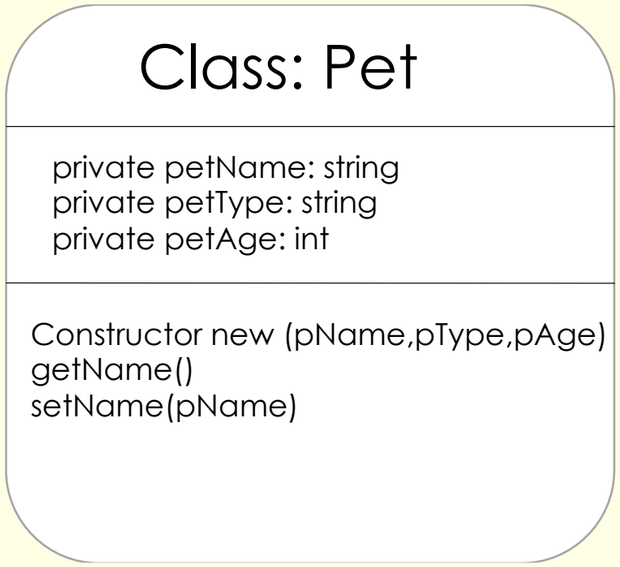
Object Oriented Programming

Key Definitions:

Keyword	Definition
Class	A blueprint for creating objects that defines attributes (data) and methods (behaviour).
Object	An **instance of a class** with specific values for its attributes.
Encapsulation	Hiding an object's data and only allowing controlled access through methods (getters and setters).
Inheritance	A child class inherits attributes and methods from a parent class, promoting code reuse.
Polymorphism	The ability for methods to take multiple forms, either by method overloading or method overriding. Method Overriding - When a child class redefines a method inherited from the parent class to change its behaviour. Method Overloading- When multiple methods in the same class have the same name but different parameters
Abstraction	Hiding complex implementation details and exposing only essential features to the user.
Constructor	A special method that is automatically called when an object is created, used to initialise attributes.
Getter Method	A method that retrieves (gets) the value of an attribute.
Setter Method	A method that updates (sets) the value of an attribute.
Public	Allows attributes and methods to be accessed from anywhere.
Private	Restricts access to attributes and methods within the same class.
Protected	Allows access within the class and its subclasses.

Below is an example of a Pet Class and inheritance

Inheritance allows a class to inherit properties and behaviours from another class, reducing code duplication.



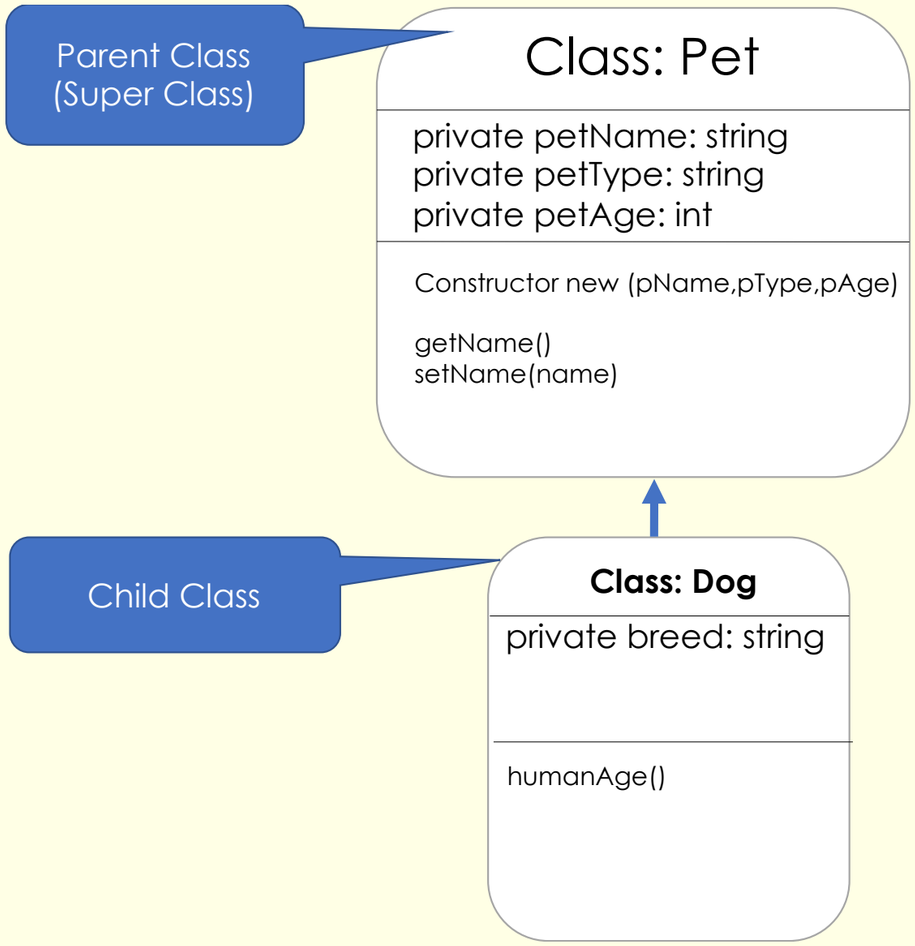

```
class Pet()
    private petName
    private petType
    private petAge

    #Constructor
    public procedure new(pName, pType, pAge)
        petName = pName
        petType = pType
        petAge = pAge
    end procedure
    #Getter methods return the value of an attribute
    public function getName()
       return petName
    end function
    # Setter methods let you change the value of an attribute
    public procedure setName(pName)
       petName = pName
    end procedure
```

