

CSE 3100: Web Programming Laboratory

## Lab 4: C# Fundamentals

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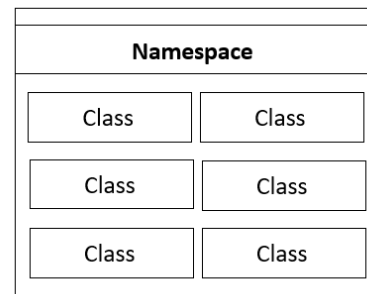
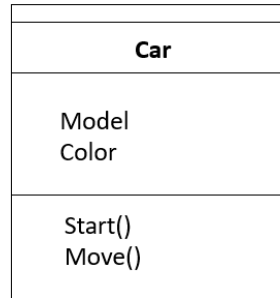
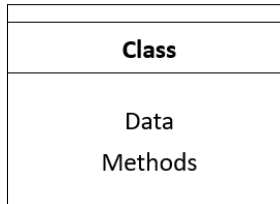
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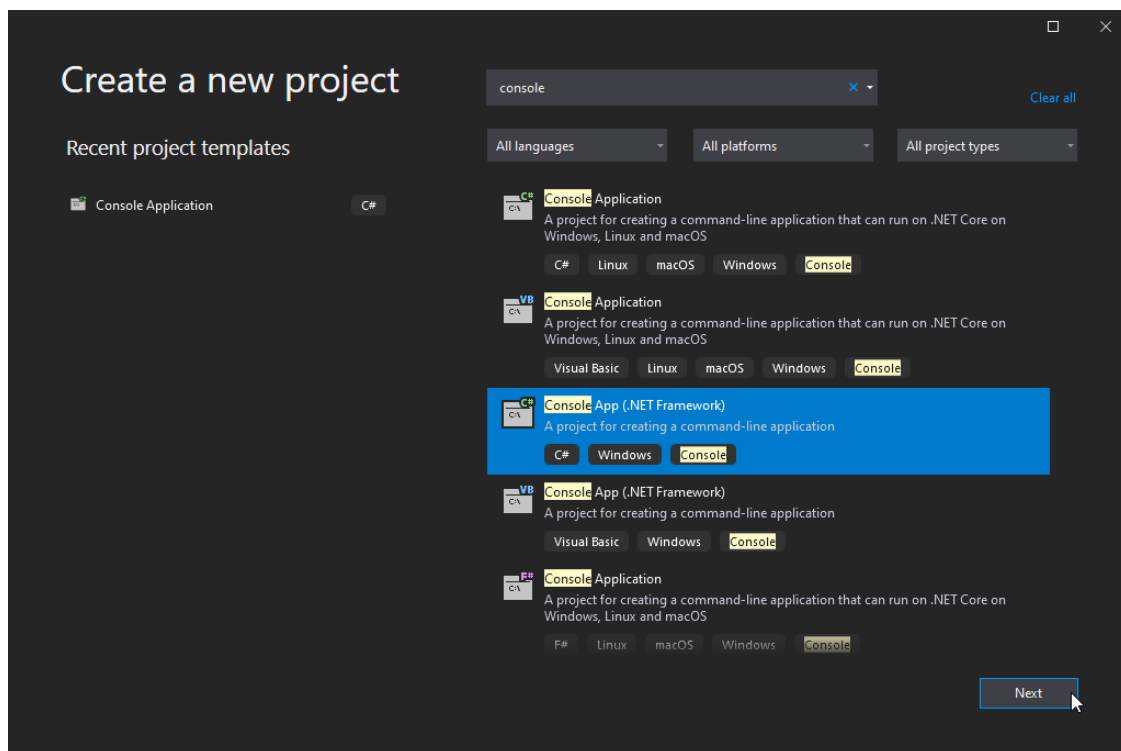
# Introduction

