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6 Types of Constructors in C#

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Default Constructor

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Default Constructor

It is commonly known as the parameterless constructor or the instance constructor.

This constructor is called when creating a new instance of the class.

A default constructor would initialize the fields to their default values:

-> Zero for numeric types
-> null for reference types

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Default Constructor

You can override the default behavior by including your own initialization code within the default constructor

```
public QuestionModel()
{
    Console.WriteLine
("Inside the default constructor");

}
```

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Parametrized Constructor

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Parametrized Constructor

This is similar to the default constructor, and shares one of the names - instance constructor.

The difference is that it takes input from outside the class

Also you can define multiple overloads of the parametrized constructor

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Parametrized Constructor

```
public QuestionModel(int id,
                     string title,
                     string description)
{
    Id = id;
    Title = title;
    Description = description;
    IsActive = true;
    PostingDate = DateTime.Now;
}
```

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Private Constructor

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Private Constructor

It is a special constructor marked as private, so it is inaccessible from outside the class

If the class doesn’t have a parametrized constructor, creating a new instance from the class with private constructor throws an exception.

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Private Constructor

A private constructor can be used only with static members within the class

Some popular implementations for private constructors are through Singletons and Factories

A private constructor restricts a class from being inherited

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Private Constructor

```
public class SimpleSingleton
{
    private static SimpleSingleton instance;
    private SimpleSingleton() { }

    public static SimpleSingleton GetInstance()
    {
        if (instance == null)
        {
            instance = new SimpleSingleton();
        }
        return instance;
    }
    public void DoSomething()
    {
        Console.WriteLine("Inside Singleton Method");
    }
}

// Invocation
SimpleSingleton.GetInstance().DoSomething();
```

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Static Constructor

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Static Constructor

Used to initialize static members of a class/struct

A static constructor is called before the instance constructor

This type of constructor is automatically called before the creation of the instance

Or when any static member is referenced

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Static Constructor

The static constructor is called at most once even if multiple instances of the same class are created

This is mainly used to define a global value for a class and use that value in any subsequent instance

Can be useful to define some configurations for the type

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Static Constructor

You cannot overload static constructor

You cannot inherit a static constructor

You cannot access a non-static field within a static constructor

Static Constructor

```csharp
public class QuestionModel
{
    static DateTime threadCreationTime;
    static short charactersLimit;

    static QuestionModel()
    {
        threadCreationTime = DateTime.Now;
        charactersLimit = 1000;

        Console.WriteLine("Inside the static constructor");
        Console.WriteLine($"Setting the threadCreationTime");
        Console.WriteLine($"Setting the charactersLimit \n");
    }
    public QuestionModel()
    {
        Console.WriteLine("New instance created, default constructor");
        Console.WriteLine($"threadCreationTime is {threadCreationTime}");
        Console.WriteLine($"characters limit is {charactersLimit} \n");
    }
}

// Invocation
QuestionModel? question1 = new();
QuestionModel? question2 = new();
```

