LINQ Questions

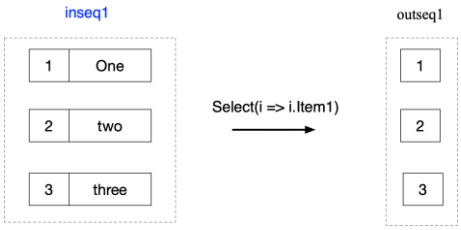
Queries

HELLO

Basic Projection

Write query and fluent syntax to perform the following?

```
var inseq1 = new [] {(1, "one"),(2, "two"),(3, "three")};
```

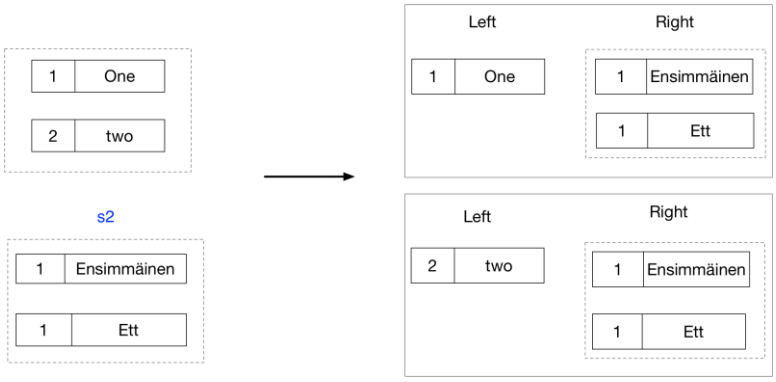



```
var f = inseq1.Select(i => i.Item1);
f.Dump();

var q = from n in inseq1 select n.Item1;
q.Dump();
```

Cross Product - Hierarchical

Write query and fluent syntax to perform the following?

```
var s1 = new[] { (1, "one"), (2, "two"), };
var s2 = new[] { (1, "Ensimmäinen"), (1, "Ett") };
```

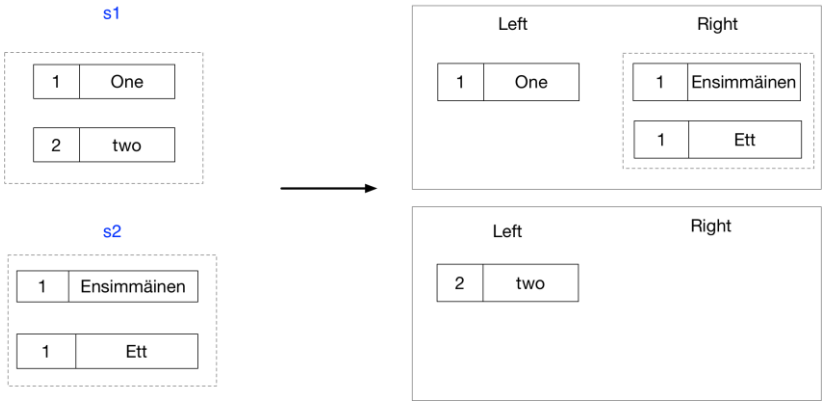



```
var f =s1
       .Select(e1 => new {Left=e1, Right=s2});

var q =  from e1 in s1
         select new {Left=e1, Right=s2};
```

Left Outer Join- Hierarchical

Write query and fluent syntax to perform the following. Write inefficient select based queries, efficient GroupJoin queries, and efficient select+lookup queries?

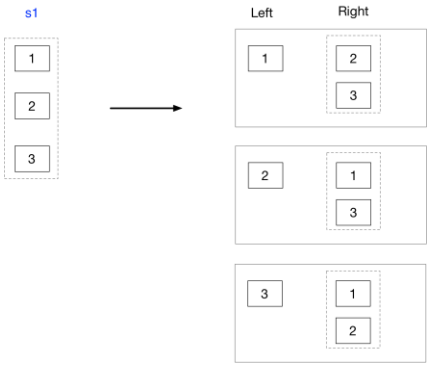
```
var s1 = new[] { (1, "one"), (2, "two"), };
var s2 = new[] { (1, "Ensimmäinen"), (1, "Ett") };
```




```
// Inefficient because the inner query iterated once per outer element
var f1 = s1.Select(e1 => new { Left = e1, Right = s2.Where(e2 => e1.Item1 == e2.Item1)});
f1.Dump();

// Inefficient because the inner query iterated once per outer element
var q1 = from e1 in s1
select new {Left=e1, Right = from e2 in s2 where e1.Item1 == e2.Item1 select e2 };
q1.Dump();

// Efficient because internally Group Join uses a lookup
var f2 = s1.GroupJoin(s2,e1=>e1.Item1, e2=> e2.Item1,(e1,c) => new {Left=e1, Right =c });
f2.Dump();

// Efficient because internally Group Join uses a lookup
var q2 = from e1 in s1
join e2 in s2 on e1.Item1 equals e2.Item1
into collection
select new {Left=e1, Right =collection };
q2.Dump();

// Efficient - uses lookup
var lookup = s2.ToLookup(e2 => e2.Item1, e2=>e2);
var f3 = s1.Select(e1 => new {Left=e1, Right=lookup[e1.Item1]});
f3.Dump();

// Efficient - uses lookup
var q3 =from e1 in s1
select new {Left=e1, Right=lookup[e1.Item1]};
```

Non Equijoin – Hierarchical

Write query and fluent syntax to perform a non-equi join as follows?

