CSE 3100: Web Programming Laboratory

Lab 4: C# Fundamentals

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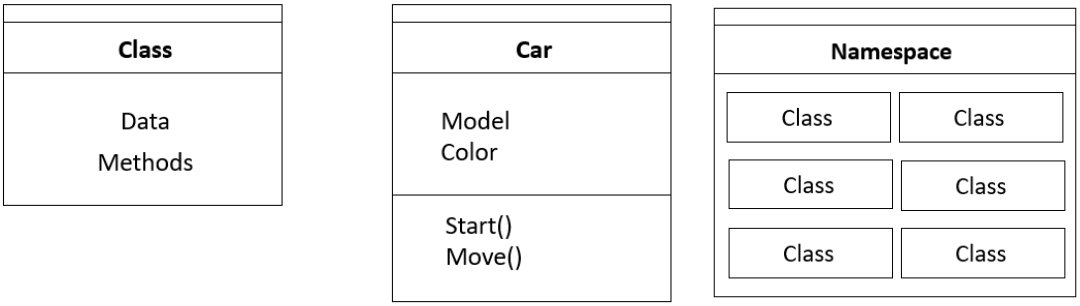
Contents

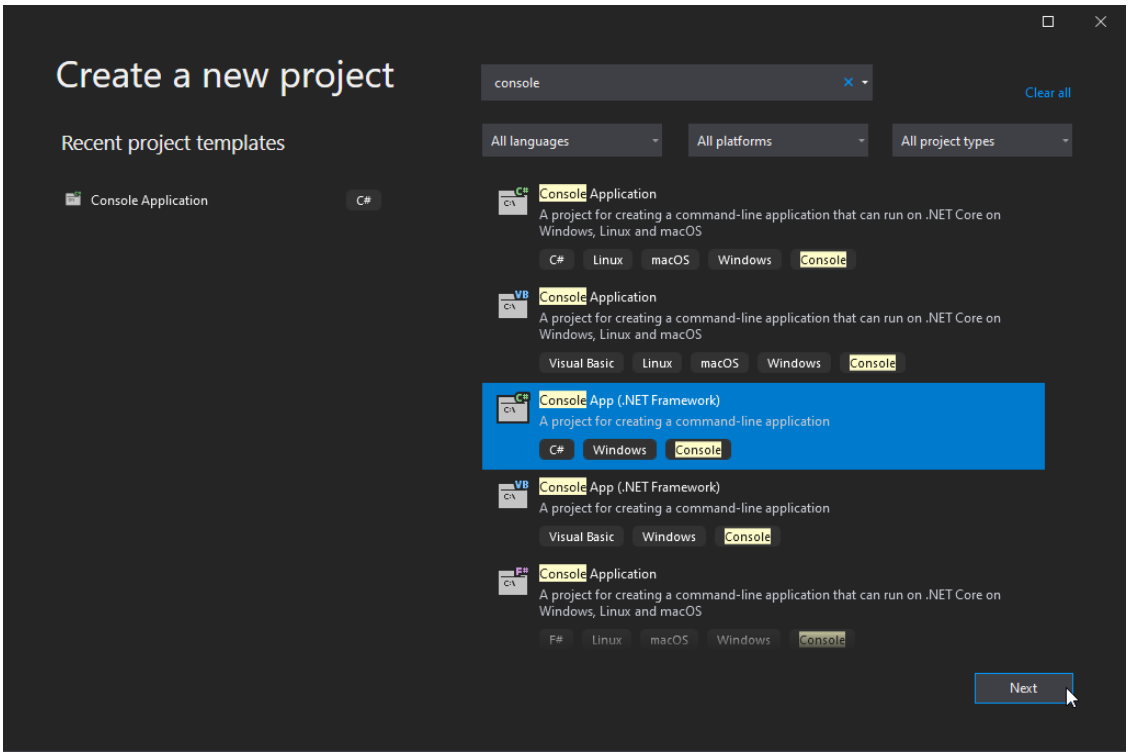
Introduction

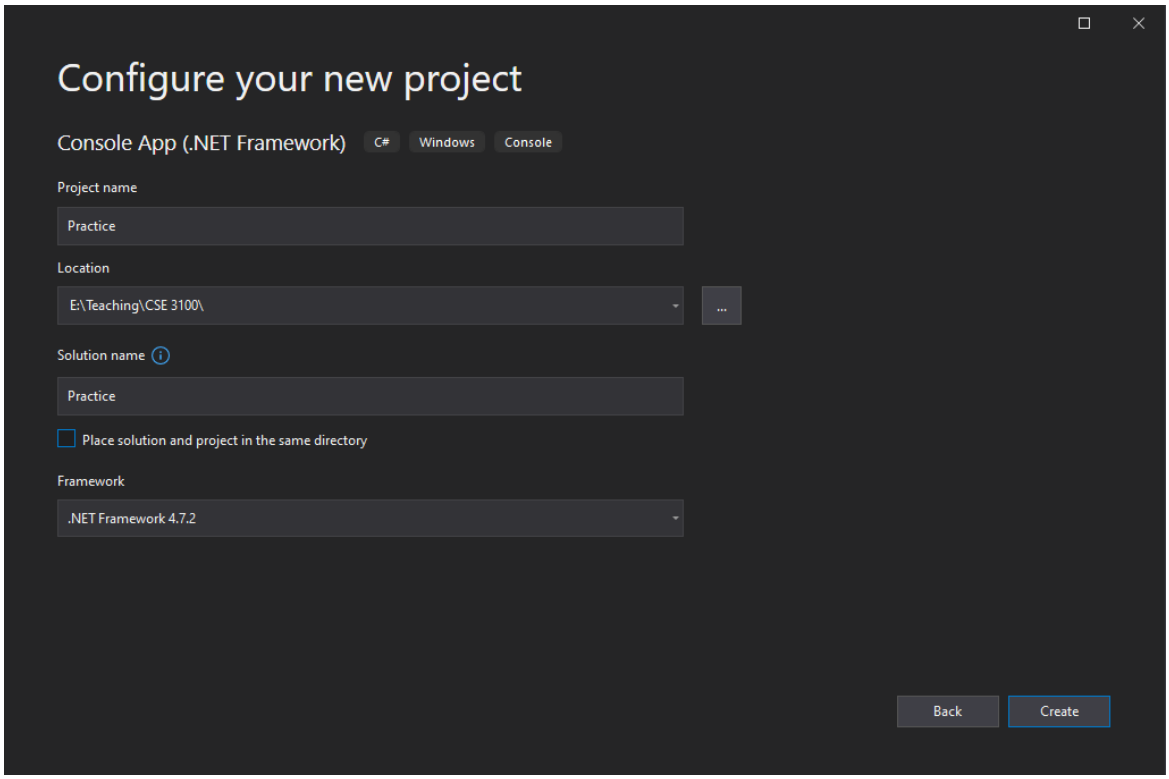
- C# is a programming language.
- .NET is a framework for building application on Windows.



