Quiz 4 Solutions

Q1: What value does function mystery return when called with a value of 4?

```c
int mystery ( int number )
{
    if ( number <= 1 )
        return 1;
    else
        return number * mystery( number - 1 );
}
```

a. 0.
b. 1.
c. 4.
d. 24.
ANS: d. 24.

Q2: Recursion is memory-intensive because:
   a. Recursive functions tend to declare many local variables.
   b. Previous function calls are still open when the function calls itself and the activation records of these previous calls still occupy space on the call stack.
   c. Many copies of the function code are created.
   d. It requires large data values.

ANS: b. Previous function calls are still open when the function calls itself and the activation records of these previous calls still occupy space on the call stack.

Q3: Linear search is highly inefficient compared to binary search when dealing with:
   a. Small, unsorted arrays.
   b. Small, sorted arrays.
   c. Large, unsorted arrays.
   d. Large, sorted arrays.

ANS: d. Large, sorted arrays.

Q4: A double subscripted array declared as int a[ 3 ][ 5 ]; has how many elements?
   a. 15
   b. 13
   c. 10
   d. 8

ANS: a. 15
Q5: Using square brackets ([ ]) to retrieve vector elements __________ perform bounds checking; using member function at to retrieve vector elements __________ perform bounds checking.
   a.  Does not, does not.
   b.  Does not, does.
   c.  Does, does not.
   d.  Does, does.
   **ANS:** b. Does not, does.

Q6: Which file open mode would be used to write data only to the end of an existing file?
   a.  ios::app
   b.  ios::in
   c.  ios::out
   d.  ios::trunc
   **ANS:** a. ios::app

Q7: A random access file is organized most like a(n):
   a.  Array.
   b.  Object.
   c.  Class.
   d.  Pointer.
   **ANS:** a. Array.

Q8: To write fixed-length records, use file open mode:
   a.  ios::app
   b.  ios::ate
   c.  ios::trunc
   d.  ios::binary
   **ANS:** d. ios::binary

Q9: The total number of elements that can be stored in a string without increasing its current amount of allocated memory is called its:
   a.  Size.
   b.  Length.
   c.  Capacity.
   d.  Maximum size.
   **ANS:** c. Capacity.

Q10: An algorithm that requires __________ operations to complete its task on n data elements is said to have a linear runtime.
   a.  \( n^3 + 9 \)
   b.  \( 3n^2 + 3n + 2 \)
   c.  \( 2n + 1 \)
   d.  6
   **ANS** c. \( 2n + 1 \)
Q11: At most, how many comparisons are required to search a sorted vector of 1023 elements using the binary search algorithm?
   a. 10
   b. 15
   c. 20
   d. 30
   ANS a. 10

Q12: Which of the following represents the efficiency of the insertion sort?
   a. $O(1)$
   b. $O(\log n)$
   c. $O(n)$
   d. $O(n^2)$
   ANS: d. $O(n^2)$

Q13: Which of the following is not a dynamic data structure?
   a. Linked list.
   b. Stack.
   c. Array.
   d. Binary tree.
   ANS c. Array.

Q14: In general, linked lists allow:
   a. Insertions and removals anywhere.
   b. Insertions and removals only at one end.
   c. Insertions at the back and removals from the front.
   d. None of the above.
   ANS a. Insertions and removals anywhere.

Q15: Which data structure represents a waiting line and limits insertions to be made at the back of the data structure and limits removals to be made from the front?
   a. Stack.
   b. Queue.
   c. Binary tree.
   d. Linked list.
   ANS b. Queue.

Q16: Given that the line
   
   delete newPtr;
   
just executed, what can you conclude?
   a. The memory referenced by newPtr is released only if it is needed by the system.
   b. The pointer newPtr is of type void *.
   c. The pointer newPtr only exists if there was an error freeing the memory.
   d. The pointer newPtr still exists.
   ANS d. The pointer newPtr still exists.
Q17: What kind of linked list begins with a pointer to the first node, and each node contains a pointer to the next node, and the pointer in the last node points back to the first node?
   a. Circular, singly-linked list.
   b. Circular, doubly-linked list.
   c. Singly-linked list.
   d. Doubly-linked list.
ANS a. Circular, singly-linked list.

Q18: How many pointers are contained as data members in the nodes of a circular, doubly linked list of integers with five nodes?
   a. 5
   b. 8
   c. 10
   d. 15
ANS c. 10

Q19: Which of the following statements about stacks is incorrect?
   a. Stacks can be implemented using linked lists.
   b. Stacks are first-in, first-out (FIFO) data structures.
   c. New nodes can only be added to the top of the stack.
   d. The last node (at the bottom) of a stack has a null (0) link.
ANS b. Stacks are first-in, first-out (FIFO) data structures.

Q20: Select the incorrect statement. Binary search trees (regardless of the order in which the values are inserted into the tree):
   a. Always have multiple links per node.
   b. Can be sorted efficiently.
   c. Always have the same shape for a particular set of data.
   d. Are nonlinear data structures.
ANS: c. Always have the same shape for a particular set of data.

Q21: Which of the following is not a sequence container provided by the STL?
   a. vector
   b. array
   c. list
   d. deque
ANS: b. array

Q22: Which of the following is a difference between vectors and arrays?
   a. Access to any element using the [] operator.
   b. Stored in contiguous blocks of memory.
   c. The ability to change size dynamically.
   d. Efficient direct access to any element.
ANS: c. The ability to change size dynamically.
The next 3 questions are about the speaker and talk from May 10th which you were asked to attend.

Q23: What was the name of the speaker?
   a. Peter Dinda
   b. Ian Foster
   c. Alok Choudhary
   d. Bob Grossman

ANS: b. Ian Foster

Q24: (2 points) What is the one word that describes Grid?
   a. Distributed
   b. Federation
   c. Computing
   d. Cloud

ANS: b. Federation

Q25: (2 points) What relationship does the speaker have with the instructor?
   a. He is his professor.
   b. He doesn't know him personally.
   c. He is his PhD advisor.
   d. He is a relative.

ANS: c. He is his PhD advisor or a. He is his professor.