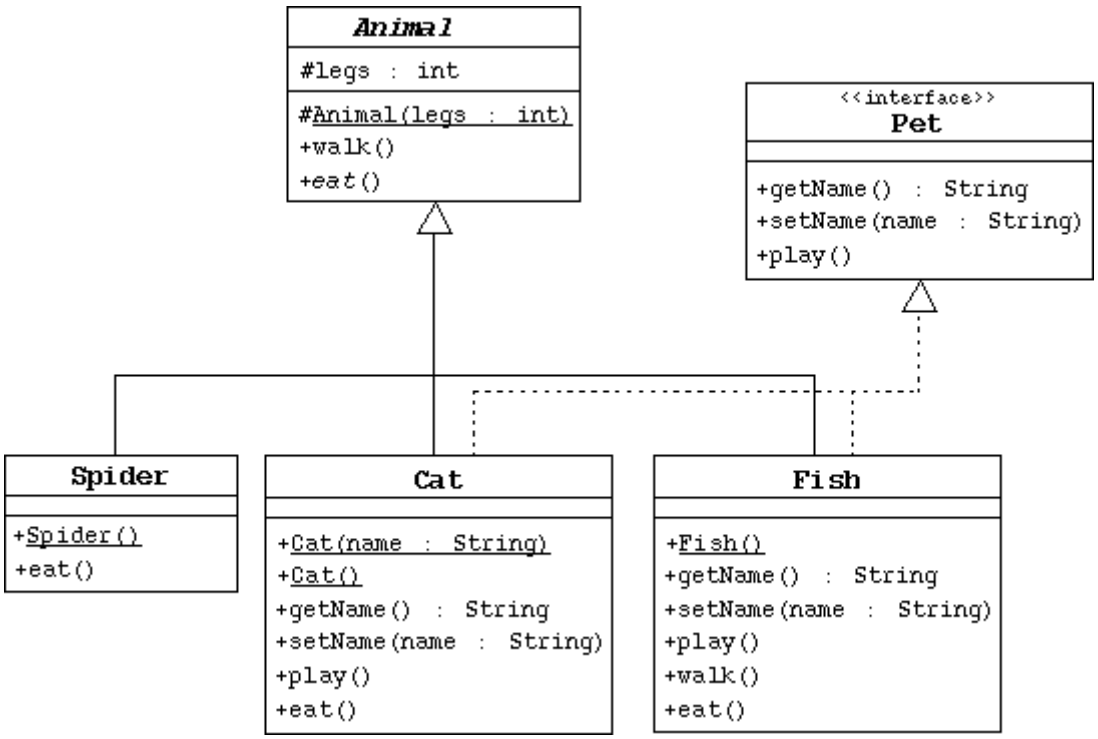
SWE1007 – Lab Exercise on Interfaces

Question 1

Assume that there is a part in a machine having three side measurements s1, s2, s3. Its inner and outer vloumes are found using the following formulae:
inner volume = 1/3 π s1*s2*s3
outer volume = 4/3 π s1*s2*s3

Define an interface **volume** which has two methods innerVolume and outerVolume. Define a class **Part** which implements this interface, having required attributes and methods, with suitable constructor.
The show() method is used to display all the attributes of the Part class.

Question 2



1. Create the Animal class, which is the abstract superclass of all animals.

   - Declare a protected integer attribute called legs, which records the number of legs for this animal.
   - Define a protected constructor that initializes the legs attribute.
   - Declare an abstract method eat.
   - Declare a concrete method walk that prints out something about how the animals walks (include the number of legs).

2. Create the Spider class.

   - The Spider class extends the Animal class.
   - Define a default constructor that calls the superclass constructor to specify that all spiders have eight legs.
   - Implement the eat method.

3. Create the Pet interface specified by the UML diagram.
4. Create the Cat class that extends Animal and implements Pet.

   - This class must include a String attribute to store the name of the pet.
   - Define a constructor that takes one String parameter that specifies the cat's name. This constructor must also call the superclass constructor to specify that all cats have four legs.
   - Define another constructor that takes no parameters. Have this constructor call the previous constructor (using the this keyword) and pass an empty string as the argument.
   - Implement the Pet interface methods.
   - Implement the eat method.

5. Create the Fish class. Override the Animal methods to specify that fish can't walk and don't have legs.
6. Create an TestAnimals program. Have the main method create and manipulate instances of the classes you created above. Start with:

   ```
   Fish d = new Fish();
   Cat c = new Cat("Fluffy");
   Animal a = new Fish();
   Animal e = new Spider();
   Pet p = new Cat();
   ```

7. Experiment by: a) calling the methods in each object, b) casting objects, c) using polymorphism, and d) using super to call super class methods.