Fall Semester 16, Dr. Punch. Exam #3 (12/16), form 3 A

Last name (printed): _____________________________________________

First name (printed): _____________________________________________

Directions:

a) DO NOT OPEN YOUR EXAM BOOKLET UNTIL YOU HAVE BEEN TOLD TO BEGIN.
b) You have 120 minutes to complete the exam (7:45-9:45)
c) This exam booklet contains 40 multiple choice questions, each weighted equally (5 points). 6 double-sided pages in 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 2.75 minutes per multiple choice problem leaves 10 minutes to go over any parts of the exam you might have skipped.
Figure 1

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

long fn1(long param1, long& param2, long* param3){
    size_t i = 0;
    long result;
    while (param3[i] != param2 && i < param1){
        i++;
    }
    if (i == param1){
        result = *param3;
        *param3 = param2;
    }
    else{
        result = i;
        long t = param3[0];
        param3[0] = param2;
        param3[i] = t;
        param2 = t;
    }
    return result;
}

int main(){
    cout << boolalpha;
    
    long a[]={10,20,30,40};
    long x = 30;
    cout << fn1(4, x, a)<<endl;    // Line 1
    cout << x << endl;            // Line 2
    cout << a[0] << endl;         // Line 3

    long b[]={10,20,30,40};
    long y = 100;
    cout << fn1(4, y, b)<<endl;    // Line 4
    cout << y << endl;            // Line 5
    cout << a[0] << endl;         // Line 6
}
```

1) For the program in Figure 1, what output is given by Line 1?  
   a) 10  
   b) 20  
   c) 30  
   d) 40  
   e) None of the above. 

2) For the program in Figure 1, what output is given by Line 2?  
   a) 10  
   b) 20  
   c) 30  
   d) 40  
   e) None of the above.
3) For the program in Figure 1, what output is given by Line 3?
   a) 10
   b) 20
   c) 30
   d) 40
   e) None of the above.

4) For the program in Figure 1, what output is given by Line 4?
   a) 10
   b) 20
   c) 30
   d) 40
   e) None of the above.

5) For the program in Figure 1, what output is given by Line 5?
   a) 10
   b) 20
   c) 30
   d) 40
   e) None of the above.

6) For the program in Figure 1, what output is given by Line 6?
   a) 10
   b) 20
   c) 30
   d) 40
   e) None of the above.
7) Which of the following is true about binary trees that are balanced (or nearly so)?
   a) They are $O(\log_2(n))$ to search
   b) They use less memory
   c) You typically would not use dynamic memory in a tree.
   d) You would never use recursion to define tree methods.
   e) None of the above

8) What is the Big O rating for finding a character in an string?
   a) $O(1)$
   b) $O(n \times \log(n))$
   c) $O(n^3)$
   d) $O(n^2)$
   e) None of the above

9) Which of the following are true about a recursive function?
   a) it calls itself.
   b) it uses the call stack.
   c) it can be expensive computationally.
   d) All of the above.
   e) None of the above.

10) What is the difference in size between a pointer to an 32bit int and a pointer to a 64bit long?
    a) They are the same size.
    b) The int pointer is smaller (requires less memory to store).
    c) The long pointer is smaller (requires less memory to store).
    d) The difference in size depends on the operating system being used.
    e) None of the above

11) Which of the following is true about the C++ switch statement?
    a) You can `switch` on a value of any type.
    b) You can use conditionals in the `case` part of the statement.
    c) A `break` in a `switch` clause allows so called "fall through" behavior to occur.
    d) All of the above
    e) None of the above

12) Which of the following are true about the C++ delete statement?
    a) Can be used with an array or a pointer to a single value.
    b) Changes the amount of memory on your local machine (makes it smaller).
    c) Returns the pointer to the deleted memory.
    d) All of the above
    e) None of the above
13) For the program in Figure 2, what type is `f` on Line 1?
   a) char  
