READ THIS NOW!

Failure to read and follow the instructions below may result in severe penalties.
Failure to adhere to these directions will not constitute an excuse or defense.

- Print your name and the five-digit course number in the spaces provided below.
- Print your name and ID number on the Opscan form; be sure to code your ID number on the Opscan form. Code Form A on the Opscan.
- Choose the single best answer for each question — some answers may be partially correct. If you mark more than one answer, it will be counted wrong.
- Unless a question involves determining whether given C++ code is syntactically correct, assume that it is. The given code has been compiled and tested, except where there are deliberate errors. Unless a question specifically deals with compiler #include directives, you should assume the necessary header files have been included.
- Note that questions about printed values disregard formatting completely.
- Be careful to distinguish integer values from floating point (real) values (containing a decimal point). In questions/answers which require a distinction between integer and real values, integers will be represented without a decimal point, whereas real values will have a decimal point, [1044 (integer), 1044.0 (real)].
- When you have completed the test, sign the pledge at the bottom and turn in the test and your Opscan.
- This is a closed-book, closed-notes examination. No calculators or other electronic devices may be used during this examination. You may not discuss (in any form: written, verbal or electronic) the content of this examination with any student who has not taken it. You must return this test form when you complete the examination. Failure to adhere to any of these restrictions is an Honor Code violation.
- There are 30 multiple-choice questions.
- The answers you mark on the Opscan form will be considered your official answers.

Do not start the test until instructed to do so!

Name ________________________________ (print: Last name, First)

VT PID: ________________________________ (print: campus email address)

Pledge: On my honor, I have neither given nor received unauthorized aid on this examination.

________________________________________

signature
For the next two questions, consider the execution of the following code fragment:

```cpp
int x = 3, y = 0;
while (x <= 8) {
    x = x - 1;
    y = y + x;
    cout << "y = " << y << endl;
}
```

1) What value is printed for the variable `x`?
   1) 4  2) 5  3) 6  4) 7  5) 8
   6) 9  7) 10  8) none of the above

2) What value is printed for the variable `y` on the third line of output?
   1) 1  2) 2  3) 3  4) 4  5) 5
   6) 6  7) 0  8) none of the above

For the next two questions, consider executing the following code fragment (assume any additional declarations, etc, needed to make the code syntactically correct):

```cpp
int j = 29;
while (j > 0) {
    j = j - (j % 3) - (j % 2) - 1;
    cout << j << endl;
}
```

3) Exactly how many times will the body of the loop be executed?
   1) 7  2) 8  3) 9  4) 10  5) 11
   6) 12  7) 13  8) 14  9) 15  10) none of the above

4) What is the fifth value printed?
   1) 20  2) 17  3) 13  4) 10  5) 8
   6) 5  7) 1  8) none of these
Consider executing the following program:

```cpp
void main ()
{
    int i, j, count=0, Answer;
    Answer = 1;
    for (i = 1; i < 3; i=i+1) {
        for (j = 1; j < 5; j=j+2){
            count++;
            Answer = Answer * i * j;
        }
    }
    cout << Answer << endl << count << endl;
}
```

7) What value is printed for the variable Answer?

1) 0 2) 1 3) 2 4) 15 5) 18 6) 36
7) 72 8) none of the above

8) What value is printed for the variable count?

1) 0 2) 1 3) 2 4) 15 5) 18 6) 36
7) 72 8) none of the above
Consider executing the following program:

```c++
void main() {
    int i, j, k, sum;
    sum = 0;
    for (i = 1; i < 5; i++)
        for (j = 1; j < 5; j++)
            for (k = 1; k < 5; k++)
                sum++;
    cout << sum << endl;
}
```

9) What is the value printed out for `sum`?

