You may take this test with you afterwards, but you must turn in your answer sheet. This test has 25 multiple-choice questions, worth 4 points each, for a total of 100 points.

This test is worth 10\% of your final grade. You must put your answers on the bubble form. This test is open book and open notes, but no computers. 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 and some questions are tricky. When a section of code is described as a program segment you can assume it is placed in the context of a program that is otherwise correct and includes all declarations and system libraries needed to make it work.

1. In what sort of situation might a switch-case statement be preferred over multiple if-else statements?
   A) When assigning a letter grade based on a score range
   B) When assigning a tax percentage based on an hourly income in dollars and cents
   C) When selecting among menu options
   D) When translating row and column inputs into a board index position

2. What is the point of the video shown in class of a man eating a bicycle?
   A) To solve a problem try working backwards from the end
   B) Some problems cannot be solved by a computer
   C) Bigger problems should be broken down into smaller problems
   D) When stuck on a problem, take a break, then come back to it

3. What is true about all binary numbers that end in 11?
   A) They are even
   B) They are odd
   C) They are multiples of three
   D) They are prime

4. What is the equivalent decimal value for the binary number 10111001 ?
   A) 93
   B) 119
   C) 157
   D) 185

5. Consider a C++ program that uses rand() to display random numbers, but does not use any version of srand(). What might we expect from running the program multiple times?
   A) The first random number will always be 0
   B) The numbers that are displayed will be random, but always increasing
   C) Each time the program is run it will display the same sequence of numbers
   D) Each time the program is run it will display different sets of numbers
6. Which of the following would be the preferable approach to take in generating random playing pieces of 'X' or 'O' for a playing board?
   A) Set two initial variables to 'X' and 'O', and use an if statement to choose between them
   B) Use a function that has a long string of 'X's and 'O's and select the next one each time
   C) Have your program alternate between 'X' and 'O'
   D) Get a random number and use the mod function to see if it is odd or even

7. What is the effect of the break statement in a loop?
   A) It bypasses the rest of the code in the loop and does the next loop iteration
   B) It first jumps out of the loop and then exits the program
   C) It reruns the current loop iteration
   D) It bypasses the rest of the code in the loop and resumes execution after the loop

8. What is the effect of the continue statement in a loop?
   A) It bypasses the rest of the code in the loop and does the next loop iteration
   B) It first jumps out of the loop and then exits the program
   C) It reruns the current loop iteration
   D) It bypasses the rest of the code in the loop and resumes execution after the loop

9. Consider code that manipulates a set of integer test scores in the range 0..100 that are typed in by a user. How many of the following situations would appropriately be implemented using an array?
   I. Find the min and max scores
   II. Display the scores in ascending order
   III. Count how many scores are within each grade range of 'A' and 'B'
   IV. Count how many there are of each score
   A) 1
   B) 2
   C) 3
   D) 4

10. What would be the effect of adding const in front of a variable declared inside a function?
    A) Local changes are allowed and are reflected back in the calling code
    B) Local changes are allowed, however they will not be reflected back in the calling code.
    C) An attempt to make a local change results in a compiler error
    D) An attempt to make a local change results in a run-time error
11. What is output from running the program segment shown below at right?

A) 30 31 20 21  
B) 31 30 21 20  
C) 21 20 31 30  
D) 20 21 30 31

```cpp
int row = 0;
int col = 0;
for(row = 3; row <= 4; row++) {
    for(col = 1; col >= 0; col--) {
        cout << row-1 << col << " ";
    }
}
```

12. Consider the program or program segment shown at left below. Which of the options (at right below) is the best answer regarding this program or program segment?

```cpp
char grade = 'B';
char values[3] = {'C','D','E'};
for( int i=0; i<7; i++) {
    values[ i] = 'A';
}
cout << "grade is " << grade;
```

A) It will not compile  
B) It will compile but will crash when it runs  
C) It will compile and run, but will likely give unexpected results  
D) It will compile and run as expected

13. Consider the following statements about using functions in a program:

   I. Functions help simplify complex problems  
   II. Functions allows you to use the same code in multiple places  
   III. Functions make programs run faster

Which of the above are true statements about functions?

A) II only  
B) I and II  
C) I and III  
D) I, II and III
14. Consider the code segment shown below:

```cpp
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:

```cpp
int i= -1;
do {
    cout << ++i << " ";
} while( i<5);
```

Option II:

```cpp
int j=25;
while( j<31) {
    cout << (j-1)%6 << " ";
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.

