

Language Comparison

Java, C#, Python and JavaScript



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Execution Model

Compiler vs. Interpreter

- **Compiled** languages



- Source code is first **compiled** to machine code, then executed
- Syntax errors are found during the **compilation** (at compile time)
- Examples: **C#, Java, C, C++, Swift, Go, Rust**

- **Interpreted** languages



- Each command is read, parsed and executed by an **interpreter**
- Syntax errors are found at **run-time**, during execution
- Examples: **Python, JavaScript, PHP, Perl, Ruby**

Statically-Typed vs. Dynamic Typed

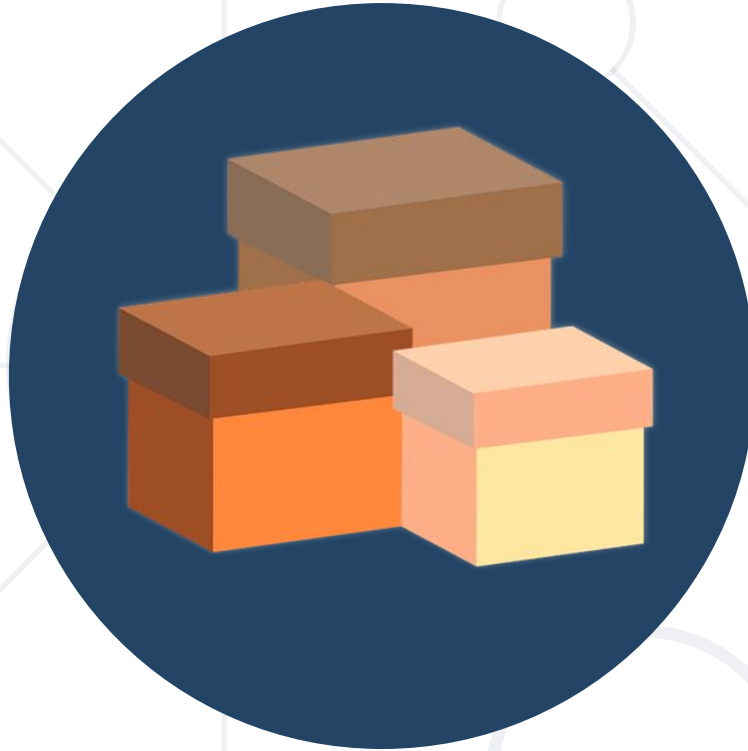
- **Type systems** in programming languages
 - **Statically-typed** languages perform type checking at compile time
 - Examples: C#, Java, Swift, C++
 - **Dynamically-typed** languages perform type checking at runtime
 - Examples: Python, JS, PHP
 - **Combined typing**: C#, TypeScript, Objective-C, Dart, ...

```
int n = 5;  
n = "Hi"; // error!  
int func(int n) { ... }
```

C#

```
let n = 5;  
n = "Hi"; // OK  
function f(n) { ... }
```

JS



Variables

Declaring Variables in C#, Java, JS and Python

- To **declare variable** in **C# / Java** you need to use the pattern:

```
{data type} {variable name} = {value};
```

- **C#**

```
int firstNumber = 5;  
string name = "Peter";  
bool isPassed = false;  
char gender = 'F';  
double mathGrade = 5.49;
```

- **Java**

```
int firstNumber = 5;  
String name = "Peter";  
boolean isPassed = false;  
char gender = 'F';  
double mathGrade = 5.49;
```


Declaring Variables in JavaScript

- To **declare variable** in **JS** you need to use the keyword **let**:

```
let {variable name} = {value};
```

- Examples

```
let firstNumber = 5;  
let name = "Peter";  
let isPassed = false;  
let mathGrade = 5.49;
```

- **Python** has no keyword for declaring a variable
 - Variables **do not need to be declared** with any particular type
- Examples of using variables in Python

```
first_number = 5  
name = "Peter"  
is_passed = False  
math_grade = 5.49
```



Data Types

Data Types in C#, Java, JS and Python

Primitive Data Types in C# and Java

- Built-in data types in **C#**

- Integer – **int, long**
- Real number – **double, float**
- Text – **string, char**
- Boolean – **bool**
- Other – **object**

```
int size = 50;  
size.GetType() → Int32
```

- Built-in data types in **Java**

- Integer – **int, long**
- Real number – **double, float**
- Text – **String, char**
- Boolean – **boolean**
- Other – **Object**

```
int size = 50;  
((Object)size).getClass()  
→ Integer
```



Data Types in JavaScript

- In **JS** data types are **inferred** from the values
 - Not explicitly specified at variable declaration
- Primitive data types
 - **number**
 - **string**
 - **boolean**
 - **object**
 - **null**
 - **undefined**

```
let size = 50;  
typeof(size) → number  
let name = "Peter";  
typeof(name) → string  
let arr = [3, 5, 8];  
typeof(arr) → object
```



Data Types in Python

- In **Python** variables keep values of certain type
 - The data type is **inferred** from the value
- Built-in data types in Python

