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C# 12
Cosa c'è di nuovo e interessante

UGIdotNET

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What’s new in C# 12

- **Primary constructors**
- **Collection expressions**
- Alias any type
- Default lambda parameters
- ref readonly parameters
- Inline arrays
- Experimental attribute
- Interceptors (“Preview”)

Primary constructors

You can now create primary constructors in any class and struct.
Primary constructors are no longer restricted to record types.

Demo

Primary constructors

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Primary constructors

- You can now add parameters to a struct or class declaration
- Parameters are in scope throughout the class definition
- Parameters are not stored if they aren't needed
- When needed the compiler creates hidden fields to represent each parameter
- Parameters aren't members of the class (`this.parameter` won’t work)
- Parameters don't become properties, except in record types (we can create properties)
- Secondary or parameterless constructors must invoke the primary constructor
- Validation can be added when assigning the corresponding properties
- Derived type can have a PC (it must invoke the base class primary constructor)
- Derived type can avoid a PC (a regular constructor must invoke the base primary)
- In derived types, watch out for ‘nested captures’ of primary parameters values
- VS and VSCode offer built-in support for primary constructors (refactorings, etc.)
- Trivia: the original implementation goes back to C# 6 (2015)

Collection expressions

Collection expressions introduce a new terse syntax to create common collection values

Demo

Collection expressions

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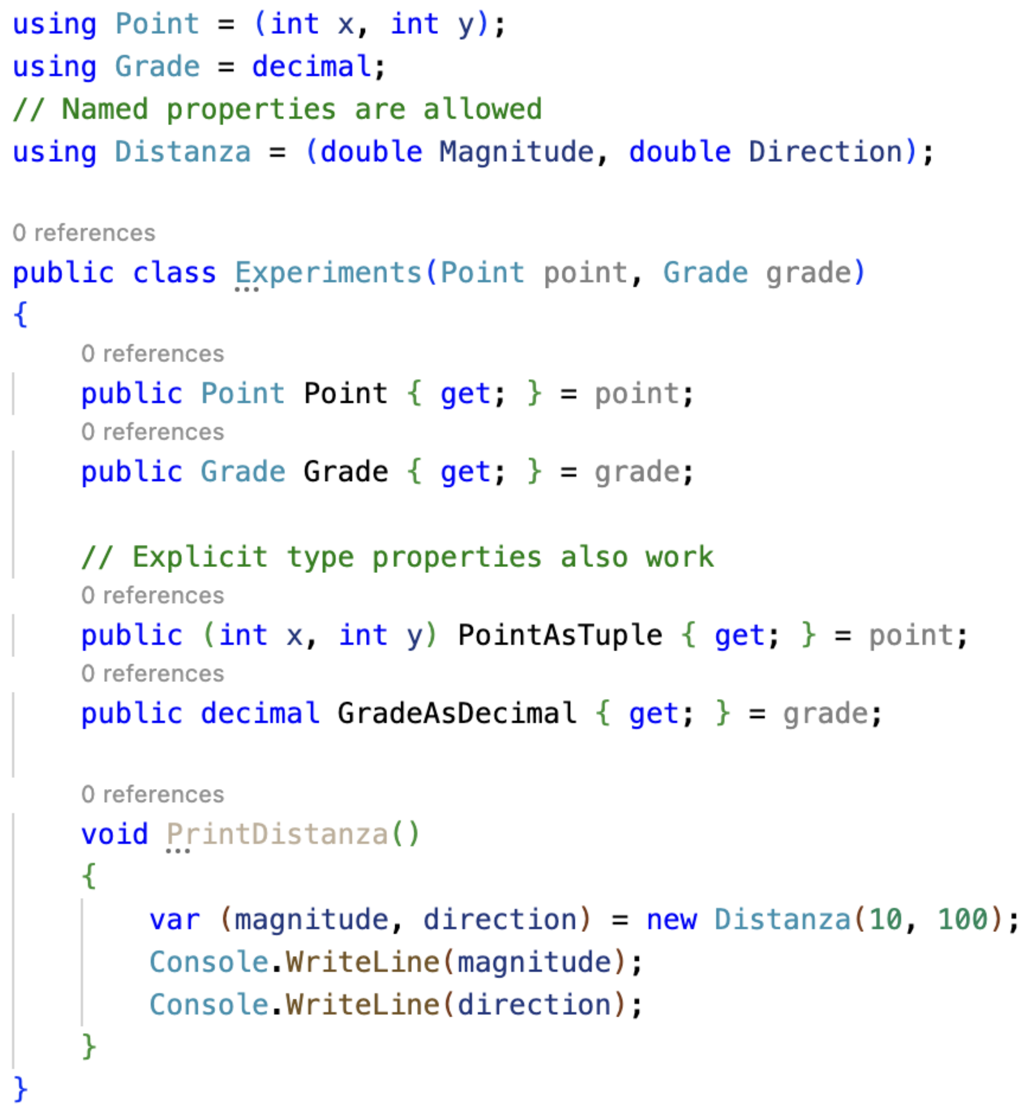
Collection expressions

