

CMPT 225 D2

Fall 2020

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Assignment 1

Inheritance and Polymorphism

Due October 8 at 23:59

You are to write a C++ program with several classes and instances of those classes.

The principal class will be called **Animal**, and it will have four different subclasses for four different types of animal (such as **Cow**, **Horse**, **Cat**, **Dog**, **Mouse**, **Sheep**, etc.). The choice of these subclasses is left to you. **Animal** should be a concrete (not abstract) class.

Animal, and each of its subclasses, should have member functions:

<u>type</u>	<u>name</u>	
string	noise()	// returns a string for the noise of the animal.
int	repeats()	// returns the number of times the animal likes to repeat its noise.
int	ageInMonths()	// returns the number of months this animal has been alive.
void	print()	

You choose the noise string for each animal, for instance, a **Cow** might have a noise of “moo”, and an **Animal** might have a noise of “grunt”. The noise should be constant for all instances of a particular class (all **Cows** should say “moo”). Do not use a non-const variable to store the noise; use a string constant in the noise function. Make noise() have dynamic binding.

Similarly, each type of animal has its own favored number of repeats between 1 and 5. (For example, all **Cows** might like to moo twice, and all **Animals** might like to grunt three times.) Again, do not use a variable to store the repeats number; use an integer constant in the repeats function. Make repeats() have static binding.

Each **instance** of an animal or its subclasses will have its own age. This should be passed to the animal via a constructor argument, and stored in a **private** member variable. Implement ageInMonths() for **Animal** and let your subclasses inherit it.

Similarly implement print() for **Animal** and not for the subclasses. Print should print the animal's age, followed by its noise() repeated repeats() times, all on a single line, followed by a newline. For instance, a sheep of 8 months age might print:

8 baa baa baa

In your `main()` subroutine (or some other subroutine that is called from `main()`), create a variable (instance) of each class that you have defined (five variables total for this). Then run `print()` for each of these variables, and print a blank line afterwards.

After that, declare an array of 10 pointers to **Animals**, and initialize each one with a type of animal. You should include instances of all the different subclasses and an instance of the superclass itself. For instance:

```
animals[0] = new Cat ...  
animals[1] = new Mouse ...  
animals[2] = new Cow ...  
animals[3] = new Animal ...  
animals[4] = new Mouse ...  
...
```

After this initialization, loop through all the elements of the array, executing `print()` on each one. Because `repeats()` is statically bound, each animal should repeat its noise the same number of times.

At the end of the program, delete all of the different animals that you allocated with **new**.

That's it for this assignment; it's intentionally a straightforward one so that you can get used to the compiler and the submission system and because there's only two weeks or so to get it done. Future assignments will also relate to lecture but may require deeper implementation.

Submit your `.h` and `.cpp` files in a zip (preferable) or tar archive. Don't submit your `.exe` or `.o` files.

You will be judged on correctness of your code and on code style, so don't forget to keep your code clean as you develop it! (Or at the very least, clean it up before submission. We don't want to see untidy code.)