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 multiple if-else statements be preferred over a switch-case statement?
   A) When validating whether or not user input of a character is in one of the vowels 'a', 'e', 'i', 'o', or 'u'
   B) When matching an athlete's uniform number with their position on the field
   C) When selecting among menu options
   D) When choosing which job description code to assign to a person based on their hourly wage in dollars, such as 10.75

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) When stuck on a problem, take a break, then come back to it
   D) Bigger problems should be broken down into smaller problems

3. What is the effect of adding a 0 to the right of a binary number?
   A) The new value is unchanged from the original
   B) The new value is the old value + 2
   C) The new value is the old value * 2
   D) The new value is the old value * 4

4. What is the decimal value 23 in binary?
   A) 010111
   B) 111010
   C) 010 011
   D) 011 010
5. Consider a C++ program that uses `rand()` to display random numbers. What is the effect of adding `srand(time(0));` to the beginning of that program?

A) It will continue to display random numbers as it did before  
B) The first random number will always be 0  
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. What is the output of the statement: `cout << (3 % -1);`

A) -3  
B) -1  
C) 0  
D) 1  
E) 3

7. 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 executes the rest of the code in the loop and then exits the loop  
C) It reruns the current loop iteration  
D) It bypasses the rest of the code in the loop and resumes execution at the next line of code after the loop

8. Consider code that manipulates a set of class test scores 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', 'B', and 'C'  
IV. Count how many there are of each score

A) 0  
B) 1  
C) 2  
D) 3  
E) 4
9. Consider the following function declaration:
   
   ```
   void f9(int x, char y, float z = 3.14);
   ```

   How many of the following function calls would match the above declaration?

   I. `f9(3, 'a', 1.5)`
   II. `f9(3, 'a')`
   III. `f9(3)`
   IV. `f9(1.5)`

   A) 1  
   B) 2  
   C) 3  
   D) 4

10. When passing an array to a function, what is the effect of adding `const` to the array declaration within the function declaration parameter list?

   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?

   ```
   int row = 0;
   int col = 0;
   for(row = 2; row <= 3; row++) {
      for(col = 0; col <= 1; col++) {
         cout << row << col << " ";
      }
   }
   ```

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

```
char grade = 'B';
char values[3] = {'C', 'D', 'E'};
for( int i=0; i<25; 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 allow multiple people to simultaneously work on solving pieces of the same problem

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:

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

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

**Option I:**
```
int i=0;
doi {
    cout << i++ << " ";
} while( i<6);
```

**Option II:**
```
int j=1;
while( j<=5) {
    cout << j-1 << " ";
    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. For which of the following cases is a `do-while` loop the most appropriate?
   A) Printing out a multiplication table
   B) Validating menu options
   C) Implementing an infinite loop
   D) Continuing to make game moves until the game is over

16. For which of the following cases is a `for` loop the most appropriate?
   A) Printing out a multiplication table
   B) Validating menu options
   C) Implementing an infinite loop
   D) Continuing to make game moves until the game is over

17. What is the output from the following code?
   ```
   char c1='A';
   char c2='1';
   cout << (char)(c1+c2);
   ```
   A) There is no output because of a compiler error.
   B) 66
   C) 'B'
   D) 'r'

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()`?
   ```
   int min(int x, int y)
   {
       return x<y ? x:y;
   }
   int max(int x, int y)
   {
       return x+y - min(x,y);
   }
   void problem18()
   {
       int x=3, y=7, z=4;
       cout << "Min and max are: "
            << min( min(x,y), z) << " "
            << max( max(x,y), z) << endl;
   }
   ```
   A) Compiler error
   B) Min is found correctly, but max isn't
   C) Min is not found correctly, but max is
   D) Both min and max are found correctly
19. Consider the following statement:
\[
\text{grade} = (\text{score} < 90) \ ? \ 'B' : 'A';
\]

Consider the following sections of code, to see if they have the same effect as the above statement.

I. 
\[
\begin{align*}
\text{if}( \text{score} &\geq 90) \\
\text{grade} &\text{ = 'A';} \\
\text{else} \\
\text{grade} &\text{ = 'B';}
\end{align*}
\]

II. 
\[
\begin{align*}
\text{if}( \text{score} &\geq 90) \\
\text{grade} &\text{ = 'A';} \\
\text{if}( \text{score} < 90) \\
\text{grade} &\text{ = 'B';}
\end{align*}
\]

III. 
\[
\begin{align*}
\text{if}( \text{score} < 90) \\
\text{grade} &\text{ = 'B';} \\
\text{else} \\
\text{grade} &\text{ = 'A';}
\end{align*}
\]

IV. 
\[
\text{switch}( \text{score}) \\ 
\text{case} 100: \\
\text{case} 99: \\
\text{case} 98: \\
\text{case} 97: \\
\text{case} 96: \\
\text{case} 95: \\
\text{case} 94: \\
\text{case} 93: \\
\text{case} 92: \\
\text{case} 91: \\
\text{case} 90: \text{grade} = 'A';\text{break;} \\
\text{default: grade} = 'B';\text{break;}
\]

*How many* of the above four sections of code (options I, II, III, IV) could be used in place of the original statement?

A) one  
B) two  
C) three  
D) four

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

I. 
\[
\begin{align*}
\text{displayBoard} \\
\text{while}( ! \text{done}) \{ \\
\text{promptForMove} \\
\text{makeMove} \\
\text{displayBoard}
\}
\]

II. 
\[
\begin{align*}
\text{while}( \text{true}) \{ \\
\text{displayBoard} \\
\text{promptForMove} \\
\text{makeMove} \\
\text{if}( \text{done}) \\
\text{break;}
\}
\]

III. 
\[
\begin{align*}
\text{do} \\
\text{displayBoard} \\
\text{promptForMove} \\
\text{makeMove} \\
\text{if}( \text{done}) \\
\text{break;}
\}\text{while}( \text{true});
\]

What is the best description of the above two 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  
E) All three options are correct
21. 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)
{
    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();`

```
int x = 1;   // global variable
void s1( int y)
{
    cout << x+y << " ";
}
void s2( int y)
{
    x = y++;  
    s1( y);  
}
void scope()
{
    x = 2;     
    s2( x);   
}
```

A) 4  
B) 5  
C) 6  
D) 7
23. Two functions can have the same name as long as:
   A) They have different return types
   B) They have either different numbers or different types of parameters
   C) They have different numbers and also have different types of parameters
   D) They have different return types and have either different parameter types or have different number of parameters

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

   A) 0
   B) 10
   C) 45
   D) 50
   E) It depends on the input

```cpp
void getScores()
{
    const int Max = 10;
    int scores[Max];
    int sum = 0;

    cin >> scores[i];
    sum = 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 useValues()
{
    const int Max = 5;

    int values[Max] = {1,3,4,7,9};
    int i = 0;

    for (i = 0; i < Max/2; ++i) {
        values[i] = values[Max-i-1];
    }

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