C# Fundamentals

8. **Generics and Interfaces with a Repository PatternObjective:Requirements:**
    - **Implement a generic in-memory repository to perform CRUD operations.**
    - **Define an interface (e.g., IRepository<T>) with methods like Add, Get, Update, and Delete.**
    - **Create a generic class that implements this interface.**
    - **Use type constraints if necessary (e.g., where T : class or implementing a specific interface).**
    - **Write a simple console UI to demonstrate the repository with a sample entity (e.g., Product or Student).**

Program code:

IEntity.cs

```
public interface IEntity
{
   int Id { get; set; }
}

// IEntity ensures each entity has an Id for repository operations.
```

IRepository.cs

```
using System.Collections.Generic;

public interface IRepository<T> where T : class, IEntity
{
   void Add(T entity);
   T Get(int id);
   // IEnumerable<T> -returning collections when you just want to loop through items
   IEnumerable<T> GetAll();
   void Update(int id, T entity);
   void Delete(int id);
```

```
}

//  Generic Repository (IRepository<T>) provides a reusable data access layer
```

InMemoryRepository.cs

```
using System;
using System.Collections.Generic;

public class InMemoryRepository<T> : IRepository<T> where T : class, IEntity
   // where T : class, IEntity: Ensures T implements IEntity
{
   // _data: Stores entities in a dictionary (key: Id, value: entity)
   // readonly-The reference to the dictionary cannot be changed after initialization (but the contents can still be modified).
   private readonly Dictionary<int, T> _data = new();
   private int _nextId = 1; // Auto-incrementing ID

   public void Add(T entity)
   {
      entity.Id = _nextId++; // Assign unique ID
      _data[entity.Id] = entity;
   }

   public T Get(int id)
   {
      //  retrieve a value from the dictionary. It returns true if the key exists, and false if it doesn't.
      // out var entity - If found, assigns the corresponding value (the entity of type T) to entity.
      _data.TryGetValue(id, out var entity);
      return entity;
   }
```

```
    public IEnumerable<T> GetAll()
    {
        return _data.Values;
    }

    public void Update(int id, T entity)
    {
        if (_data.ContainsKey(id))
        {
            entity.Id = id; // Preserve the ID
            _data[id] = entity;
        }
        else
        {
            Console.WriteLine($"Entity with ID {id} not found.");
        }
    }

    public void Delete(int id)
    {
        if (_data.ContainsKey(id))
        {
            _data.Remove(id);
        }
        else
        {
            Console.WriteLine($"Entity with ID {id} not found.");
        }
    }
}
```

```
//  InMemoryRepository<T> is a simple implementation using a dictionary
```

