

CSE 4714 / 6714 – Theory and Implementation of Programming Languages

Lab 3 – Vectors and Classes

Vectors are used in C++ when a resizable list data structure is needed.

<https://www.cplusplus.com/reference/vector/vector/>

As all data structures (array, vector, set, etc.) in C++, each vector can only hold one data type. That data type is specified when the vector is declared. For example, a vector that holds integers would be declared as

```
vector<int> mylist;
```

How can we store items of different types in the same vector? For example, in the TIPS Interpreter we will need to store a list of statements within a compound statement. But the statements in the list will not be the same type: some are assignment statements, some are if statements, some are read statements, etc.

One way to accomplish this goal is to use pointers and inheritance. In this lab you will create a set of classes that hold data values: strings, integers, and floating-point numbers. Each of these classes will be derived (inherit from) a common superclass: `DataNode`. Then we can declare a vector that contains pointers to `DataNode` instances.

```
vector<DataNode*> aVector;
```

Because each of our `DataNode` subclasses (`StringNode`, `IntegerNode`, `FloatNode`) are `DataNodes`, we can add pointers to string nodes, integer nodes, and float nodes to the vector.

Instructions

Complete the `StringNode`, `IntegerNode`, and `FloatNode` classes. Each class requires constructor, destructor, and `printTo` methods. Each constructor should accept an argument and save that value within the node. The `printTo` method is an example of *double dispatch*:

https://en.wikipedia.org/wiki/Double_dispatch

Once the data node classes are complete, use the comments within `driver.cpp` as instructions on what functionality should be added to the `main` method.

Use the files in `Lab_3_Starting_Point.zip` as a starting point for your program.

Output

The expected output is shown in the `output.correct` file.

HINT: Use `diff` to compare the output of your program to the expected output file. This is much easier than trying to compare the files manually.

Deliverable

The deliverable is a zip file of the files needed to build and execute your program. Create a zip file named `netid_lab_3.zip` and upload that file to the assignment. Do not include any files generated by the `makefile` in your submission. For example, your submission should not include any `.o` or executable files.

Grading

Feel free to assist other students on this lab assignment. If you need additional help, please contact the TA or attend their office hours.

Category	Percentage
Correct Output	45
Does not hard code size of the vector or accesses to vector elements	15
Uses an iterator in the driver method	15
Sets pointers to <code>nullptr</code> after calls to destructors	15
Submitted Correctly	10

Initial submissions that are late will be penalized 10 points for each day past the due date/time. The timestamp of your last submission will be used to calculate the late penalty.

Any code that does not compile / run in the Windows Subsystem for Linux will receive a grade of 0.