You may take this test with you after the test, but you must turn in your answer sheet.

This test has 25 multiple-choice questions, each worth 4 points, for a total of 100 points. This test is worth 20% of your final grade. You must put your answers on the bubble form.

This test is open book and open notes. For the multiple choice problems, select the best answer for each one and select the appropriate letter on your answer sheet. Be careful - more than one answer may seem to be correct. Some questions are tricky. When a problem describes a segment or fragment of code you may assume the rest of the program is correct and would be supplied to make it work. Assume all code is in a C++ program compiled with a C++ compiler.

1. Consider the code segment shown below:

   ```
   for(int k=0; k<5; ) {
      cout << ++k << " ";
   }
   ```

Which of the following two code segments will give the same output as the above code?

Option I:

   ```
   int i = 1;
   do {
      cout << i++ << " ";
   } while( i<6);
   ```

Option II:

   ```
   int j=6;
   while( j>0) {
      cout << 6-j << " ";
      j--;
   }
   ```

a. Neither I nor II will give the same output.
b. I will give the same output, but II will not
c. II will give the same output, but I will not
d. Both I and II will give the same output.

2. Consider a section of code that finds the min and max value from a set of integers in the range 0..100. How should min and max be initialized?

   a. min=50; max=50;
b. min=100; max=100;
c. min=0; max=0;
d. min=100; max=0;
3. What is the output of the following C++ program segment, called with `confuseDriver()`?

```cpp
int s=2, y=5;
void confuse1(int b, int &a)
{
    y = a++;
    s = b;
}
void confuse2(int &a, int &s)
{
    a = s + 1;
    s++;
}
void confuseDriver()
{
    int a=2;
    confuse1( a, y);
    confuse2( y, y);
    cout << a+y << endl;
}
```

a) 5  
b) 7  
c) 8  
d) 9

4. Assume that function `swap()` correctly swaps its two arguments. What is the order of the numbers in the `values` array after running the code segment shown at right below?

```cpp
const int Max = 5;
int values[Max] = {1,3,4,7,9};
for (int i=0; i<Max/2; i++) {
    swap( values[i],values[Max-i-1] );
}
```

a) 1 3 4 7 9  
b) 9 7 4 3 1  
c) 1 3 4 3 1  
d) 9 7 4 7 9
5. Consider the code below, where one of the four function calls shown at right could be inserted into the underlined section:

```
void f1( int &p, int q) {
    q--; 
    p++; 
}

void f2( int &x, int &y) {
    x--; 
    y++; 
}

void f3( int c, int &d) {
    c++; 
    --d; 
}

void parameters() {
    int y=7; 
    int x=3; 
    _______  // <Function call here
    cout << x+y; 
}
```

*How many* of the above three function calls could be used in the underlined space so that when function `parameters()` is called the program prints out the value *9*?

a) None  
b) One  
c) Two  
d) Three

6. What is the output from the code segment shown at right below, called with `scope();`?

```
int x = 3;   // global variable
void s1( int y) {
    cout << x+y << " ";
}

void s2( int y) {
    y = x++; 
    s1( x); 
}

void scope() {
    x = 2; 
    s2( x); 
}
```

a) 3  
b) 4  
c) 5  
d) 6
7. Consider the following function declaration:
   void f1(char c, float f = 1.1, bool b = true);
   How many of the following function calls would match the above declaration?
   I. f1( 't', 9.5, false)
   II. f1( 'm', 9.5)
   III. f1("9.5", true)
   IV. f1()

   a. 1
   b. 2
   c. 3
   d. 4

8. When calling a class get member function, what is the effect of adding const to the end of the function header?
   a. Changes to data members have scope only within the member function
   b. Changes to data members can be made. The const serves as documentation only.
   c. The compiler will generate an error message if a data member is changed
   d. An attempt to make a data member change results in a run-time error

9. What is the output from the following code?
   char c2='A';
   cout << (char)(c2+1) << endl;

   a. There is no output because of a compiler error.
   b. A + 1
   c. A
   d. B

10. Consider trying to find a particular number within an unsorted array of 199 unique random numbers.
    On average how many numbers will have to be examined before the number you are searching for is found?
    Select the range below that includes this number.

    a) 0 to 6
    b) 7 or 8
    c) 9 to 10
    d) 11 to 50
    e) 51 to 100
11. Consider using binary search to find a particular number within a sorted array of 199 unique random numbers. On average how many numbers will have to be examined before the number you are searching for is found?

a) 0 to 6  
b) 7 or 8  
c) 9 to 10  
d) 11 to 50  
e) 51 to 100

12. Consider the code segment shown below. If after the function call to changeLetters(...) the value of number has changed, what is the most likely cause?

```cpp
int number = 5;
char letters[]="ABCD";
// ... other code would be here
// ...
cout << number;
changeLetters( letters);
cout << number;
```

a) Although number is not passed to function changeLetters(), function changeLetters() itself calls a second function which changes number  
b) number is a global variable instead of a local variable as it should be  
c) Function changeLetters() overwrites the end of array letters  
d) There is some ASCII control characters that are present in the code even though they are not visible

13. Consider the following array of numbers to be sorted:

```
6 5 7 2 1 4 3
```

Assume we are sorting into ascending order, and we always start our passes at the right-hand side. How many swaps are made when using Selection Sort as compared to Bubble Sort to put the elements into ascending order, as done in class? Which of the statements below best describes the result?

a) Selection Sort does 5+ fewer swaps than Bubble Sort  
b) Selection Sort does 2, 3, or 4 fewer swaps than Bubble Sort  
c) Selection Sort and Bubble Sort are within 1 swap of each other  
d) Bubble Sort does 2, 3, or 4 fewer swaps than Selection Sort  
e) Bubble Sort does 5+ fewer swaps than Selection Sort
14. What is the output of the code segment below when called with:
   char string1[ 81] = "One.Two";
   char string2[ 81] = "Yes No";
   f14( string1, string2);

```
void f14( char *pString1, char *pString2)
{
    char *pTemp = strchr( pString1, '.');
    *pTemp = '\0';
    strcat( pString2, pString1);
    cout << pString2 << endl;
}
```

a) One  
b) Yes No  
c) OneYes No  
d) Yes NoOne

15. What is the output of the code segment below when called with:
   char string3[ 81] = "every element";
   f15( string3, 'e');

```
void f15( char *pString, char c)
{
    char *pTemp = pString;
    while( pTemp) {
        pTemp = strchr( pString, c);
        if( pTemp) {
            strcpy(pTemp, ++pTemp);
        }
    }
    cout << pString << endl;
}
```

a) very element  
b) vry element  
c) eey eeet  
d) vry lmnt
16. Consider the following function declaration:

```c
void displayTable( int values[][ ]);
```

Note that there is no value inside either the first or second set of square brackets to specify the array size. Which of the following statements is the best description of this situation?

a) Values are not required in either set of brackets  
b) You must have a value in the first set of brackets, but not necessarily the second  
c) You don't need a value in the first set of brackets, but do in the second  
d) You must supply values for both sets of brackets

17. Consider the following function declaration:

```c
void setValues( int values[]);
```

Note that there is no value inside the square brackets to specify the array size. Which of the following statements is the best description of this situation?

a) This will cause a compiler error and will not run  
b) This will compile, but will cause a run-time error  
c) Having no number will allow writing past the end of the array, which would be disallowed if a number value were supplied.  
d) Having no number will allow writing past the end of the array, which would still be possible even if a number value were supplied.

18. Consider the various sorting algorithms discussed in class. What characteristic of a sorting algorithm is most important in making it efficient?

a) It is fast  
b) It minimizes the number of repetitions  
c) While it may do more comparisons, it does fewer swaps.  
d) It moves elements close to their final position as soon as possible

19. Which of the following is the best description of objects and classes?

a) Classes are a general category, while objects are particular instances.  
b) Objects are a general category, while classes are particular instances.  
c) Both objects and classes are synonyms that describe a general category  
d) Both objects and classes are synonyms that describe a particular instances
20. What is the output of the code segment below when called with:
   Date d1;
   cout << d1.day << "/" << d1.month << "/" << d1.year << endl;

```cpp
class Date
{
   public:
      Date(int theMonth, int theDay, int theYear) {}
   private:
      int day, month, year;
};
```

a) Compiler error
b) Run-time error
c) //
d) 1/2/2000

21. Imagine we create a Date class with the following single constructor:
   Date(int theMonth, int theDay, int theYear) {
      month = theMonth; day = theDay; year = theYear;
   }
   The driver code then has the following, which generates an error:
   Date d1;
   What is the likely reason for this error?

   a) The Date class is declared after the declaration of d1
   b) There is already a declared Date object with the name d1
   c) This is a declaration and is not calling the Date class constructor
   d) There is no default constructor for the Date class

22. Imagine we are using one of the later versions of the Date class that we developed.
   The driver code then has the following, which doesn't work correctly:
   Date d2();
   What is the likely reason for this error?

   a) The compiler understands this as a declaration rather than a call to the Date class constructor
   b) There is no default constructor for the Date class
   c) The Date class is declared after the declaration of d2
   d) There is already a declared Date object with the name d2
23. Imagine we create a Date class `compareTo` member function that is defined as:

```cpp
bool isSameAs( Date otherDate) {
    return day == otherDate.day &&
    month == otherDate.month &&
    year == otherDate.year;
}
```

This might be called in a situation such as:
```
if( d1.isSameAs( d2)) {
    cout << "They are equal " << endl;
}
```

In the above example of `d1.isSameAs( d2)`, how does the `isSameAs()` function connect the `d2` day, month and year data members in the `isSameAs()` function with the corresponding `d1` data members?

a) `d1` must be declared within the `Date` class
b) There must be a set of braces `{ … }` providing enclosing scope for both `d1` and the `isSameAs()` function
c) `d1` is sent as an implicit `this` parameter to the `isSameAs()` function
d) `d1` must be declared as `static` within the `Date` class

24. In class we saw an example where Employee `e2` was created as a copy of Employee `e1`. When we later changed the startDate for `e2`, the startDate for `e1` ended up being changed as well. How were we able to fix this?

a) We overloaded the Employee assignment operator
b) We created Destructors for both the Date and Employee classes
c) We had the Employee copy constructor call the Date copy constructor
d) We had the Employee copy constructor make a new Date and used it with the Date copy constructor

25. What is the output of the code segment shown at right when function `testf1()` is called?

```cpp
void f1( int y)
{
    static int x=1;
    cout << x++;
}

void testf1()
{
    for( int x=0; x<3; x++) {
        f1( x);
    }
}
```

a) 0 0 0
b) 0 1 2
c) 1 1 1
d) 1 2 3