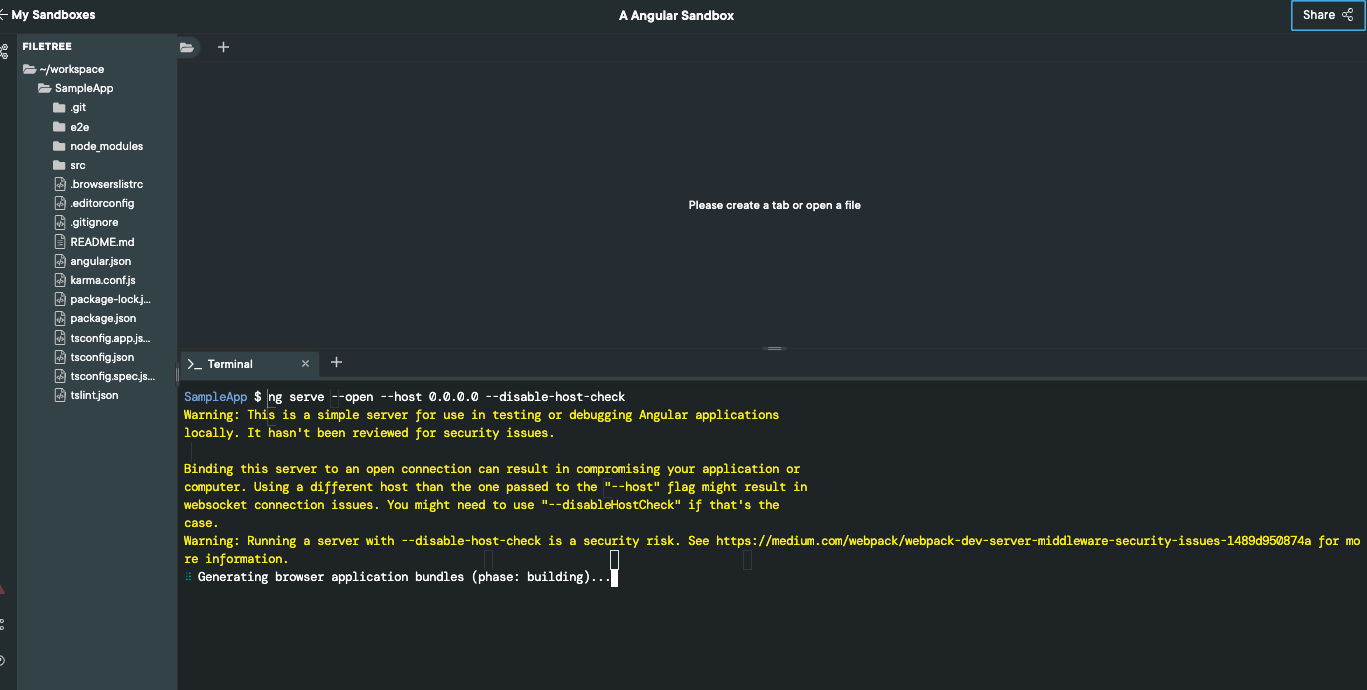
* **TASK – 2: Running an angular application.**

**4. Navigate to project root folder.**

****

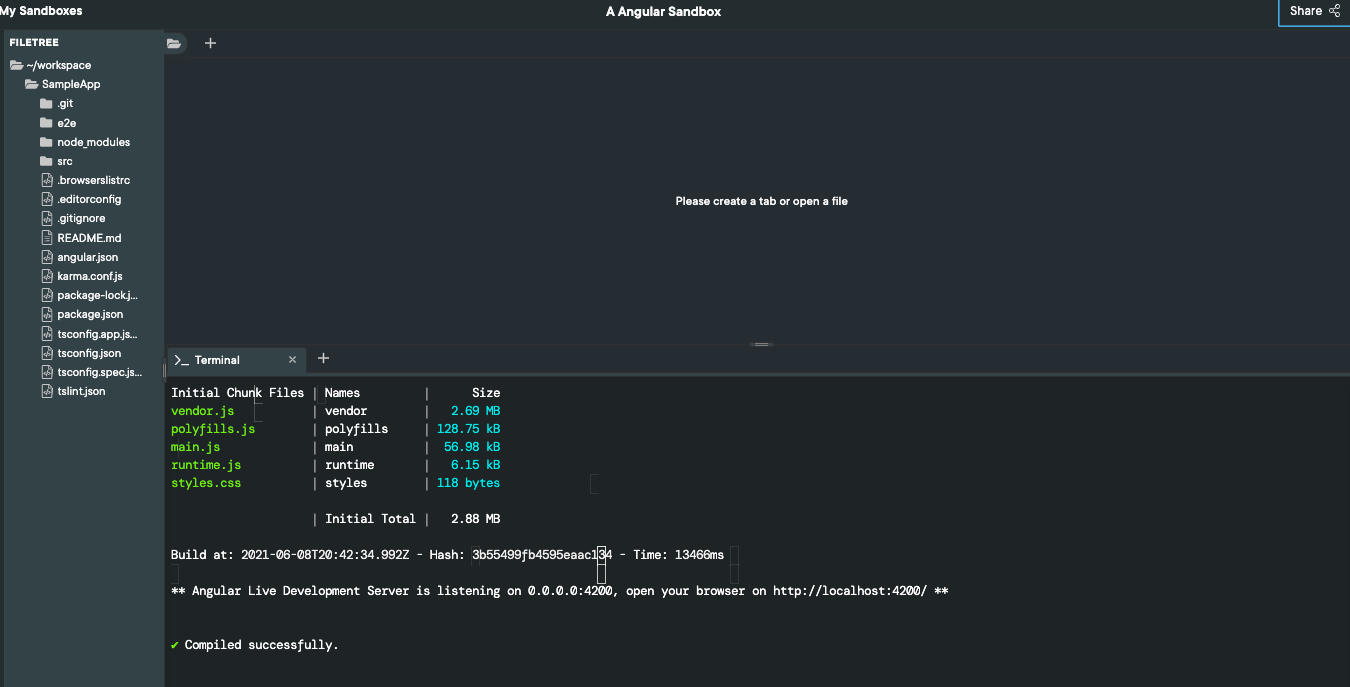
*Figure 11: Navigate to root folder directory of previously created angular application.*

**5. Start a local development angular server using below command.**

****

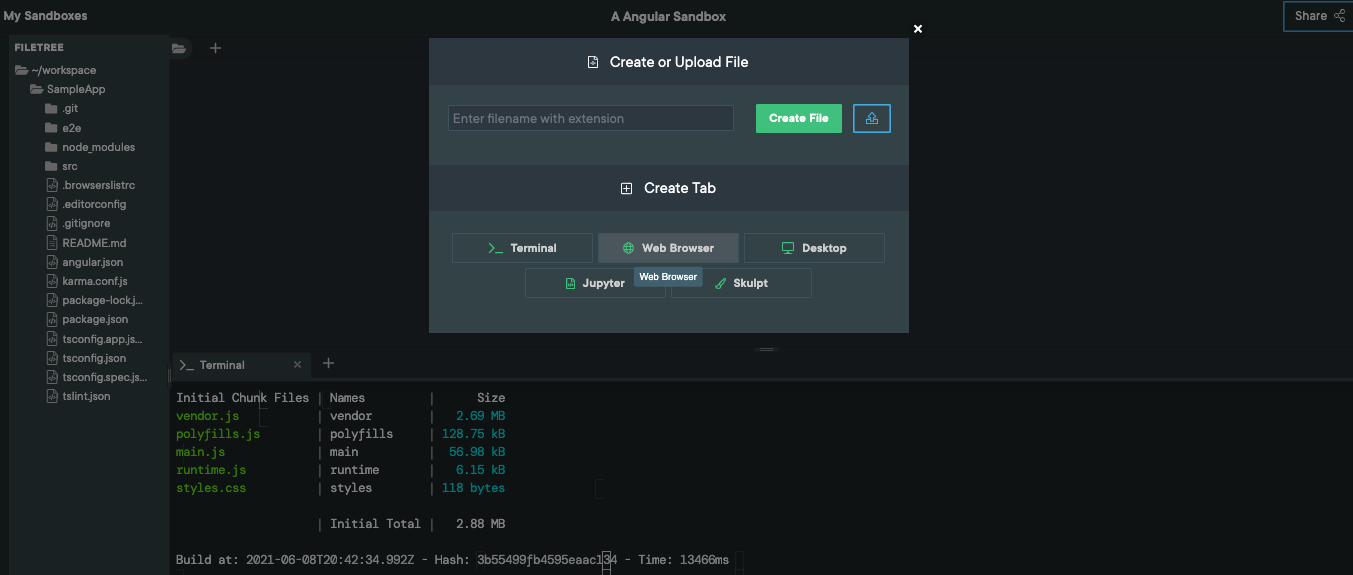
*Figure 12: Starting local development server using command “ng serve --open --host 0.0.0.0 --disable-host-check ”.*