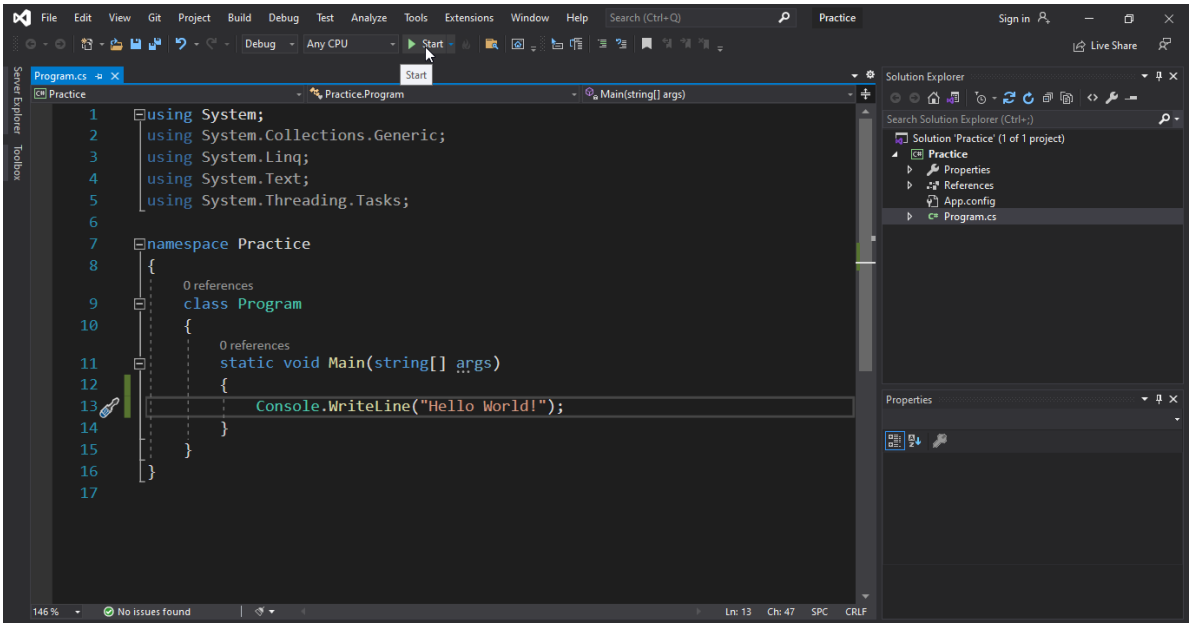
Creating a new project

Create a new **Console App (.NET Framework)**





Let's write our first program.



Data types

Primitive Types

	C# Type	.NET Type	Bytes	Range
Integral Numbers	**byte**	Byte	1	0 to 255
	short	Int16	2	-32,768 to 32,767
	int	Int32	4	-2.1B to 2.1B
	long	Int64	8	…
Real Numbers	**float**	Single	4	-3.4×10^{38} to 3.4×10^{38}
	double	Double	8	…
	decimal	Decimal	16	-7.9×10^{28} to 7.9×10^{28}
Character	**char**	Char	2	Unicode Characters
Boolean	**bool**	Boolean	1	True / False

Default **Real Number** type is **Double**. For example, if we directly write 3.456 to a float type variable, there will be an error. For that we have to write, **3.456f for float** and **3.456m for decimal.**

```
0 references
class Program
{
    0 references
    static void Main(string[] args)
    {
        double dVal = 3.456;     // No Error
        float fVal = 3.456;      // Error
        decimal decVal = 3.456; // Error

        float fVal2 = 3.456f;     // Error resolved
        decimal decVal2 = 3.456m; // Error resolved

        Console.ReadLine();
    }
}
```

struct System.Double
Represents a double-precision floating-point number.

CS0664: Literal of type double cannot be implicitly converted to type 'decimal'; use an 'M' suffix to create a literal of this type

Non-Primitive Types

- String
- Array
- Enum
- Class

Scope

```
byte a = 1;
Console.WriteLine(a);

{
    Console.WriteLine(a);

    byte b = 2;
    Console.WriteLine(b);

    {
        Console.WriteLine(b);

        char c = 'c';
        Console.WriteLine(c);
    }

    Console.WriteLine(c);   // Error: c is Out of scope
}
```

Using var to declare variable type

```
class Program
 {
     static void Main(string[] args)
     {
         var number = 2;
         var ch = 'a';
         var str = "Hello World";
         var fNumber = 45.6f;

         Console.WriteLine(number);
         Console.WriteLine(ch);
         Console.WriteLine(str);
         Console.WriteLine(fNumber);

         Console.ReadLine();
     }
 }
```

Type conversion

Implicit type conversion

```
byte b = 1;
int i = b;    // byte value will be converted to int value
Console.WriteLine("b = {0}, i = {1}", b, i);
```

