.NET Framework

1. CLR (Common Language Runtime)
   1. CLR acts as an interface between the os and the .NET system
   2. CLS (Common Language specification)
   3. CTS (Common type system)
2. BCL/FCL (Base class library or framework class library)
   1. Z

Managed vs Native:

1. Managed code is code that is executed by .NET runtime, which provides addition features like memory management, type safety, and security.
   1. Easier to write and debug
   2. More portable, assuming the other system has .NET runtime installed
2. Native code is directly executed by the computer’s processor and does not have features like type safety or memory management.
   1. Faster and more efficient
   2. Less portable since its specific to the processor and OS on which it was compiled.

What is a runtime?

1. A runtime is a program that is responsible for executing code at the execution phase of a program. Runtimes provide the environment in which code is executed, and include additional features to support execution of the code.
2. Examples: OS runtimes (windows os), Language runtimes (.NET), browser runtimes (JS)

How C# code is compiled:

1. Write your code, compile it using the csc.exe (included in the .NET SDK), this creates an assembly (with MSIL and metadata) in the form of a dll or exe file, depending on the type of project you create.
   1. MSIL (binary represented) is a low-level, platform-agnostic (aka cross platform) code generated by C# compiler. MSIL is not executed directly by the computer’s hardware, but rather by the .NET runtime, which is a VM that runs on top of your OS.
   2. When you compile C# code, the csc translate it into MSIL, stored in the assembly in the form of dll or exe.
   3. When you run your program, the .NET runtime loads the assembly and executes the MSIL code, which is then converted to native machine code by the JIT compiler.
   4. Any machine that has the .NET runtime installed can now run the code.
   5. MSIL and native code are both binary but different types of binary. MSIL are run using the .NET runtime regardless of any OS but native code is specific to particular os and cannot be executed without being recompiled.
2. If we were to include other files in the created assembly, like images or data files, just add them to your project and they will be automatically included in the assembly when its built.
3. Use ‘AssemblyInfo.cs’ file to specify metadata about your assembly, like version number etc.
4. When you run your program, the .NET runtime loads the assembly and executes the MSIL code, which is converted to native machine code by the Just-In-Time (JIT) compiler.
5. Summary: csc, .NET runtime to run MSIL, JIT, computer processor.

Build vs compile:

1. Bulid refers to the process of creating a software program or component from source code. This involves compiling source code, linking it with other libraries or modules, and creating an exe or library file.
2. Compile refers to the process of translating source code into machine code or other intermediate representation that can be executed by a computer processor.

Library vs package:

1. A library is a collection of code that can be used by other programs. Libraries are typically compiled binaries that can be linked with other programs at compile time or runtime.
2. A package is a collection of code that are bundled together and distributed as a single unit. Packages are typically used to distribute libraries and modules, as well as their dependencies in a standardized format.
3. Package is a collection of modules and libraries are collection of packages.
   1. Library -> package -> modules

What is a contract in C#: