You must turn in all copies of the answer sheet and test.

This pledged test is closed-book, closed-notes. All answers must be written on the answer sheet.

Unless otherwise stated within a problem, assume that each program and/or program segment compiles and runs without error. Each question is independent unless otherwise stated.

In the questions that follow you are sometimes asked to give the output of a code segment. If you believe the code segment does not produce any output, write NONE.

1. Write a single C++ assignment statement, utilizing predefined math library functions as needed, to evaluate the below expression and assign its value as shown (assume all variables are of type double)

$$x = \frac{b + \sqrt{b^2 - 4ac}}{2a}$$

2. Each function _____ creates a new activation record.

3. When a parameter is passed by _____, a copy of the object is passed to the called function. Any modifications made to the parameter by the called function change the copy, not the original object.

4. True or False   When a function is invoked, flow of control is transferred from the invoking function to the invoked function. When the invoked function completes, control is transferred back to the invoking function.

5. True or False   The versions of the copy constructor and member assignment operator supplied by the compiler perform memberwise assignment (shallow copying).

6. True or False   Any member of a class is accessible to all of the other members of that class regardless of its declaration section.

7. True or False   Data members represent the properties or attributes of a class.

8. Before a function is invoked, it must be _____ or defined.

9. One of the standard libraries defines a _____ function that enables a program to be immediately terminated.

10. One of the standard libraries defines an _____ macro that enables an integral/boolean expression to be evaluated. If the expression is false, the program is terminated.

11. Information to a function is passed via _____.

12. A function that does not return a value has type _____.

13. A _____ constructor initializes a new object to be a duplicate of a previously defined object.

14. The client interface to a class object occurs in the _____ section of the class definition.

15. Class members of a _____ section are intended to be used only by other members of the class.

16. _____ parameters can be specified for trailing parameters only.

17. _____ is when two or more functions have the same name.

18. An _____ is a well-defined and complete data abstraction that uses the information-hiding principle.

19. A default constructor requires _____ parameters.

20. An _____ in the return type for a function or operator indicates that a reference return is being performed.

21. _____ is the reason class objects that are not modified in a function or operator are typically passed as constant reference parameters rather than as value parameters.

22. ADT libraries often contain _____ functions and operators that are not part of the ADT class, but do provide behavior that is expected with the objects.

23. What is printed by this program?

```
#include <iostream.h>
#include <ctype.h>
int main () {
   char ch = 'z';
   if ( isupper(ch) ) {
      cout << "1" << endl;
   }
   else {
      cout << "2" << endl;
   }
   return 0;
}
```

24. What is printed by this program?

```
#include <iostream.h>
#include <ctype.h>
int main () {
   cout << toupper(  tolower ('A') ) << endl;
   return 0;
}
```

25. What does the assert statement below do when the following program is executed?

```
#include <iostream.h>
#include <assert.h>
int main () {
   float a = 1;
   float b = 0;
   float c = 0;
   float d;
   assert (b+c);
   d = a / (b + c);
   return 0;
}
```

26. What is printed by the following program?

```
#include <iostream.h>
void special (int a, int b);
int main () {
   int i = 1;
   int j = 2;
   special (i, j);
   cout << "i=" << i << " j=" << j << endl;
   return 0;
}
void special (int a, int b) {
   a = 10;
   b = 20;
   return;
}
```

27. What is printed by the following program?

```
#include <iostream.h>
void special (int &a, int &b);
int main () {
    int i = 1;
    int j = 2;
    special (i, j);
    cout << "i=" << i << " j=" << j << endl;
    return 0;
}
void special (int &a, int &b) {
    a = 10;
    b = 20;
    return;
}
```

28. What is printed by the following program?

```
#include <iostream.h>
int a = 10;
int main () {
    {
        float a = 3.5;
        {
            char a = 'Q';
        }
        cout << "a=" << a << "::a=" << ::a << endl;
    }
    return 0;
}
```

29. What is printed by the following program?

```
#include <iostream.h>
int main () {
    int i = 10;
    int j = 20;
    {
        int i = 30;
        int j = 40;
    }
    cout << "i=" << i << " j=" << j << endl;
    return 0;
}
```

30. The parameters in a function invocation are called the _____ parameters. The parameters are represented in the invoked function by the _____ parameters.

