

Web Design and Development

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Lecture: Sheet (What different between)

1) Framework vs library :

Library:

- A **library** is a **collection of prewritten functions or objects** that your program can use.
- You **control** when and how to call these functions.
- The **flow of control** stays with **your code**, not the library.

Example: (javascript)

```
var str = "Geeks. ForGeeks";  
var pos = str.lastIndexOf(".");
```

lastIndexOf() is a function provided by the JavaScript String library.

You, the developer, decide when to call it.

The function returns the position of the last "." in the string.

So, you're using the library to do a specific task (find the last index), but **you control** when to use it and what happens after.

Framework:

A **framework**, on the other hand, provides a **predefined structure** that already contains some open or unimplemented functions or objects which the user must fill in to create a custom application.

C++ or Java users can think of this as **implementing abstract functions** — the framework provides the base, and you add your own code where needed.

Definition:

In computer programming, a software framework is an abstraction in which software providing generic functionality can be selectively changed by additional user-written code, thus creating application-specific software.

Example: (javascript)

```
$(document).ready(function() {  
    // This code will be called by the jQuery framework  
    // when the document is fully loaded.  
    /* Your custom code here */  
});
```

`$(document).ready()` is a function from the jQuery framework.

You don't call it directly — instead, the framework calls your code when the webpage is ready.

You just write what to do inside the function.

So, unlike a library (where you call the code), in a **framework**, **the framework calls your code** at the right time.

2)Compiler vs preprocessor :

Preprocessor:

- In computer science, a preprocessor (or precompiler) is a program that processes its input data to produce output that will later be used as input by another program (usually the compiler).
- The output is called a preprocessed form of the source code.
- Generally, a preprocessor takes in code written in the same language (e.g., C/C++), transforms it, and outputs code in the same language.
- Then, that transformed code is sent to the compiler for further processing.

- For example, in C and C++, the preprocessor handles:
 - #include (adding header files)
 - #define (macros)
 - #ifdef / #endif (conditional compilation)
- In web development, Pug is an example of an HTML preprocessor that simplifies HTML writing by using indentation instead of traditional tags.

Compiler:

A **compiler** translates **source code** written in a high-level programming language (like C++, Java, or C#) into **machine code** or **assembly code** that the computer's processor can execute.

It checks syntax, optimizes the code, and generates an **executable file**.

Example:

The **C++ compiler** takes your .cpp file (after preprocessing) and converts it into a .exe or binary file that can run on your computer.

The **preprocessor** runs **before** the compiler — it prepares the source code.
The **compiler** runs **after** — it translates the prepared code into machine language.

3) TypeScript vs JavaScript:

JavaScript:

- JavaScript is a scripting language used to make web pages interactive.
- It runs directly in the browser (like Chrome, Edge, or Firefox).
- It is a dynamically typed language, meaning you don't need to specify data types — they are decided at runtime.

Example:

```
let num = 10; // number
```

```
num = "Hello"; // valid, but may cause runtime errors
```

TypeScript:

- TypeScript is a superset of JavaScript developed by Microsoft.
- It adds static typing, meaning you must declare the type of variables, functions, etc.
- TypeScript cannot run directly in the browser — it first needs to be compiled into JavaScript.

Example:

```
let num: number = 10;
```

```
num = "Hello"; // Error: Type 'string' is not assignable to type 'number'
```