Explicit type conversion

```
int i = 1;
byte b = i; // Compliation error: Won't be converted implicitly
Console.WriteLine("b = {0}, i = {1}", b, i);
```

To solve this,

```
int i = 1;
byte b = Convert.ToByte(i);
Console.WriteLine("b = {0}, i = {1}", b, i);
```

Another example,

```
var number = "1234";
int i = Convert.ToInt32(number);
Console.WriteLine("number = {0}, i = {1}", number, i);
```

Try-catch

```
try
{
    var number = "1234";
    byte b = Convert.ToByte(number);
    Console.WriteLine("number = {0}, i = {1}", number, b);
}
catch (Exception e)
{
    Console.WriteLine(e.Message);
}

Output:
Value was either too large or too small for an unsigned byte.
```

C# operators

Arithmetic operators

	Operator	Example
Add	**+**	a + b
Subtract	**-**	a - b
Multiply	*****	a * b
Divide	**/**	a / b
Remainder	**%**	a % b

	Operator	Example	Same as
Increment	**++**	a++	a = a + 1
Decrement	**--**	a--	a = a - 1

Comparison operators

	Operator	Example
Equal	**==**	a == b
Not Equal	**!=**	a != b
Greater than	**>**	a > b
Greater than or equal to	**>=**	a >= b
Less than	**<**	a < b
Less than or equal to	**<=**	a <= b

Logical operators

	Operator	Example
And	**&&**	a && b
Or	**||**	a || b
Not	**!**	!a

Bitwise operators

	Operator	Example
And	**&**	a & b
Or	**|**	a	b

Array

```
// 1D array
int[] numbers = { 1, 2, 3, 4, 5 };

string[] friends = new string[5];
friends[0] = "Jim";
friends[1] = "Kelly";

//2D array
int[,] numbers2d =
{
    { 1, 2, 3 },
    { 4, 5, 6 },
    { 7, 8, 9 }
};
Console.WriteLine(numbers2d[2, 1]);
```

Methods

```
static void Main(string[] args)
{
    SayHi("Jack");
    Console.WriteLine(AddNumbers(1, 3));
    Console.ReadLine();
}

static void SayHi(string name)
{
    Console.WriteLine("Hello " + name);
}

static double AddNumbers(double a, double b)
{
    return a + b;
}
```

If-else statement

```
static int GetMax(int a, int b)
{
    int result;
    if (a > b)
    {
        result = a;
    }
    else
    {
        result = b;
    }
    return result;
}
```

Switch statement

```
static string GetDay(int dayIndex)
{
    string dayName;
    switch (dayIndex)
    {
        case 0:
            dayName = "Sunday";
            break;
        case 1:
            dayName = "Monday";
            break;
        case 2:
            dayName = "Tuesday";
            break;
        case 3:
            dayName = "Wednesday";
            break;
        case 4:
            dayName = "Thursday";
            break;
        case 5:
            dayName = "Friday";
            break;
        case 6:
            dayName = "Saturday";
            break;
        default:
            dayName = "None";
            break;
    }
    return dayName;
}
```

While loop

```
int i = 0;
while (i < 5)
{
    Console.WriteLine(i);
    i++;
}
```

