Language Comparison

C#, Python and JavaScript

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Table of Contents

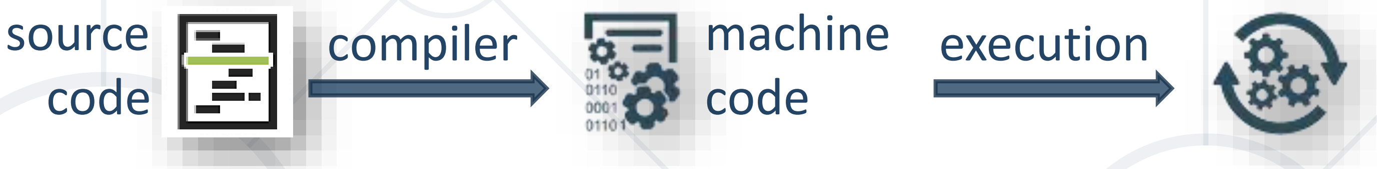
1. Execution Model
2. Variables
3. Data Types
4. Printing on the Console
5. Conditional Statements
6. Loops
7. Development Environments (IDE)

Execution Model

Compiler vs. Interpreter

Language Execution Model

- **Compiled** languages



source code

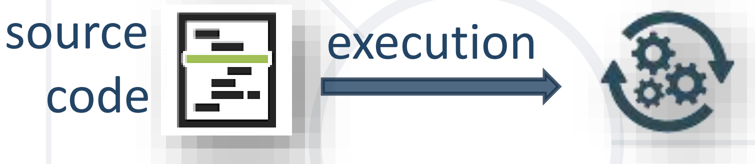
compiler

machine code

execution

  - 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



source code

execution

  - 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

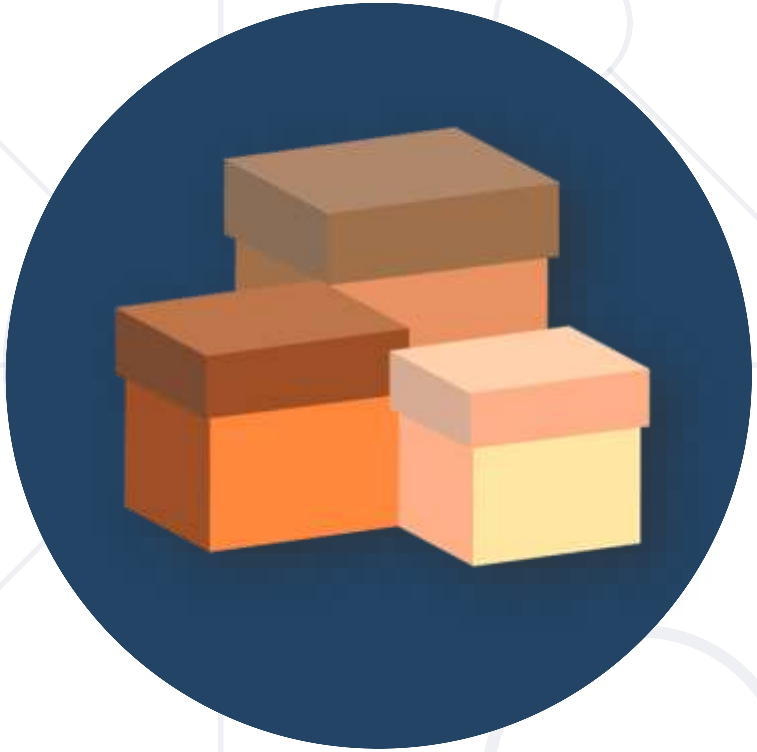
- **Type systems** in programming languages
  - **Statically-typed** languages perform type checking at compile time
    - Examples: C#, Java, Swift, C++
  - **Dynamically-typed** languages perform type checking at runtime
    - Examples: Python, JS, PHP

C#

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

JS

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



Variables

Declaring Variables in C#, JS and Python

Declaring Variables in C#

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

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

```csharp
int firstNumber = 5;
string name = "Peter";
bool 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;
```

Declaring Variables in Python

- **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#, JS and Python

Primitive Data Types in C#

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

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

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#, 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 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**