Once compiled successfully, output similar to below is displayed in terminal.

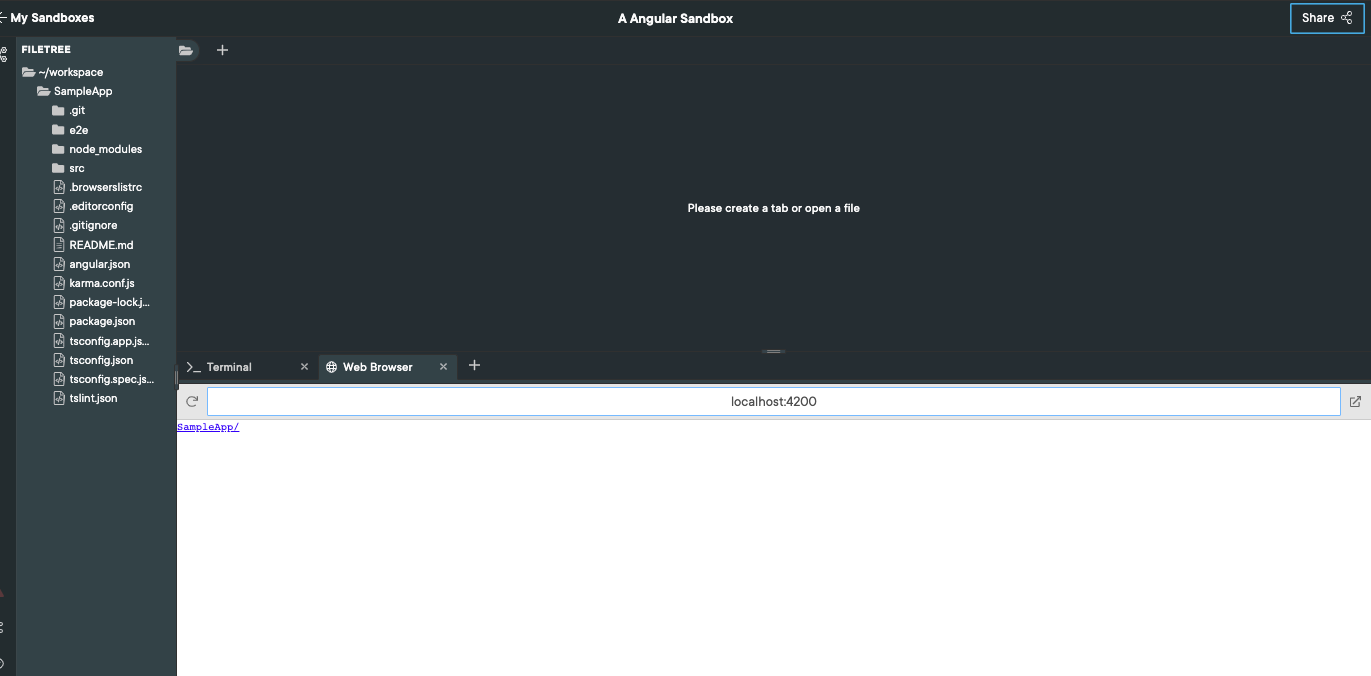
****

*Figure 13: Check code for successful compilation of code and its dependencies.*

**6. Open a browser tab and navigate to URL** [**http://localhost:4200**](http://localhost:4200) **in it.**

****

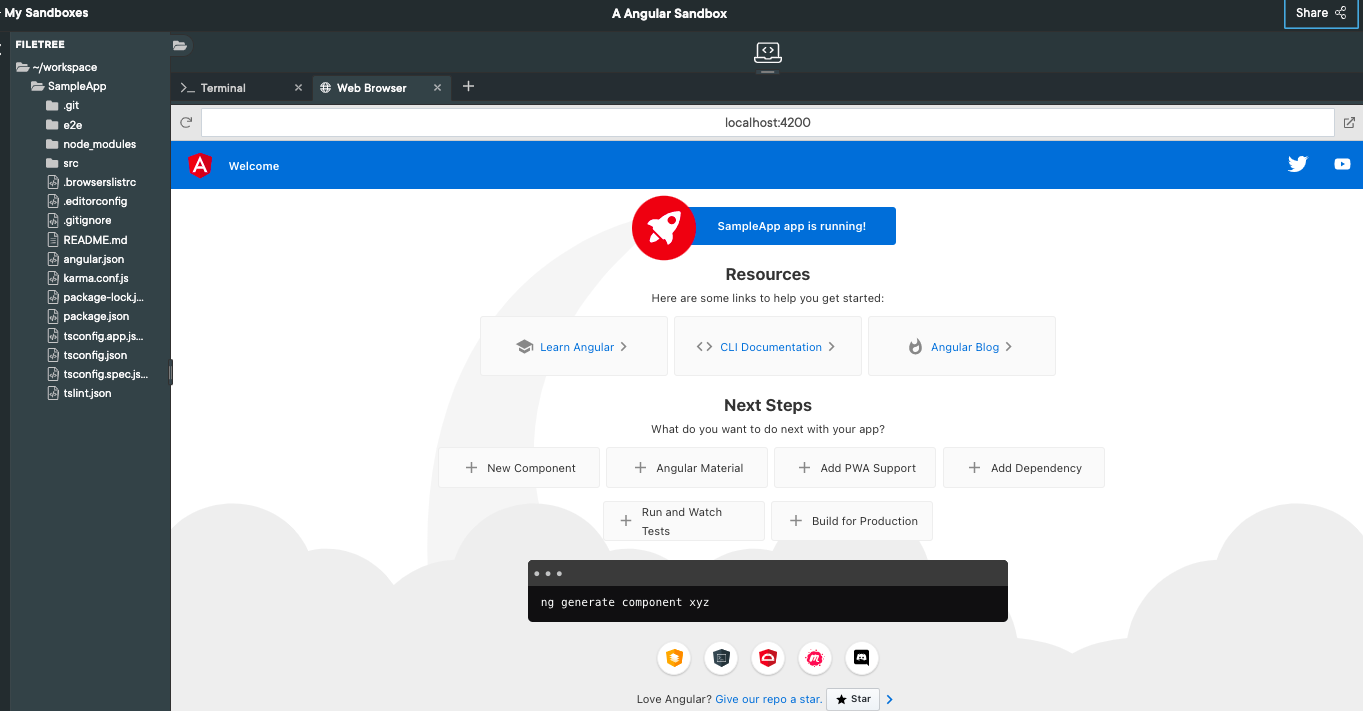
*Figure 14: Opening a browser window for accessing the localhost webpage.*