Product.cs

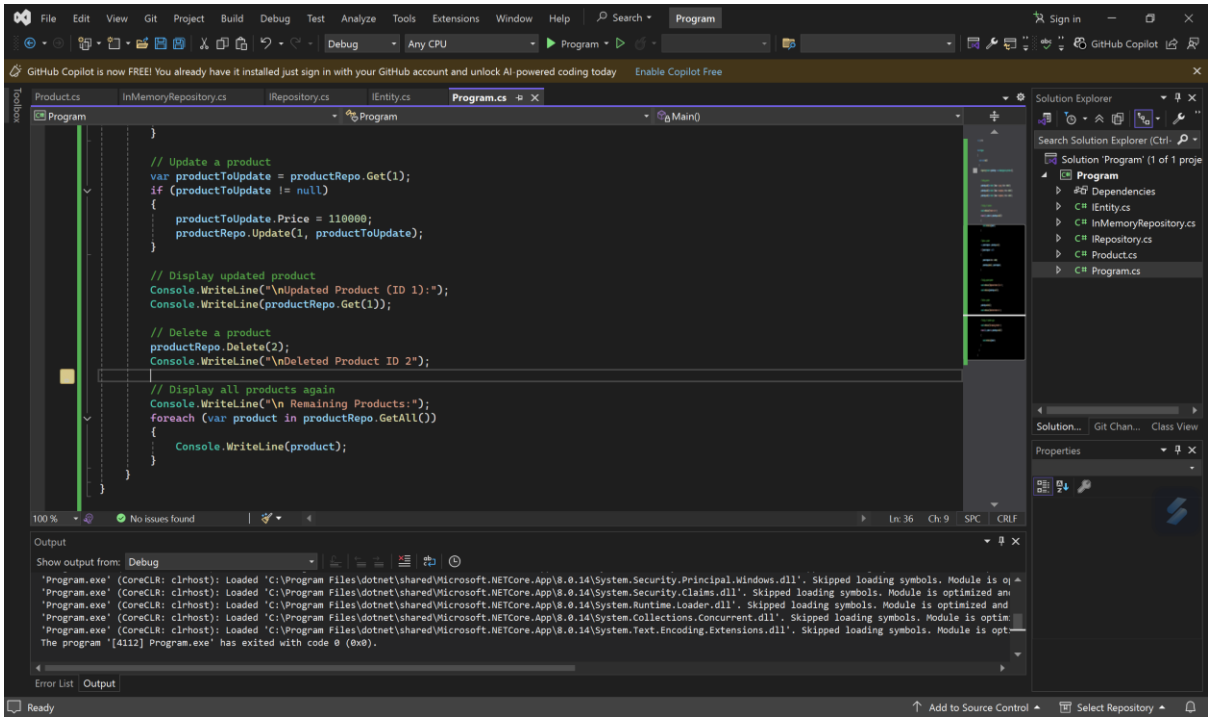
```
public class Product : IEntity
{
    public int Id { get; set; } // required by IEntity
    public string Name { get; set; }
    public double Price { get; set; }

    public override string ToString()
    {
        return $"ID: {Id}, Name: {Name}, Price: Rs.{Price}";
    }
}
```

Program.cs

```
using System;

class Program
{
    static void Main()
    {
        IRepository<Product> productRepo = new InMemoryRepository<Product>();

        // Adding products
        productRepo.Add(new Product { Name = "Laptop", Price = 98000 });
        productRepo.Add(new Product { Name = "Smartphone", Price = 30000 });
        productRepo.Add(new Product { Name = "Headphones", Price = 15000 });

        // Display all products
        Console.WriteLine("Product List:");
```

```
        foreach (var product in productRepo.GetAll())
        {
            Console.WriteLine(product);
        }

        // Update a product
        var productToUpdate = productRepo.Get(1);
        if (productToUpdate != null)
        {
            productToUpdate.Price = 110000;
            productRepo.Update(1, productToUpdate);
        }

        // Display updated product
        Console.WriteLine("\nUpdated Product (ID 1):");
        Console.WriteLine(productRepo.Get(1));

        // Delete a product
        productRepo.Delete(2);
        Console.WriteLine("\nDeleted Product ID 2");

        // Display all products again
        Console.WriteLine("\n Remaining Products:");
        foreach (var product in productRepo.GetAll())
        {
            Console.WriteLine(product);
        }
    }
}
```