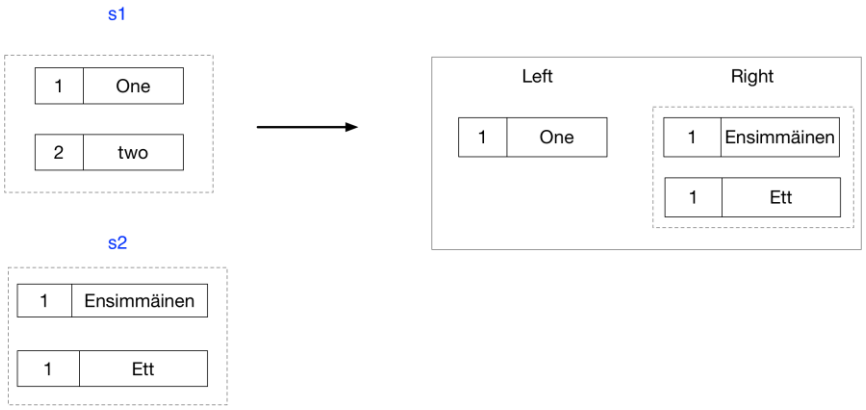



```
var s1 = new[] { 1, 2, 3};
var q1 = from e1 in s1
    select new {
                 Left=e1,
                Right=from e2 in s1
                where e2 != e1
                select e2
                };
```

```
var f1 = s1.Select(e1 => new { Left = e1, Right = s1.Where(e2 => e1 !=
e2) });
```

Inner Join – Hierarchical

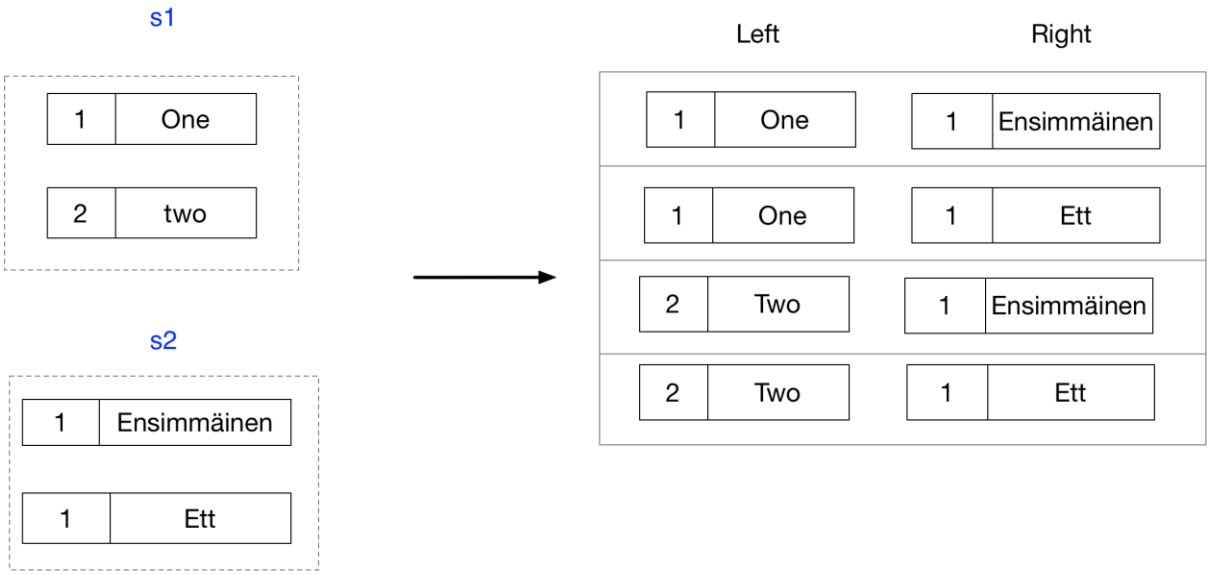
Write query and fluent syntax to perform a non-equi join as follows?




```
// Inefficient
var f1 = s1
       .Select(e1 => new {Left = e1, Right=s2.Where(e2=>e1.Item1 == e2.Item1)})
       .Where(s => s.Right.Any());

// Inefficient
var q1 =     from e1 in s1
             select new {Left = e1, Right=s2.Where(e2=>e1.Item1 == e2.Item1)}
             into r
             where r.Right.Any()
             select r;
// GroupJoin
var f2 =s1
       .GroupJoin(s2, e1=>e1.Item1, e2=>e2.Item1,(e,si)=>new {Left = e, Right=si})
       .Where(s => s.Right.Any());

       // Group Join
       var q2 =     from e1 in s1
                          join e2 in s2 on e1.Item1 equals e2.Item1
                          into c
                          select new {Left = e1, Right=c}
                          into d
                          where d.Right.Any()
                          select d;

// Efficient using select and lookup
var lookup = s2.ToLookup(s => s.Item1);
var f3 = s1
       .Select(e1 => new { Left = e1, Right = lookup[e1.Item1] })
       .Where(s => s.Right.Any());
       f3.Dump();

// Efficient using select and lookup
var q3 = from e1 in s1
          select new { Left = e1, Right = lookup[e1.Item1] }
          into r
          where r.Right.Any()
          select r;
```