****

*Figure 15: Running the angular application and accessing it using browser.*

**7. Accessing the application running on local development server.**

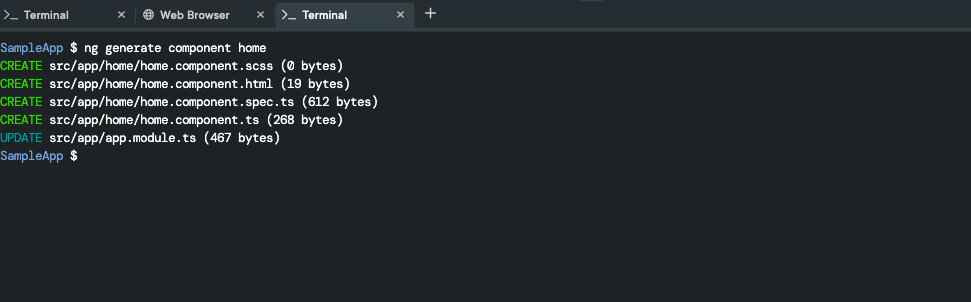
Press enter after entering URL <http://localhost:4200> in browser tab. Below screen is displayed in browser.

****

*Figure 16: Running the starter/new angular app and accessing it from browser UI.*

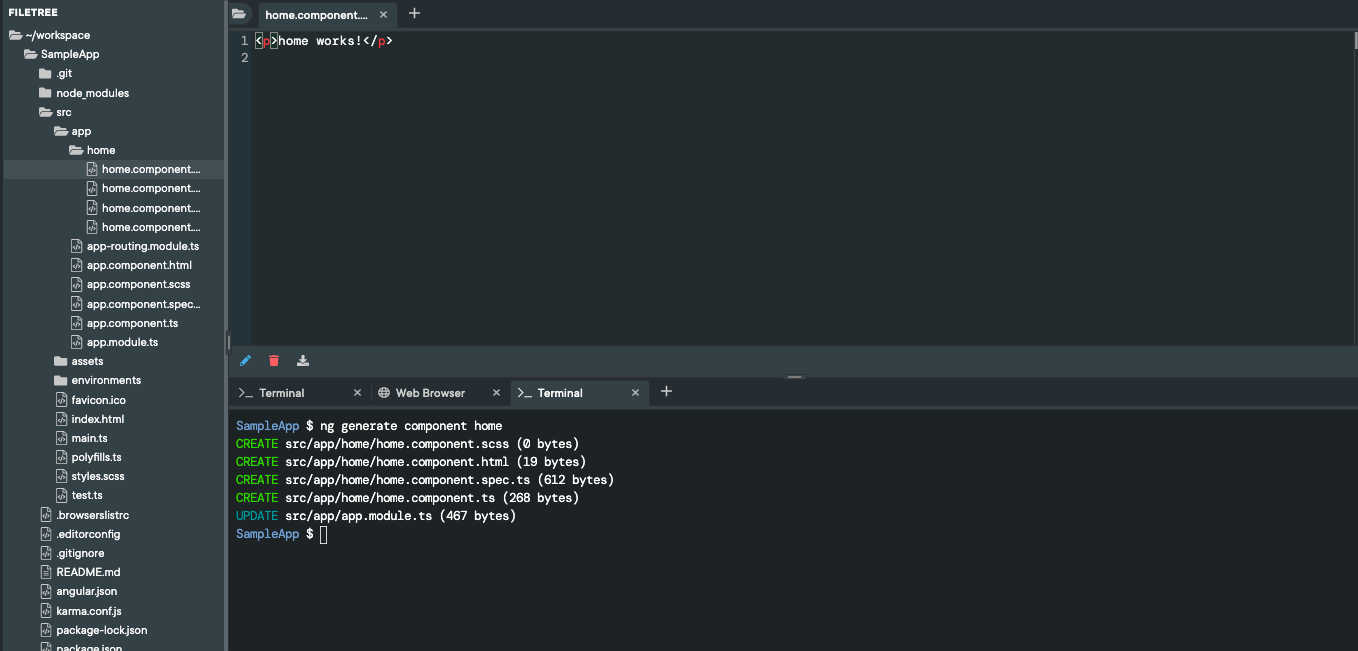
**8. Create a new component named as home using below command:**

ng generate component home



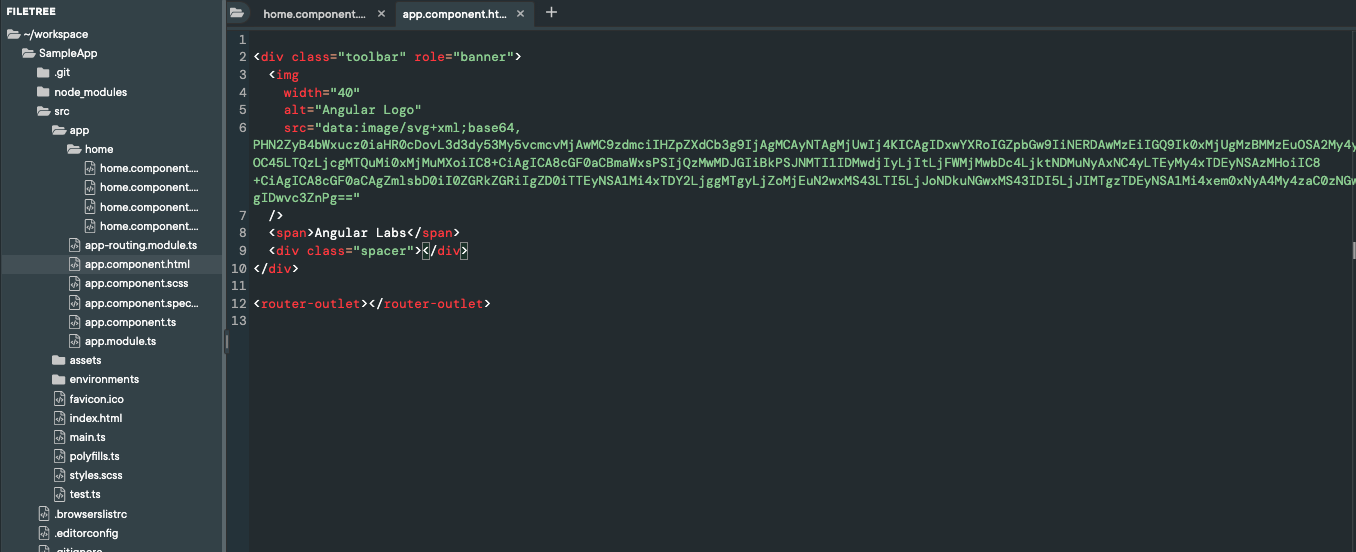
*Figure 17:Creating the component named as home using ng generate component home.*

**Locating the created component named as home.**

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*Figure 18:Locating the files created by ng generate component home.*

**9. Open the file named as app.component.html and edit as below:**

****

*Figure 19: Adding changes to the file named as app.component.html*

**Code snippet for file “app.component.html”**

<div class="toolbar" role="banner">

<img

width="40"

alt="Angular Logo"

src="data:image/svg+xml;base64,PHN2ZyB4bWxucz0iaHR0cDovL3d3dy53My5vcmcvMjAwMC9zdmciIHZpZXdCb3g9IjAgMCAyNTAgMjUwIj4KICAgIDxwYXRoIGZpbGw9IiNERDAwMzEiIGQ9Ik0xMjUgMzBMMzEuOSA2My4ybDE0LjIgMTIzLjFMMTI1IDIzMGw3OC45LTQzLjcgMTQuMi0xMjMuMXoiIC8+CiAgICA8cGF0aCBmaWxsPSIjQzMwMDJGIiBkPSJNMTI1IDMwdjIyLjItLjFWMjMwbDc4LjktNDMuNyAxNC4yLTEyMy4xTDEyNSAzMHoiIC8+CiAgICA8cGF0aCAgZmlsbD0iI0ZGRkZGRiIgZD0iTTEyNSA1Mi4xTDY2LjggMTgyLjZoMjEuN2wxMS43LTI5LjJoNDkuNGwxMS43IDI5LjJIMTgzTDEyNSA1Mi4xem0xNyA4My4zaC0zNGwxNy00MC45IDE3IDQwLjl6IiAvPgogIDwvc3ZnPg=="