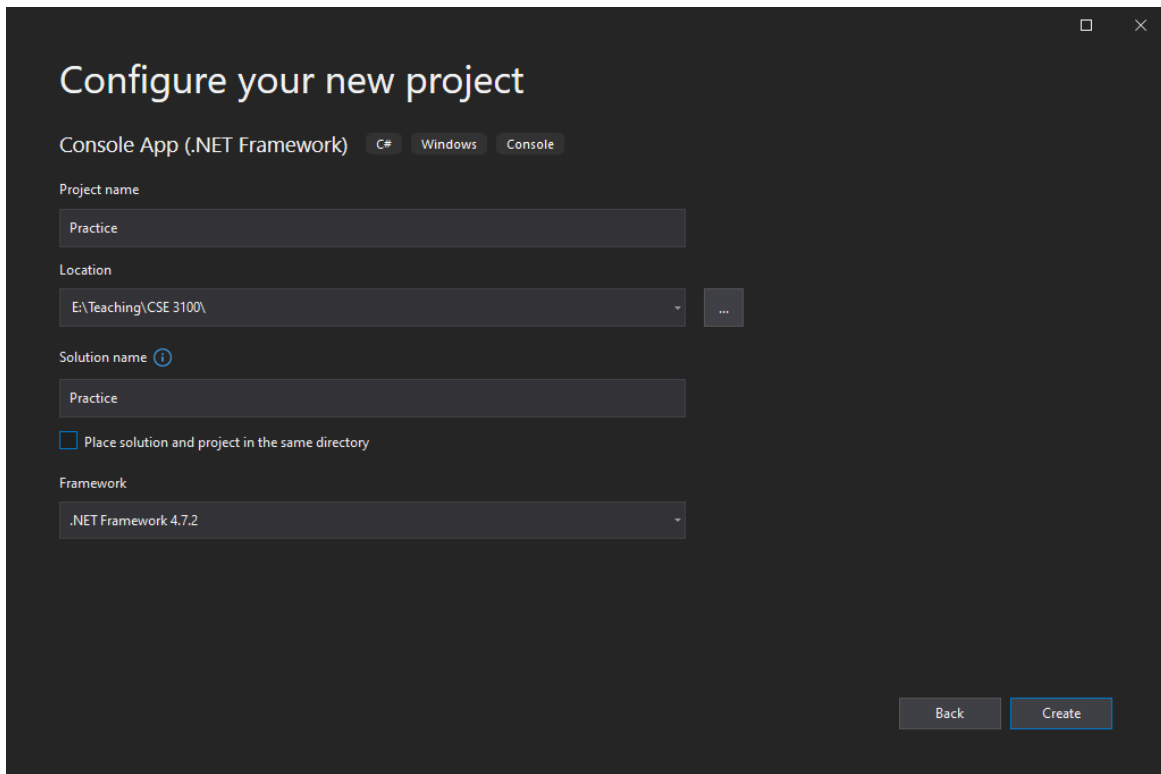
- C# is a programming language.
- .NET is a framework for building application on Windows.



