Data Structures **BITL2**

Worksheet 2

9 September 2021

1. **Warm up:** Answer the following True / False questions.
   (a) Several pointers can point to the same `int`
   (b) One pointer can point to several `int`s
   (c) It is possible to create an array that holds both `int` and `char` types.
   (d) It is possible to create an array that holds pointers to either both `int` or `char` types.

The next two problems refer to the following uncompiled `C++` files.

`arrows.cpp`

```
1 #include <iostream>
2 using namespace std;
3 int main() {
4    int num = 10;
5    int* ptr = &num;
6    int& ref = *ptr;
7    cout << ref << endl;
8    return 0;
9 }
```

`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() {}
```

1. This question is about the program that results from compiling `arrows.cpp`.
   (a) What is the output of the program?
   (b) Change line 7 so that the output is the address of `num`.
   (c) What would happen (if anything) if the reference `ref` instead of the pointer `ptr` was defined first? That is, what will happend if lines 5 and 6 are replaced with:

```
5       int& ref = *num;
6       int* ptr = &ref;
```

   (d) Suppose lines 6 and 7 are changed to

```
6       int** newptr = &ptr;
7       cout << newptr << endl;
```

   What will be the output? How can you change this line 7 so that the output is `10`?

2. This question is about `database.cpp` and `header.h`.
   (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 wether 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 << &Trusty.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.