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Introduction to TypeScript

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Course: Introduction to TypeScript

Lecture on: Introduction to Typescript

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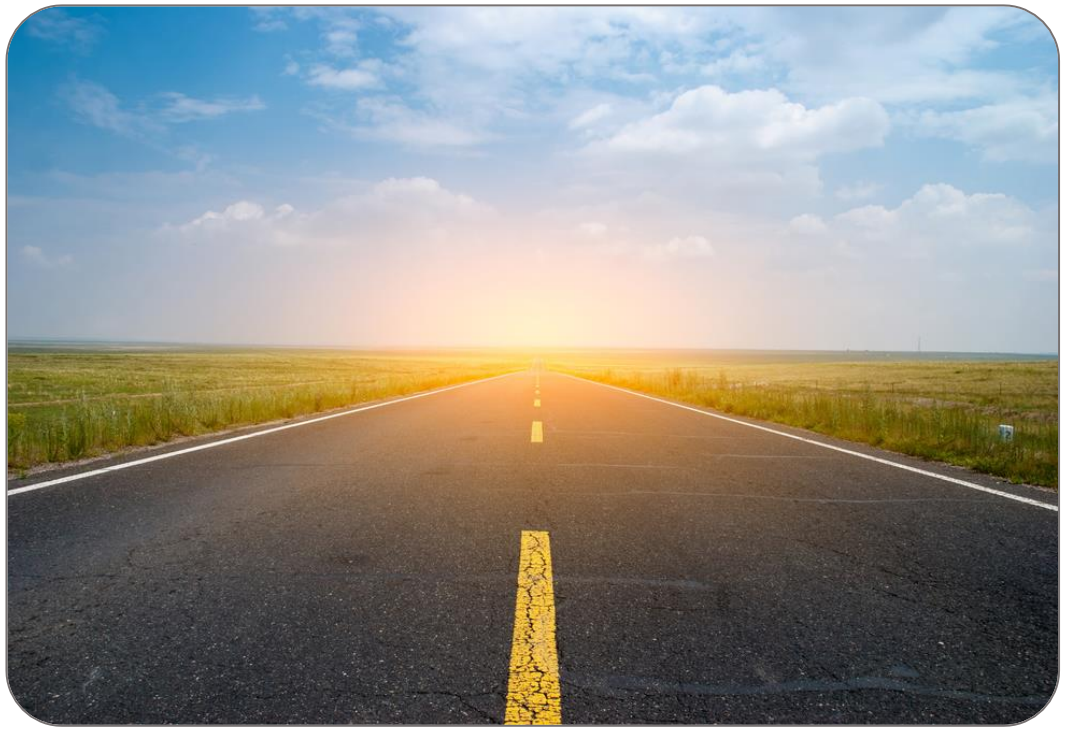
COURSE ROADMAP

- **Introduction to TypeScript (TS)**
- Operators, Conditions and loops in TS
- Functions in TS
- Hands-on coding session - I
- Classes and interfaces in TS
- Type manipulation in TypeScript
- Modules in TS
- Hands-on coding session - II