For loop

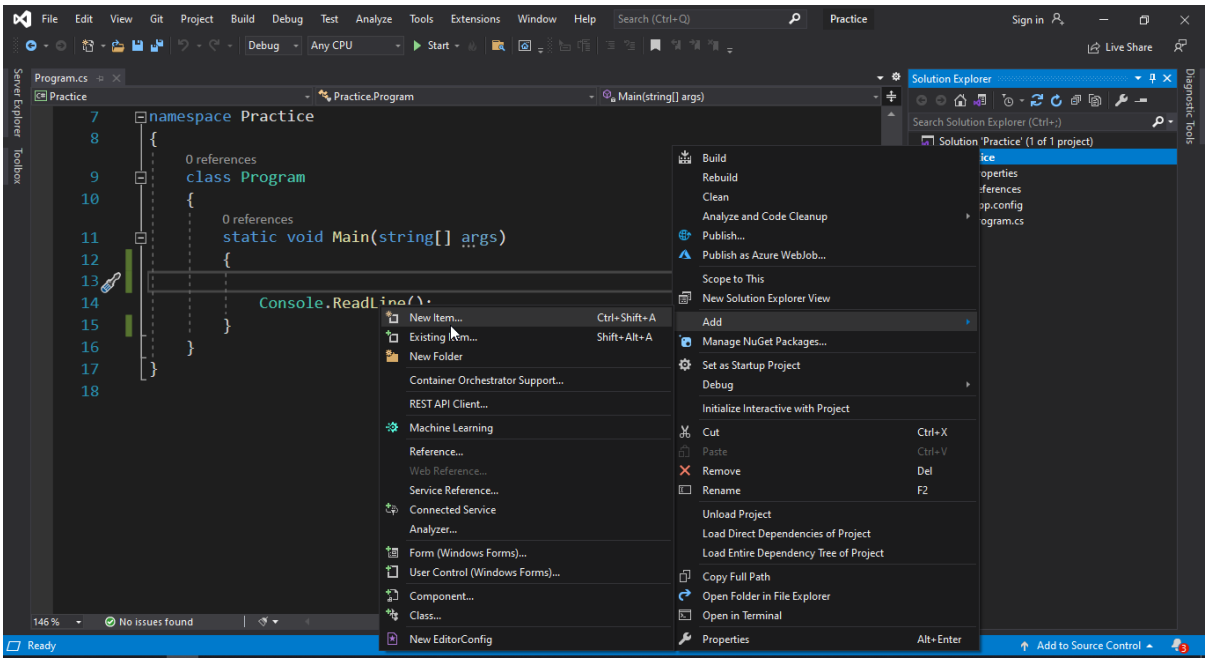
```
for (int i = 0; i < 5; i++)
{
    Console.WriteLine(i);
}
```

