

Quiz 4 Solutions

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

```
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

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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. $2n + 1$

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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.

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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 `vector`s 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.

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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.