Constructor method
To create an instance of an object from a class

```
#main program
# pet object
myPet = new Pet("Buster","dog",5)
#Access an attribute
print(myPet.getName())
#Change an attribute
myPet.setName("Bob")
```

Encapsulation is the concept of restricting direct access to an object's data and allowing interaction only through getter and setter methods.




```
class dog inherits pet
    private breed
     """constructor class"""
    public procedure new (pName, pType, pAge, pBreed)
        super(pName, pType, pAge)
        breed = pBreed
    end procedure

    public procedure humanAge()
        humanAge = petAge * 7
        print(humanAge)
    end procedure
end class
```

Class: Pet

private petName: string
private petType: string
private petAge: int

Constructor new (pName,pType,pAge)

getName()
setName(name)
display()

Class: Dog

private breed: string

humanAge()
display()

Polymorphism

Polymorphism lets the same method name work in different ways, either in different classes or with different parameters in the same class.

Method Overriding

A child class replaces a method from the parent class with its own version.

Parent Class – Pets

```
procedure display()
    print( “Name”, petName)
    print(“Type”, petType
    print(“Age”, petAge)
end procedure
```

Child Class – Dogs

```
procedure display()
    print( “Name”, self.name)
    print(“Type”, petType)
    print(“Age”, petAge)
    print(“Breed”, breed)
end procedure
```

Object Oriented Programming
Below is an example of a Pet Class:

Object pseudocode	Explanation	Python Code
class Pet	A class will contain class variables, constructor method and methods	class Pet(object):
private petName private petType private petAge	Define the class variables: public or private Private – means only accessible within the class Public – means outside the class Protected - means can be shared with any child classes	Not required in python but in the exam add a comment next to the attribute to make it clear it is private, for example: self.age = pAge #private

public procedure new(pName, pType, age)
 	
petName = pName
petType = pType
petAge = pAge
 	
end procedure
	Constructor method for pets class
	
	This is what will happen when you create a new instance of pet (known as an object)
	
	Must use correct declaration appropriate name and new
	
	Include any parameters required for creating a new object
		def __init__(self,pName,pType,pAge):
		self.petName = pName #private
		self.petType = pType #private
		self.age = pAge #private

public function getName()
return petName
end function
 	
public procedure setName(pName)
petName = pName
end procedure
	Method are usually public.
	
	It can be a procedure or function (return something).
	
	getter methods are used to **return** an objects attribute
	
	setter methods are used to change an attribute
		def getName(self):
		return self.name
		
		def setName(self,name):
		self.name = name

myPet = new Pet("Buster", "Dog", 3)	This is used to create a new instance of Pet (class instantiation) in the main program	myPet = Pet("lily", "dog", 3
print(myPet.getName())	This is how you use a method within a class	print(myPet.getName() myPet.setName("Fred")

Inheritance

OOP pseudocode	Explanation	Python Code
class Dog inherits Pet	The dog class inherits the methods and attributes from Pet The Pet class is the Parent class (superclass) The Dog class is the child class	class Dog(Pet): """pet class"""

Class Dog inherits Pet
 	
private breed
 	
#Constructor Method
public procedure new(pName, pType, pAge, pBreed)
super (pName,pType, pAge)
 	
breed = pBreed
 	
end procedure
end class
 	
Alternative:
 	
Class Dog inherits Pet
 	
private breed
 	
#Constructor Method
public procedure new(pName, pType, pAge, pBreed)
super.petName = pName
super.petType = pType
super.petAge = pAge
 	
breed = pBreed
 	
end procedure
end class
	In the child class, you can declare new class variables, in this case , dogbreed
	
	In the constructor method list all the parameters and then in the method to refer to attributes inherited form the parent class use the super.*inheritedvariable*
		class Dog(Pet):
		
		def __init__(self,pName,pType,pAge,pBreed):
		super().__init__(pName,pType,pAge)
		self.breed = pBreed

private procedure humanAge() humanAge = petAge * 7 print (humanAge) end procedure	This method private as it is only to accessed within the Dog class	def humanAge(self): humanAge = self.petAge * 7 print(humanAge)
myDog= new Dog("Buster", “Dog”, 3, “Border terrier”)	Main Program: Create a new instance of dog using all the constructor parameters.	myDog = dog(“Buster”,”Dog”, 4, “Border terrier”)
print(MyDog.getName()) myDog.humanAge()	In the main program, you can then use methods in the dog class and pet class.	print(myDog.getName()) mydog.humanAge()