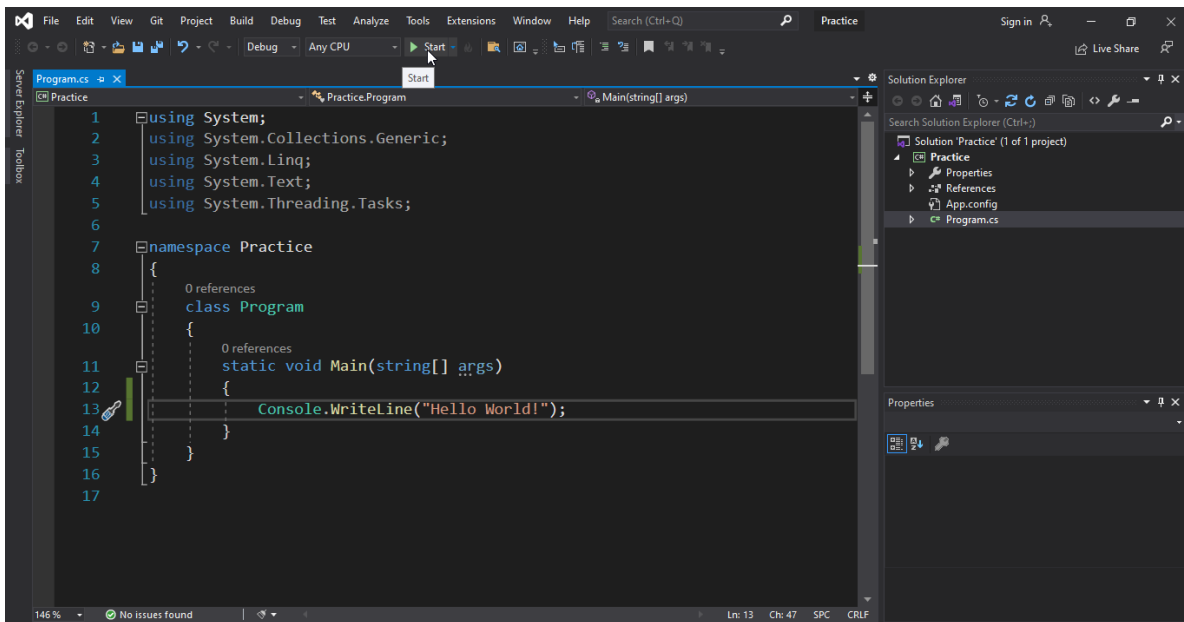
## Creating a new project

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	<b>byte</b>	Byte	1	0 to 255
	<b>short</b>	Int16	2	-32,768 to 32,767
	<b>int</b>	Int32	4	-2.1B to 2.1B
	<b>long</b>	Int64	8	...
Real Numbers	<b>float</b>	Single	4	$-3.4 \times 10^{38}$ to $3.4 \times 10^{38}$
	<b>double</b>	Double	8	...
	<b>decimal</b>	Decimal	16	$-7.9 \times 10^{28}$ to $7.9 \times 10^{28}$
Character	<b>char</b>	Char	2	Unicode Characters
Boolean	<b>bool</b>	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; // Compilation 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	<b>&amp;&amp;</b>	a && b
Or	<b>  </b>	a    b
Not	<b>!</b>	!a

## Bitwise operators

	Operator	Example
And	<b>&amp;</b>	a & b
Or	<b> </b>	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

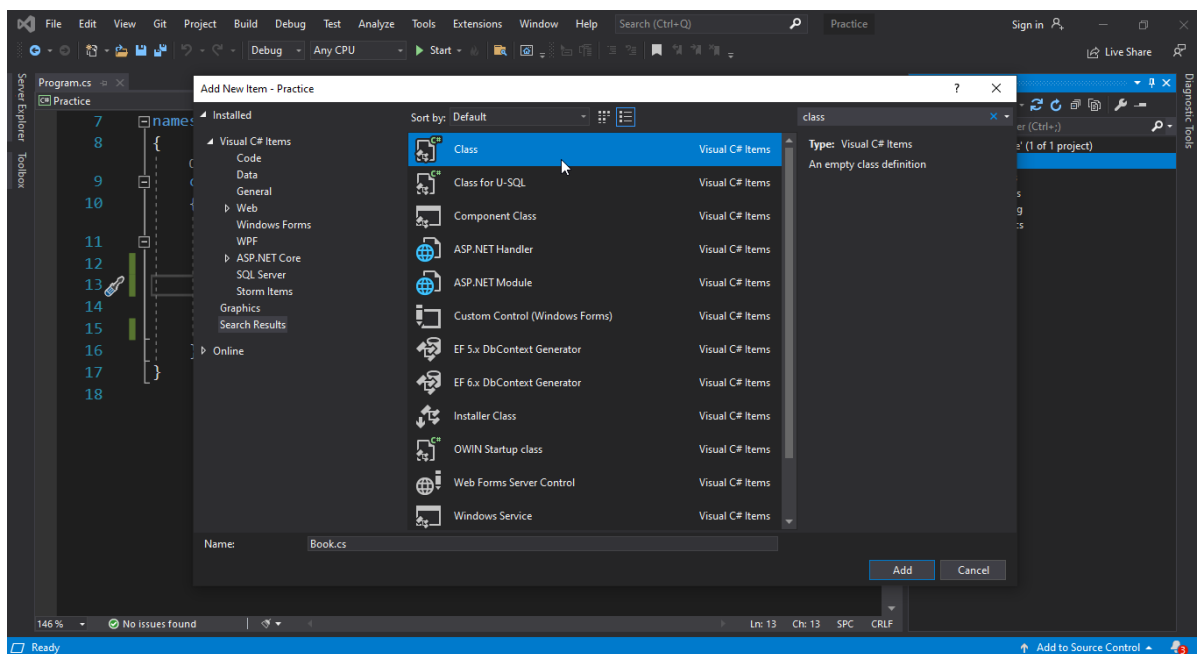
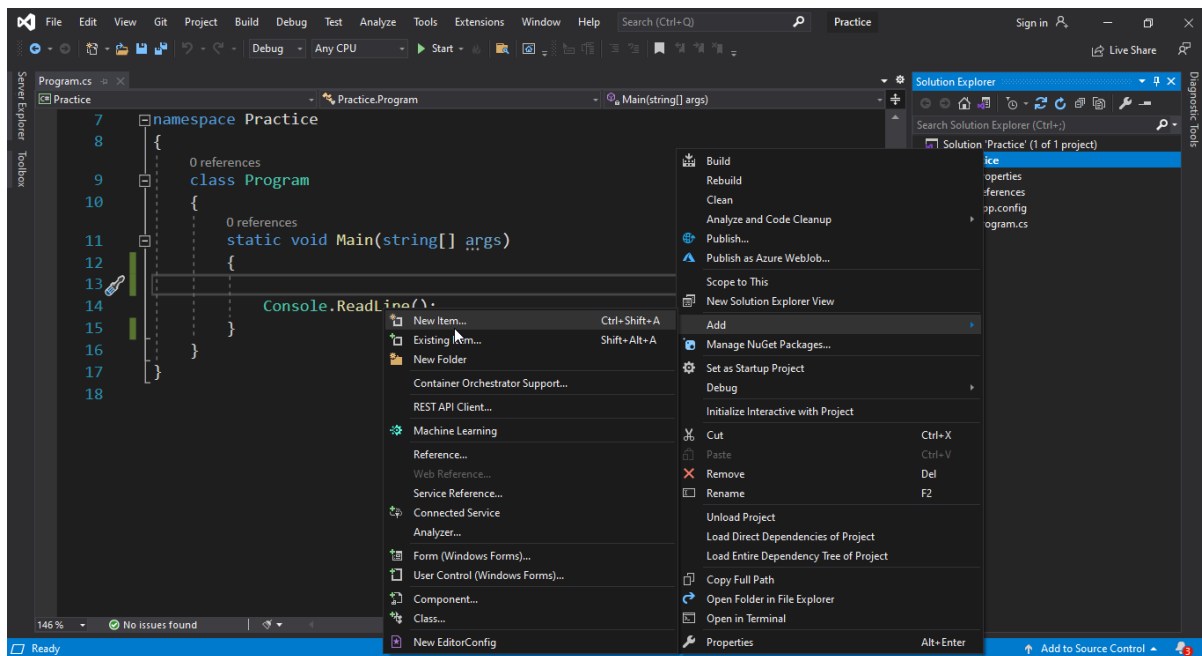
```
for (int i = 0; i < 5; i++)
{
    Console.WriteLine(i);
}
```

