Spring Semester 17, Dr. Punch. Exam #3 (05/04), 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.
For the program in Figure 1, what is the type of \texttt{fn1\_result} on Line 1?

a) \texttt{long}  
b) \texttt{long\*}  
c) \texttt{long\&}  
d) \texttt{size\_t}  
e) None of the above.
2) For the program in Figure 1, what output is given by Line 2?
   a) some address
   b) 10
   c) 20
   d) 30
   e) None of the above.

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

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

5) For the program in Figure 1, what is the type of fn2_result on Line 5?
   a) long
   b) long*
   c) bool
   d) size_t
   e) None of the above.

6) For the program in Figure 1, what output is given by Line 6?
   a) true
   b) false
   c) 1
   d) 0
   e) None of the above.

7) For the program in Figure 1, what output is given by Line 7?
   a) some address
   b) 10
   c) 20
   d) 30
   e) None of the above.

8) For the program in Figure 1, what output is given by Line 8?
   a) some address
   b) 10
   c) 20
   d) 30
   e) None of the above.
9) If a program contains the line `unsigned int i = -1;`, which of the following is true:
   a) The program will not compile
   b) The program will compile but not run
   c) The program compiles and runs and value contained in the variable `i` will be `-1`
   d) The program compiles and runs but the variable `i` has an undefined value.
   e) None of the above

10) Which of the following are true about default class constructors?
    a) If you do not write your own default constructor, the compiler will synthesize one for you.
    b) If you write any other constructor, the compiler **will not** synthesize a default
    c) You can utilize the synthesized default constructor with `=default`.
    d) All of the above
    e) None of the above

11) Which of the following are true about the statement `auto val = new long[10];`?
    a) You can delete that memory with the statement `delete val;`
    b) The type of `val` is `long`.
    c) The size of `val` is 10 bytes exactly.
    d) All of the above.
    e) None of the above.

12) In the demonstration of insertion_sort vs selection_sort, which of the following statements are true?
    a) Selection sort was generally faster.
    b) They are both O(n^2)
    c) Insertion sort was slowest when starting with a nearly sorted array.
    d) All of the above.
    e) None of the above

13) Which of the following are true statements regarding lambda expressions?
    a) The keyword `lambda` occurs at the beginning of each lambda expression.
    b) The result of a lambda expression cannot be assigned to a variable.
    c) A lambda expression creates an anonymous function
    d) All of the above
    e) None of the above

14) Which of the following are true statements above an overloaded operator for a user-defined class?
    a) An overloaded operator can be either a function or a method.
    b) Any symbol can be used as an overloaded operator.
    c) Overloaded operators are restricted to 2 parameters (though defaults can be used).
    d) All of the above
    e) None of the above
// let's assume I got the includes right

using pr = pair<long, long>; // global type shortcut

void fn1(vector<long> &v_l, map<long, long> &m){
    for (auto ele : v_l)
        m[ele] = 1;
}

bool fn2(const pr &p1, const pr &p2){
    return p1.second < p2.second;
}

vector<pr> fn3(map<long, long> &m){
    vector<pr> v_l;
    for (auto ele : m)
        v_l.push_back(ele);
    sort(v_l.begin(), v_l.end(), fn2);
    return v_l;
}

vector<long> fn4(map<long, long> &m){
    vector<long> v_l;
    transform(m.begin(), m.end(), v_l.begin(), back_inserter(v_l),
        [] (pr p) { return p.second;});
    return v_l;
}

int main(){
    cout << boolalpha;
    map<long, long> m= {{1,0}, {2,0}, {3,0}, {4,0}};
    vector<long> v_l ={1,2,3,4,1,2,3,1,2,1};
    fn1(v_l, m);
    cout << m.size() << endl; // Line 1
    cout << m[3] << endl; // Line 2
    cout << (m.begin() -> first) << endl; // Line 3
    cout << fn2(*m.begin(), {5,7}) << endl; // Line 4
    auto result1 = fn3(m);
    cout << result1.front().first << endl; // Line 5
    auto result2 = fn4(m);
    cout << result2.back() << endl; // Line 6
    cout << m[5] << endl; // Line 7
    cout << m.size() << endl; // Line 8
}
15) For the program in Figure 2, what value is output on Line 1?
   a) 1  
   b) 2  
   c) 3  
   d) 4  
   e) None of the above

