Fall Semester 15, Dr. Punch. Exam #3 (12/18), 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

Form A

1  2  3  4  5  6  7  8  9 10
E  C  B  C  A  D  D  C  D  B

11  12  13  14  15  16  17  18  19  20
A  D  D  C  A  E  A  C  D  B

21  22  23  24  25  26  27  28  29  30
B  A  E  B  D  A  A  E  B  B

31  32  33  34  35  36  37  38  39  40
C  C  C  E  B  C  E  A  D  C
#include<iosstream>
using std::cout; using std::endl;

long fn1(long& l_1, long l_2){
    long c = 0;
    while (l_1 >= l_2) {
        l_1 -= 1;
        c += 1;
    }
    return c;
}

long* fn2(long* l_1, long l_2) {
    *l_1 = *l_1 + l_2;
    return l_1;
};

int main (){
    long l_1 = 20, l_2 = 10;
    long* l_3 = nullptr;
    l_2 = fn1(l_1, l_2);
    cout << l_1 << endl;    // Line 1
    cout << l_2 << endl;    // Line 2
    // cout << l_3 << endl;    // Line 3
    l_1 = 20;
    l_2 = 10;
    l_3 = fn2(&l_1, l_2);
    cout << l_1 << endl;    // Line 4
    cout << l_2 << endl;    // Line 5
    cout << l_3 << endl;    // Line 6
}

1) For the program in Figure 1, what output is given by Line 1?
   a) 0
   b) 10
   c) 11
   d) 12
   e) None of the above.

2) For the program in Figure 1, what output is given by Line 2?
   a) 0
   b) 10
   c) 11
   d) 12
   e) None of the above.
3) For the program in Figure 1, if Line 3 were uncommented, what would be the result?
   a) output some address
   b) segmentation fault occurs
   c) output some random value
   d) outputs 0
   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) some address
   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) some address
   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) some address
   e) None of the above.
7) What is the "rule of three" for C++ classes?
   a) You must provide three constructors in a dynamic memory class
   b) There should be no more than three private variables in a class.
   c) No more than three overloaded operators should be provided in a class.
   d) If you provide a copy constructor, destructor or operator=, you should provide them all.
   e) None of the above

8) What is the Big O rating for finding a value in an unsorted array/vector?
   a) O(1)
   b) O(n * log(n))
   c) O(n)
   d) O(n^2)
   e) None of the above

9) Which of the following represents the best meaning of the new operator?
   a) more memory is provided to the operating system.
   b) provides access to hidden memory in the operating system
   c) what it does depend on which operating system you are using.
   d) the operating system marks some memory as owned by your running code.
   e) None of the above.

10) Which of the following are true about STL vectors and a regular C++ arrays?
    a) Both are fixed in their size.
    b) Both have their first value at index 0
    c) Both can use generic algorithms using iterators.
    d) All of the above.
    e) None of the above

11) Which of the following is true regarding an STL sort algorithm on a container?
    a) Assumes the existence of an operator< on the container's values.
    b) Only works on numeric values.
    c) Requires a single pointer/iterator argument to the first value, no other arguments
    d) All of the above
    e) None of the above

12) Which of the following are true about a class constructor?
    a) It can be explicitly invoked
    b) Has the same name as the class
    c) Has no return value
    d) All of the above
    e) None of the above
13) For the program in Figure 2, what type is `elem` on Line 1?

a) `char`

b) `long`

c) `map<char, long>::iterator`

d) `pair<char, long>`

e) None of the above
14) For the program in Figure 2, what type is `elem` on Line 2?
   a) `char`
   b) `long`
   c) `map<char, long>::iterator`
   d) `pair<char, long>`
   e) None of the above

15) For the program in Figure 2, what value is output on Line 3?
   a) 10
   b) 15
   c) 20
   d) 30
   e) None of the above

16) For the program in Figure 2, what value is output on Line 4.
   a) 10
   b) 15
   c) 20
   d) 30
   e) None of the above

17) For the program in Figure 2, what value is output on Line 5.
   a) c
   b) b
   c) a
   d) q
   e) None of the above

18) For the program in Figure 2, what value is output on Line 6.
   a) 11
   b) 21
   c) 36
   d) 46
   e) None of the above

19) For the program in Figure 2, what value is output on Line 7.
   a) 33
   b) 43
   c) 58
   d) 68
   e) None of the above

20) For the program in Figure 2, what value is output on Line 8.
   a) 25
   b) 35
   c) 10
   d) 0
   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 output is produced by Line 1?