- **int**
- **float**
- **str**
- **boolean**
- **list**

```
size = 50;
type(size) → int
name = "Peter"
type(name) → str
values = [2, 3, 4]
type(values) → list
```





Printing on the Console

Printing Data in C#, Java, JS and Python

Printing on the Console in C#

- **Printing** content and then going to a **new line**

```
Console.WriteLine("Peter");
```

- **Printing** content and staying on the **same line**

```
Console.Write(" and Maria");
```

- **Printing with formatting**

```
string name = "Maria";  
int age = 25;  
Console.WriteLine(  
    $"{name} is {age} years old.");
```



Printing on the Console in Java

- **Printing** content and then going to a **new line**

```
System.out.println("Peter");
```

- **Printing** content and staying on the **same line**

```
System.out.print(" and Maria");
```

- **Printing with formatting**

```
String name = "Maria";  
int age = 25;  
System.out.printf(  
    "%s is %d years old.", name, age);
```



Printing on the Console in JavaScript

- **Printing** content and then going to a **new line**

```
console.log("Peter");
```

- **Printing** content and staying on the **same line**

```
process.stdout.write("and Maria");
```

Works only at
the server-side

- **Printing** with **formatting**

```
let name = "Maria";  
let age = 25;  
console.log(  
  `${name} is ${age} years old.`);
```



Printing on the Console in Python

- **Printing** content and then going to a **new line**

```
print("Peter");
```

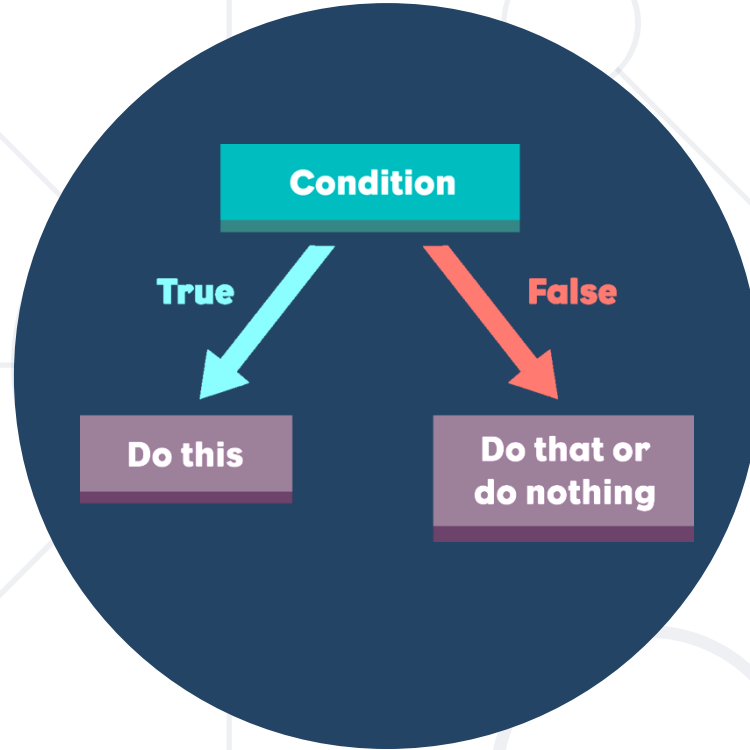
- **Printing** content and staying on the **same line**

```
print("and Maria", end='');
```

- **Printing** with **formatting**

```
name = "Maria";  
age = 25;  
print(  
    f'{name} is {age} years old.');
```





Conditional Statements

If-Else Statements in C#, Java, JS and Python

If-Else Statements in C# and Java

▪ if-else in C#

```
double grade = 4.50;  
if (grade >= 3.00)  
{  
    Console.WriteLine("Passed!");  
}  
else  
{  
    Console.WriteLine("Failed!");  
}
```

▪ if-else in Java

```
double grade = 4.50  
if (grade >= 3.00) {  
    System.out.println("Passed!");  
} else {  
    System.out.println("Failed!");  
}
```



If-Else in JavaScript and Python

■ if-else in JavaScript

```
let grade = 4.50;  
if (grade >= 3.00) {  
    console.log("Passed!");  
} else {  
    console.log("Failed!");  
}
```

■ if-else in Python

```
grade = 4.50  
if grade >= 3.00:  
    print("Passed!")  
else:  
    print("Failed!")
```





Loops

Loops in C#, Java, JS and Python

While Loop in C# and Java

■ while loop in C#

```
int counter = 0;
while (counter <= 9)
{
    Console.WriteLine(counter);
    counter++;
}
```

■ while loop in Java

```
int counter = 0;
while (counter <= 9) {
    System.out.println(counter);
    counter++;
}
```



While Loop in JS and Python

■ while loop in JS

```
let counter = 0;  
while (counter <= 9) {  
  console.log(counter);  
  counter++;  
}
```

■ while loop in Python

```
counter = 0  
while counter <= 9:  
  print(counter)  
  counter += 1
```



For Loop in C# and Java

- for-loop in C#

```
for (int i = 0; i <= 9; i++)  
{  
    Console.WriteLine(i);  
}
```

