

MAT 202 – Computer Science II

Homework #4 - A Pet Hierarchy

1. Name _____
2. Due: 10/31/05 10:30am
3. Grading

In this project we are going to create an abstract class **Animal** along with several derived classes. Include a string data member of **Animal** to store the type of animal being discussed. **Animal** will have at least two purely virtual functions for eating and sleeping. Also, all animals must have a weight and length according to our hierarchy, so include functions for getting weight and length as shown below. Also, our animals may grow, so include mutators for setting weight and length. Never allow these values to be set inappropriately. Animals also have a boolean value which describes whether it can fly or not. Lastly, we can compare two **Animals** by overloading the less than operator. One animal is considered less than another animal if it weighs less.

Pure virtual functions:

```
void eat();  
void sleep();
```

Virtual Functions:

```
void set_weight(float w);  
void set_length(float l);  
void set_can_fly(bool b);
```

Invariant Functions:

```
string get_type();  
float get_weight();  
float get_length();  
bool operator<( Animal & rhs); \\ I had problems with adding const here  
bool can_fly();
```

Cat will be a derived class of **Animal** and it will have a string variable for its color. Don't forget to also alter its constructor to set it to an **Animal** of the correct type, weight and length. For the purposes of this project, when cats sleep, they sleep for twelve hours. When a cat eats, it eats for one hour. This class should NOT be an abstract class.

Virtual Functions:

```
string get_color();
```

Overridden Functions:

```
void sleep();  
void eat();
```

Dragon will be another derived class of **Animal**. It should also have a string variable for its disposition. As before, construct the dragon appropriately. Dragons eat for 24 hours and sleep for 2400 hours. Also, dragons have a minimum length of four feet. Dragons who weigh over two thousand pounds cannot fly, otherwise they can fly.

Virtual Functions:

```
string get_disposition();
```

Overridden Functions:

```
void sleep();  
void eat();  
void set_length();  
void set_weight();
```

`void sleep();` an output fn that outputs the special variable (color or disposition) followed by the type of animal & how long it sleeps.

`void eat();` an output fn that outputs the special variable (color or disposition) followed by the type of animal & how long it eats.

`istream & operator>>(istream & out, Animal * & a);` is an input function that declares memory for and gets an **Animal** input.

A very simple main.cpp:

```
#include <iostream>  
#include "Dragon.h"  
#include "Cat.h"  
    \\ I do not include Animal.h because presumably Cat.h and Dragon.h does  
int main()  
{  
Animal *a;  
cout << "Input a c for cat or d for dragon followed by the animal's"  
    << "weight, height and special (color or disposition)";  
cin >> a;  
cout << "The animal is a " << a->get_length() << " foot long " << a->get_type()  
<< ", weighs " << a->get_weight() << " pounds and it ";  
if(a->can_fly() == true)  
    cout << "can fly" << endl;  
else  
    cout << "cannot fly" << endl;  
for(int i = 0; i < 2; i++)  
{  
    a->eat();  
    a->sleep();  
    a->set_weight(a->get_weight()+100); \\ grow one hundred pounds  
}  
cout << "The animal is a " << a->get_length() << " foot long " << a->get_type()  
<< ", weighs " << a->get_weight() << " pounds and it ";  
if(a->can_fly() == true)    cout << "can fly" << endl;  
else    cout << "cannot fly" << endl;  
}
```

SAMPLE INPUT:

d 1900 100 angry

SAMPLE OUTPUT:

The animal is a 100 foot long dragon, weighs 1900 pounds and it can fly

The angry dragon eats for 24 hours.

The angry dragon sleeps for 2400 hours.

The angry dragon eats for 24 hours.

The angry dragon sleeps for 2400 hours.

The animal is a 100 foot long dragon, weighs 2100 pounds and it cannot fly

SAMPLE INPUT:

c 10 3 black

SAMPLE OUTPUT:

The animal is a 3 foot long cat, weighs 10 pounds and it cannot fly

The black cat eats for 1 hour.

The black cat sleeps for 12 hours.

The black cat eats for 1 hour.

The black cat sleeps for 12 hours.

The animal is a 3 foot long cat, weighs 210 pounds and it cannot fly