



LINQ

(Language-Integrated Query)

.NET CORE

Language-Integrated Query (LINQ) is the name for a set of Libraries and classes based on the integration of query capabilities directly into the C# language.

[HTTPS://DOCS.MICROSOFT.COM/EN-US/DOTNET/CSHARP/LINQ/](https://docs.microsoft.com/en-us/dotnet/csharp/linq/)

LINQ - Overview

<https://docs.microsoft.com/en-us/dotnet/csharp/linq/>

<https://docs.microsoft.com/en-us/dotnet/csharp/programming-guide/concepts/linq/>

Traditionally, queries against data (in a DB or file) have been expressed as simple strings without type-checking at compile time or IntelliSense.

You'd have to learn a different query language for each type of data source:

- SQL databases,
- XML documents,
- various Web services, etc.
- With **LINQ**, a query is a language construct, just like **classes**, **methods**, **events**.
- Query expressions are written in a declarative query syntax.
- You can perform filtering, ordering, and grouping operations on data sources with minimum code.
- You use the same basic query expression patterns to query and transform data in SQL databases, ADO.NET Datasets, XML documents and streams, and .NET collections.

LINQ - Overview

<https://docs.microsoft.com/en-us/dotnet/csharp/linq/>

A complete LINQ query operation includes:

- creating a data source,
- defining the query expression, and
- executing the query in a *foreach* statement.

There are two *Query Expression* syntaxes:

- Query Syntax
- Method-Based Syntax

```
class LINQQueryExpressions
{
    static void Main()
    {
        // Specify the data source.
        int[] scores = new int[] { 97, 92, 81, 60 };

        // Define the query expression.
        IEnumerable<int> scoreQuery =
            from score in scores
            where score > 80
            select score;

        // Execute the query.
        foreach (int i in scoreQuery)
        {
            Console.Write(i + " ");
        }
    }
}

// Output: 97 92 81
```

LINQ – Query Expression Basics

A **query** is a set of instructions that describes what data to retrieve from a given data source (or sources) and what type and organization the returned data should have. A **query expression** is a query expressed in **query** syntax.

The source data is organized logically as a sequence of elements of the same kind. For example:

- a SQL database table contains a sequence of rows.
- In an XML file, there is a "sequence" of XML elements
- An 'in-memory' collection contains a sequence of objects.

A **query expression** must begin with a **from** clause and must end with a **select** or **group** clause. Between the first **from** clause and the last **select** or **group** clause, it can contain one or more of: **where**, **orderby**, **join**, **let** and even more **from** clauses. You can also use the **into** keyword to enable the result of a **join** or **group** clause to serve as the source for additional **query** clauses in the same query expression.

From an application's viewpoint, the specific **type** and structure of the original source data is not important.

The application always sees the source data as an **IEnumerable<T>** or **IQueryable<T>** collection.

LINQ – Query Expression Examples

<https://docs.microsoft.com/en-us/dotnet/csharp/linq/query-expression-basics>

<https://docs.microsoft.com/en-us/dotnet/csharp/linq/query-expression-basics#what-is-a-query-expression>

A query can:

1. Retrieve a subset of the elements to produce a new sequence without modifying the individual elements. The query may then sort or group the returned sequence in various ways
2. Retrieve a sequence of elements but transform them to a new type of object.
3. Retrieve a singleton value about the source data, such as:
 - The number of elements that match a certain condition.
 - The element that has the greatest or least value.
 - The first element that matches a condition, or the sum of particular values in a specified set of elements.

```
IEnumerable<int> highScoresQuery =  
    from score in scores  
    where score > 80  
    orderby score descending  
    select score;
```

```
IEnumerable<string> highScoresQuery2 =  
    from score in scores  
    where score > 80  
    orderby score descending  
    select $"The score is {score}";
```

```
int highScoreCount =  
    (from score in scores  
     where score > 80  
     select score)  
    .Count();
```


LINQ – Query Variables

<https://docs.microsoft.com/en-us/dotnet/csharp/linq/query-expression-basics#query-variable>

A *query variable* is any variable that stores a *query* instead of the result of a *query*.

A *query variable* is always an *enumerable type* that will produce a sequence of elements when it is iterated over in a *foreach* statement or a direct call to its *IEnumerator.MoveNext* method.

```
static void Main()
{
    // Data source.
    int[] scores = { 90, 71, 82, 93, 75, 82 };

    // Query Expression.
    IEnumerable<int> scoreQuery = //query variable
        from score in scores //required
        where score > 80 // optional
        orderby score descending // optional
        select score; //must end with select or group

    // Execute the query to produce the results
    foreach (int testScore in scoreQuery)
    {
        Console.WriteLine(testScore);
    }
}

// Outputs: 93 90 82 82
```

LINQ – Additional Practice

[Starting a query expression](#)

[*select* clause](#)

[Filtering, ordering, and joining](#)

[*orderby* clause](#)

[*let* clause](#)

[Ending a query expression](#)

[*Continuations with "into"*](#)

[*where* clause](#)

[*join* clause](#)

[Subqueries in a query expression](#)

LINQ – Method Expressions

<https://docs.microsoft.com/en-us/dotnet/csharp/programming-guide/concepts/linq/query-syntax-and-method-syntax-in-linq>

As a rule when you write *LINQ* queries, it is recommended to use *query syntax* whenever possible and *method syntax* whenever necessary.

Some queries must be expressed as method calls. Such as:

- to retrieve the number of elements that match a specified condition.
- to retrieve the element that has the maximum value in a source sequence.

```
class QueryVMMethodSyntax
{
    static void Main()
    {
        int[] numbers = { 5, 10, 8, 3, 6, 12};

        //Query syntax:
        IEnumerable<int> numQuery1 =
            from num in numbers
            where num % 2 == 0
            orderby num
            select num;

        //Method syntax:
        IEnumerable<int> numQuery2 = numbers.Where(num => num % 2 == 0).OrderBy(n => n);

        foreach (int i in numQuery1)
        {
            Console.Write(i + " ");
        }
        Console.WriteLine(System.Environment.NewLine);
        foreach (int i in numQuery2)
        {
            Console.Write(i + " ");
        }

        // Keep the console open in debug mode.
        Console.WriteLine(System.Environment.NewLine);
        Console.WriteLine("Press any key to exit");
        Console.ReadKey();
    }
}

/*
Output:
6 8 10 12
6 8 10 12
*/
```

LINQ – Activity

<https://docs.microsoft.com/en-us/dotnet/csharp/tutorials/working-with-linq>

1. Complete the tutorial at the above link.
2. Then change all queries in Method Syntax.