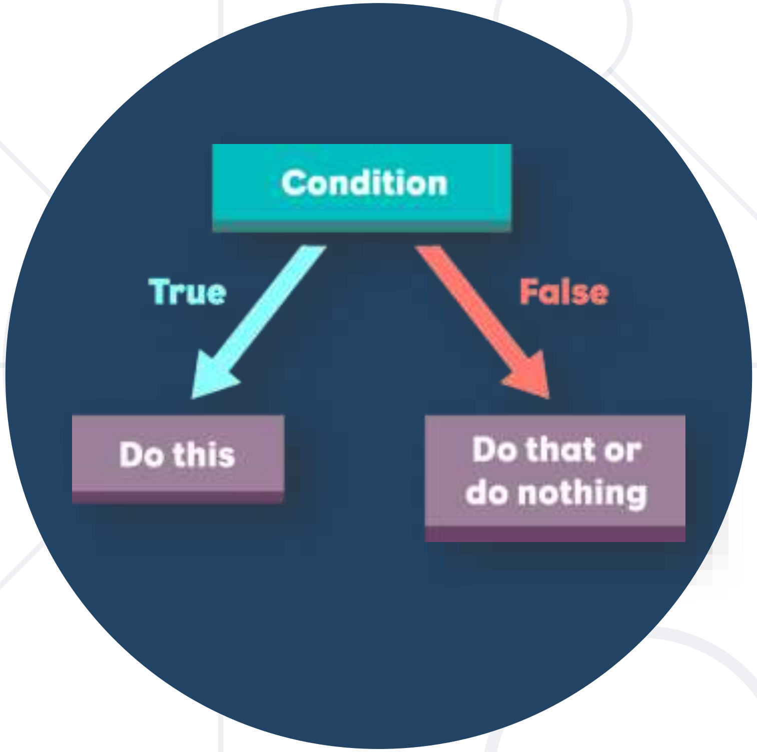
```
print("Peter")
```

- **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#, JS and Python

If-Else Statements in C#

- **if-else** in **C#**

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

If-Else in JavaScript and Python

- `if-else` in **JavaScript**

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

- `if-else` in **Python**

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

Loops

Loops in C#, JS and Python

While Loop in C#

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

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

IDE

Integrated Development Environments

Most Popular IDE for C#

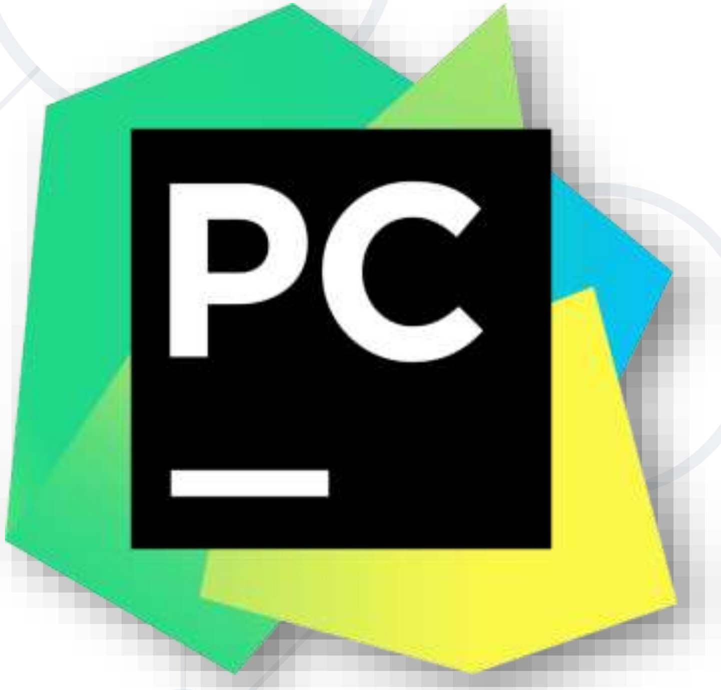
Visual Studio

Most Popular IDE for JavaScript

Visual Studio Code

Most Popular IDE for Python

PyCharm



Universal Online IDEs

REPL.it

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