TODAY'S AGENDA

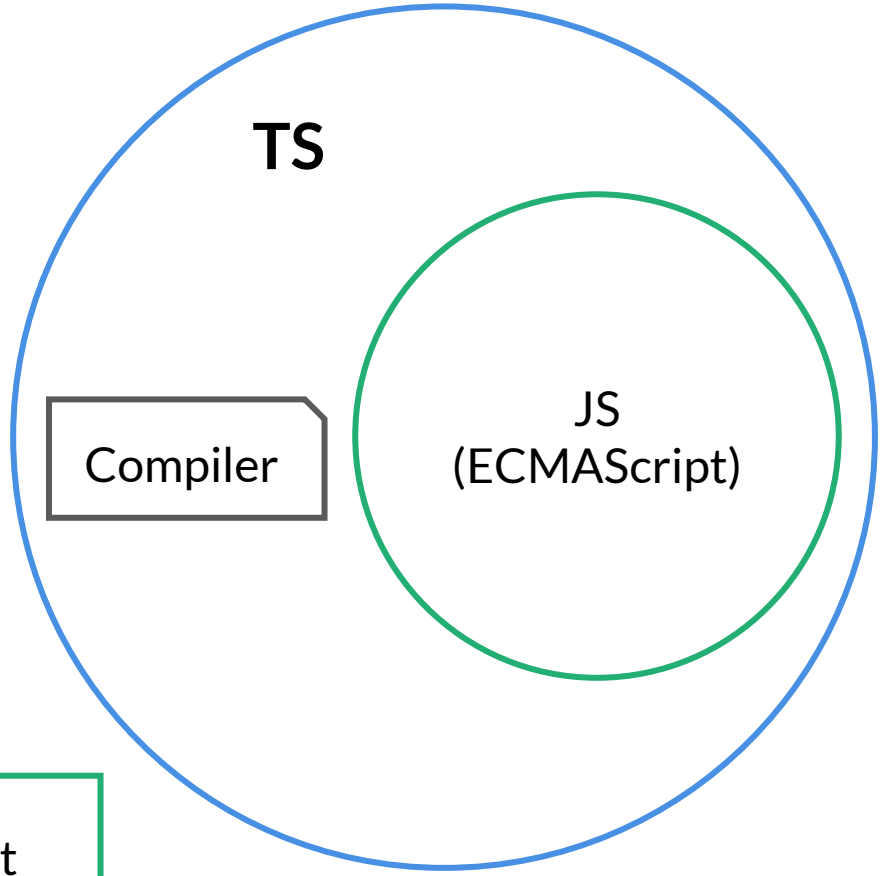
- Introduction to TypeScript (TS)
- Installation / set-up
- Hello World Program
- TypeScript types
- TS variables

Introduction to TypeScript

TYPESCRIPT: INTRODUCTION

What is TypeScript?

- *TypeScript (TS) is a typed superset of JavaScript that compiles to plain JavaScript
- According to the 2021 Developer Survey by Stack Overflow, TS is ranked among the top 10 most preferred programming languages
- The extension of a TypeScript file is '.ts'



INTRODUCTION TO TYPESCRIPT

Difference between JavaScript and TypeScript

- TypeScript is a strongly typed programming language that builds on JavaScript, which is also known as JavaScript with type or syntax for types

Parameter	TypeScript	JavaScript
What is	Powerful type System, including generics & JS features	Lightweight, interpreted, Object-oriented language with first-class functions
Data Binding	TypeScript uses concepts like types and interfaces to describe data being used	No such concept is available with JavaScript
Ecosystem	The Ecosystem is quite powerful and intuitive. Thus, it allows you to statically type various type of idiomatic JavaScript features like union types, intersection, discriminated union	JavaScript offers the option to explore and create code without a build Step
Npm package	With TypeScript, many npm packages either come with static type definitions or have an external one that is easy to install	JavaScript offers the option to explore and create code without a build Step

INTRODUCTION TO TYPESCRIPT

Difference between JavaScript and TypeScript

Parameter	TypeScript	JavaScript
Learning curve	Stiff learning curve. Requires prior scripting knowledge	Flexible and easy to learn, scripting language
Prototyping	TypeScript has a feature of prototyping	JavaScript doesn't have this feature
Community	TypeScript does not have a large community of developers	The JavaScript has a huge community of developers
Compilation	TypeScript code needs to be compiled	No need to compile JavaScript
Annotation	To get the most out of TypeScript features, developers should constantly annotate their code.	No Annotations Required is need for JavaScript

WHY TYPESCRIPT

Why do we need TypeScript?

- Helps discover inconsistencies while writing code
- Provides productive development tools for JS IDEs and practices
- Benefits of a **statically typed** language.
- Improves the JavaScript experience:
  - Structured, Organised, Readable and Consistent
  - Can be used with any browser or JavaScript engine

TYPESCRIPT: STATIC TYPES

What is static typing?