/>

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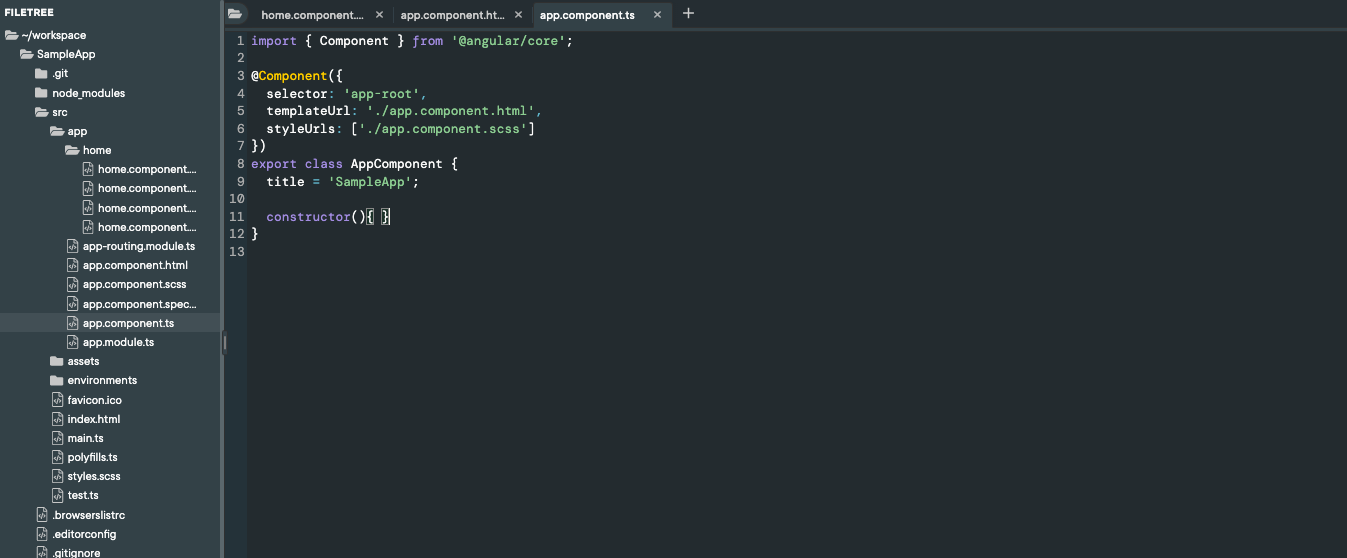
<div class="spacer"></div>

</div>

<router-outlet></router-outlet>

*Snippet 1: Code snippet for file app.component.html.*

**10. Open the file named as app.component.ts and edit as below:**



*Figure 20: Adding changes to the file named as app.component.ts*

**Code snippet for file “app.component.ts”**

import { Component } from '@angular/core';

@Component({

selector: 'app-root',

templateUrl: './app.component.html',

styleUrls: ['./app.component.scss']

})

export class AppComponent {

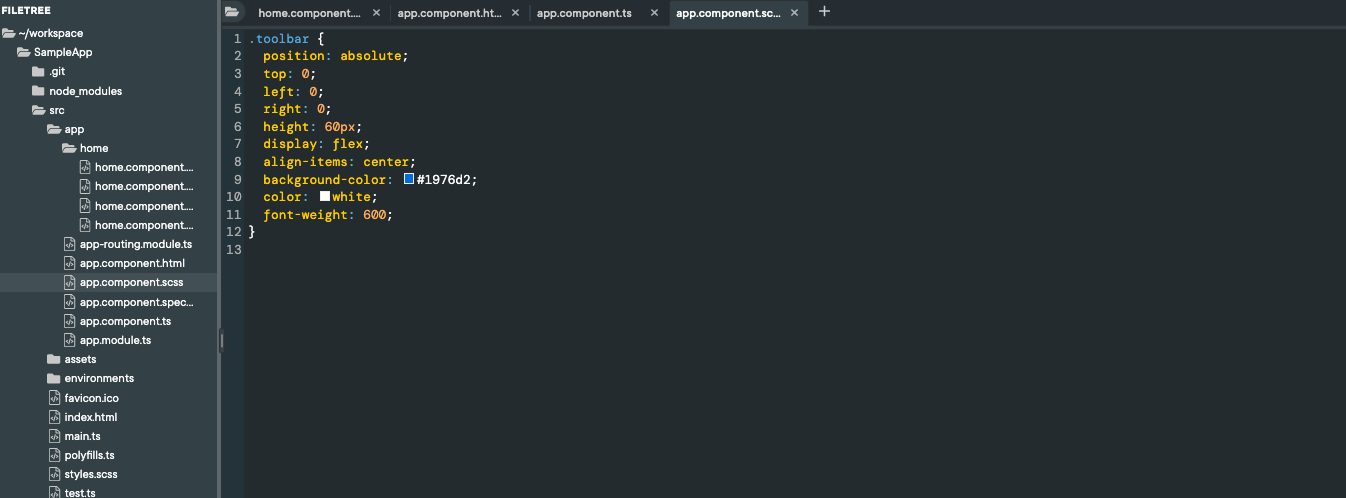
title = 'SampleApp';

constructor(){ }

}

*Snippet 2: Code snippet for file app.component.ts*

**11. Open the file named as app.component.scss and edit as below:**



*Figure 21: Adding changes to the file named as app.component.html*

**Code snippet for file “app.component.scss”**

.toolbar {

position: absolute;

top: 0;

left: 0;

right: 0;

height: 60px;

display: flex;

align-items: center;

background-color: #1976d2;

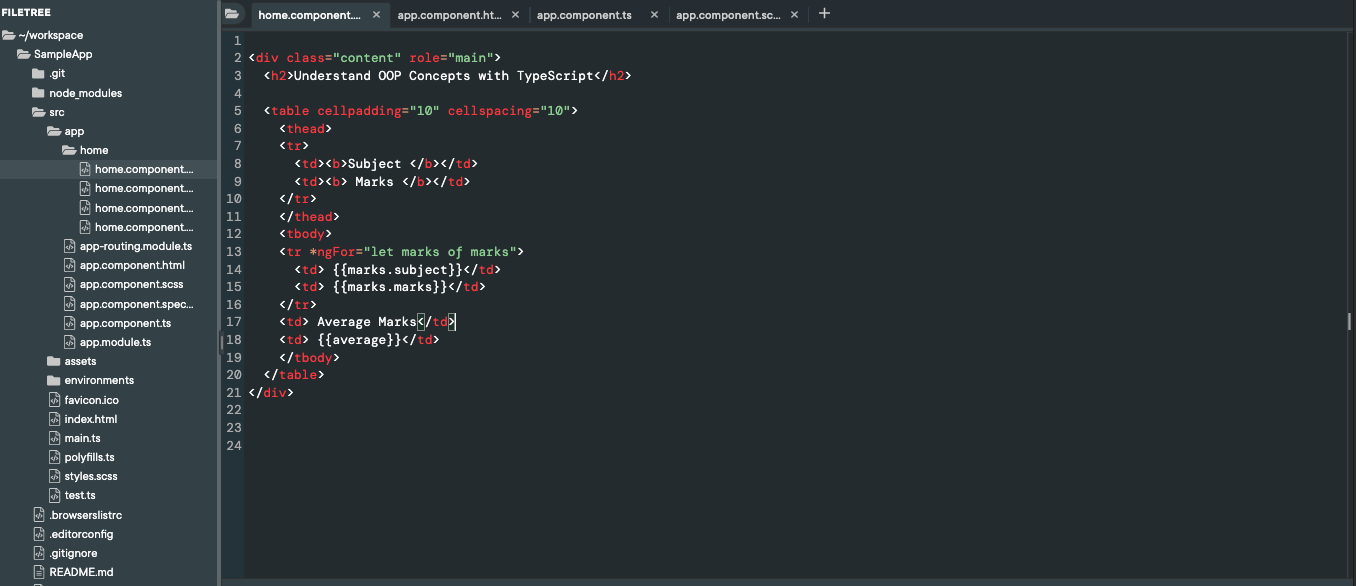
color: white;

font-weight: 600;

