Last name (printed): ____________________________________________________________

First name (printed): _________________________________________________________

Directions:

a) DO NOT OPEN YOUR EXAM BOOKLET UNTIL YOU HAVE BEEN TOLD TO BEGIN.

b) You have 80 minutes to complete the exam (10:20-11:40)

c) This exam booklet contains 30 multiple choice questions, each weighted equally (5 points). **10 pages total**

d) You may use one 8.5" x 11" note sheet during the exam. No other reference materials or calculating devices may be used during the examination.

e) Questions will not be interpreted during the examination.

f) You should choose the single best alternative for each question, even if you believe that a question is ambiguous or contains a typographic error.

g) Please fill in the requested information at the top of this exam booklet.

h) Use a #2 pencil to encode any information on the OMR form.

i) Please encode the following on the OMR form:

   - Last name and first initial
   - MSU PID
   - Exam form (see the title of this page)

j) Please sign the OMR form.

k) Only answers recorded on your OMR form will be counted for credit.

l) Completely erase any responses on the OMR form that you wish to delete.

m) You must turn in this exam booklet and the OMR form when you have completed the exam. When leaving, please be courteous to those still taking the exam.

Good luck.

**Timing tip.** A rate of 2.5 minutes per multiple choice problem leaves 5 minutes to go over any parts of the exam you might have skipped.
1) For the program in Figure 1, give the output of Line 1?
   a) 8 
   b) 9 
   c) 10 
   d) 11 
   e) None of the above.

2) For the program in Figure 1, give the output of Line 2?
   a) 8 
   b) 9 
   c) 10 
   d) 11 
   e) None of the above.

3) For the program in Figure 1, give the output of Line 3?
   a) 1 
   b) 2 
   c) 3 
   d) 4 
   e) None of the above.
4) For the program in Figure 1, give the output of Line 4?
   a) 1
   b) 2
   c) 3
   d) 4
   e) None of the above.

5) For the program in Figure 1, give the output of Line 5?
   a) 0
   b) 1
   c) 2.5
   d) 2
   e) None of the above.
6) Given long n = 5; what does cout << n++; return?
   a) The value printed, in this case 5
   b) No return.
   c) The value printed, in this case 6
   d) 0
   e) None of the above

7) Given long n = 5; what does cout << n++; print to output?
   a) The value 5
   b) No return.
   c) The value 6
   d) 0
   e) None of the above

8) Which of the following are true about the symbol &?
   a) In a declaration it means address
   b) In a statement it means reference
   c) Two of them together in a statement mean logical and
   d) All of the above
   e) None of the above

9) Given string s="abc"; What does s.find('z'); return?
   a) 0.
   b) Throws an error.
   c) Empty string
   d) "abc"
   e) None of the above

10) Which of the following are true about the symbol *?
    a) In a declaration it means pointer.
    b) In a statement between two integers (1 * 2), it means multiply.
    c) In a statement next to a variable (*p), it means dereference.
    d) All of the above.
    e) None of the above

11) Given string s="abc";
    What type is ch in for(auto ch : s){cout << ch}?
    a) string
    b) char
    c) auto
    d) Not enough information is provided to tell.
    e) None of the above

12) Which of the following initializes a string s to the value "Hi Mom"?
    a) string s = "Hi Mom";
    b) string s("Hi Mom");
    c) string s = {'H', 'i', ' ', 'M', 'o', 'm'};
    d) All of the above
    e) None of the above
### Figure 2

```cpp
#include<iostream>
using std::cout; using std::endl;

bool f1 (long *n1, long n2, long &n3){
   if ((*n1) > n2){
      n3 = (*n1) * n2;
      n2 *= 2;
      *n1 = 10;
   }
   else{
      n3 = n2 + n2;
      n2 *= 3;
      *n1 = 20;
   }
   return (n2 > n3);
}

int main (){  
   long v1 = 3, v2 = 4, v3 = 5;  
   long *x1 = &v1;

   auto result = f1(x1, v2, v3); // Line 1
   cout << x1 << endl; // Line 2
   cout << result << endl; // Line 3
   cout << v1 << endl;    // Line 4
   cout << v2 << endl;    // Line 5
   cout << v3 << endl;    // Line 6
}
```

13) For the program in Figure 2, what type is `result` on Line 1.
   a) int  
   b) double  
   c) long*  
   d) long& 
   e) None of the above

14) For the program in Figure 2, what value is output on Line 2.
   a) some address  
   b) 4  
   c) 10  
   d) 20 
   e) None of the above

15) For the program in Figure 2, give the output of Line 3.
   a) 0  
   b) 1  
   c) true  
   d) false  
   e) None of the above
16) For the program in Figure 2, give the output of Line 4.
   a) some address
   b) 4
   c) 10
   d) 20
   e) None of the above

17) For the program in Figure 2, give the output of Line 5.
   a) 4
   b) 12
   c) 0
   d) some address
   e) None of the above

18) For the program in Figure 2, give the output of Line 6.
   a) 3
   b) 6
   c) 9
   d) some address
   e) None of the above
For the program shown in Figure 3, what output is produced by Line 1?

a) 0
b) 1
c) true
d) false
e) None of the above
20) For the program shown in Figure 3, what output is produced by Line 2?
   a) xyzabc
   b) abcxyz
   c) axbycz
   d) xaybzc
   e) None of the above

21) For the program shown in Figure 3, what output is produced by Line 3?
   a) xyzabc
   b) abcxyz
   c) axbycz
   d) xaybzc
   e) None of the above

22) For the program shown in Figure 3, what output is produced by Line 4?
   a) abc
   b) abcabc
   c) aabbcc
   d) empty string
   e) None of the above

23) For the program shown in Figure 3, what output is produced by Line 5?
   a) !A1B2cd
   b) abcd
   c) !12.
   d) ABcd
   e) None of the above

24) For the program shown in Figure 3, what output is produced by Line 6?
   a) 0
   b) 1
   c) 2
   d) 3
   e) None of the above
25) For the program in Figure 4, what value is printed by Line 1?
   a) xbc
   b) ayz
   c) xbcayz
   d) empty string
   e) None of the above
26) For the program in Figure 4, what value is printed by Line 2?
   a) xbc
   b) xbcxbcxbc
   c) 3
   d) xbcayz
   e) None of the above

27) For the program in Figure 4, what value is printed by Line 3?
   a) 0
   b) 10
   c) 20
   d) 30
   e) None of the above

28) For the program in Figure 4, what value is printed by Line 4?
   a) 0
   b) 10
   c) 20
   d) 30
   e) None of the above

29) For the program in Figure 4, Line 5 will not compile. What is the cause?
   a) Cannot match template Type
   b) Problem with the return type of the function
   c) Operation in the function cannot be performed on type
   d) Malformed statement
   e) None of the above

30) For the program in Figure 4, Line 6 will not compile. What is the cause?
   a) Cannot match template Type
   b) Problem with the return type of the function
   c) Operation in the function cannot be performed on type
   d) Malformed statement
   e) None of the above