- JavaScript supports dynamic types:
  - In JavaScript, a variable can be re-assigned values of different types
- Static mode:
  - TS compels developers to maintain type integrity for variables. This means that once a variable is defined with a certain type, it must always be assigned values of the same type
  - TS allows variables to be accompanied by a type definition, as shown in the adjacent example. If the definition does not match the type of an assigned value, then the editor shows a warning (type '41410' is not assignable to type 'string')

This is a JavaScript code

```
let customerId = "CUSTOMER01";
customerId = 41410;
customerId = {
    pre: 'CUSTOMER01',
    post: 41410,
};
console.log(customerId); // prints
41410
```

why-typescript.js

This is a TypeScript code

```
let customerId = "CUSTOMER01";
customerId = 41410;
customerId = {
    pre: 'CUSTOMER01',
    post: 41410,
}; // throws an error
```

why-typescript.ts

TYPESCRIPT: STATIC TYPES

Another example

- This is valid in JavaScript:

```
let value = 5;
value = "hello";
console.log(value); // prints “hello”
```

- In the above example, the type changes from number to string, whereas in TypeScript below will throw an error.

```
let value = 5;
value = "hello"; // error: Type '"hello"' is
not assignable to type ‘number’
```

INTRODUCTION TO TYPESCRIPT

Features of TypeScript

- Object Oriented Programming (OOP)

```
class ObjectModel
{
                objectId:  number;
                objectName: string;
                objectName: string;
        }
class objectOperation{
                addobject(objectData: ObjectModel) : number
{
                let objectId =5;// Id returned after save
                return objectId;
      }
}
```

INTRODUCTION TO TYPESCRIPT

Features of TypeScript

- **TypeScript is portable:** TS is portable because it can run across browsers, devices, and operating systems. It can run on any environment that JavaScript runs on. TypeScript does not need a VM or a specific runtime environment to execute

- **Generics:**

```
function identity<T> (arg: T): T {
        return arg;
}

//example showing implementation of generics

let output = identity <string>("myString");
let outputl = identity <number> (23);
```

INTRODUCTION TO TYPESCRIPT

Features of TypeScript

- **Supports of JavaScript libraries:** TypeScript supports most of the existing JavaScript code, frameworks, tools and other libraries
- **DOM Manipulation:** TypeScript can be used to manipulate the DOM for adding or removing elements similar to JavaScript

INTRODUCTION TO TYPESCRIPT

Disadvantage of TypeScript over JavaScript

- TypeScript takes a long time to compile the code
- TypeScript does not support abstract classes
- If we run the TypeScript application in the browser, a compilation step is required to transform TypeScript into JavaScript

INTRODUCTION TO TYPESCRIPT

Installation and Set-Up

via npm

- TypeScript is available as a package on the pm registry as 'typescript'. You will need a copy of Node.js as an environment to run the package. Then, you can use a dependency manager such as ppm, yarn or pnpm to download TypeScript into your project

```
npm install typescript --save-dev
```

INTRODUCTION TO TYPESCRIPT

Installation and Set-Up

Via Visual Studio

For most project types, you can get TypeScript as a package in NuGet for your MSBuild projects, for example, an ASP.NET Core app

When using NuGet, you can install TypeScript through Visual Studio using the following:

- Manage NuGet Packages window (that you can get to by right-clicking on a project node)
- NuGet Package Manager Console (found in Tools > NuGet Package Manager > Package Manager Console) and then running this:

```
Install-PackageMicrosoft.TypeScript.MSBuild
```

Poll 1 (15 Sec)

Which of the following is correct regarding TypeScript?

1. `TypeScript contains classes and interfaces`
2. `TypeScript provides mandatory static typing`
3. `JavaScript provides static typing`

Poll 1 (Answer)

Which of the following is correct regarding TypeScript?

