Instructions: This homework assignment focuses on a review of the basics of classes in C++. The answers may be determined from the assigned readings and the CS 1704 course notes.

Opscans will be supplied in class and collected at the first class meeting during the week of February 12. No late opscans will be accepted. Mutilated opscans may be discarded. Improperly or poorly marked opscans will be graded according to the default scan and no corrections will be made.

For questions 1 through 8, consider the following class and object declarations:

```cpp
class Artifact {
private:
  string Name; // line 1
  int Date; // line 2
public:
  Artifact(); // line 3
  Artifact(string N, int A); // line 4
  string getName() const; // line 5
  int getDate() const; // line 6
};

Artifact Book001("James' Anxious Enquirer", 1848), // line 7
Book002("Hitchcock's Geology", 1857); // line 8
Artifact Ceramic001, // line 9
Ceramic002("Anasazi pot", 1100); // line 10
```

1. Which of the following identifiers are names of class members?
   1) Name  
   2) Date  
   3) Book001 and Book002  
   4) Ceramic001 and Ceramic002  
   5) Artifact  
   6) All of these  
   7) 1 and 2 only  
   8) 3 and 4 only  
   9) None of these

2. Which of the following identifiers are names of class objects?
   1) Name  
   2) Date  
   3) Book001 and Book002  
   4) Ceramic001 and Ceramic002  
   5) Artifact  
   6) All of these  
   7) 1 and 2 only  
   8) 3 and 4 only  
   9) None of these

3. Which of the following are declarations of class constructors?
   1) Artifact();  
   2) Artifact(string N, int A);  
   3) string getName() const;  
   4) int getDate() const;  
   5) All of these  
   6) 1 and 2 only  
   7) 3 and 4 only  
   8) None of these

4. Which of the following identifiers are names of class member functions that are not constructors?
   1) Artifact();  
   2) Artifact(string N, int A);  
   3) string getName() const;  
   4) int getDate() const;  
   5) All of these  
   6) 1 and 2 only  
   7) 3 and 4 only  
   8) None of these
5. The use of the keyword "const" in line 5 indicates:

1) that the return value from getName() is a constant value.
2) that the parameter(s) to getName() are constant values.
3) that getName() is not allowed to modify any of its parameters.
4) that getName() is not allowed to modify any of the data members of an Artifact object.
5) nothing because it is incorrect syntax.
6) None of these

6. The object declaration in line 7:

1) uses the Artifact constructor whose prototype is given in line 3.
2) uses the Artifact constructor whose prototype is given in line 4.
3) uses the Artifact constructor whose prototype is given in line 5.
4) uses the Artifact constructor whose prototype is given in line 6.
5) is syntactically incorrect because there is no matching constructor.
6) None of these

7. The object declaration in line 9:

1) uses the Artifact constructor whose prototype is given in line 3.
2) uses the Artifact constructor whose prototype is given in line 4.
3) uses the Artifact constructor whose prototype is given in line 5.
4) uses the Artifact constructor whose prototype is given in line 6.
5) is syntactically incorrect because there is no matching constructor.
6) None of these

8. Which of the following expressions are allowed, given the class and variable declarations?

1) Book001 = Book002
2) Ceramic001 = Ceramic002
3) Book001 = Ceramic002
4) Book001 == Book002
5) Ceramic001 == Ceramic002
6) All of these
7) 1 and 2 only
8) 1, 2 and 3 only
9) 4 and 5 only
10) Neither

For questions 9 through 12, consider the class declaration and implementation:

```cpp
class Account {
private:
    double Balance;
public:
    Account(double StartBal = 0.0);
    void Deposit(double Amount);
    void Withdraw(double Amount);
    double getBalance() const;
};

Account::Account(double StartBal) {
    Balance = StartBal;
}

void Account::Deposit(double Amount) {
    Balance += Amount;
}

void Account::Withdraw(double Amount) {
    Balance -= Amount;
}

double Account::getBalance() const {
    return Balance;
}
```
9. Which member functions are observer (or reporter) operations?

