EIABC

COMPUTER PROGRAMMING ASSIGNMENT

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Compare and contrast C# and Python programming languages

Overview of C#

C# is a powerful language that closely follows the traditional C & C++ constructs, but it is more modern and easier to learn. Developed by Microsoft, this Object-oriented programming language also has a lot in common with Java. C# code can be compiled on different platforms and comes with a host of strong features such as –

- Integration with .NET framework
- Component-oriented
- High-level structured language
- Modern syntax; easy to learn
- Rich standard library
- Automatic garbage collection

The basic structure of a C# program is similar to that of C++ and Java. A namespace declaration, class definition (variables and methods), main method – that's it. Here is a simple program that prints the name of a user.

```csharp
using System;

namespace PrintNameApplication {

   class PrintUserName {

      static void Main(string[] args) {

         /* Write user name to console */

   String userName;

userName = Console.ReadLine();

         Console.WriteLine("Hello, " + username + ". How are you today?");

      }

   }

}
```

Here is the explanation for the code –

- Think of **using** keyword similar to the import or include statement that means if we want to use System namespace in the program, we include it using the 'using' statement. There can be many 'using' statements in a program.
- **Namespace** contains a collection of classes. If there is more than one class with the same name, each class can be uniquely identified with the namespace.
- **Class** contains the method (in this case the **main** method). When we run the program, the main method is executed. Main method is the entry point for any C# program.
- In this program, we get user input and display the same with a message. Since we are getting it from console, we are using some basic I/O methods like ReadLine () and WriteLine ().

Benefits of C#

C# integrates with, the powerful .NET framework. Besides, if you know Java and want to move to .NET, learning C# can give you the necessary boost. Some benefits of C# are –

- Simple, robust and scalable
- Type-safe code, C# doesn't allow unsafe casts
- Fast compilation and execution time
- Structured programming language
- Supports language interoperability

Overview of Python

Just like C#, Python is a general-purpose programming language. It follows C & Java in most of its features. It is portable and easy to learn the language that has high-level programming capabilities.

Are you wondering -?

Why then do we have another programming language, when there are so many already? Well, since Python is derived from many other languages, it has the best features of all. For one, we can say that it is a dynamically typed language (i.e. type checking is done at runtime). Secondly, if you want to make changes to an existing legacy system – Python is the language to go for. Lastly, if you are new to programming, Python is where you should start your programming journey.

Some features of Python –

- Supports both Object-Oriented Programming as well as functional and structured programming
- Easy to code, read, maintain and port
- A rich standard library that is portable and compatible on various platforms like Windows, Mac or UNIX.
- Supports automatic garbage collection

Let us write the same PrintName program in Python to get the feel of the code –

```python
# print name

name = input("Enter your name-")

print("Your name is ", name)
```

What we achieved in about 10 lines in C#, we have done in just 2 lines in Python. The code is just like typing a sentence in English! Note that there are no ';'(semicolons) at the end of each line. The comments are added using '#' as compared to '/*' in C#. There are no type declarations. I haven't written 'String name;' anywhere in the code. There are no imports!

Well – that's the level of ease we are talking about!

Few more benefits of Python

- Python can interact with most of the other languages and platforms using the Python Package Index (PyPI). PyPI has a set of third-party modules to achieve this.
- Huge standard library that includes OS interfaces, web services tools and much more.
- Free to use and distribute; Python has been developed under open source license
- Apt for network applications that use multiple protocols.

C# vs Python: Head to head Comparison:

Now that we have a basic understanding of both languages, let us now compare the more profound differences in a side by side manner –

C#	Python
Developed by Microsoft. Comes with the license.	Open-source development and distribution, even for commercial use
Based on OOP concepts	supports multi-paradigm programming (OOP, procedural)
Statically typed. The compiler will give errors for wrong typecasting	Dynamic type-casting. No need for variable declarations.

Supports work on .NET framework	Can be integrated with Java (JVM), .NET, C and JavaScript
Dependency injection works like a charm.	No concept of DI as such, however, you can add customized tags to any object at run time or do monkey patching to point to a different third-party code for testing.
More organized and consistent syntax and format.	Simple, easy to read and code, doesn't contain too many symbols or formats.
More static language. Everything has to be built (compiled) and then run.	Reduces a whole step in the development cycle as everything is dynamic, picked at run-time.
No interpreter	Interactive interpreter to write programs easily
Because of the Common Language Infrastructure (CLI) framework, C# is faster and offers better performance	The development work is faster, but when compared to C#, the performance is slightly lacking.
Library support is good and has its base from the .NET framework	There is no beating Python in its huge set of pre-packaged libraries. A lot of code can be reused which makes the work easy for developers
Multi-threading is quite easy using the .NET framework	Because of the Global Interpreter Lock (GIL), multithreading requires multiple processes.

Conclusion

There is no denying that C# has a more organized structure like an OOP language has. This means there are no inconsistencies in the syntax and formatting rules. However, the code in Python can be written easily because of the huge set of standard libraries. C# can do all the stuff that Python is able to do and gives better performance. Python gets you into coding fast and neat. There are no confusions of multiple braces ({}) as we have in C#. Python has some great built-in data types. If you want to work on both Python and C#, go for IronPython, which has been developed for those who want to write in Python with .NET framework. It is a Microsoft implementation of Python, written in C#. This way you can explore the benefits of both languages and use them as deemed fit. Last 2 cents – think of C# on Windows and Python on Linux!