**1 question**

**DIRECTIONS: Please complete the following program according to the specification given. Remember that all program segments are to be written in Java.**

Partial credit will be given for incomplete answers, so provide as much of the answer as you can.

Notes:

* Assume that the classes listed in the Quick Reference found in the Appendix have been imported where appropriate.
* Unless otherwise noted in the question, assume that parameters in method calls are not null, and that methods are called only when their preconditions are satisfied.
* In writing solutions for each question, you may use any of the accessible methods that are listed in classes defined in that question. Writing significant amounts of code that can be replaced by a call to one of these methods may not receive full credit.

Consider the hierarchy of classes shown for a small part of a bird sanctuary.

Bird

Owl

SnowyOwl

ElfOwl

Notice that an Owl *is-a* Bird, a SnowyOwl *is-a* Owl, and an ElfOwl *is-a* Owl.

The class Bird is specified as an abstract class as shown in the following declaration. Each Bird has a name and a noise that are specified when it is constructed.

public abstract class Bird {

private String myName;

private String myNoise;

/\*\* Constructor for objects of class Bird \*/

public Bird (String name, String noise) {

myName = name;

myNoise = noise;

}

public String getName() { return myName; }

public String getNoise() { return myNoise; }

public abstract String getFood();

}

1. An Owl is a Bird whose noise is "hoot". The food it eats depends on the type of Owl, which means that getFood cannot be implemented in the Owl class. Given the hierarchy shown above, write a complete class declaration for the class Owl, including its constructor and any method(s).
2. A SnowyOwl is an Owl whose name is always "Snow owl". A SnowyOwl will randomly eat a hare, a lemming, or a small bird (depending on what's available!), where each type of food is equally likely. The SnowyOwl class should use a random number to determine which food the SnowyOwl will eat (E.g. if num is 1, eat hare, if num is 2, eat lemming etc). Assuming that the Owl class has been correctly defined, and given the class hierarchy shown previously, write a complete declaration of the class SnowyOwl, including implementation of its constructor and method(s).

Hint: To get a whole number between 1 and 3, use Math.random() to get a random decimal number between 0 and 1, and then multiply by 3 and cast to int (or use Math.round()) to get a whole number.

1. Consider the following partial declaration of class BirdSanctuary.

public class BirdSanctuary {

/\*\* The list of birds \*/

private Bird[ ] birdList;

/\*\*

\* Precondition: Each Bird in birdList has a getFood method implemented

\* for it.

\* Postcondition: For each Bird in the birdList array, its name followed by

\* the result of a call to its getFood method has been

\* printed, one line per Bird. \*/

public void allEat() {

/\* to be implemented in this part \*/

}

//The constructor and other methods are not shown.

}

Complete method allEat below.

public void allEat() {

}