C# Tutorial Notes for Beginners

1. Introduction to C#

C# (pronounced 'C-Sharp') is a modern, object-oriented programming language developed by Microsoft. It runs on the .NET platform and is commonly used for desktop apps, web development, games (Unity), and more.

2. Hello World Program

```
using System;


class Program
{
    static void Main()
    {
        Console.WriteLine("Hello, World!");
    }
}
```

3. Variables and Data Types

```
int age = 25;
string name = "Alice";
double pi = 3.14;
bool isActive = true;
char grade = 'A';
```

4. Operators

```
int x = 5;

int y = 2;

int sum = x + y;  // +, -, *, /, %, ++, --

bool result = (x > y); // >, <, >=, <=, ==, !=
```

5. Control Statements

```
// if-else

if (age > 18)

    Console.WriteLine("Adult");

else

    Console.WriteLine("Minor");


// switch

switch (grade)

{

    case 'A': Console.WriteLine("Excellent"); break;

    case 'B': Console.WriteLine("Good"); break;

    default: Console.WriteLine("Try Again"); break;

}


// loops

for (int i = 0; i < 5; i++)

    Console.WriteLine(i);
```

```
int i = 0;

while (i < 5)

{

    Console.WriteLine(i);

    i++;

}
```

6. Arrays

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

Console.WriteLine(numbers[0]); // prints 1
```

7. Functions (Methods)

```
static int Add(int a, int b)

{

    return a + b;

}
```

8. Classes and Objects

```
class Person

{

    public string Name;

    public void SayHello()

    {

        Console.WriteLine("Hello " + Name);
```

```
    }
}
```

```
Person p = new Person();
p.Name = "Bob";
p.SayHello(); // prints Hello Bob
```

9. OOP Concepts

- Encapsulation - Wrapping data and methods.
- Inheritance - One class inherits from another.
- Polymorphism - Many forms (method overloading/overriding).
- Abstraction - Hiding complex details.

10. Exception Handling

```
try
{
    int x = 10 / 0;
}
catch (DivideByZeroException e)
{
    Console.WriteLine("Error: " + e.Message);
}
finally
{
```

```
    Console.WriteLine("Done");
}
```

11. Namespaces

```
namespace MyApp
{
    class MyClass { }
}
```

12. File I/O (Basics)

```
using System.IO;

File.WriteAllText("data.txt", "Hello File");
string text = File.ReadAllText("data.txt");
Console.WriteLine(text);
```

13. Using Visual Studio or VS Code

Create a Console App. Use 'dotnet run' to compile and run in terminal (with .NET SDK installed).

14. Popular Libraries

- System.Collections.Generic - lists, dictionaries
- System.Linq - data querying
- Newtonsoft.Json - JSON serialization