1. TypeScript contains classes and interfaces
2. TypeScript provides mandatory static typing
3. JavaScript provides static typing

Poll 2(15 Sec)

Which of the following is incorrect regarding TypeScript?

1. TypeScript support modules
2. TypeScript is a scripting language rather than an object-oriented language
3. TypeScript is the subset of JavaScript

Poll 2(Answer)

Which of the following is incorrect regarding TypeScript?

1. TypeScript support modules
2. TypeScript is a scripting language rather than an object-oriented language
3. TypeScript is the subset of JavaScript

INTRODUCTION TO TYPESCRIPT

Hello World Program

- The simplest way to write a hello world program in typeScript is shown below:

```
let message: string = 'Hello, World!';
console.log(message);
```

- To compile TypeScript code, we can run the following command on the command line:
  `tsc hello.ts`
- Run the JavaScript file using the following command on the command line:
  `node hello.js`

TypeScript (TS) – Data Types

TYPESCRIPT: DATA TYPES

Data types in TS have the following types:

Built-in data types:

- Boolean
- Number
- String
- Void
- Any

User-defined data types:

- Array
- Tuple
- Enum
- Objects (will be covered later)
- Classes (will be covered later)
- Interfaces (will be covered later)

```
let isOpen: boolean = true;

let numberOfScreens: number = 3;

let firstName: string = "Ifrah";

let language: string[] = ["English", "Hindi",
"Telugu"];

let userRole: [string, number] = ["User", 100];

enum Role {Admin, User};
let customerOne: string = Role.Admin;
console.log(customerOne);

let useful: void = undefined;
let b: null = null
let theatreLocation: any = 400018;
```

TYPESCRIPT VARIABLES

TypeScript Variables

- The type syntax for declaring a variable is given below:

- let: let and const are the two variable types introduced in ES6 and are also applicable to TypeScript

```
let employeeName = ”John”;
```

- const: const makes a variable a constant where its value cannot be changed and have same scoping as let

```
const num:number = 100;
```

- All the declarations are hoisted. var is initialised with undefined, whereas others remain uninitialised

TYPESCRIPT VARIABLES

var	let	const
It has been available since the first version of JavaScript	It is a new way to declare variables in JavaScript, starting from ES6	It is used to store a value that will not be changed throughout the execution of the script. It was also introduced recently in ES6
It has a global/function scope	It has a block scope	It also has a block scope
It can be updated or re-declared in its scope	It cannot be re-declared	It represents a constant value. So, it cannot be updated or re-declared

HANDS-ON EXERCISE (3 MIN)

Features of TypeScript

Suppose you need to store information regarding a theatre. Create the following variables to store information about the theatre, along with the values that need to be stored:

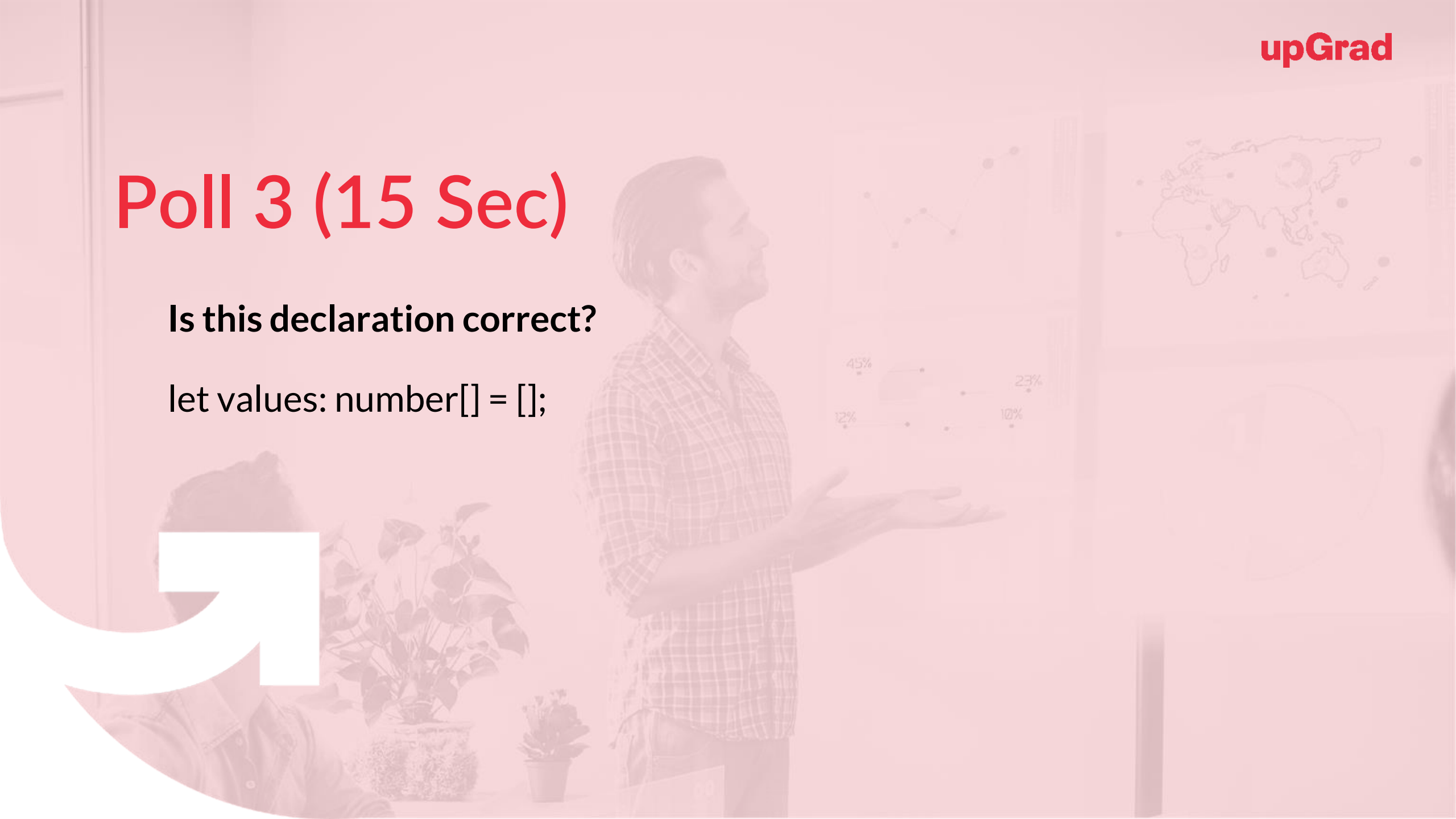
- Theatre Name: Inox
- Number of Seats: 350
- Movie Screens Present: 10, 11, 12
- Restaurant Details: Name of restaurant and the number of outlets in the theatre
- The name of the restaurant should be MacD, with 1 outlet present in the theatre
- A movie can have only one of three statuses: Upcoming, Ongoing and Deleted. Store this information in a variable and set the status of the movie Tenet as ‘Upcoming’.
- Theatre Location: To store the street location or the pincode of the theatre
  It should store ‘Worli Naka’ as a ‘string’ value or 400018 as the ‘numerical’ value

You can find the solution here

Poll 3 (15 Sec)