- Collection expressions offer a terse, unified syntax
- In most cases, they also offer superior performance
- Support a large number of collection types and variants
- They avoid refactoring when the underlying type changes
- Accept both constant and variable values
- Support inclusion of other collections via spread operator
- Can be supported even in custom types (library authors!)
- Syntax symmetricity with pattern matching and/or slicing
- VS and VS Code offer full collection expressions support
- Trivia: Dictionary expressions? Maybe in the future

Alias any type

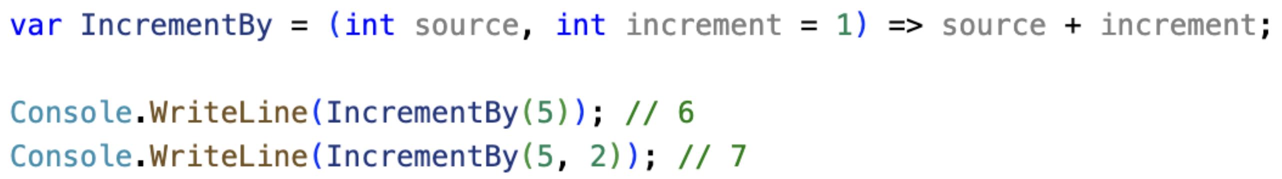
You can use the using alias directive to alias any type, not just named types.



```
using Point = (int x, int y);
using Grade = decimal;
// Named properties are allowed
using Distanza = (double Magnitude, double Direction);

0 references
public class Experiments(Point point, Grade grade)
{
    0 references
    public Point Point { get; } = point;
    0 references
    public Grade Grade { get; } = grade;

    // Explicit type properties also work
    0 references
    public (int x, int y) PointAsTuple { get; } = point;
    0 references
    public decimal GradeAsDecimal { get; } = grade;

    0 references
    void PrintDistanza()
    {
        var (magnitude, direction) = new Distanza(10, 100);
        Console.WriteLine(magnitude);
        Console.WriteLine(direction);
    }
}
```

Default lambda parameters

Beginning with C# 12, you can provide default values for parameters on lambda expressions.