1) 11  2) 12  3) 3  4) 10  5) 15  6) 16
7) 20  8) 8  9) 0  10) none of the above

Now, consider executing the following slightly different program:

```c++
void main() {
    int i, j, k, sum;
    for (i = 1; i < 5; i++) {
        sum = 0;
        for (j = 1; j < 5; j++)
            for (k = 1; k < 5; k++)
                sum++;
        cout << sum << endl;
    }
}
```

10) What is the value printed on the third line of output?

1) 11  2) 12  3) 3  4) 10  5) 15  6) 16
7) 20  8) 8  9) 0  10) none of the above

11) Given the function heading

```c++
int FindIt( int& howMany,
            float& alpha,
            float  beta    )
```

which of the following is a valid function prototype for `FindIt`?

1) int FindIt( int howMany, float alpha, float  beta );
2) void FindIt( int& howMany, float& alpha, float  beta, float  default );
3) int FindIt( int& howMany, float& alpha, float  beta );
4) 1 and 2 above
5) 1 and 3 above
6) 1, 2, and 3 above
7) none of the above
For the next 2 questions consider the following code:

```cpp
void main ()
{
    int Value1 = 2;
    int Value2 = 5;

    Mystery (Value1, Value2);
    cout << Value1 << ' ' << Value2 << endl;
}

void Mystery (int& Param1, int Param2)
{
    Param1 = Param1 * Param1;
    Param2 = Param2 + Param2;
}
```

12) What is printed out for Value1?

1) 1    2) 2    3) 3    4) 4    5) 5    6) 6 7) 0 8) 10 9) none of the above

13) What is printed out for Value2?

1) 1    2) 2    3) 3    4) 4    5) 5    6) 6 7) 0 8) 10 9) none of the above

14) Consider the function definition

```cpp
void DoThis( int alpha, 
    int& beta )
{
    int temp;

    alpha = alpha + 100;
    temp = beta;
    beta = 999;
}
```

What is the output produced by execution of the code below?

```cpp
int gamma = 10, delta = 20;
DoThis(gamma, delta);
cout << "gamma = " << gamma << " and delta = " << delta << endl;
```

1) gamma = 10 and delta = 20        4) gamma = 110 and delta = 999
2) gamma = 110 and delta = 20       5) none of the above
3) gamma = 10 and delta = 999
15) Which of the loops below produces the same number of loop iterations as the following loop? (variable count is of type int)

```cpp
for (count = 1; count < 10; count++)
    DoSomething();
```

1) ```cpp
   for (count = 10; count >= 1; count--)
   DoSomething();
```  
2) ```cpp
   for (count = 9; count > 0; count--)
   DoSomething();
```  
3) ```cpp
   for (count = 10; count > 0; count--)
   DoSomething();
```  
4) 1 and 2 above  
5) 1 and 3 above  
6) 1, 2, and 3 above  
7) none of the above

Consider the following code:

```cpp
void doh (int x);
int main()
{
    int x,y;

    // do something silly
    x=10;
y=11;
doh(x);
doh(y);
    cout << x << ' ' << y << endl;
    return 0;
}
```

16) What are the values of variables x and y output by the code above?

1) 10  11  
2) 20  22  
3) 11  10  
4) 40  11  
5) 20  12  
6) 40  14

17) What would be the values of variables x and y output by the code above if the prototype and header for the function doh was changed to doh(int& x) ?

1) 10  11  
2) 20  22  
3) 11  10  
4) 40  11  
5) 20  12  
6) 40  14
For the next two consider the following code:

```c
int ray[5];
int j = 0;

for (i = 0; i < 5; i++)
{
    ray[i] = j;
    ray[i] = ray[i] + 1;
    j = j + 1;
}
```

18) What is the contents of the array `ray` after the for loop?

1) 0 1 2 3 4 2) 1 2 3 4 5 3) 0 2 4 6 8 4) 1 3 5 7 9

19) What is the contents of the array location `ray[1]` after the for loop?

1) 1 2) 2 3) 3 4) 4 5) 5 6) 6 7) 7 8) 8 9) 9 10) none of the above

Consider the following code:

```c
int main()
{
    int x[20];         // line 1
    for (int i=1; i<=20; i++)     // line 2
        x[i] = i * i;           // line 3
    return 0;              // line 4
}
```

20) Which line of code should be changed to prevent a possible runtime error in the program?

1) line 1 2) line 2 3) line 3 4) line 4 5) either 1 or 2 6) either 1 or 3 7) either 2 or 3 8) either 1 or 4
For the next 5 questions, consider the incomplete function definition given below:

```cpp
// Count0s takes an array of integers and count the number of times
// the value 0 appears in the array.
//
// Parameters:
//     Array[]    array containing integers.
//     NumOfDigits number of integers to check
//     Total0     number of 0s in the array

void Count0s(int _________, int NumOfDigits, int& Total0)// Line A
{
    int LoopCounter;
    for(LoopCounter=0;________;LoopCounter++)  //Line B
    {
        if (________ == 0)    //Line C
            Total0=Total0+________;   //Line D
    }
    cout<"The number of '0's are = "<_________;  //Line E
}
```

21) How should the blank for the first parameter in line A be filled?
   1) & Array           2) Array[]              3) & Array[]
   4) [] Array           5) & [] Array           6) none of these

22) How should the blank in line B be filled?
   1) LoopCounter < 100
   2) LoopCounter <= NumOfDigits
   3) LoopCounter <= 100
   4) LoopCounter < NumOfDigits
   5) none of these

23) How should the blank in line C be filled?
   1) Array[NumOfDigits]
   2) Array[LoopCounter]
   3) LoopCounter
   4) none of these
   5) NumOfDigits

24) How should the blank in line D be filled?
   1) 1
   2) Array
   3) LoopCounter
   4) none of these
   5) NumOfDigits

25) How should the blank in line E be filled?
   1) Total0
   2) Array[LoopCounter]
   3) LoopCount
   4) none of these
   5) NumOfDigits
For the next five questions, consider this (incomplete) code segment. The function ReverseValues() is intended to take as a parameter an array of integers & the usage of the array. When the function call terminates, the function will have reversed the order of the integers in the array and returned the number of swapped array locations.

```java
public int ReverseValues(int ___________, int Usage) { // line A
    int numSwaps = 0; // line B
    int tempInt; // line C
    int Lo = 0; // line D
    int Hi = ___________; // line E

    while (Lo < Hi) { // line F
        //swap the Lo & Hi indexed elements of the array parameter t2List
        tempInt = ___________; // line G
        ___________; // line H
        ___________; // line I
        numSwaps++; // line J
        Lo++; // line K
        Hi--; // line L
    }
    return numSwaps; // line M
}
```

26) How should the blank for the parameter in line A be filled?
   1) & t2List  2) t2List[]  3) & t2List[]
   4) []t2List  5) &[] t2List  6) none of these

27) How should the blank in line E (initializing Hi) be filled?
   1) Usage   2) Usage + 1  3) Usage - 1
   4) t2List.length()  5) none of these

28) How should the blank in line G be filled?
   1) t2List[Lo]   2) t2List[Hi]  3) t2List[Usage]
   4) t2List[Hi - numSwaps]  5) none of these

29) How should the blank in line H be filled?
   1) t2List[Lo] = tempInt   2) t2List[Lo] = t2List[tempInt]
   3) t2List[Lo] = Hi   4) t2List[Lo] = t2List[Hi]
   5) t2List[Lo] = Usage   6) t2List[Lo] = t2List[Usage]
   7) none of these

30) How should the blank in line I be filled?
   1) t2List[Hi] = tempInt   2) t2List[Hi] = t2List[tempInt]
   3) t2List[Hi] = Hi   4) t2List[Hi] = t2List[Hi]
   5) t2List[Hi] = Usage   6) t2List[Hi] = t2List[Usage]
   7) none of these