}

*Snippet 3: Code snippet for file app.component.scss*

**12. Open the file named as home.component.html and edit as below:**



*Figure 22: Adding changes to the file named as home.component.html*

**Code snippet for file “home.component.html”**

<div class="content" role="main">

<h2>Understand OOP Concepts with TypeScript</h2>

<table cellpadding="10" cellspacing="10">

<thead>

<tr>

<td><b>Subject </b></td>

<td><b> Marks </b></td>

</tr>

</thead>

<tbody>

<tr \*ngFor="let marks of marks">

<td> {{marks.subject}}</td>

<td> {{marks.marks}}</td>

</tr>

<td> Average Marks</td>

<td> {{average}}</td>

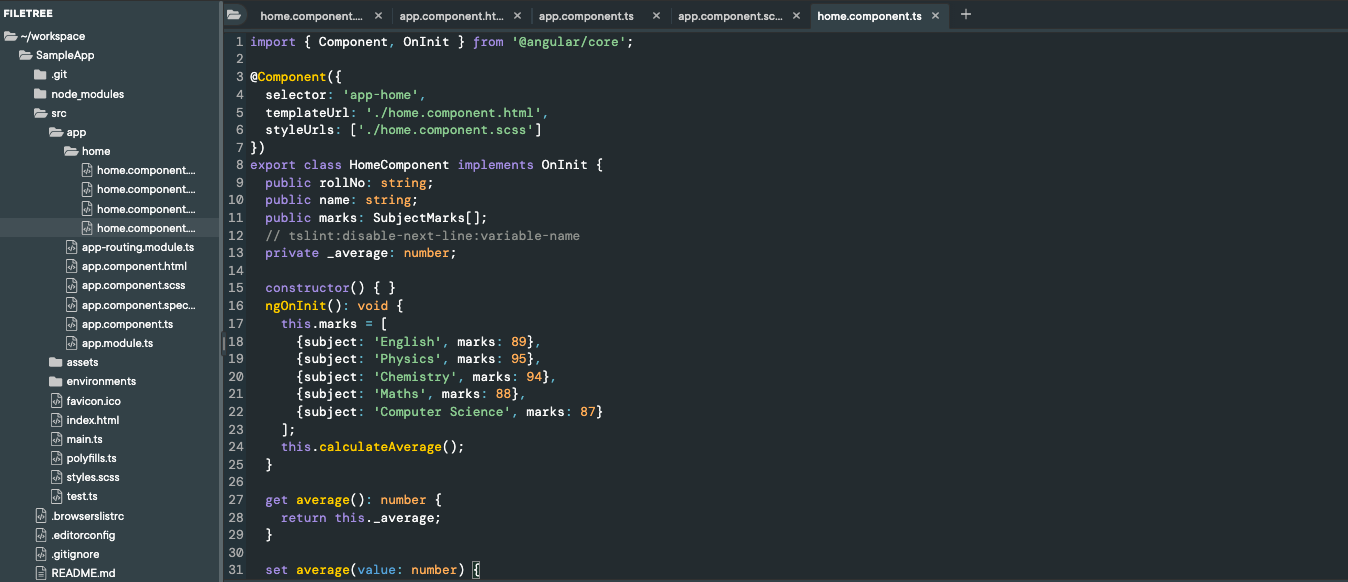
</tbody>

</table>

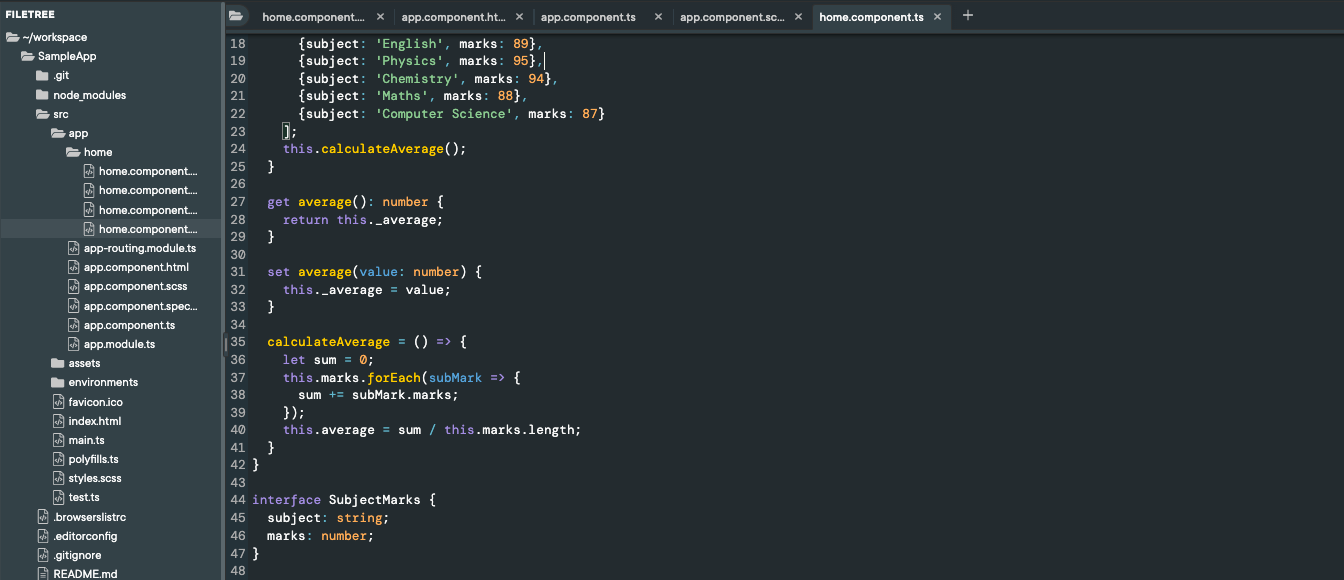
</div>

*Snippet 4: Code snippet for file home.component.html*

**13. Open the file named as home.component.ts and edit as below:**



*Figure 23: Adding changes to the file named as home.component.ts*



*Figure 24: Visualising the changes added to file named as home.component.ts*

**Code snippet for file “home.component.ts”**

import { Component, OnInit } from '@angular/core';

@Component({

selector: 'app-home',

templateUrl: './home.component.html',

styleUrls: ['./home.component.scss']

})

export class HomeComponent implements OnInit {

public rollNo: string;

public name: string;

public marks: SubjectMarks[];

// tslint:disable-next-line:variable-name

private \_average: number;

constructor() { }

ngOnInit(): void {

this.marks = [

{subject: 'English', marks: 89},

{subject: 'Physics', marks: 95},

{subject: 'Chemistry', marks: 94},

{subject: 'Maths', marks: 88},

{subject: 'Computer Science', marks: 87}

];

this.calculateAverage();