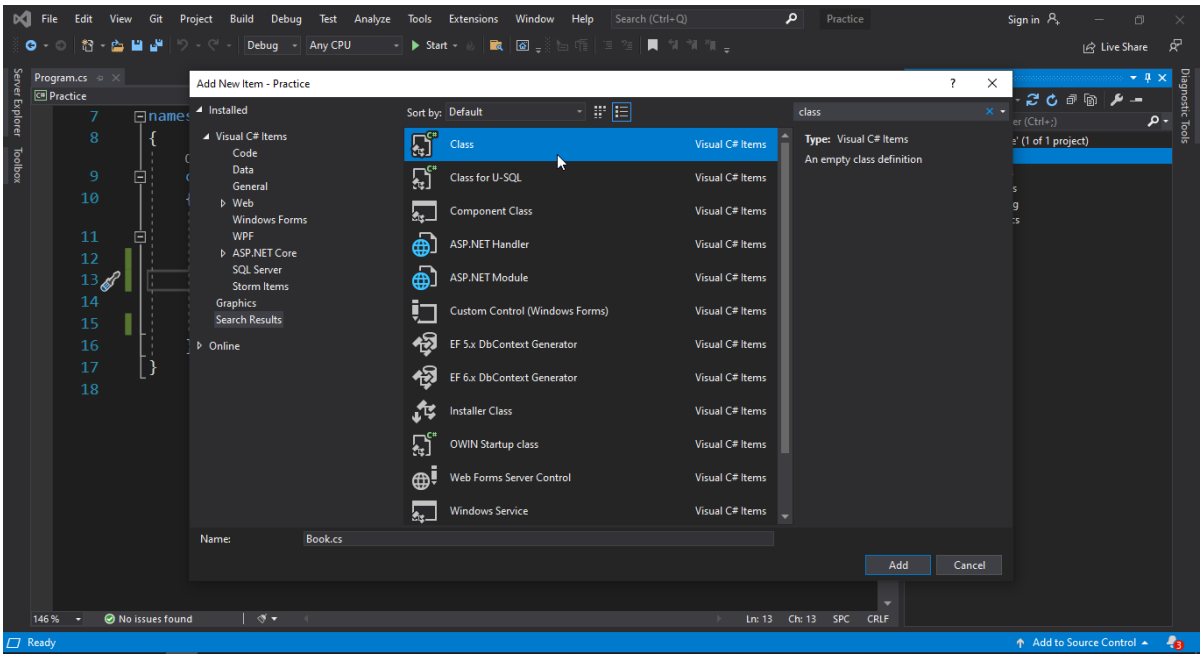
Foreach loop

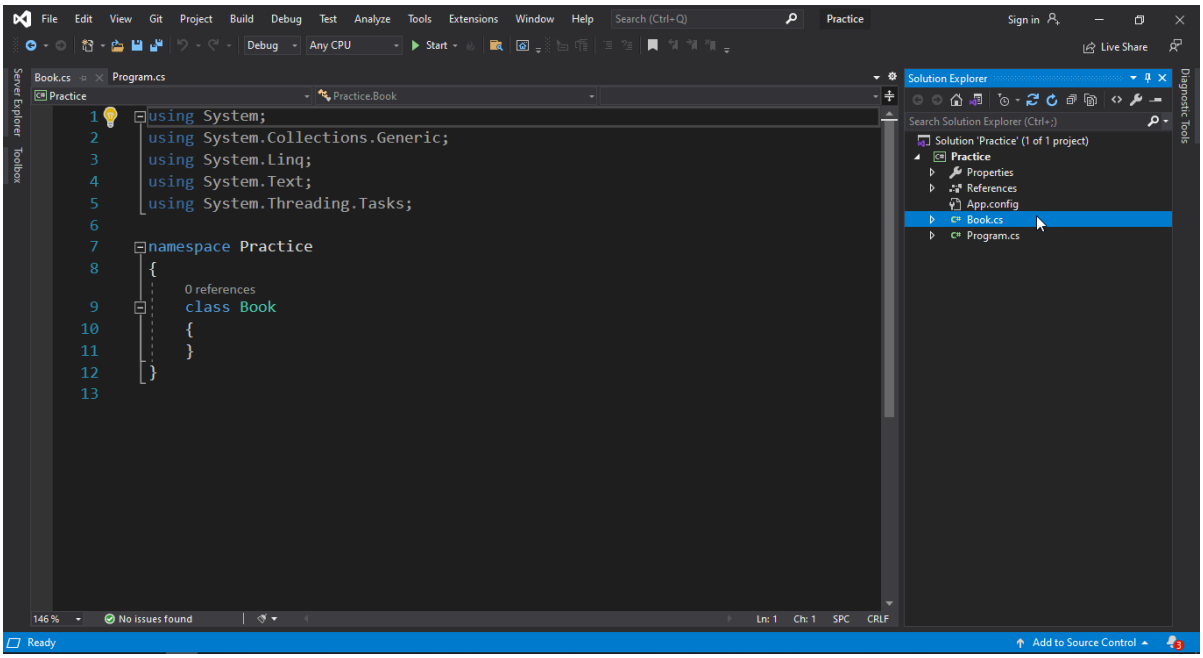
```
int[] numbers = { 1, 2, 3, 4, 5 };
foreach (int value in numbers)
{
    Console.WriteLine(value);
}
```

Class

Creating a new class in the project,







New class **Book** will be created on same namespace.

Book class:

```
class Book
{
    public string title;
    public string author;
    public int pages;

    public string GetDetails()     // Method
    {
        return "Name: "+ title +"; Author "+ author +"; "+ Convert.ToString(pages)
+" pages.";
    }
}
```

Main **Program** class:

```
class Program
{
    static void Main(string[] args)
    {
        Book book1 = new Book();
        book1.title = "Harry Potter";
        book1.author = "JK Rowling";
        book1.pages = 400;

        Console.WriteLine(book1.GetDetails());
        Console.ReadLine();
    }
}
```