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

A) min=0; max=0;
B) min=100; max=0;
C) min=50; max=50;
D) min=100; max=100;

16. Which of the following would not be enough to differentiate between two functions that otherwise have the same declaration?

A) Different function names
B) Different parameter types
C) Different number of parameters
D) Different return types

17. Remember that ' ' is 32, '0' is 48, 'A' is 65 and 'a' is 97. What is the output from the following code?

```cpp
char c1='2';
char c2='0';
cout << (char)(c1+c2);
```

A) There is no output because of a compiler error.
B) 20
C) 02
D) 'b'
18. Consider the code segment shown at right below used to find the minimum and maximum of three numbers. What is the result of calling this program segment using `problem18()`?

- A) 1 5
- B) 5 1
- C) 3 3
- D) 1 3
- E) 3 1

```cpp
int g1(int x, int y) {
    if (x<y)
        return x;
    else
        return y;
}

int g2(int x, int y) {
    return x+y - g1(x,y);
}

void problem18() {
    int x=1, y=3, z=5;
    cout << "Values are: "
    << g1( g1(x,y), z) << " "
    << g2( g2(x,y), z) << endl;
}
```

19. Consider the two design options shown below, to be used in creating a tic-tac-toe program:

I. displayBoard
   while( ! done) {
      promptForMove
      makeMove
      displayBoard
   }

II. while( true) {
      displayBoard
      promptForMove
      makeMove
      if( done())
        break;
   }
   displayBoard

III. do{
    displayBoard
    promptForMove
    makeMove
    if( done())
      break;
  } while( true);

What is the best description of the above three designs?

- A) Only one of the options is correct
- B) Only options I and II are correct
- C) Only options I and III are correct
- D) Only options II and III are correct
20. What is the output of the following C++ program segment, called with `confuseDriver()`?

```cpp
int s=1, y=3;

void confuse1(int y, int s)
{
    s++;
    y++;
}

void confuse2(int b, int &s)
{
    y = ++(s);
    s = b;
}

void confuse3(int &a, int &s)
{
    a = s + 1;
    s++;
}

void confuseDriver()
{
    int s=2;

    confuse1( s, y);
    confuse2( s, y);
    confuse3( s, y);
    cout << s+y << endl;
}
```

a) 3
b) 4
c) 6
d) 8
21. Consider the code below, where one of the four function calls shown at right could be inserted into the underlined section:

```cpp
void f1( int p, int &q)
{
    p = p + 1;
    q = q - 1;
}

void f2( int a, int b)
{
    a++;  
    b--;  
}

void f3( int &x, int y)
{
    x = x - 1;  
    y = y + 1;  
}

void f4( int &c, int &d)
{
    c++;  
    --d;  
}

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

How many of the above four function calls could be used in the underlined space so that when function parameters() is called the program prints out the value 10?

A) One  
B) Two  
C) Three  
D) Four

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

```cpp
int x = 4;  // global variable
void s1( int y)
{
    cout << x+y << "."; 
}

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

void scope()
{
    x = 1;  
    s2( x);  
}
```
23. Consider using binary search to find a particular number within an array of 350 numbers that are in ascending order. Assuming that after each guess we get feedback to go higher or lower, which of the following is closest to the number of guesses we will need to find any number?

A) 11
B) 9
C) 7
D) 5

24. What is the output from calling function `getScores()` shown at right below?

A) 3
B) 4
C) 45
D) 50
E) It depends on the input

```cpp
void getScores()
{
    const int Max = 4;
    int scores[Max];
    int sum = 0;

    cout << "Enter scores: ";
    for(int i=1; i<Max; i++) {
        cin >> scores[i];
        sum = i;
    }
    cout << sum << endl;
}
```

25. What is the output from calling function `useValues()` shown at right below?

A) 1 3 4 7 9
B) 9 7 4 3 1
C) 0 9 7 7 9
D) 9 7 4 7 9

```cpp
void swap( int &x, int &y)
{
    int temp = x;
    x = y;
    y = temp;
}

void useValues()
{
    const int Max = 5;
    int values[Max] = {1,3,4,7,9};
    int i=0;

    for (i=0; i<Max; ++i) {
        swap( values[i], values[Max-i-1]);
    }

    // Print numbers
    for (i=0; i<Max; ++i) {
        cout << values[i] << " ";
    }
}
```