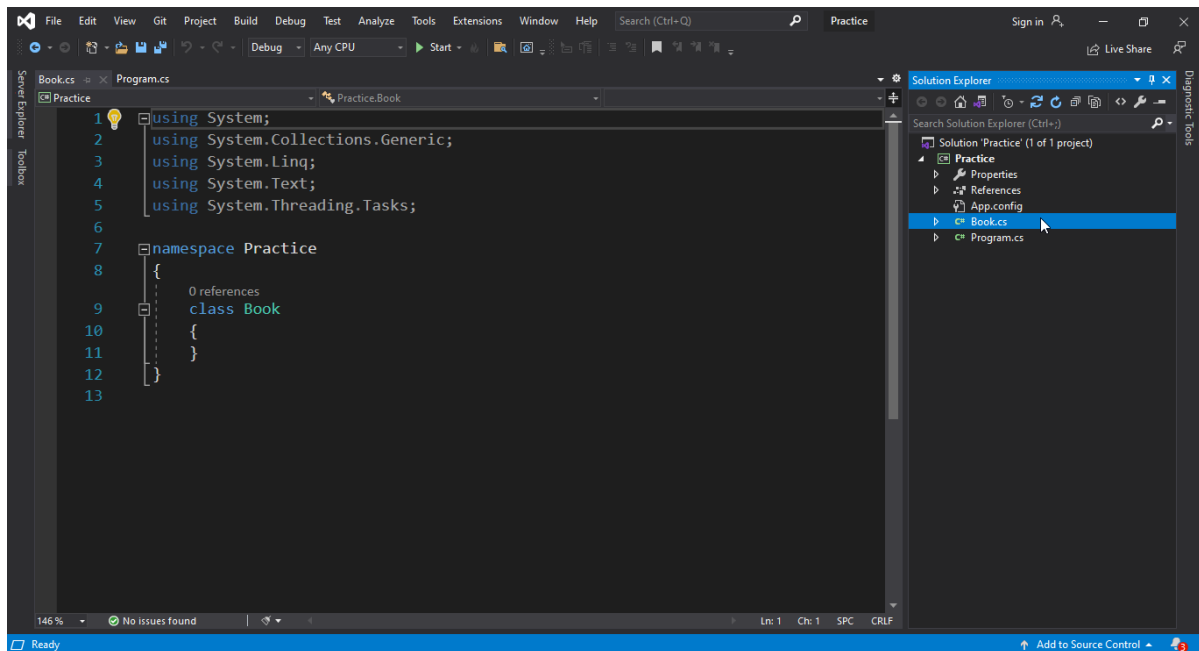
## Foreach loop

```
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();
    }
}
```