}

get average(): number {

return this.\_average;

}

set average(value: number) {

this.\_average = value;

}

calculateAverage = () => {

let sum = 0;

this.marks.forEach(subMark => {

sum += subMark.marks;

});

this.average = sum / this.marks.length;

}

}

interface SubjectMarks {

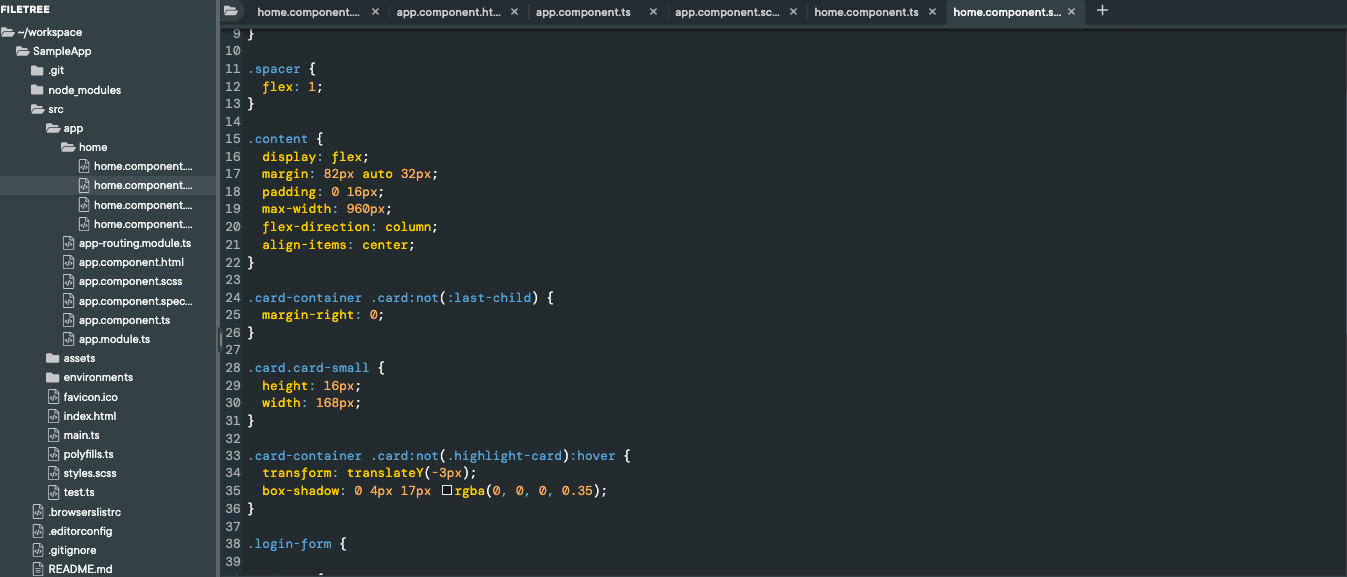
subject: string;

marks: number;

}

*Snippet 5: Code snippet for file home.component.ts*

**14. Open the file named as home.component.scss and edit as below:**



*Figure 25: Adding changes to the file named as home.component.scss*

**Code snippet for file “home.component.scss”**

h1,h2,h3,h4,h5,

h6 {

margin: 8px 0;

}

p {

margin: 0;

}

.spacer {

flex: 1;

}

.content {

display: flex;

margin: 82px auto 32px;

padding: 0 16px;

max-width: 960px;

flex-direction: column;

align-items: center;

}

.card-container .card:not(:last-child) {

margin-right: 0;

}

.card.card-small {

height: 16px;

width: 168px;

}

.card-container .card:not(.highlight-card):hover {

transform: translateY(-3px);

box-shadow: 0 4px 17px rgba(0, 0, 0, 0.35);

}

.login-form {

.input {

padding: 5px 20px;

margin-top: 25px;

}

.go-back-button {

margin-right: 10px;

}

.login-button {

font-size: 16px;

padding: 5px 20px;

margin-top: 25px;

.error-message {

margin-bottom: 5px;

}

.mat-progress-spinner circle,

.mat-spinner circle {

stroke: red !important;

}

}

.forgot {

font-size: 14px;

text-align: left;

margin: 0 0 0 15px;

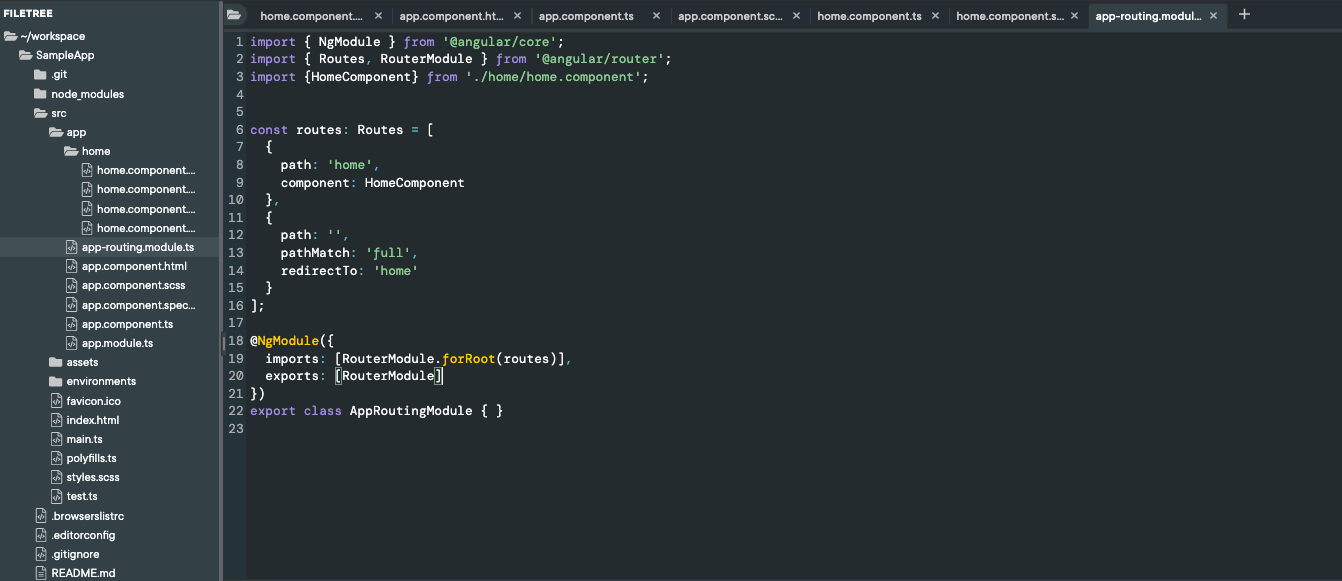
cursor: pointer;

}

}

*Snippet 6: Code snippet for file home.component.scss*

**15. Open the file named as app-routing.module.ts and edit as below:**



*Figure 26: Adding changes to the file named as app-routing.module.ts for routing configuration.*

**Code snippet for file “app-routing.module.ts”**

import { NgModule } from '@angular/core';

import { Routes, RouterModule } from '@angular/router';

import {HomeComponent} from './home/home.component';

const routes: Routes = [

{

path: 'home',

component: HomeComponent

},

{

path: '',

pathMatch: 'full',

redirectTo: 'home'

}

];

