

OOPs Advanced Concepts Comparison

Feature	Java	Python	C++
Syntax for Defining Inheritance	class Child extends Parent {}	class Child(Parent):	class Child : public Parent {}
Multiple Inheritance	Not supported directly. Achieved through interfaces with implements.	Fully supported. Handled using Method Resolution Order (MRO).	Fully supported. Handled via virtual inheritance to avoid the Diamond Problem.
Access Modifiers	public, protected, private. No support for private inheritance.	No strict keywords for access modifiers, but uses <code>_protected</code> and <code>__private</code> name mangling conventions.	public, protected, private inheritance. Control over visibility in the derived class.
Method Overriding	Uses <code>@Override</code> annotation. <code>super</code> keyword to call the parent method.	Supports overriding. Uses <code>super()</code> to call the parent method.	Supports overriding with <code>virtual</code> keyword. C++11 onwards allows <code>override</code> keyword for clarity.
Constructor and Destructor Calls	Child class constructor calls parent class constructor using <code>super()</code> . No destructors (garbage collector handles cleanup).	<code>super().__init__()</code> or <code>ParentClass.__init__(self)</code> for constructor chaining. Destructors (<code>__del__</code>) rarely needed due to garbage collection.	Parent constructor called automatically, or explicitly in child. Destructors called in reverse order (child first).

Abstract Classes and Interfaces	Abstract classes and interfaces enforce method overriding. Interfaces can have default methods from Java 8 onwards.	Abstract classes use the abc module. Methods marked with @abstractmethod.	Abstract classes created using pure virtual functions (= 0). Any class with at least one is abstract.
Inheritance Types	Single inheritance only (via extends). Multiple inheritance through interfaces (via implements).	Supports single and multiple inheritance directly.	Supports single and multiple inheritance directly.
Diamond Problem	Avoided by design—multiple inheritance not allowed for classes. Interfaces are used to avoid this issue.	Handled using Method Resolution Order (MRO) to ensure the correct method resolution path.	Resolved using virtual inheritance (virtual keyword).

This table provides a structured overview of how inheritance is managed in Java, Python, and C++.

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