



# Lab 07: The Cow Strikes Back

#### **Overview**

This lab's purpose is to provide students with experience in inheritance of classes and working with multiple classes. It is recommended that students use command line tools and editors for this lab (though it is not strictly speaking required). This lab will require students to build on their previous lab experience, in which a version of the **cowsay** utility was created; however, this lab will be written in C++. Note that you will need to set the language version to C++17 in your CMakeLists.txt file for this project.

## **Specification**

Students will convert the driver program (cowsay) from Java and also create two new classes - Dragon and IceDragon. The Dragon class should extend the Cow class, and IceDragon must be derived from Dragon. As before, the HeiferGenerator class is provided for you – but updated to a C++ version (HeiferGenerator.cpp and HeiferGenerator.h). It will also handle the new Dragon class and its subtypes. You must also prepare a CMake build file for this project. Students may implement private attributes and methods if they chose to do so. This is not required – it is purely optional. No public attributes / methods should be added to the specification!

#### **Executable Specification**

Your program must accept command line arguments as follows:

cowsay -1 Lists the available cows

cowsay MESSAGE Prints out the MESSAGE using the default cow
Prints out the MESSAGE using the specified COW

In addition, this version of the utility handles a special set of Cow-derived Dragon classes (and its subclasses). Whenever a dragon-type cow is selected, the display of the message must be followed by a line stating whether or not the dragon is fire-breathing:





#### **Cow Class**

The Cow class must have all the same methods as previously required, though students may add private methods. The methods are repeated here, briefly, for reference. (Note that **setImage()** should be marked as <u>virtual</u>.)

#### **Dragon Class**

The **Dragon** class must be derived from the **Cow** class and must make all its methods available. You may mark any additional methods virtual as necessary. In addition, Dragon must provide the following methods:

```
public Dragon(const string& _name, const string& _image)
```

Constructor; creates new **Dragon** object with given **name** and **image**. This must be its **only** public constructor!

```
public bool canBreatheFire()
```

This method should exist in every Dragon class. For the default Dragon type, it should always return true.

#### **IceDragon Class**

The **IceDragon** class must be derived from the **Dragon** class and must make all its methods available:

```
public IceDragon(const string& _name, const string& _image)
```

Constructor; creates a new **IceDragon** object with the given **name** and **image**. This should be the **only** public constructor for the **IceDragon** class!

```
public bool canBreatheFire()
```

For the **IceDragon** type, this method should always return **false**.

#### **HeiferGenerator Class (Provided)**

```
public static vector<Cow*>& getCows()
```

Returns a reference to a vector of cow object pointers from built-in data set. This will call the **Cow** constructor and **setImage()** methods of the cow class if needed to initialize new cow objects uniquely for each data set.

```
public static Dragon* getDragonPointer(Cow* candidate)
```

If object pointed to by **candidate** is a **Dragon** (including an **IceDragon**), returns a **Dragon** pointer to the object. Otherwise, returns **nullptr**.

### **Submissions**

**NOTE**: Your output must match the example output \*exactly\*. If it does not, *you will not receive full credit for your submission*! (Note that matching sample output is necessary, but not sufficient, for full credit.)

Files: cowsay.cpp, Cow.cpp, Cow.h, Dragon.cpp, Dragon.h, IceDragon.cpp, IceDragon.h, CMakeLists.txt Method: Submit on Canvas

### **Sample Output**

```
finn@BMO:~$ ./cowsay
finn@BMO:~$ ./cowsay Hello World!
```



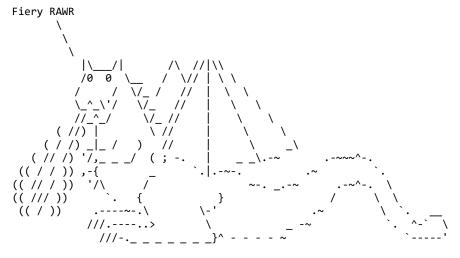
finn@BMO:~\$ ./cowsay -n kitteh Meow-Meow!

finn@BMO:~\$ ./cowsay -n ninja Hello world!
Could not find ninja cow!

finn@BMO:~\$ ./cowsay -1

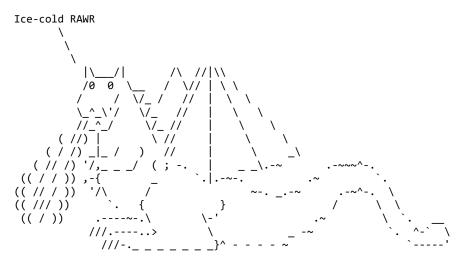
Cows available: heifer kitteh dragon ice-dragon

finn@BMO:~\$ ./cowsay -n dragon Firey RAWR



This dragon can breathe fire.

finn@BMO:~\$ ./cowsay -n ice-dragon Ice-cold RAWR



This dragon cannot breathe fire.