Cross Product - Flat

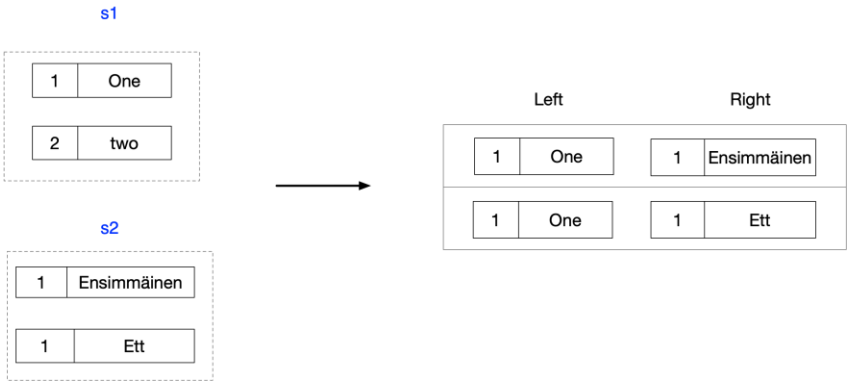
Write query and fluent syntax to perform the following?




```
var s1 = new[] { (1, "one"), (2, "two"), };
var s2 = new[] { (1, "Ensimmäinen"), (1, "Ett") };


var f =s1
       .Select(e1 => new {Left=e1, Right=s2});

var q = from e1 in s1
         select new {Left=e1, Right=s2};
```

Inner Join - Flat

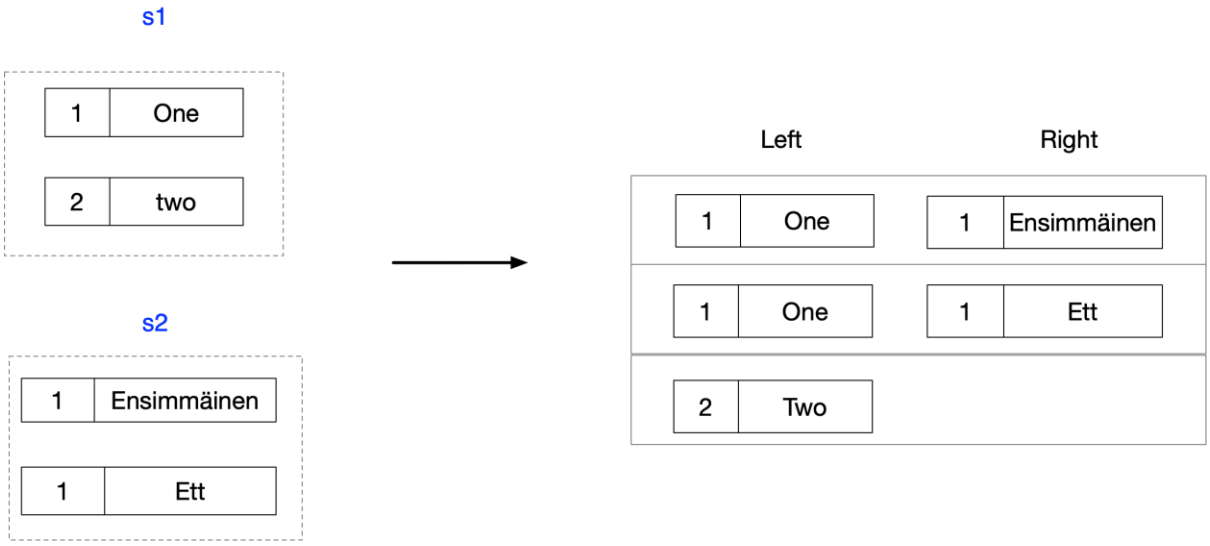
Write query and fluent syntax to perform the following.?




```
// Fluent Syntax - Inefficent Group Join
var f1 = s1
          .SelectMany(e1 => s2, (e1, e2) => new { e1,e2})
          .Where(r => r.e1.Item1 == r.e2.Item1)
          .Select(r => new {Left=r.e1, Right=r.e2});

// Query Syntax - Inefficent Group Join
var q1 = from e1 in s1
           from e2 in s2
           where e1.Item1 == e2.Item1
           select new {Left=e1, Right=e2};
//q1.Dump();

// Fluent - Efficient, using Join which internally uses a lookup
var f2 = s1.Join(s2, e1=>e1.Item1, e2=>e2.Item1, (e1,e2)=>new {Left=e1,
Right=e2});

// Query - Efficient, using Join which internally uses a lookup
var q2 = from e1 in s1
           join e2 in s2 on e1.Item1 equals e2.Item1
           select new {Left=e1, Right=e2};

// Fluent - Efficient using SelectMany and Lookup
var lookup = s2.ToLookup(e1 => e1.Item1);
var f3 = s1
          .SelectMany(e1 => lookup[e1.Item1], (e1, e2) => new { e1, e2 })
          .Select(r => new { Left = r.e1, Right = r.e2 });

// Query Syntax - Efficient using SelectMany and lookup
var q3 = from e1 in s1
           from e2 in lookup[e1.Item1]
           select new { Left = e1, Right = e2 };
```

