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| **Course Number** | *CSci 120* |
| **Descriptive Title** | *Object-oriented Programming* |
| **Programming Language** | *Java* |

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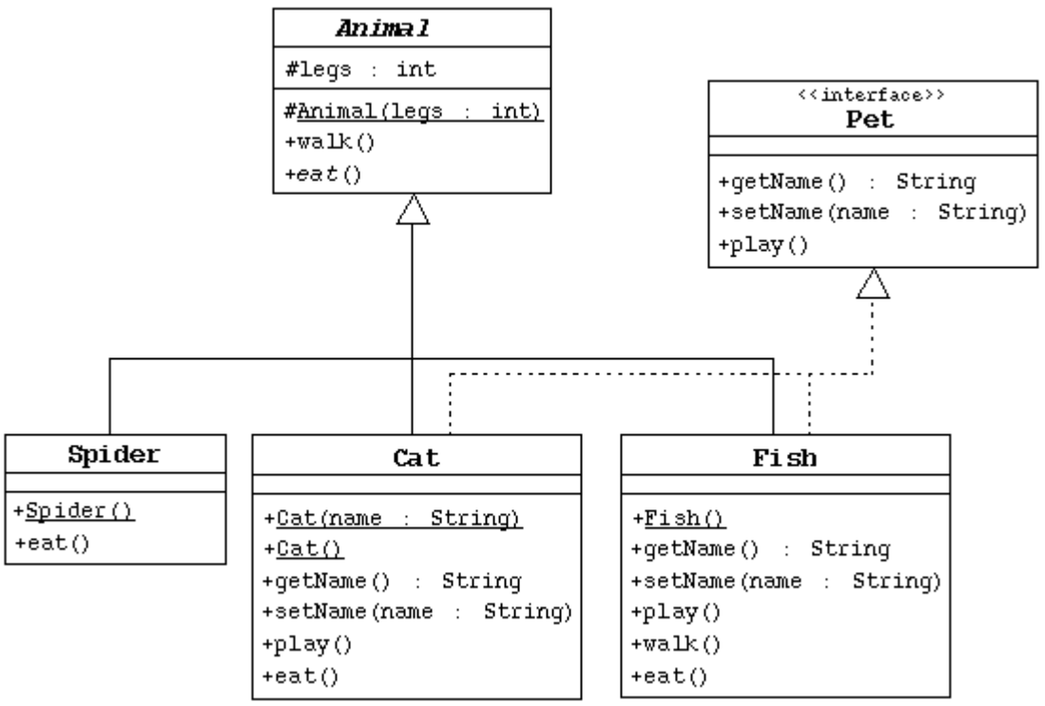
| **Problem Set Number** | *7* |
| **Problem Number** | *2* |
| **Activity Title** | *Use Interfaces and Abstract Classes* |

## Objective

In this exercise you will create a hierarchy of animals that is rooted in an abstract class `Animal`. Several of the animal classes will implement an interface called `Pet`. You will experiment with variations of these animals, their methods, and polymorphism.

## Directions




1. Create the `Animal` class, which is the abstract superclass of all animals.
    a. Declare a protected integer attribute called `legs`, which records the number of legs for this animal.
    b. Define a protected constructor that initializes the `legs` attribute.
    c. Declare an abstract method `eat`.
    d. Declare a concrete method `walk` that prints out something about how the animals walks (include the number of legs).
2. Create the `Spider` class.
    a. The `Spider` class extends the `Animal` class.
    b. Define a default constructor that calls the superclass constructor to specify that all spiders have eight legs.
    c. 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`.
    a. This class must include a `String` attribute to store the name of the pet.
    b. 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.

c. 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.

d. Implement the `Pet` interface methods.

e. 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. Implement the `eat` method.

6. Create a `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();
```

Experiment by:

a) calling the methods in each object

b) casting objects

c) using polymorphism

d) using `super` to call super class methods.