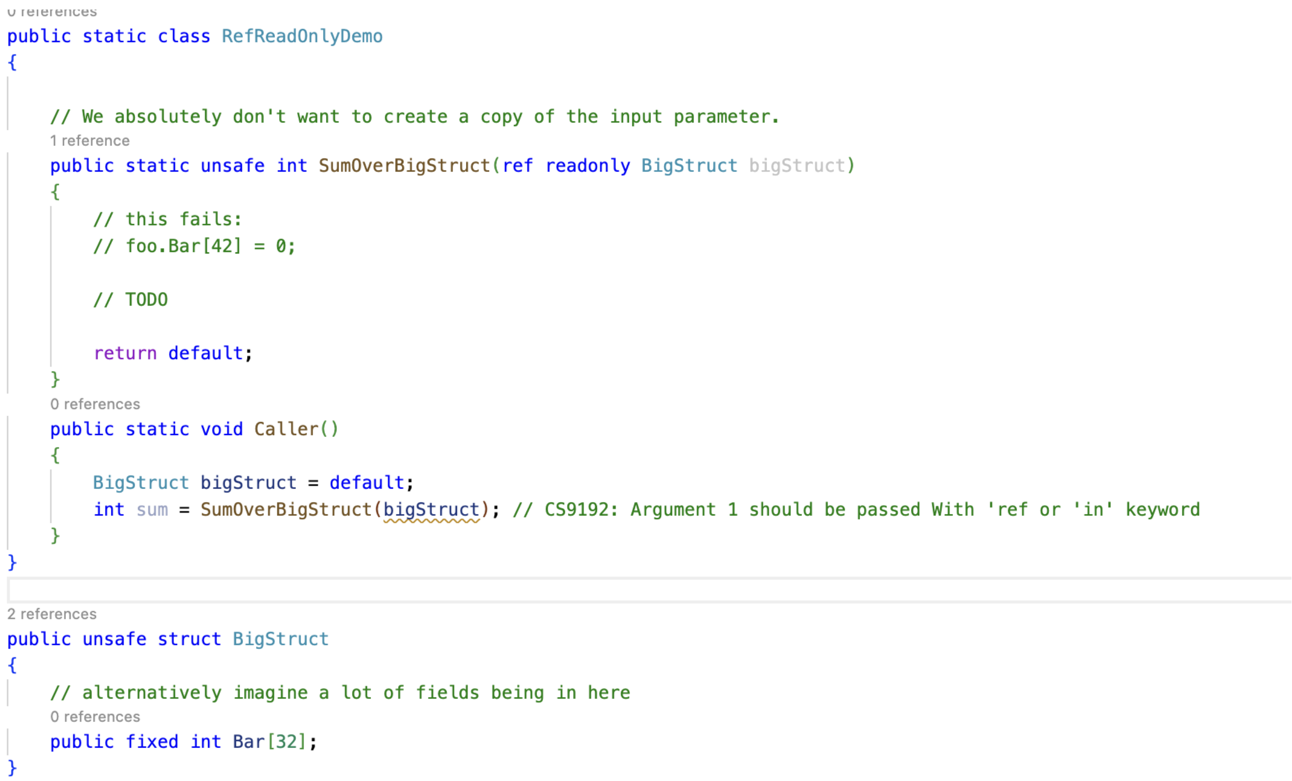
```
var IncrementBy = (int source, int increment = 1) => source + increment;

Console.WriteLine(IncrementBy(5)); // 6
Console.WriteLine(IncrementBy(5, 2)); // 7
```

ref readonly

The addition of ref readonly parameters provides the final combination of passing parameters by reference or by value.

Assume you have a fairly large struct that you absolutely don't want to copy around: `def readonly` triggers a warning on the caller side unless he/she uses ‘ref’ or ‘in’.

Mostly used by the runtime team and library authors. Performance and clarity, again.