1) Deposit()  
2) Withdraw()  
3) getBalance()  
4) All of these  
5) 1 and 2 only  
6) 2 and 3 only  
7) 1 and 3 only  
8) None of these

10. Which member functions are mutator operations?

1) Deposit()  
2) Withdraw()  
3) getBalance()  
4) All of these  
5) 1 and 2 only  
6) 2 and 3 only  
7) 1 and 3 only  
8) None of these

For questions 11 through 12, assume we have declared the following object:

Account Checking(1000.00);

11. Which of the following statements would add 150.00 to the Balance field of Checking?

1) Balance += 150.00;  
2) Checking.Balance += 150.00;  
3) Deposit(150.00);  
4) Checking.Deposit(150.00);  
5) Account.Balance += 150.00;  
6) Account.Deposit(150.00);  
7) 2 and 4 only  
8) 3 and 4 only  
9) None of these

12. Which of the following statements would print the Balance field of Checking?

1) cout << Balance;  
2) cout << Checking.Balance;  
3) cout << Checking.getBalance();  
4) All of these  
5) 1 and 2 only  
6) 2 and 3 only  
7) 1 and 3 only  
8) None of these

13. Which of the following statements about C++ classes is false?

1) A class can have both data members and function members.  
2) A class can have both public and private members.  
3) By default, data members of a class are private and function members are public.  
4) Public members of a class are selected by using dot notation.  
5) Aggregate assignment is permitted for objects of a class.  
6) None of these is false.

14. Which of the following statements about constructors for C++ classes is false?

1) A class constructor has no return type.  
2) The name of a class constructor is the same as that of the class.  
3) The parameter list of a class constructor may be empty.  
4) A class may have more than one constructor.  
5) C++ requires that the programmer implement a constructor for each class.  
6) None of these is false.
15. Which of the following C++ built-in operations are defined (automatically) for class objects?

1) == 4) +
2) . 5) All of these
3) = 6) 1 and 2 only

7) 2 and 3 only
8) 1, 2 and 3 only
9) None of these

16. Which lines of the following class declaration contain a syntax error?

```cpp
class Foo { // line 1
    private: // line 2
        int N; // line 3
    public: // line 4
        int Foo(); // line 5
    } // line 6
```

1) line 1 only
2) line 3 only
3) line 4 only
4) line 5 only
5) line 6 only
6) lines 2 and 4 only
7) lines 4 and 5 only
8) lines 5 and 6 only
9) None of these

17. A class, Bar, has a member function F that takes no parameters, returns an int value, and does not modify any of the data members. Which of the following would be the best function prototype for F in the class declaration?

1) int F() const;
2) const int F();
3) int Bar::F();
4) const int Bar::F();
5) int Bar::F() const;
6) None of these

18. Suppose that the class declaration of Bar includes the following function prototype:

```cpp
bool LessThan(const Bar& anotherObject);
```

Which of the following tests in the client code correctly uses this function to compare two Bar objects, Alpha and Beta?

1) if (Alpha < Beta)
2) if (Alpha.LessThan(Beta))
3) if (LessThan(Alpha, Beta))
4) if (Alpha.LessThan.Beta)
5) if (LessThan(Alpha).Beta)
6) None of these

19. If the designer of a C++ class wishes to allow users of the class to inspect but not modify a private data member X, what is the best approach?

1) Provide a corresponding observer function as a class member.
2) Provide a corresponding mutator function as a class member.
3) Declare the data to be public, not private.
4) Provide an additional class constructor.
5) Do nothing because it is not acceptable to let clients inspect private data.
6) 1 and 2 only
7) None of these
20. If the designer of a C++ class wishes to allow users of the class to both inspect and modify a private data member X, what is the best approach?

1) Provide a corresponding observer function as a class member.
2) Provide a corresponding mutator function as a class member.
3) Declare the data to be public, not private.
4) Provide an additional class constructor.
5) Do nothing because it is not acceptable to let clients inspect private data.
6) 1 and 2 only
7) None of these

For questions 21 and 22, consider the class declaration:

```cpp
class MyClass {
  private:
    int Priv;
  public:
    ... 
    MyClass();
    // Postcondition:
    // Private data initialized to zero
    MyClass(int n);
    // Postcondition:
    // Private data initialized to n
};
```

and client code

```cpp```
MyClass Gamma;
MyClass Omega(5, 0);
```cpp```

21. Once Omega is created, what is the value of Omega.Priv?

1) 0
2) 5
3) n
4) Unknown, but the declaration of Omega is valid.
5) The declaration of Omega is invalid.
6) None of these

22. After Gamma is created, what is the value of Gamma.Priv?

1) 0
2) 5
3) n
4) Unknown, but the declaration of Gamma is valid.
5) The declaration of Gamma is invalid.
6) None of these

23. The ability to declare members of a class to be private is most associated with which of the following software engineering goals?

1) information hiding
2) reusability
3) separation
4) self-immolation
5) None of these
24. The purpose of using the keyword `inline` with a function is to:

1) increase the probability that the function will work correctly.
2) improve the run-time performance of the program.
3) reduce the number of functions that must be written by the programmer.
4) reduce the number of function calls that must be written by the programmer.
5) None of these

25. Implementing two or more functions that have the same name but different formal parameter lists is:

1) bad programming practice and should be avoided.
2) an error and will always produce compile-time errors.
3) known as overloading.
4) known as inlining.
5) None of these