
JAVA
ABSTRACT
CLASSES

Objective

The primary objective of this lab is to provide you with the skills necessary to be able to create and work with abstract classes.

Part 1

In the previous lab, it does not make sense to create an object of the Shape type.

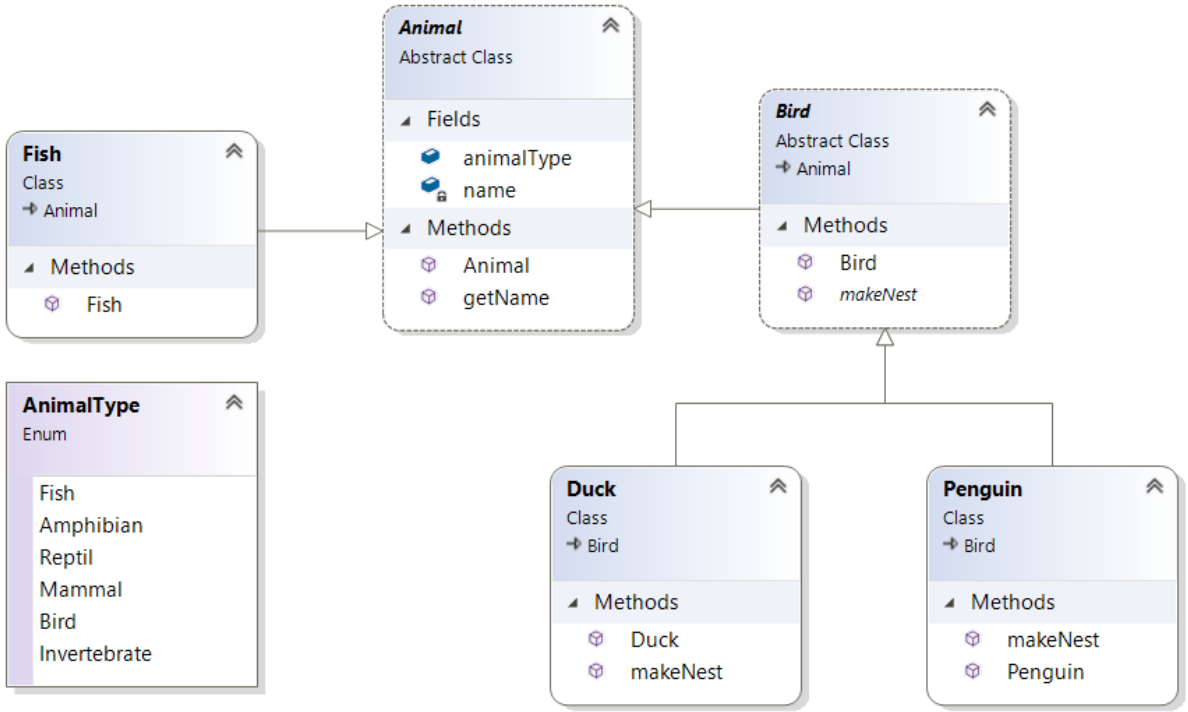
Please mark the Shape class as abstract and then run your code.

Part 2

You are going to have Penguins, Ducks, and Fish in a collection.

Penguins and Ducks will be derived from the Bird class. We have decided that 'Bird' is too abstract for what we want.

The class diagram after completing the lab can be seen below.



Step by step

1. Create a new class called **Program** with a **main()** method in a package called **exercise9**.
2. Add the following classes to the package:
   a. Animal, Bird, Fish, and Duck

3. Create an enum to define the six animal types like:

```
enum AnimalType {
 Fish,
 Amphibian,
 Reptil,
 Mammal,
 Bird,
 Invertebrate
}
```

4. Add code to the Animal class:
   a. Make this class **abstract**
   b. Add a field to define the type, like:
      `AnimalType animalType;`
   c. Add a field called **name** with **getName()** method.
   d. Provide this class with a constructor to set the animal's name.

5. Add code to the Bird class:
   a. Make this class also **abstract**
      we want to make different kinds of birds, not a generic bird!
   b. **extends** the Animal class.
   c. Create a constructor to set the bird's name.
   d. Set the type of the animal to Bird within the constructor.
   e. Provide it with an abstract method called makeNest() because all birds make their nest in a different way.

      Tip: `public abstract void makeNest();`

6. Write code for the Duck class:
   a. **extends** Bird.
      By default a **Duck** will also be an **Animal** (Bird extends Animal).
   b. You'll need to provide a constructor because the super class (Bird) has a constructor with a String parameter to set the name.
   c. Implement the makeNest() method (just print a message).

7. Write code for the Penguin class:
   a. **extends** Bird.
   b. Provide a constructor similar to the Duck class.

8. Create a class called Fish and set its name and type using a constructor
   Feel free to give the fish other methods like swim().

9. Open class `Program`.
    a. Create an array/ArrayList of **Animal** called **animals**
    Place different Animal instances in the array.
    b. Write an enhanced '`for`' loop that iterates over the **animals**.
    This is an example of **Polymorphism**.

    Every Fish, Penguin, or Duck can be referred to as an Animal and can therefore be placed in a collection of type Animal.
10. Run your code to make sure it works.
11. How would you detect if an animal in the list is a Bird and how would you then call its makeNest() method?
12. Add other animal type if you have time.