

Inheritance :

```
class Animal:
```

```
    def __init__(self, name, species):
```

```
        self.name = name
```

```
        self.species = species
```

```
    def speak(self):
```

```
        pass
```

```
# Derived class (Child class) inheriting from Animal
```

```
class Dog(Animal):
```

```
    def __init__(self, name, breed):
```

```
        super().__init__(name, species="Dog")
```

```
        self.breed = breed
```

```
    def speak(self):
```

```
        return f"{self.name} barks!"
```

```
# Another derived class (Child class) inheriting from Animal
```

```
class Cat(Animal):
```

```
    def __init__(self, name, color):
```

```
        super().__init__(name, species="Cat")
```

```
        self.color = color
```

```
    def speak(self):
```

```
        return f"{self.name} meows!"
```

```
dog = Dog("Buddy", "Golden Retriever")
```

```
cat = Cat("Whiskers", "Gray")
```

```
print(f"{dog.name} is a {dog.species} of breed {dog.breed}. {dog.speak()}")
```

```
print(f"{cat.name} is a {cat.species} with {cat.color} fur. {cat.speak()}")
```

Abstraction:

```
class Person:
```

```
    def __init__(self, name, age):
```

```
        self.name = name
```

```
        self.age = age
```

```
    def introduce(self):
```

```
        print(f"Hi, I'm {self.name} and I am {self.age} years old.")
```

```
person1 = Person("Alice", 30)
```

```
person2 = Person("Bob", 25)
```

```
print(person1.name) # Output: Alice
```

```
print(person2.age) # Output: 25
```

```
person1.introduce() # Output: Hi, I'm Alice and I am 30 years old.
```

```
person2.introduce() # Output: Hi, I'm Bob and I am 25 years old.
```

Encapsulation:

```
class Student:
```

```
    def __init__(self, name, age):
```

```
        self.__name = name # Private attribute
```

```
        self.__age = age # Private attribute
```

```
    def get_name(self):
```

```
        return self.__name
```

```
    def set_name(self, name):
```

```
        if len(name) > 0:
```

```
            self.__name = name
```

```
def get_age(self):  
    return self.__age  
  
def set_age(self, age):  
    if age >= 0:  
        self.__age = age  
  
def display_info(self):  
    print(f"Name: {self.__name}, Age: {self.__age}")  
student1 = Student("Alice", 20)  
student1.display_info()  
student1.set_name("Bob")  
student1.set_age(22)  
student1.display_info()
```

Polymorphism:

```
class Shape:  
    def area(self):  
        pass  
  
class Circle(Shape):  
    def __init__(self, radius):  
        self.radius = radius  
  
    def area(self):  
        return 3.14 * self.radius * self.radius  
  
class Rectangle(Shape):  
    def __init__(self, width, height):
```

```
self.width = width
```

```
self.height = height
```

```
def area(self):
```

```
    return self.width * self.height
```

```
def print_area(shape):
```

```
    print(f"Area: {shape.area()}")
```

```
circle = Circle(5)
```

```
rectangle = Rectangle(4, 6)
```

```
print("Circle:")
```

```
print_area(circle)
```

```
print("Rectangle:")
```

```
print_area(rectangle)
```