@NgModule({

imports: [RouterModule.forRoot(routes)],

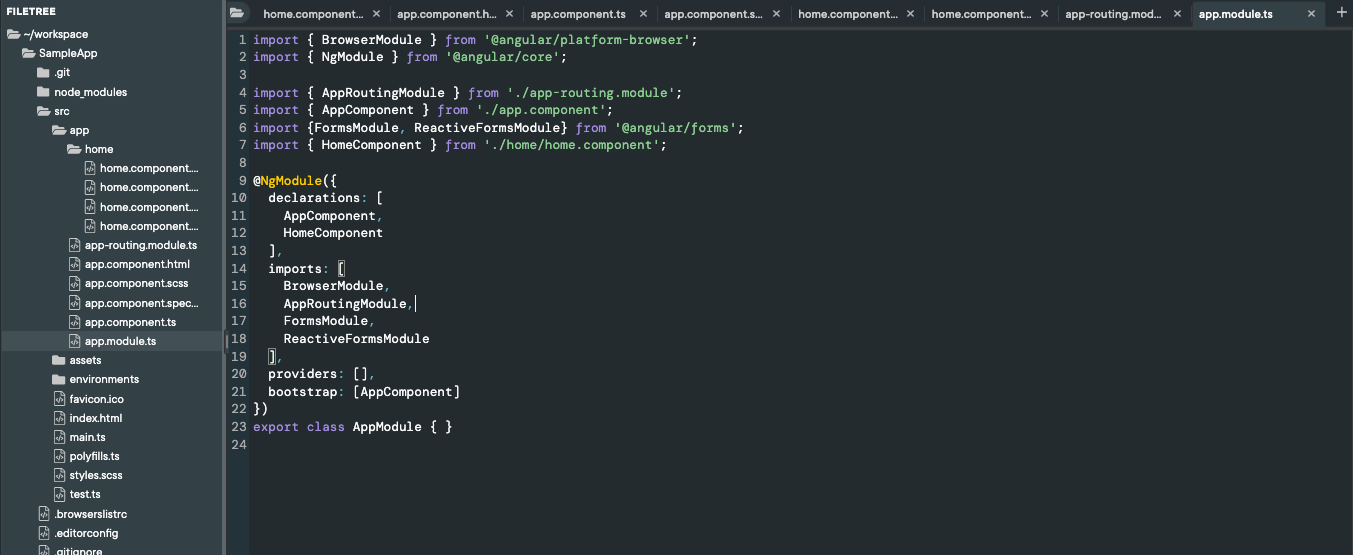
exports: [RouterModule]

})

export class AppRoutingModule { }

*Snippet 7: Code snippet for file app-routing.module.ts*

**16. Open the file named as app.module.ts and edit as below:**



*Figure 27: Adding changes to the file named as app.module.ts.*

**Code snippet for file “app.module.ts”**

import { BrowserModule } from '@angular/platform-browser';

import { NgModule } from '@angular/core';

import { AppRoutingModule } from './app-routing.module';

import { AppComponent } from './app.component';

import {FormsModule, ReactiveFormsModule} from '@angular/forms';

import { HomeComponent } from './home/home.component';

@NgModule({

declarations: [

AppComponent,

HomeComponent

],

imports: [

BrowserModule,

AppRoutingModule,

FormsModule,

ReactiveFormsModule

],

providers: [],

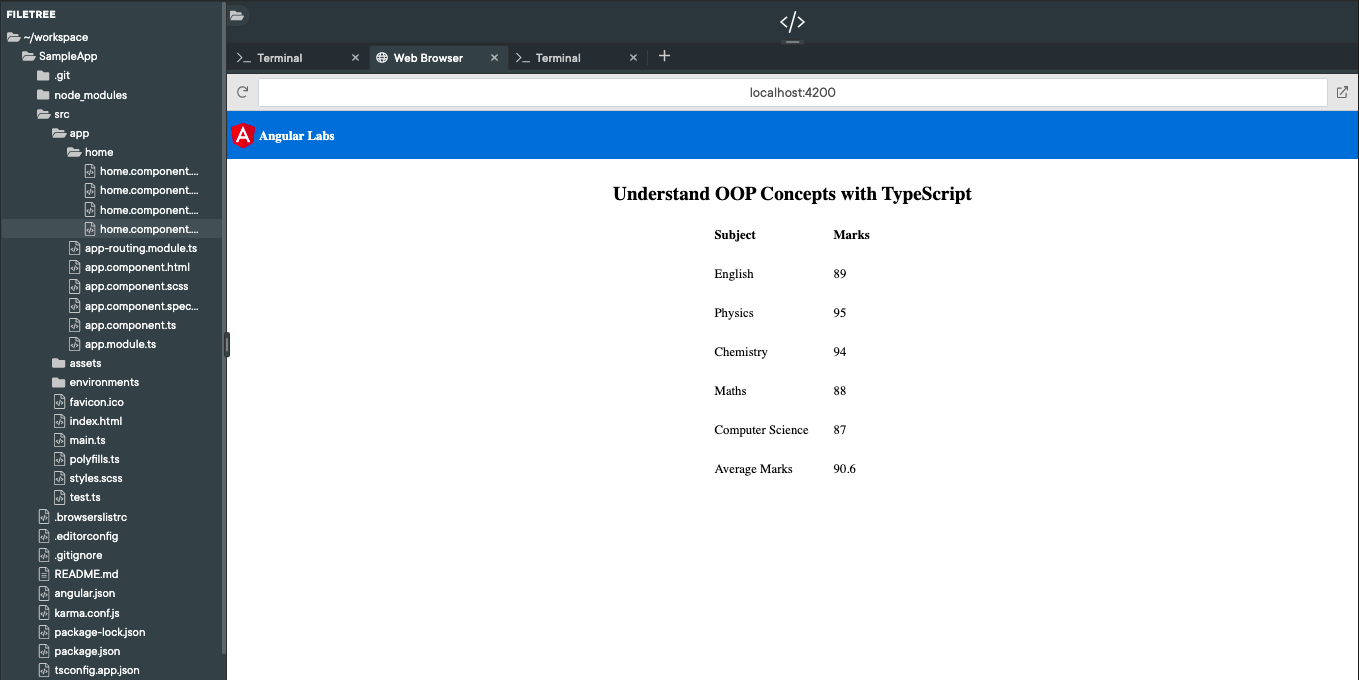
bootstrap: [AppComponent]

})

export class AppModule { }

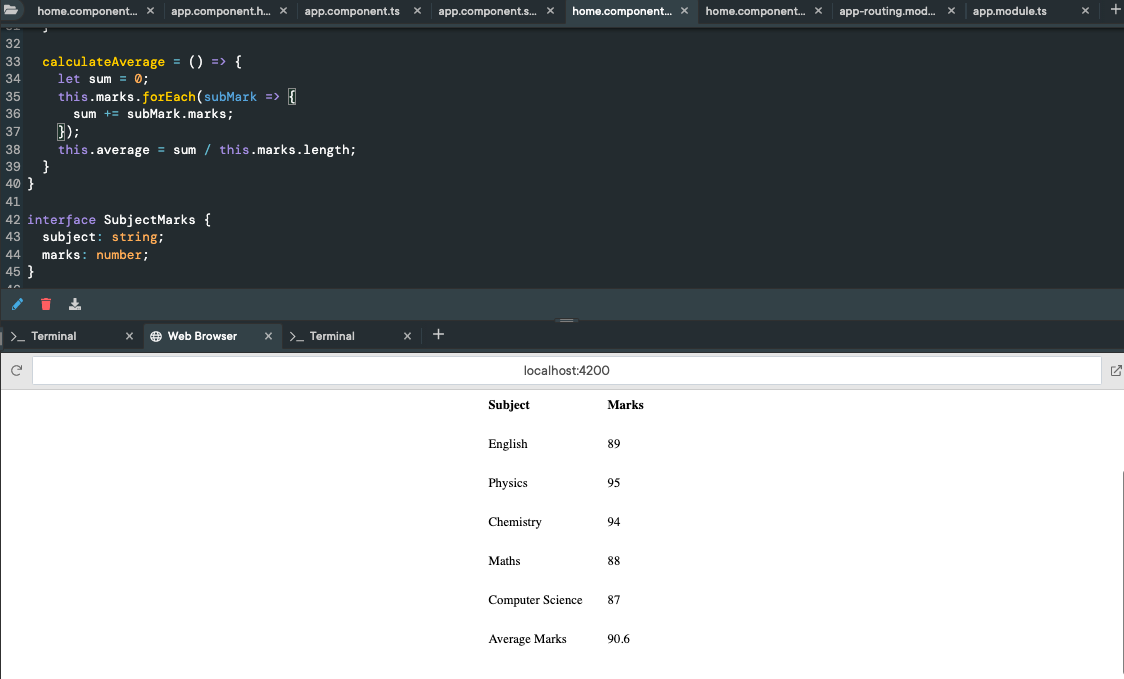
*Snippet 8: Code snippet for file app.module.ts*