31. A _____ is a description of a function's interface.

32. A _____ statement supplies a value from the invoked function to the invoking function.

33. A _____ object is an object defined within a statement block.

34. A _____ object is an object defined outside of any function interface or function body.

35. C++ supports two forms of parameter passing styles: _____ and _____.

Use the following definitions for Question 36 through Question 42.

```
class Widget {
   public:
      bool Flag;
      Widget();
      Widget(const int Value);
      int GetValue();
      void SetValue(const int Value);
      void DisplayAccesses();
   protected:
      int DataItem;
      int NumberAccesses;
      void UpdateAccesses();
};
```

36. The class `Widget` has how many data members?

37. The class `Widget` has how many member functions that can be invoked by a constant `Widget` object?

38. The class `Widget` has how many constructors?

39. True or False   The function `SetValue()` defined in the `class Widget` is a constructor member function.

40. True or False   The function `SetValue()` is a public member function of the class `Widget`.

41. True or False   `Widget public` member functions can access the `Widget` data member `DataItem`.

42. True or False   A client function `main()` can access the `Widget` data member `Flag`.

43. The author of the following program intends to read two integers `A` and `B`, compare their values, then print out the value of the larger followed by the value of the smaller. However, the program logic below is incorrect and does not work as the author intended even though the program itself compiles successfully. Identify the author's programming error.

```
#include <iostream.h>
void Swap (int x, int y);
int main () {
   int A;
   int B;
   cout << "Enter two integers: " << flush;
   cin >> A >> B;
   if (A < B) {
      Swap(A, B);
   }
   cout << "The larger is: " << A << "and the smaller is: "
    << B << endl;
   return 0;
}
void Swap (int x, int y) {
   int temp;
   temp = x;
   x = y;
   y = temp;
   return;
}
```

44. Write a user-defined function which is compatible with the function `main()` below. Your function must compute the area of a square when it is passed as a parameter the length of one side of the square. All variables and calculations should be done in double-precision floating point.

```
#include <iostream.h>
// Your function would go here but write it on the answer sheet

int main () {
   double LengthOfSide;
   cout << "Input the length of one side of the square:" << flush;
   cin >> LengthOfSide;
   cout << "A square whose side is of length: " << LengthOfSide
    << endl;
   cout << "has an area of: " << AreaOfSquare(LengthOfSide)
    << endl;
   return 0;
}
```

45. Write a user-defined function which is compatible with the function `main()` below. Your function must compute the volume of a cylinder when it is passed as a parameter the radius and the height of the cylinder, where the volume of a cylinder is $\pi \times radius^2 \times height$. Declare a constant to represent π and use 3.1415 as its value. All calculations and variables should be double-precision floating point.

```
#include <iostream.h>
// Your function would go here but write it on the answer sheet

int main () {
   double CylinderRadius;
   double CylinderHeight;
   cout << "Input the radius of the cylinder:" << flush;
   cin >> CylinderRadius;
   cout << "\nInput the height of the cylinder:" << flush;
   cin >> CylinderHeight;
   cout << "\nA cylinder whose radius is: " << CylinderRadius
    << endl;
   cout << "\nand whose height is: " << CylinderHeight << endl;
   cout << "\nhas a volume of: ";
   cout << AreaOfCylinder(CylinderRadius,CylinderHeight) << endl;
   return 0;
}
```

46. Complete the definition for a class `Vehicle`, which has two public constructors, one which takes no parameters, and another which takes a single `string` value parameter `s`. A `string` data member `ThisName` should be accessible only to objects of type `Vehicle`. Similarly, an `int` data member `ThisTurbo` should be accessible only to objects of type `Vehicle`. The class `Vehicle` should provide a parameterless member function, `GetName()` that returns a value of the same type as data member `ThisName`. This function is accessible by client code and does not modify any of the members of the class. `Vehicle` should also provide a parameterless boolean member function `IsTurbo()`, callable only by members of the `Vehicle` class. This member does not modify members of the class. The class `Vehicle` should provide another member function, `SetTurbo()`, that takes a single integer parameter `t` and returns `void`, and is only accessible to objects of `Vehicle` class. This member may modify members of the class.