   b) string  
   c) size_t  
   d) can't tell, it's a template  
   e) None of the above

14) For the program in Figure 2, what value is output on Line 2?
   a) 0  
   b) 2  
   c) 3  
   d) 7  
   e) None of the above

15) For the program in Figure 2, what value is output on Line 3?
   a) 0  
   b) 2  
   c) 3  
   d) 7  
   e) None of the above
16) For the program in Figure 2, what value is output on Line 4?
   a) 1
   b) 2
   c) 3
   d) 4
   e) None of the above
17) For the program in Figure 2, what value is output on Line 5?
   a) empty string
   b) jkl
   c) abc
   d) ghi
   e) None of the above
18) For the program in Figure 2, what value is output on Line 6?
   a) empty string
   b) jkl
   c) abc
   d) ghi
   e) None of the above
19) For the program in Figure 2, what value is output on Line 7.
   a) 1
   b) 2
   c) 3
   d) 4
   e) None of the above
20) For the program in Figure 2, using the invocation of fn1 on Line 2, what type is
    substituted for V in the template program?
    a) long
    b) string
    c) size_t
    d) no type, it's a template
    e) None of the above
Figure 3 is one program. Program starts in column 1 and continues in column 2

21) For the program in Figure 3, what is the full type of `e` on Line 1?
   a) vector<string>
   b) vector
   c) string
   d) string&
   e) None of the above

22) For the program in Figure 3, what output is produced by Line 2?
   a) abc
   b) axb
   c) bya
   d) empty string
   e) None of the above
23) For the program in Figure 3, what output is produced by Line 3?
   a) 0
   b) 1
   c) 2
   d) 3
   e) None of the above

24) For the program in Figure 3, what output is produced by Line 4?
   a) a
   b) czb
   c) barb
   d) empty string
   e) None of the above

25) For the program in Figure 3, what output is produced by Line 5?
   a) 0
   b) 1
   c) 2
   d) 3
   e) None of the above

26) For the program in Figure 3, what output is produced by Line 6?
   a) abcxyzbarb
   b) :xyzbarb
   c) ::barb
   d) abc:barb
   e) None of the above

27) For the program in Figure 3, what output is produced by Line 7?
   a) arbb
   b) barb
   c) cba
   d) abc
   e) None of the above

28) For the program in Figure 3, what output is produced by Line 8?
   a) xyz
   b) zxy
   c) abc
   d) cab
   e) None of the above
29) For the program in Figure 4, what output is produced by Line 1?
   a) 1
   b) 2
   c) 3
   d) 4
   e) None of the above

30) For the program in Figure 4, what output is produced by Line 2?
   a) 1
   b) 2
   c) 3
   d) 4
   e) None of the above

Figure 4 is one program. Program starts in column 1 and continues in column 2.
31) For the program in Figure 4, what output is produced by Line 3?
   a) 2
   b) 4
   c) 8
   d) 16
   e) None of the above

32) For the program in Figure 4, what output is produced by Line 4?
   a) 1
   b) 2
   c) 3
   d) 4
   e) None of the above

33) For the program in Figure 4, what output is produced by Line 5?
   a) 2
   b) 4
   c) 8
   d) 16
   e) None of the above

34) For the program in Figure 4, what output is produced by Line 6?
   a) 1
   b) 2
   c) 3
   d) 4
   e) None of the above

35) For the program in Figure 4, what output is produced by Line 7?
   a) 1
   b) 10
   c) 2
   d) 20
   e) None of the above
Figure 5 is one program. Program starts in column 1 and continues in column 2.
36) For the program in Figure 5, what output is produced on Line 1?
   a) 0
   b) 1
   c) 2
   d) 3
   e) None of the above

37) For the program in Figure 5, what output is produced on Line 2?
   a) 0
   b) 1
   c) 2
   d) 3
   e) None of the above

38) For the program in Figure 5, what output is produced by Line 3?
   a) 8
   b) 9
   c) 10
   d) 11
   e) None of the above

39) For the program in Figure 5, what output is produced by Line 4?
   a) a
   b) b
   c) ' ' // a blank character
   d) c
   e) None of the above

40) For the program in Figure 5, what output is produced by Line 5?
   a) a
   b) b
   c) ' ' // a blank character
   d) c
   e) None of the above