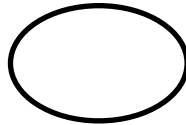


Total/32

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***No books; No calculator; No computer; No email; No internet; No notes; No phone. Neatness counts! Do your scratch work elsewhere and enter only your final answer into the spaces provided.***

1. Implicitly generated members for class `foo`.

(a) Write the prototypes of the class members implicitly generated by a C++98 compiler. [2✓]

(b) Write the prototypes implicitly generated by a C++11 compiler that were not part of C++98. [1✓]

2. Given the declaration `map<string, string> m;` write a loop that explicitly uses iterators to print each key and value pair, one pair per line. [2✓]

3. Given the declaration `map<string, string> m;` write a loop that writes out each key and value pair, one pair per line, but do not code anything that explicitly uses an iterator. Hint: use a C++11 feature not present in C++98. [2✓]

4. Write a function which will reverse a container. Assume it has bidirectional iterators produced by `begin()` and `end()`. For example, `{1,2,3,4,5}` should become `{5,4,3,2,1}`. You may use

```
template <typename T> void std::swap (T&, T&);
```

from the standard library. [3✓]

```
template <typename container>
void reverse (container& con) {
```

5. Write a function `split` which takes an input container and copies alternate elements into two output containers. For example, if the input container has {1,2,3,4,5,6,7,8,9} then the first output container is assigned {1,3,5,7,9} and the second output container is assigned {2,4,6,8}. Assume forward iterators and the function `push_back`. [3✓]

```
template <typename T>
void split (const T& input, T& first, T&second) {
```

6. Define `operator=` as it would appear in a `.cpp` file for the class `quux`. A partial header is shown here. [3✓]

```
class quux {
    private:
        int i;
        string s;
        vector<int>* vip;
        counter* ct;
    public:
        quux& operator= (const quux&);
};
```

7. Finish the definition of class `stack`. Since the stack is implemented as containing a vector, the implicitly provided members all work and need not be defined. Define the following public members as *inline* functions which operate on the vector: `push`, `pop`, `top`, `size`, `empty`, `begin`, `end`. Iteration on the stack should begin at the top and end at the bottom. [4✓]

```
template <typename T>
class stack {
    private:
        vector<T> data;
        typedef typename vector<value_type>::const_reverse_iterator
            const_iterator;
    public:
```

Multiple choice. To the *left* of each question, write the letter that indicates your answer. Write **Z** if you don't want to risk a wrong answer, which count negative points. [12✓]

number of correct answers		$\times 1 =$	$= a$
number of wrong answers		$\times \frac{1}{2} =$	$= b$
number of missing answers		$\times 0 =$	0
column total $c = \max(a - b, 0)$	12		$= c$

- In the absense of specific reasons against it, what should the default container be?
  - deque
  - list
  - string
  - vector
- What class replaces pointers and does memory management by reference counting?
  - auto\_ptr
  - reference\_ptr
  - shared\_ptr
  - unique\_ptr
- If `operator<<` is declared as a friend of class `foo`, what should be its signature?
  - `ostream& operator<< (const ostream&, const foo&);`
  - `ostream& operator<< (const ostream&, foo&);`
  - `ostream& operator<< (ostream&, const foo&);`
  - `ostream& operator<< (ostream&, foo&);`
- Given the declarations  
`string s; string t;`  
which is impossible?
  - `s != t and &s != &t`
  - `s != t and &s == &t`
  - `s == t and &s != &t`
  - `s == t and &s == &t`
- The default copy and move constructors are inappropriate if a class object contains what kind of data member?
  - pointer
  - primitive
  - string
  - vector
- Given the declaration `foo x;`, what is the correct prototype for `update` so that it may change the contents of `x` if called as `update(x)`?
  - `void update (foo&&);`
  - `void update (foo&);`
  - `void update (foo);`
  - `void update (foo*);`
- If a function member refers to a data member `x` without qualification, it is equivalent to what expression?
  - `auto->x`
  - `self->x`
  - `that->x`
  - `this->x`
- What is the declaration of the postfix `operator--` which is a member of class `foo`?
  - `foo &operator-- ();`
  - `foo &operator-- (foo &);`
  - `foo operator-- (foo &, int);`
  - `foo operator-- (int);`
- Using `new` but never using `delete` results in:
  - dangling pointer
  - memory leak
  - null pointer
  - segmentation fault
- If `v.size() == 10`, then `v.end()` is equivalent to the address of:
  - `v[-1]`
  - `v[0]`
  - `v[9]`
  - `v[10]`
- Searching for a particular item in which of these containers will have a running time of  $O(\log_2 n)$ ?
  - list
  - map
  - unordered\_map
  - vector
- Which is the proper way to catch an exception called `exn`?
  - `catch (exn &&e)`
  - `catch (exn &e)`
  - `catch (exn *e)`
  - `catch (exn e)`