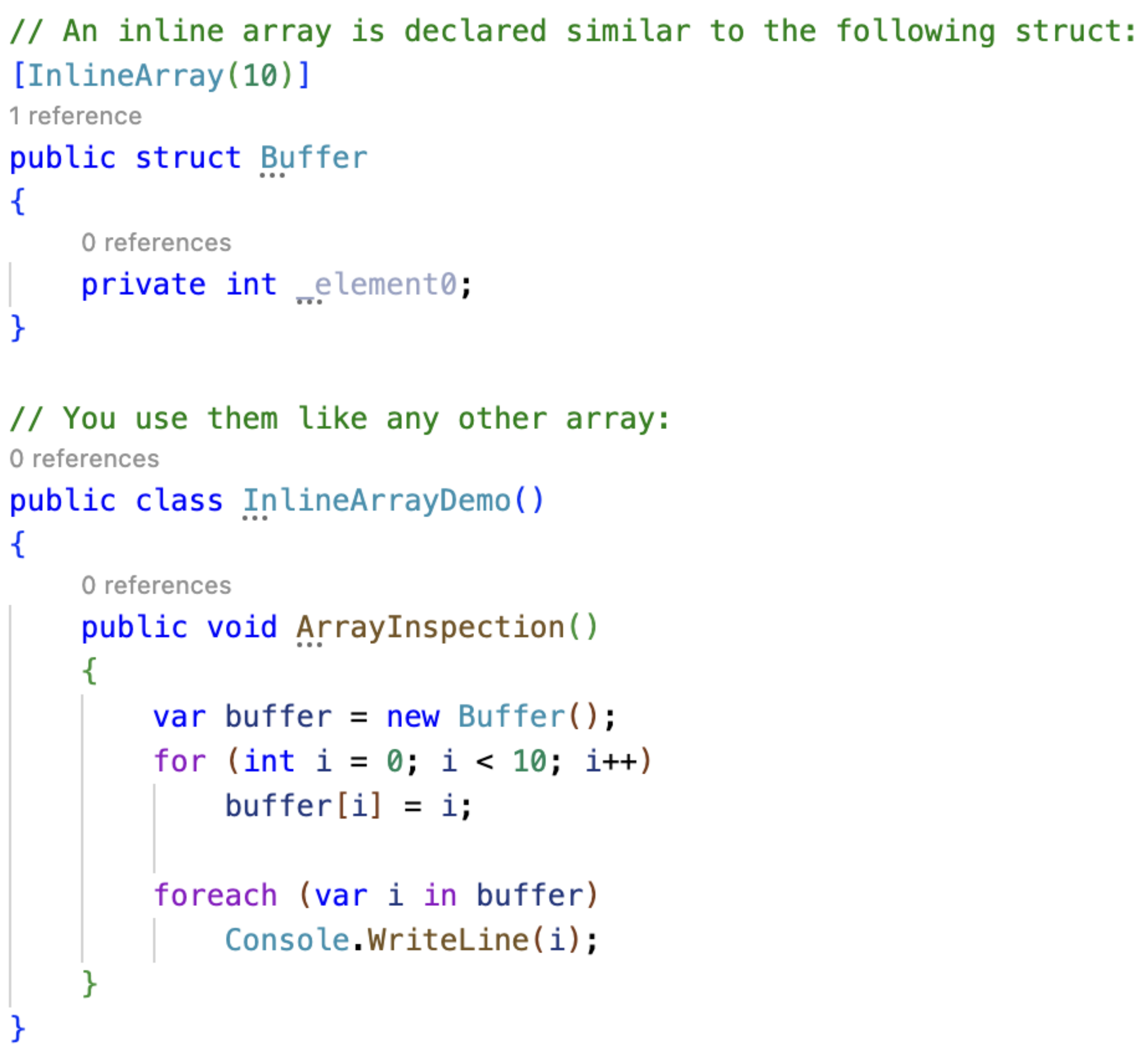
```
0 references
public static class RefReadOnlyDemo
{

    // We absolutely don't want to create a copy of the input parameter.
    1 reference
    public static unsafe int SumOverBigStruct(ref readonly BigStruct bigStruct)
    {
        // this fails:
        // foo.Bar[42] = 0;

        // TODO

        return default;
    }
    0 references
    public static void Caller()
    {
        BigStruct bigStruct = default;
        int sum = SumOverBigStruct(bigStruct); // CS9192: Argument 1 should be passed With 'ref or 'in' keyword
    }
}

2 references
public unsafe struct BigStruct
{
    // alternatively imagine a lot of fields being in here
    0 references
    public fixed int Bar[32];
}
```

Inline arrays

Inline arrays enable a developer to create an array of fixed size in a struct type.

They are used mainly by the runtime team and other library authors for improved performance *with* safety. Inline arrays perform similar to unsafe fixed size buffers.

You likely won't declare your own inline arrays, but you use them transparently when they're exposed as `System.Span<T>` or `System.ReadOnlySpan<T>` objects from runtime APIs.



```
// An inline array is declared similar to the following struct:
[InlineArray(10)]
1 reference
public struct Buffer
{
    0 references
    private int _element0;
}

// You use them like any other array:
0 references
public class InlineArrayDemo()
{
    0 references
    public void ArrayInspection()
    {
        var buffer = new Buffer();
        for (int i = 0; i < 10; i++)
            buffer[i] = i;

        foreach (var i in buffer)
            Console.WriteLine(i);
    }
}
```

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