**17. Open browser tab and visualise the changes done as below:**

****

*Figure 28: Visualising the code change in the web page to understand input forms.*

**18. Visualising the output.**



*Figure 29:Understanding the displayed data via alter where alert content is the data entered by user at runtime.*

**18. Understanding the OOP properties like access level specifiers on class members and their inside templates.**

It has to be noted here that class properties which are marked as private cannot be directly accessed from in the HTML template in case of AOT compilation. However public class properties can be both modified and accessed from outside the class as these are declared as public.

For accessing and updating the class propertied marked as private, we need to define set & get method for each member where get can be used to access the property and set can be modify its value as in case of statement this.average = sum / this.marks.length (Here average is actually a setter function which is updating the value of class property average which is marked as private).

The value of average can’t be modified directly using assignment operator in TypeScript and AOT compilation will throw the error for the same hence getter and setter methods are used.

However for class properties declared as public, their values can be directly accessed/modified outside class or from templates as in case of marks variable which is marked with public access specifier.

****

*Figure 30: Understanding the visibility level of different properties of class and their accessibility methods.*

**Code Snippet:**

**Code snippet/commands.**

1. ng

2. ng new SampleApp

3. ng serve --open --host 0.0.0.0 --disable-host-check

4. <http://localhost:4200>

5. ng generate component home

// File app.component.html

<div class="toolbar" role="banner">

<img

width="40"

alt="Angular Logo"

src="data:image/svg+xml;base64,PHN2ZyB4bWxucz0iaHR0cDovL3d3dy53My5vcmcvMjAwMC9zdmciIHZpZXdCb3g9IjAgMCAyNTAgMjUwIj4KICAgIDxwYXRoIGZpbGw9IiNERDAwMzEiIGQ9Ik0xMjUgMzBMMzEuOSA2My4ybDE0LjIgMTIzLjFMMTI1IDIzMGw3OC45LTQzLjcgMTQuMi0xMjMuMXoiIC8+CiAgICA8cGF0aCBmaWxsPSIjQzMwMDJGIiBkPSJNMTI1IDMwdjIyLjItLjFWMjMwbDc4LjktNDMuNyAxNC4yLTEyMy4xTDEyNSAzMHoiIC8+CiAgICA8cGF0aCAgZmlsbD0iI0ZGRkZGRiIgZD0iTTEyNSA1Mi4xTDY2LjggMTgyLjZoMjEuN2wxMS43LTI5LjJoNDkuNGwxMS43IDI5LjJIMTgzTDEyNSA1Mi4xem0xNyA4My4zaC0zNGwxNy00MC45IDE3IDQwLjl6IiAvPgogIDwvc3ZnPg=="

/>

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<div class="spacer"></div>

</div>

<router-outlet></router-outlet>

// File app.component.ts

import { Component } from '@angular/core';

@Component({

selector: 'app-root',

templateUrl: './app.component.html',

styleUrls: ['./app.component.scss']

})

export class AppComponent {

title = 'SampleApp';

}

// File app.component.scss

.toolbar {

position: absolute;

top: 0;

left: 0;

right: 0;

height: 60px;

display: flex;

align-items: center;

background-color: #1976d2;

color: white;

font-weight: 600;

}

// File app-routing.module.ts

import { NgModule } from '@angular/core';

import { Routes, RouterModule } from '@angular/router';

import {HomeComponent} from './home/home.component';

const routes: Routes = [

{

path: 'home',

component: HomeComponent

},

{

path: '',

pathMatch: 'full',

redirectTo: 'home'

}

];

@NgModule({

imports: [RouterModule.forRoot(routes)],

exports: [RouterModule]

})

export class AppRoutingModule { }

// File app.module.ts

import { BrowserModule } from '@angular/platform-browser';

import { NgModule } from '@angular/core';

import { AppRoutingModule } from './app-routing.module';

import { AppComponent } from './app.component';

import {FormsModule, ReactiveFormsModule} from '@angular/forms';

import { HomeComponent } from './home/home.component';

@NgModule({

declarations: [

AppComponent,

HomeComponent

],

imports: [

BrowserModule,

AppRoutingModule,

FormsModule,

ReactiveFormsModule

],

providers: [],

bootstrap: [AppComponent]

})

export class AppModule { }

// File home.component.html

<div class="content" role="main">

<h2>Understand OOP Concepts with TypeScript</h2>

<table cellpadding="10" cellspacing="10">

<thead>

<tr>

<td><b>Subject </b></td>

<td><b> Marks </b></td>

</tr>

</thead>

<tbody>

<tr \*ngFor="let marks of marks">

<td> {{marks.subject}}</td>

<td> {{marks.marks}}</td>

</tr>

<td> Average Marks</td>

<td> {{average}}</td>

</tbody>

</table>

</div>

// File home.component.ts

import { Component, OnInit } from '@angular/core';

@Component({

selector: 'app-home',

templateUrl: './home.component.html',

styleUrls: ['./home.component.scss']

})

export class HomeComponent implements OnInit {

public marks: SubjectMarks[] = [];

// tslint:disable-next-line:variable-name

private \_average = 0;

constructor() { }

ngOnInit(): void {

this.marks = [

{subject: 'English', marks: 89},

{subject: 'Physics', marks: 95},

{subject: 'Chemistry', marks: 94},

{subject: 'Maths', marks: 88},

{subject: 'Computer Science', marks: 87}

];

this.calculateAverage();

}

get average(): number {

return this.\_average;

}

set average(value: number) {

this.\_average = value;

}

calculateAverage = () => {

let sum = 0;

this.marks.forEach(subMark => {

sum += subMark.marks;

});

this.average = sum / this.marks.length;

}

}

interface SubjectMarks {

subject: string;

marks: number;

}

// File home.component.scss

h1,h2,h3,h4,h5,

h6 {

margin: 8px 0;

}

p {

margin: 0;

}

.spacer {

flex: 1;

}

.content {

display: flex;

margin: 82px auto 32px;

padding: 0 16px;

max-width: 960px;

flex-direction: column;

align-items: center;

}

.card-container .card:not(:last-child) {

margin-right: 0;

}

.card.card-small {

height: 16px;

width: 168px;

}

.card-container .card:not(.highlight-card):hover {

transform: translateY(-3px);

box-shadow: 0 4px 17px rgba(0, 0, 0, 0.35);

}

.login-form {

.input {

padding: 5px 20px;

margin-top: 25px;

}

.go-back-button {

margin-right: 10px;

}

.login-button {

font-size: 16px;

padding: 5px 20px;

margin-top: 25px;

.error-message {

margin-bottom: 5px;

}

.mat-progress-spinner circle,

.mat-spinner circle {

stroke: red !important;

}

}

.forgot {

font-size: 14px;

text-align: left;

margin: 0 0 0 15px;

cursor: pointer;

}

}