- for-loop in Java

```
for (int i = 0; i <= 9; i++) {  
    System.out.println(i);  
}
```



For Loop in JS and Python

- for-loop in JS

```
for (let i = 0; i <= 9; i++) {  
  console.log(i);  
}
```

- for-loop in Python

```
for i in range(0, 10):  
  print(x)
```





IDE

Integrated Development Environments

Visual Studio

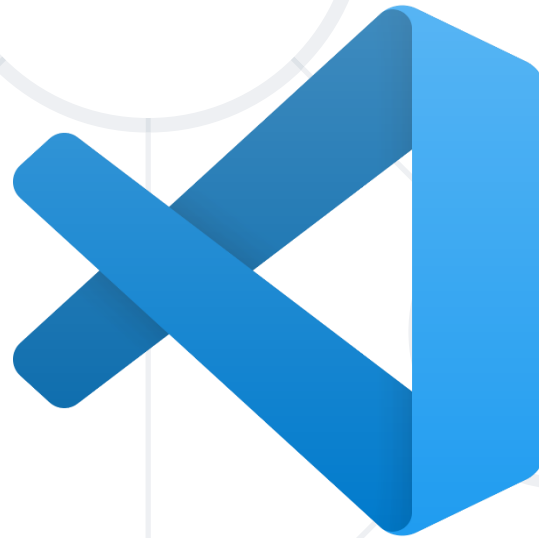


Most Popular IDE for Java

IntelliJ IDEA



Visual Studio Code



Most Popular IDE for Python

PyCharm



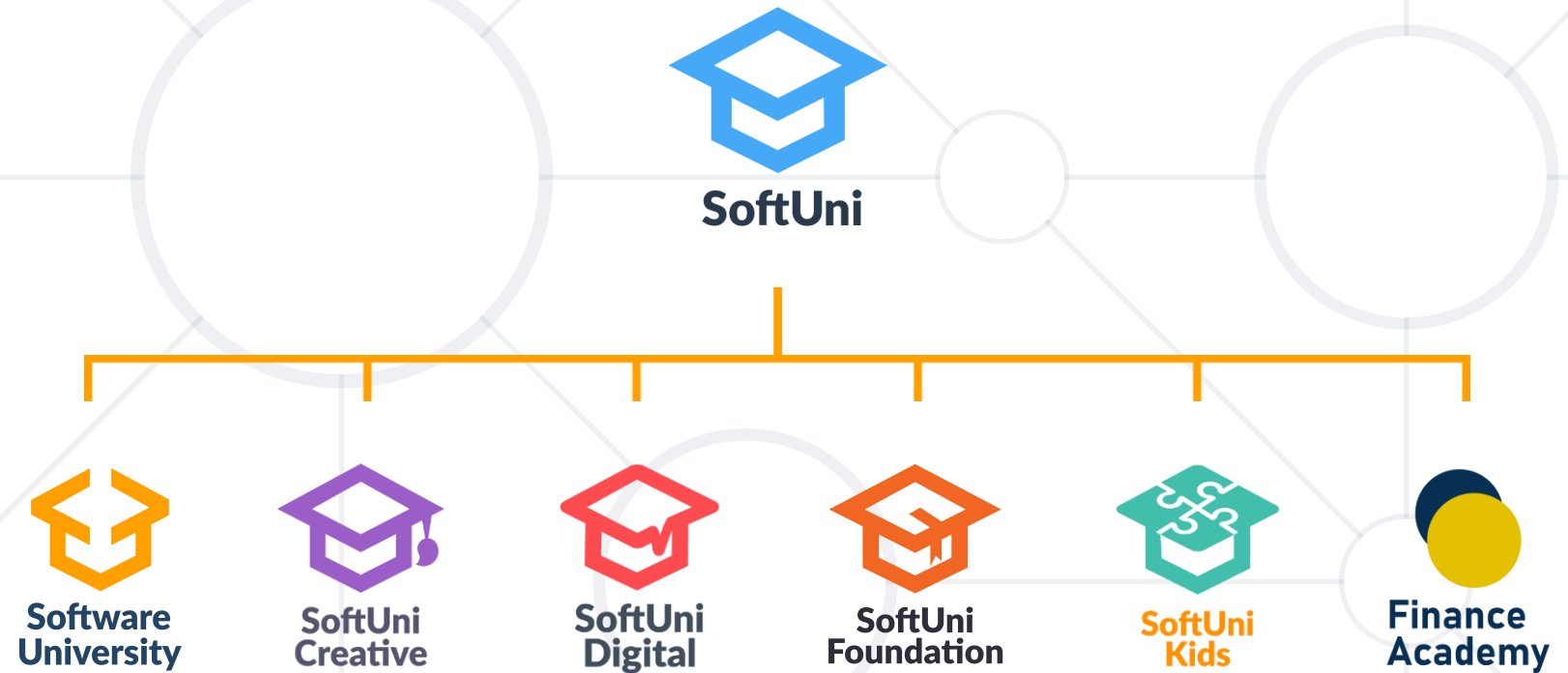
REPL.it

Online IDE for C#, Java, JS, Python and many others



repl.it

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