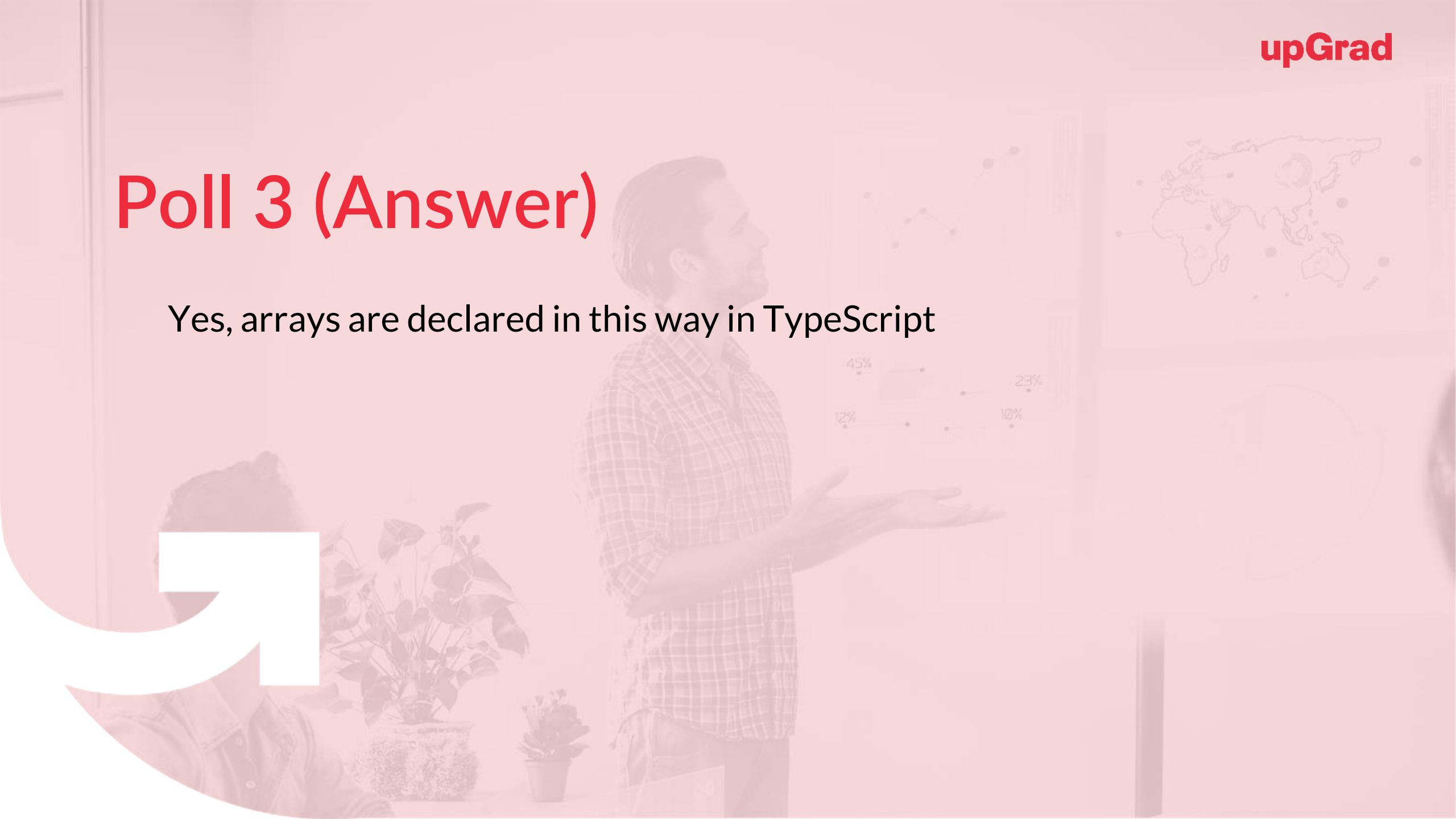
Is this declaration correct?

let values: number[] = [];



Poll 3 (Answer)

Yes, arrays are declared in this way in TypeScript



Poll 4 (15 Sec)

What is the difference between the types String and string in TypeScript?

Hint: related to JS and TS

Poll 4 (Answer)

Answer:

- String is the JavaScript String type that you could use to create new strings
- string is the TypeScript string type that you can use to type variables, parameters and return values

KEY TAKEAWAYS

- Introduction to TypeScript
- Why do we need TypeScript
- Different ways to install TS
- Hello World Program
- TypeScript Types
- TS Variables

TASKS TO COMPLETE AFTER THE SESSION

MCQs
Coding Questions

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Thank you!