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

23) For the program in Figure 3, what output is produced by **Line 3**?
   a) 2  
   b) 3  
   c) 4  
   d) 5  
   e) None of the above

24) For the program in Figure 3, what output is produced by **Line 4**?
   a) 0  
   b) 1  
   c) 2  
   d) 3  
   e) None of the above

25) For the program in Figure 3, what output is produced by **Line 5**?
   a) 6  
   b) 10  
   c) 15  
   d) 25  
   e) None of the above

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

27) For the program in Figure 3, what output is produced by **Line 7**?
   a) 11  
   b) 4  
   c) 5  
   d) 6  
   e) None of the above

28) For the program in Figure 3, what output is produced by **Line 8**?
   a) 6  
   b) 10  
   c) 15  
   d) 25  
   e) None of the above
Figure 4 is one program. Program starts in column 1 and continues in column 2

29) For the program in Figure 4, what output is produced by Line 1?
   a) 0
   b) 1
   c) 2
   d) 3
   e) None of the above
30) For the program in Figure 4, what output is produced by Line 2?
   a) 0
   b) 10
   c) 20
   d) 30
   e) None of the above

31) For the program in Figure 4, what output is produced by Line 3?
   a) 0
   b) 1
   c) 2
   d) 3
   e) None of the above

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

33) For the program in Figure 4, what output is produced by Line 5?
   a) 0
   b) 1
   c) 2
   d) 3
   e) None of the above

34) For the program in Figure 4, what output is produced by Line 6?
   a) 0
   b) 10
   c) 20
   d) 30
   e) None of the above
```cpp
#include <iostream>
using std::cout; using std::endl;
#include <string>
using std::string;
#include <vector>
using std::vector;
#include <algorithm>
using std::transform;

template<typename T>
class MyClass{
  public:
    vector<T> v_;
    MyClass();
    MyClass(T t);
    void m1(T t, long l);
    void m2();
  
  template<typename T>
  MyClass<T>:::MyClass(T t){
    v_ = {t};
  }

  template<typename T>
  void MyClass<T>:::m1(T t, long l){
    T temp = t;
    for(int i=0; i<l; i++){
      v_.push_back(temp);
      temp = temp + t;
    }
  }

  // templated function for transform template<typename T>
  T myFun(T t1){
    return t1 + t1;
  }

  template<typename T>
  void MyClass<T>:::m2(){
    transform(v_.begin(), v_.end(),
             v_.begin(), myFun<T>);
  }
};

int main(){
  MyClass<long> mc1(1);
  cout << mc1.v_[0] << endl; // Line 1
  mc1.m1(2, 4);
  cout << mc1.v_[3] << endl; // Line 2
  mc1.m2();
  cout << mc1.v_[3] << endl; // Line 3

  MyClass<string> mc2("a");
  cout << mc2.v_[0] << endl; // Line 4
  mc2.m1("b",4);
  cout << mc2.v_[3] << endl; // Line 5
  mc2.m2();
  cout << mc2.v_[3] << endl; // Line 6
}
```

Figure 5 is one program. Program starts in column 1 and continues in column 2.
35) 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
36) For the program in Figure 5, what output is produced on Line 2?
   a) 2
   b) 4
   c) 6
   d) 8
   e) None of the above
37) 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
38) For the program in Figure 5, what output is produced by Line 4?
   a) a
   b) b
   c) ' ' // a blank character
   d) 0
   e) None of the above
39) For the program in Figure 5, what output is produced by Line 5?
   a) a
   b) b
   c) bb
   d) bbb
   e) None of the above
40) For the program in Figure 5, what output is produced by Line 6?
   a) bb
   b) bbbb
   c) bbbbb
   d) a
   e) None of the above