Left Outer Join - Flat

Write query and fluent syntax to perform the following.?




```
/* First we show how the mechanics work of first doing a group join
*  and then a SelectMany */
IEnumerable<((int, string) leftEl, IEnumerable<(int, string)> rightMatches)> joinResults
	= Enumerable.GroupJoin(
		/* Left Sequence */ s1,
		/* Right Sequence */ s2,
		/* Left Key Selector */ leftEl => leftEl.Item1,
		/* Right Key Selector */ rightEl => rightEl.Item1,
		/* Result Selector */ (leftEl, rightMatches) => (leftEl, rightMatches));

IEnumerable<(string Left, string Right)> flattenedResults =
	Enumerable.SelectMany(
		/* Source Sequence */ joinResults,
		/* Collection Selector */ jointElement =>
jointElement.rightMatches.DefaultIfEmpty(),
		/* Result Selector */
		(tuple, valueTuple) =>
			(Left: tuple.leftEl.Item2, Right:
		valueTuple.Item2));flattenedResults.Dump();


// Concise Fluent Syntax
IEnumerable<(string Left, string Right)> f1 = s1
	.GroupJoin(s2, e1 => e1.Item1, e2 => e2.Item1, (leftEl, rightMatches)
		=> (leftEl, rightMatches))
	.SelectMany(jointElement
		=> jointElement.rightMatches.DefaultIfEmpty(),
		(tuple, valueTuple) => (Left: tuple.leftEl.Item2, Right: valueTuple.Item2));

// Concise Query Syntax
IEnumerable<(string Left, string Right)> q2 =
	from leftEl in s1
	join rightEl in s2 on leftEl.Item1 equals rightEl.Item1 into matches
	from match in matches.DefaultIfEmpty()
	select (Left: leftEl.Item2, Right: match.Item2);
```

Basics

What is LINQ?

A language feature that enables us to write type safe queries over any collection that implements `IEnumerable<T>`

What inspired LINQ?

The functional programming paradigm

What are the basic elements

- Sequences
- Elements
- Query operators
- Queries

What do lambda expressions in query operators always operate on?
Individual elements

Do query operators alter the input sequence?
No, they always generate a new sequence

What does LINQ query comprise?
A pipeline of operators that accept and return ordered sequences

What does an SQL query comprise?
A netwoek of clauses working on unordered sets

How is deferred execution implemented?
Query operators provide deferred execution by returning decorator sequences.

What are the advantages of deferred execution?

- Decouples construction from execution
- Allows one to construct a query in multiple steps
- You can re-evaluate a query by enumerating it again.

What are the exceptions that return immediately?

ToList, ToArray, ToDictionary, ToLookup

Single element or scalar operators such as First or Count

How do decorator sequences differ from traditional collection classes?

In general a decorator sequence has no storage of its own to store elements

What does it have instead?

A reference to another sequence supplied at runtime

What happens when you request data from a decorator?

It must in turn ask for data from its wrapped input sequence

What happens when you chain query operators?

A chain of decorators are created

What happens when you enumerate a query?

You query the original input sequence transformed through a layering chain of decorators

What happens if you call ToList() on query?

The whole chain is collapsed into a single list

```
emp + b);}
```