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

18) For the program in Figure 2, what value is output on Line 4.
   a) true  
   b) false  
   c) 1  
   d) 0  
   e) None of the above

19) For the program in Figure 2, what value is output on Line 5?
   a) 1  
   b) 2  
   c) 3  
   d) 4  
   e) None of the above

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

21) 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
22) For the program in Figure 2, what value is output on Line 8?
   a) 1
   b) 2
   c) 3
   d) 4
   e) None of the above
Figure 3 is one program. Program starts on the left and continues with the main() inset 23) For the program in Figure 3, what type is i on Line 1?

a) char
b) string
c) long
d) int
e) None of the above
24) 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
25) For the program in Figure 3, what output is produced by Line 3?
   a) a
   b) b
   c) c
   d) empty string
   e) None of the above
26) 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
27) 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
28) For the program in Figure 3, what output is produced by Line 6?
   a) 0
   b) 1
   c) 2
   d) 3
   e) None of the above
29) For the program in Figure 3, what output is produced by Line 7?
   a) a
   b) b
   c) c
   d) empty string
   e) None of the above
30) For the program in Figure 3, what output is produced by Line 8?
   a) abcde
   b) edcba
   c) cdefg
   d) aaaaa
   e) None of the above
31) For the program in Figure 3, what output is produced by Line 9?
   a) a
   b) b
   c) c
   d) empty string
   e) None of the above

32) For the program in Figure 3, how many regular functions (not methods/function_members) are there?
   a) 0
   b) 1
   c) 2
   d) 3
   e) None of the above
Figure 4 is one program. Program starts in column 1 and continues in column 2.

33) For the program in Figure 4, what output is produced on Line 1?

   a) 0
   b) 2
   c) 3
   d) 4
   e) None of the above

```cpp
// STRUCTURE STUFF
template<typename T>
struct AStruct{
    T *a_ = nullptr;
    size_t s_ = 0;
    AStruct *n_ = nullptr;

    AStruct() = default;
    AStruct(T*, size_t);
};

template<typename T>
AStruct<T>::AStruct(T *param1, size_t param2){
    a_ = new T[param2];
    for(size_t i=0; i<param2; ++i)
        a_[i] = *(param1 + i);
    s_ = param2;
}

// CLASS STUFF
template<typename T>
class MyClass{
private:
    AStruct<T> *f_ = nullptr;
    size_t s_ = 0;

public:
    MyClass() = default;
    MyClass(T*, size_t);
    T m1(size_t);
    size_t m2(T*, size_t);
};

template<typename T>
MyClass<T>::MyClass(T* param1, size_t param2){
    AStruct<T> *t = new AStruct<T>(param1, param2);
    f_ = t;
    s_ = 1;
}

template<typename T>
MyClass<T>::~MyClass(){
    delete f_;
    f_ = nullptr;
}

int main(){
    long ary1[4]={2,3,4,5};
    cout << *(ary1 + 3) << endl; // Line 1
    AStruct<long> as(ary1, 4);
    cout << as.s_ << endl; // Line 2
    cout << *(as.a_) << endl; // Line 3
    MyClass<long> mc(ary1, 4);
    cout << mc.m1(1) << endl; // Line 4
    cout << mc.m1(4) << endl; // Line 5
    long ary2[3]={3,4,5};
    cout << mc.m2(ary2, 3) << endl; // Line 6
    cout << mc.m1(1) << endl; // Line 7
    cout << mc.m1(4) << endl; // Line 8
}```
34) For the program in Figure 4, what output is produced on Line 2?
   a) 0  
   b) 2  
   c) 3  
   d) 4  
   e) None of the above

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

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

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

38) For the program in Figure 4, what output is produced by Line 6?
   a) 0  
   b) 2  
   c) 3  
   d) 4  
   e) None of the above

39) For the program in Figure 4, what output is produced by Line 7?
   a) 0  
   b) 2  
   c) 3  
   d) 4  
   e) None of the above

40) For the program in Figure 4, what output is produced by Line 8?
   a) 0  
   b) 2  
   c) 3  
   d) 4  
   e) None of the above