Constructor

Book class:

```
class Book
{
    public string title;
    public string author;
    public int pages;

    public Book()   // Constructor
    {

    }

    public Book(string aTitle, string aAuthor, int aPages) // Constructor
    {
        title = aTitle;
        author = aAuthor;
        pages = aPages;
    }

    public string GetDetails()
    {
        return "Name: "+ title +"; Author "+ author +"; "+ Convert.ToString(pages)
+" pages.";
    }
}
```

At **Program** class:

```
class Program
{
  static void Main(string[] args)
  {
      Book book1 = new Book();
      book1.title = "Harry Potter";
      book1.author = "JK Rowling";
      book1.pages = 400;
      Console.WriteLine(book1.GetDetails());

      Book book2 = new Book("The Falling of Love", "Marisa Oldham", 678);
      Console.WriteLine(book2.GetDetails());
      Console.ReadLine();
  }

}
```

Getter setter

Book class:

```
class Book
{
    public string title;
    public string author;
    public int pages;
    private int rating;     // Can't access beyond the scope of this class

    public int Rating
    {
        get
        {
            return rating;
        }
        set
        {
            if (value < 0) rating = 0;
            else if (value > 5) rating = 5;
        }
    }

    public Book(string aTitle, string aAuthor, int aPages, int aRating)
    {
        title = aTitle;
        author = aAuthor;
        pages = aPages;
        Rating = aRating;
    }
}
```

Program class:

```
class Program
{
    static void Main(string[] args)
    {
        Book book1 = new Book("Harry Potter", "JK Rolling", 400, 5);
        Book book2 = new Book("The Falling of Love", "Marisa Oldham", 678, 6);

        Console.WriteLine(book2.rating);    // Error
        Console.WriteLine(book2.Rating);
        Console.ReadLine();
    }
}
```

Static class attributes

Book class:

```
class Book
{
    public string title;
    public string author;
    public int pages;
    public static int bookCount;

    public Book(string aTitle, string aAuthor, int aPages, int aRating)
    {
        title = aTitle;
        author = aAuthor;
        pages = aPages;
        bookCount++;
    }

    public int GetBookCount()
    {
        return bookCount;
    }
}
```

Program class:

```
class Program
{
    static void Main(string[] args)
    {
        Book book1 = new Book("Harry Potter", "JK Rolling", 400, 5);
        Console.WriteLine(Book.bookCount);  // 1

        Book book2 = new Book("The Falling of Love", "Marisa Oldham", 678, 6);
        Console.WriteLine(book2.GetBookCount());  // 2

        Console.ReadLine();
    }
}
```

Static methods & classes

UsefulTools class:

```
static class UsefulTools
{
    public static void SayHi(string name)
    {
        Console.WriteLine("Hello " + name);
    }
}
```

Program class:

```
class Program
{
    static void Main(string[] args)
    {
        UsefulTools.SayHi("Jack");

        Console.ReadLine();
    }
}
```

Inheritance

Chef class:

```
class Chef
{
    public void MakeChicken()
    {
        Console.WriteLine("The chef makes chicken");
    }

    public void MakeSalad()
    {
        Console.WriteLine("The chef makes salad");
    }

    public virtual void MakeSpecialDish()
    {
        Console.WriteLine("The chef makes bbq ribs");
    }
}
```

ItalianChef class inherits **Chef** class, also overrides method **MakeSpecialDish()**:

```
class ItalianChef : Chef
{
    public override void MakeSpecialDish()
    {
        Console.WriteLine("The italian chef makes pasta");
    }

    public void MakePizza()
    {
        Console.WriteLine("The italian chef makes pizza");
    }
}
```

Program class:

```
class Program
{
    static void Main(string[] args)
    {
        Chef chef = new Chef();
        chef.MakeChicken();
        chef.MakeSalad();
        chef.MakeSpecialDish();

        ItalianChef italian = new ItalianChef();
        italian.MakeChicken();
        italian.MakeSalad();
        italian.MakeSpecialDish();
        italian.MakePizza();

        Console.ReadLine();
    }
}
```