1. Given the partial class below, determine which of the following function prototypes are valid when included in the public section of the class declaration. If the declaration is valid, write the letter **V**, if it is not valid, write the letters **NV.** Also, if it is invalid, give a brief explanation why it is invalid.

```
class Bar
{
  public:

    a) _____  Bar operator-(const Bar &a) const;
    b) _____  double operator*(double a) const;
    c) _____  Bar operator*(const Bar &a, const Bar &b) const;
    d) _____  friend Bar operator%(const Bar& a);
    e) _____  friend Bar operator-(const Foo& f, const Bar& b) const;
    f) _____  Bar operator-() const;

};
```

2. Answer True or False (**T/F**) for the questions below.

    a) The compiler will issue an error if you overload the + operator in your class to perform subtraction.

    b) A `struct` cannot have private member functions.

    c) When using a member function to overload a binary operator, the function is implicitly invoked by whichever operand (left or right) is a member of the class.

    d) Constructors can be used for conversions only to convert to its class type, not to another type.

    e) A `struct` can have private members.

    f) Data members are initialized in the order they appear in the member initializer list.

    g) A default constructor can be defined either with default arguments for all arguments or with no arguments at all (i.e. void).

3. The member initializer list is required for certain data members of a class. Determine which data members listed below always require the use of an initializer list. Write **YES** if they require it, and **NO**, if they don't require it.

    a) constants
    b) dynamically allocated
    c) references
    d) pointers
    e) private members

```
struct Foo         class Foo
{                  {
  int a;             int a;
  int b;             int b;
};                 };
```

4. There is a class named Foo and a struct named Foo above. What is the difference between the two?

5. Several constructors are prototyped below. What are the names of each constructor? Choose the letter from the 3 choices below. Some choices may be used more than once.

Choices:
- A) default constructor
- B) non-default constructor
- C) conversion constructor

Constructor Prototypes:
- a) `Foo(int a = 5, int b = 10);`
- b) `Foo();`
- c) `Foo(double a, int b, int c = 0);`
- d) `Foo(const Bar& f);`
- e) `Foo(int a);`
- f) `Foo(int a, int b);`

```
class StopWatch
{
  public:
    StopWatch(int secs) {
      seconds_ = secs;
    };
  private:
    int seconds_;
};
```

6. Given the complete *StopWatch* class above, indicate whether or not the following statements compile. Write **C**, if the code compiles, and **NC** if it does not compile. If it doesn't compile, explain why **very briefly**.

- a) _____   `StopWatch sw1;`

- b) _____   `StopWatch *sw2;`

- c) _____   `StopWatch sw3[5];`

- d) _____   `StopWatch *sw4[5];`

- e) _____   `StopWatch sw5[] = {1, 2, 3};`

- f) _____   `StopWatch *sw6[] = {1, 2, 3};`

- g) _____   `StopWatch *sw7 = new StopWatch;`

```
class Student
{
  public:
    // Non-default constructor declaration
  private:
    int age_;
    double GPA_;
    String login_;
};
```

7. Given the Student class above, **implement** a proper, non-default constructor. That is, implement a constructor outside of the class definition that will initialize all 3 private members of the class using the 3 parameters that are properly passed in. You **MUST** use a **member initialization list**.