Instructions:

- Print your name in the space provided below.
- Answer each question in the space provided.
- If you want partial credit, justify your answers briefly and concisely, even when justification is not explicitly required.
- There are 13 questions, priced as marked. The maximum score is 100.
- When you have completed the test, sign the pledge at the bottom of this page and turn in the test.
- This is a closed-book, closed-notes examination. No calculators or other electronic devices may be used during this examination.
- You may not discuss (in any form: written, verbal or electronic) the content of this examination with any student who has not taken it. You must return this test form when you complete the examination. Failure to adhere to any of these restrictions is an Honor Code violation.

Do not start the test until instructed to do so!

Name ___________________________ printed

Pledge: On my honor, I have neither given nor received unauthorized aid on this examination.

_________________________________________ signed
Consider the following declarations:

```cpp
int *aptr, bptr;
int const *cptr;
int anInteger;
```

1. (5 points) Correct any of these declarations so they will all be syntactically correct. If they are all correct then say no changes are necessary.

Consider the following node class of a linked list:

```cpp
class Node {
  private:
    int data;
    Node *nextPtr;
  
  public:
    Node (int);
    void setData (int);
    int getData() const;
    void setNextPt(Node *);
    const Node getNextPtr() const;
}
```

2. (5 points): write the destructor for this class

3. (10 points) For this same class, briefly discuss why you would or would not want to have an assignment method. (Do not code the assignment method if you believe the class should have one.)
Consider the following class:

```cpp
class Sentence {
private:
    string* Words;
public:
    Sentence(ifstream& In, int N);
    ~Sentence();
};
```

```
Sentence::Sentence(ifstream& In, int N) {
    if ( N > 0 ) {
        Words = new string[N];
        // input code omitted
    } else Words = NULL;
}
Sentence::~Sentence() {
    delete [] Words;
}
```

4. (15 points) Write a copy constructor for this sentence class assuming a source sentence with N words.

5. (5 points) Briefly explain when you would logically need or not need a copy constructor for this class.
6. [5 points] In C++, when an object is used as an actual parameter and passed to an existing object by value, the formal parameter is:

1) a copy of the actual parameter, made by the assignment operator.
2) a copy of the actual parameter, made by the copy constructor.
3) logically the same object as the actual parameter.
4) This is not allowed.
5) None of these

Consider the following specification for a medical office system:

Family Practice Associates wants a way of keeping track of their patients’ diagnoses, their patients’ family members, and the medications related to a specific diagnosis. Potential diagnoses are at least diabetes, high blood pressure, sickle cell anemia, and emphysema. Physicians in this practice need to be able track relatives of patients with genetically based diseases and also need to track a particular medication for all patients in the case that recommended dosages are changed by the Federal Drug Administration.

[7 points each] Choosing from the following answers,

| object | class | attribute | behavior | none |

In terms of designing an object-oriented model of the Family Practice Associates record system determine whether each of the entities listed below is best characterized as a(n) ________ in the system, or if it is none. Justify your answers in one short sentence.

7. family
8. track relatives
9. dosage
10. sickle cell anemia
11. physician

12. (10 points) Consider possible classes: diagnosis and medication. Is this an aggregation or an association? Justify your answer in one short sentence. Note its cardinality. (an example of cardinality is 1:1)

13. (10 Points) Consider possible classes: patient and diagnosis. Is this an aggregation or an association? Justify your answer in one short sentence. Is it a static or a dynamic relationship?