Data Structures
BITL3

Worksheet 4

Fall 2022

6 October 2022

1. **Warm up:** Answer the following True / False questions.

   (a) If your code initiates a `class` with a constructor, you must delete it with a destructor.

   (b) The private members of a `class` can never changed.

   (c) Every method of a `struct` can be chained.

2. This problem refers to the following uncompiled `C++` files.

database.cpp

```
#include <iostream>
#include <string>
using namespace std;
using std::string;
#include "header.h"
int main() {
    Bank Trusty;
    Employee Dusty;
    ...
    return 0;
}
```

header.h

```
struct Bank {
    string name;
    int employeeNum;
    Bank() { employeeNum = 0; };
};

class Employee {
    string name;
    Bank employer;
    public:
        Employee();
};
Employee::Employee() {}
```

   (a) Which (nonempty) line in `header.h` is unnecessary? That is, removing which line will produce the same program?

   (b) For each the following options to place in the line `...` of `database.cpp`, decide whether or not an error will be produced when the file is compiled. If no error is produced, what will be the ouput when the resulting program is executed?

      i. `cout << Trusty.employeeNum << endl;`
      ii. `cout << Trusty.name << endl;`
      iii. `Dusty.name = "Gutsy";`
      iv. `Trusty.name = "Musty"; cout << Bank.name << endl;`
      v. `Dusty.employer = Trusty; Dusty.employer.employeeNum++;`

   (c) Create new public functions `setName` and `getName`, with constructors, for the class `Employee` that set the string `name` and that return it, respectively.

3. This question is about *inheritance*.

   (a) Write a `struct` called `IntlBank` derived from `Bank` (to indicate an international bank), that has three new public objects:

   - `countries`, an array of strings, of the countries in which the bank operates
   - `employees`, an array of integers, of the number of employees in each country
   - `homebase`, a string representing the country housing the bank's headquarters

   (b) Give this `struct` a function `getHome`, which returns the `Bank` of the `homebase` country.

   (c) Give this structure a function `checkSum`, which returns `true` if the sum of the employees across all countries is equal to `employeeNum`, otherwise returning `false`.