



Task: Object Oriented Programming - Inheritance

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Introduction

Welcome to the Inheritance Task!

Inheritance is quite a complicated concept to grasp but it is an important feature of OOP that you will need to understand to make yourself proficient in programming. It is a useful feature used to make your code neater and more logical.



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What is inheritance?

To help us understand inheritance we are going to consider an example using animals. Consider two animals – a lion and a cheetah. Although these are not the same animal, they are both animals so they have certain things in common. Let's say all animals have four legs and a head and teeth. Because all animals have these features, we can define a lion and a cheetah as animals.

Now let's put this in a programming context. If we had to create a class for a lion and one for a cheetah, we would find that we would be duplicating a lot of the same methods and fields in the two classes because the two animals are similar and therefore have features in common. Programmers are lazy! So we always want to try do things as efficiently as possible which means we minimise the number of duplicates we create. To do this in this example we could make use of inheritance

If we created a class for animals and we defined all the common methods and fields for the two animals in here, we could then **derive** the lion and cheetah classes from it. We would create another two classes – one for the lion and one for the cheetah. These would both **inherit** all the methods and fields from the **superclass** – the animal class. This means the lion and cheetah classes would both have all the properties that the animal class has as well as others which would be specific to that class. Think of the lion and cheetah class as subclasses of the animal class.

Inheritance - hands on!

Let's create the scenario above. Create an animal class with variables common to both the lion and the cheetah e.g. number of teeth, spots(Boolean), weight. We will now create the lion class. An example animal class has been included in the task folder in case you get confused.

It is, however, advised that you create one on your own to practice your skills. The animal class is very similar to previous classes you have created so there should be nothing new there. The lion class will seem quite different to any other class you have created, but do not worry you will understand everything shortly.

Below is the initial setup of the lion class:

```
public class Lion extends Animal{  
  
    public Lion(int numTeeth, boolean spots, int weight) {  
        super(numTeeth, spots, weight);  
    }  
  
}
```

You will notice many unusual things here. The first will be the word 'extends'. This is a Java keyword which tells Java that you are using inheritance and it also tells Java that the class name which follows this keyword is the class you will be inheriting from – in this case it is the 'Animal' class.

The next thing you will notice is the constructor. If the class you are inheriting from has a constructor which requires parameters, these parameters have to be passed into the subclass and the superclass object must be constructed using these parameters.

You will see that the keyword 'super' is used to denote the superclass. The constructor of the super class is used here without defining a specific object for it. This is a special case because it is being used in inheritance and therefore it will not cause an error. When accessing methods and variables of the superclass the 'super' keyword will be used along with the dot operator.

You can now add anything to this class that is specific to a 'lion' and it will have those features in addition to all those which are specific to all animals.

Please note that when you use a field or a method of the superclass it will not change for all instances of the superclass. It will only change for that particular instance. Inheritance is not the same as using static variables or methods.

Compulsory Task 1

Follow these steps:

- Modify the existing Animal.java file for this task.
- Using the Lion class template as shown in the pdf file, expand the class to have features specific to a lion.
- Add a field for lion type.
- Add a method in this class which sets the lion type based on it's weight (note that the weight is a derived field from the superclass).
- If they weight is less than 80kg, it's type should be a cub. If less than 120kg, it should be female. And if greater than 120kg.
- Print out the type of lion.
- Compile, save and run your file.

Compulsory Task 2

Follow these steps:

- Modify the existing Animal.java file for this task.
- Create a class called 'Cheetah' that:
 - Inherits from the Animal class.
 - Makes use of at least one static field which needs to have a static setter and getter.
 - Contains a constructor.
 - Contains a toString() method.
 - Has an array as one of it's fields.
- Create an application class, and within it create a Cheetah object and print it out with the main method.
- Compile, save and run your file.



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