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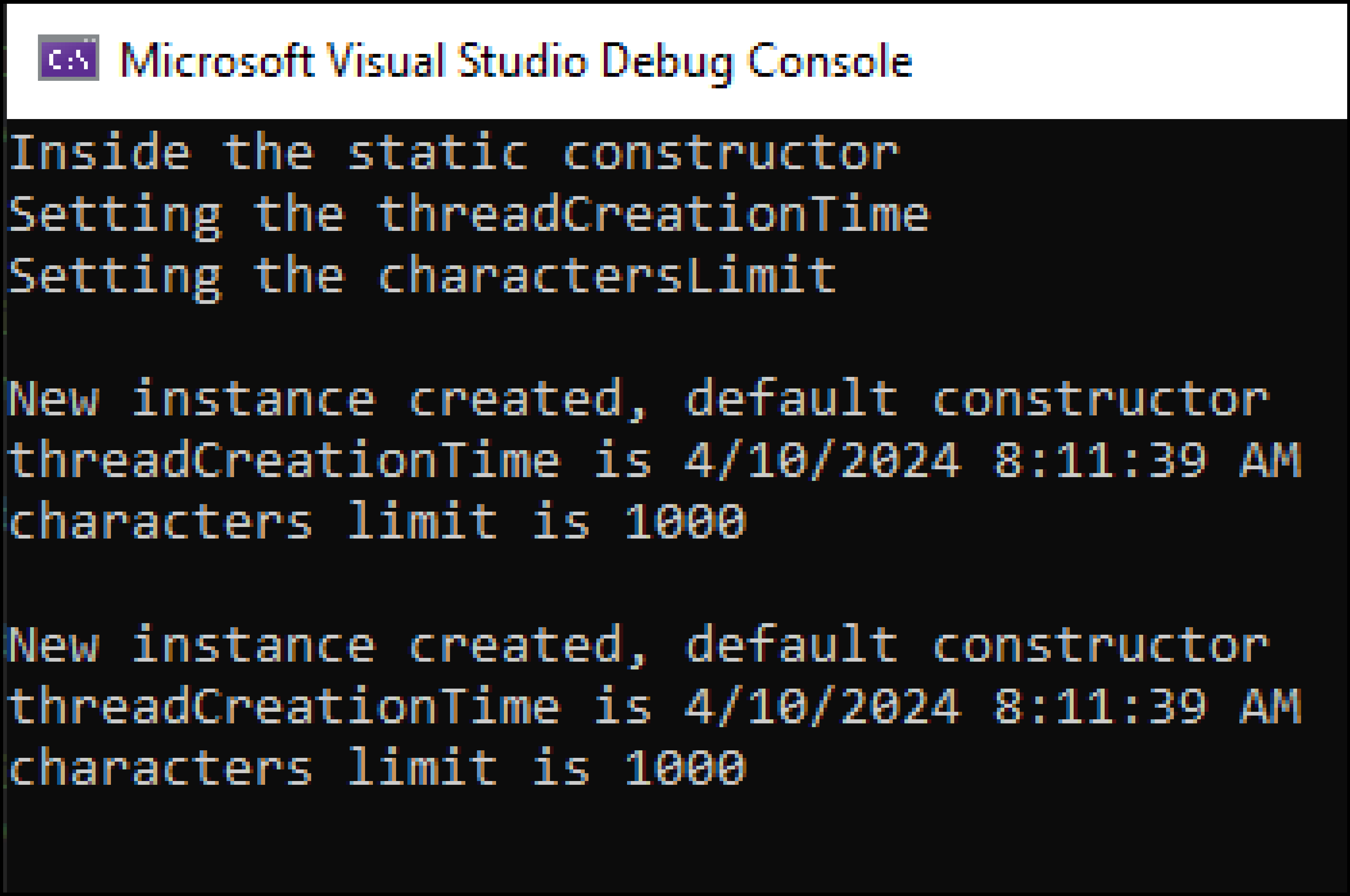
Static Constructor


Microsoft Visual Studio Debug Console

```
Inside the static constructor
Setting the threadCreationTime
Setting the charactersLimit

New instance created, default constructor
threadCreationTime is 4/10/2024 8:11:39 AM
characters limit is 1000

New instance created, default constructor
threadCreationTime is 4/10/2024 8:11:39 AM
characters limit is 1000
```

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Copy Constructor

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Copy Constructor

This type of constructor was first introduced in C++

It is used to copy class members’ values to another class as to create a duplicate or clone

Copying data from instance to instance requires you decide the depth level of copy in your copy constructor - Shallow and Deep

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Copy Constructor

Shallow copy copies values of the primitive data types and copies references of the reference types

Deep copy copies each of the primitive data types and creates new instance of the reference types and includes any nested reference types recursively

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Copy Constructor

A copy constructor should include an instance of the class as parameter

And then inside it, you can manually assign each value from the input parameter instance to the matching member within the class

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Copy Constructor

```csharp
public class QuestionModel
{
    public QuestionModel(QuestionModel questionModel)
    {
        Id = questionModel.Id;
        Title = questionModel.Title;
        Description = questionModel.Description;
        IsActive = questionModel.IsActive;
        PostingDate = questionModel.PostingDate;
    }

   // Code remove for brevity
}

QuestionModel? question1 = new(
    1,
    "How many words in English?",
    "This is the question, " +
    "how many words are there " +
    "in the English language?");

// Invocation
QuestionModel? question2 = new(question1);
```

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Primary Constructor

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Primary Constructor

This was introduced in C# 12

A primary constructor is a concise way to write parametrized constructor

This constructor's parameters have class or struct level scope

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Primary Constructor

If the primary constructor’s parameters are accessed in a method within the class/struct, the compiler creates hidden fields to represent each parameter

Primary Constructor

You can use them to do different operations:

- Initialize Properties or Fields
- Initialize base class
- Specify Parameters in Dependency Injection

  (Useful with ASP.NET Core Controllers when you are injecting dependencies in controllers or services)

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Primary Constructor

```
public class QuestionModel
    (int id,
    string? title,
    string? description,
    bool isActive,
    DateTime? postingDate)
{
    public int Id => id;
    public string? Title => title;
    public string? Description => description;
    public bool IsActive => isActive;
    public DateTime? PostingDate => postingDate;
}
```

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