Output: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GitHub Copilot is now FREE! You already have it installed just sign in with your GitHub account and unlock AI-powered coding today
Enable Copilot Free
Product.cs
InMemoryRepository.cs
IRepository.cs
IEntity.cs
Program.cs
Program
Program
Main()
}
// Update a product
var productToUpdate = productRepo.Get(1);
if (productToUpdate != null)
{
productToUpdate.Price = 110000;
productRepo.Update(1, productToUpdate);
}
// Display updated product
Console.WriteLine("\nUpdated Product (ID 1):");
Console.WriteLine(productRepo.Get(1));
// Delete a product
productRepo.Delete(2);
Console.WriteLine("\nDeleted Product ID 2");
// Display all products again
Console.WriteLine("\n Remaining Products:");
foreach (var product in productRepo.GetAll())
{
Console.WriteLine(product);
}
}
}
100 %
No issues found
Ln: 36
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SPC
CRLF
Solution Explorer
Search Solution Explorer (Ctrl
Solution 'Program' (1 of 1 proje
Program
Dependencies
IEntity.cs
InMemoryRepository.cs
IRepository.cs
Product.cs
Program.cs
Solution...
Git Chan...
Class View
Properties
Output
Show output from: Debug
'Program.exe' (CoreCLR: clrhost): Loaded 'C:\Program Files\dotnet\shared\Microsoft.NETCore.App\8.0.14\System.Security.Principal.Windows.dll'. Skipped loading symbols. Module is o
'Program.exe' (CoreCLR: clrhost): Loaded 'C:\Program Files\dotnet\shared\Microsoft.NETCore.App\8.0.14\System.Security.Claims.dll'. Skipped loading symbols. Module is optimized an
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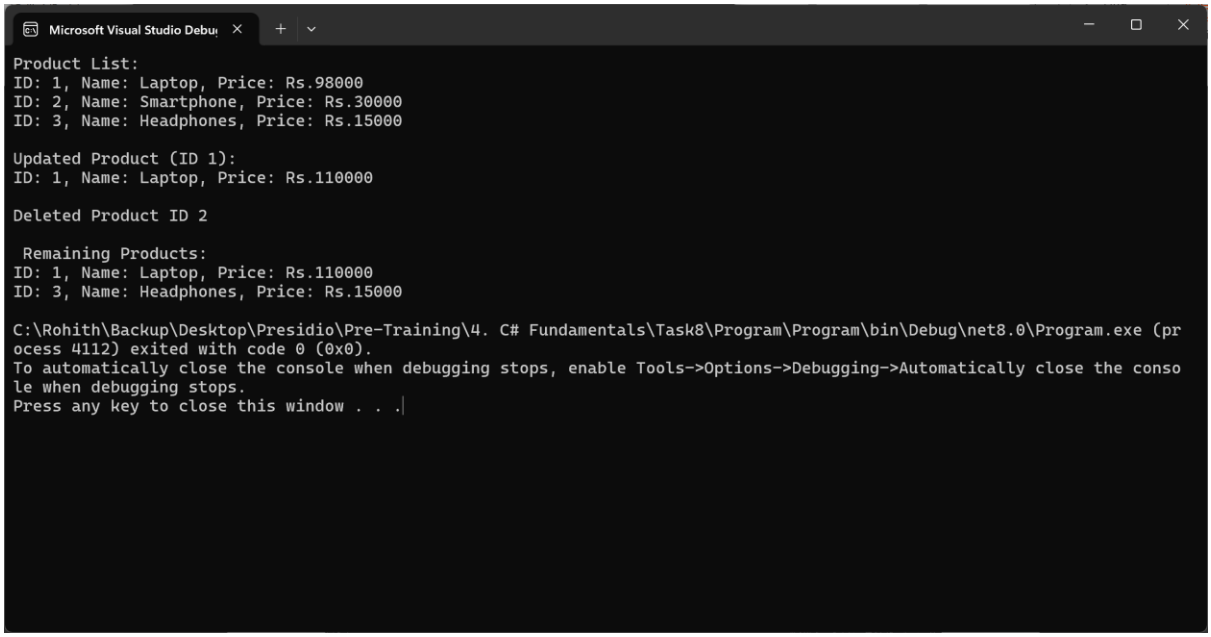
'Program.exe' (CoreCLR: clrhost): Loaded 'C:\Program Files\dotnet\shared\Microsoft.NETCore.App\8.0.14\System.Text.Encoding.Extensions.dll'. Skipped loading symbols. Module is opt
The program '[4112] Program.exe' has exited with code 0 (0x0).
Error List
Output
Ready
Add to Source Control
Select Repository


Microsoft Visual Studio Debu
Product List:
ID: 1, Name: Laptop, Price: Rs.98000
ID: 2, Name: Smartphone, Price: Rs.30000
ID: 3, Name: Headphones, Price: Rs.15000
Updated Product (ID 1):
ID: 1, Name: Laptop, Price: Rs.110000
Deleted Product ID 2
Remaining Products:
ID: 1, Name: Laptop, Price: Rs.110000
ID: 3, Name: Headphones, Price: Rs.15000
C:\Rohith\Backup\Desktop\Presidio\Pre-Training\4. C# Fundamentals\Task8\Program\Program\bin\Debug\net8.0\Program.exe (pr
ocess 4112) exited with code 0 (0x0).
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the conso
le when debugging stops.
Press any key to close this window . . .