# C# and dotnet

## Stack vs Heap Memory

## Dependency Injection

Software design pattern and a technique used in object-oriented programming to achieve loose coupling between components and manage dependencies between classes. The process of obtaining the dependencies required by a class is moved out of the class itself, and the dependencies are provided from the outside (typically by a DI container) when the class is instantiated.

Example in Github: DependencyInjection folder

## Covariance and Contravariance

## Generics

Introduces concept of type paramters.

To create reusable, type-safe code by defining classes, interfaces, and methods that can work with different data types. Avoids the need for unnecessary type casting.

Signature:

***public class GenericList<T>***

***public interface IRepository<T, TKey>***

Applicable for interface and struct as well

Opposite of this is heterogeneous collection one of the example is array list

## LINQ - Language Integrated Query

Name for a set of technologies based on the integration of query capabilities directly into the C# language.

| **Clause** | **Description** |
| --- | --- |
| **[from](https://learn.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/from-clause)** | Specifies a **data source** and a range variable (similar to an iteration variable). |
| **[where](https://learn.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/where-clause)** | **Filters** source elements **based on** one or more **Boolean expressions** separated by logical AND and OR operators ( && or || ). |
| **[select](https://learn.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/select-clause)** | **Specifies** the **type and shape** that the elements in the returned sequence will have when the query is executed. |
| **[group](https://learn.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/group-clause)** | **Groups** query results **according to a specified key value**. |
| **[into](https://learn.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/into)** | Provides an identifier that can serve as a reference to the results of a join, group or select clause. |
| **[orderby](https://learn.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/orderby-clause)** | Sorts query results in ascending or descending order based on the default comparer for the element type. |
| **[join](https://learn.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/join-clause)** | **Joins two data sources** based on an **equality comparison** between two specified matching criteria. |
| **[let](https://learn.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/let-clause)** | Introduces a range variable to store sub-expression results in a query expression. |
| **[in](https://learn.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/in)** | Contextual keyword in a [join](https://learn.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/join-clause) clause. |
| **[on](https://learn.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/on)** | Contextual keyword in a [join](https://learn.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/join-clause) clause. |
| **[equals](https://learn.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/equals)** | Contextual keyword in a [join](https://learn.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/join-clause) clause. |
| **[by](https://learn.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/by)** | Contextual keyword in a [group](https://learn.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/group-clause) clause. |
| **[ascending](https://learn.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/ascending)** | Contextual keyword in an [orderby](https://learn.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/orderby-clause) clause. |
| **[descending](https://learn.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/descending)** | Contextual keyword in an [orderby](https://learn.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/orderby-clause) clause. |