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}

Lecture OOP, Object Oriented Programming, class, Objects, Instances, Constructor

Question
Assume that a class Point2D exists. Write the header for a member function that overloads the + operator for that class.
Answer
?

Question
Assume a class named Dollar exists. Write the headers for member functions that overload the prefix and postfix ++ operators for that class.
Answer
?

Question
Assume a class named Complex exists. Write the header for a member function that overloads the >= operator for that class.
Answer
?

Question
Assume a class named Length exists. Write the header for a member function that overloads cout << operator for that class.
Answer
?

Question
Assume a class named Collection exists. Write the header for a member function that overloads the [] operator for that class.
Answer
?

Question
?
Answer
?

Lecture OOP, Object Oriented Programming, Inheritance, Polymorphism, Virtual Functions, Pure Virtual Functions

Question
When does static binding take place?
When does dynamic binding take place?
Answer
?

Question
What is a pure virtual function? When is it necessary?
Answer
?

Question
A program has a class Potato, which is derived from the class Vegetable, which is derived from the class Food. Is this an example of multiple inheritance? Why or why not?
Answer
?

Question
Write the first line of the declaration for a Poodle class. The class should be derived from the Dog class with public base class access.
Answer
?

Question
Write the first line of the declaration for a class A. The class A should derive from three classes B, C, and D, where the base class access specification is different for each base class. Mention all assumptions in comments line.
Answer
?

Question
Suppose a class named Tiger is derived from both the Felis class and the Carnivore class. Here is the first line of the Tiger class declaration:
class Tiger : public Felis, public Carnivore
Here is the function header for the Tiger constructor:
Tiger(int x, int y) : Carnivore(x), Felis(y)
Which base class constructor is called first, Carnivore or Felis?
Answer
?

Question
?
Answer
?

Lecture OOP, Exceptions, Templates, Function Templates, Class Templates

Question
What is a throw point?
Answer
?

Question
What is an exception handler?
Answer
?

Question
Explain the difference between a try block and a catch block.
Answer
?

Question
What happens if an exception is thrown, but not caught?
Answer
?

Question
What is “unwinding the stack”?
Answer
?

Question
What happens if an exception is thrown by a class’s member function?
Answer
?

Question
How do you prevent a program from halting when the new operator fails to allocate memory?
Answer
?

Question
Why is it more convenient to write a function template than a series of overloaded functions?
Answer
?

Question

Why must you be careful when writing a function template that uses operators such as [] with its parameters?
Answer
?

Question
Write a function template that interchanges two values of variables of any type.
Answer
?

Question
Write a function template that displays contents of array of any type with array size parameter.
Answer
?

Question
?
Answer
?

Lecture Standard Template Library, STL

Question
When using one of the STL algorithm function templates, you typically work with a range of elements that are denoted by two iterators, to what does the first iterator point?
To what does the second iterator point?
Answer
?

Question
You have written a class, and you plan to store objects of that class in a vector. If you plan to use the sort() or binary_search() functions on the vector's elements, what operator must the class overload?
Answer
?

Question
What is a function object?
Answer
?

Question
If you want to create function objects from a class, what must the class overload?
Answer
?

Question
What is an anonymous function object?
Answer
?

Question
What is a lambda expression?
Answer
?

Question
?
Answer
?

Lecture Linked Lists, Pointer-based Lists

Question
What are some of the advantages that linked lists have over arrays?
Answer
?

Question
What advantage does a linked list have over the STL vector?
Answer
?

Question
What is a list head?
Answer
?

Question
What is a self-referential data structure?
Answer
?

Question
How is the end of a linked list usually signified?
Answer
?

Question
Name five basic linked list operations.
Answer
?

Question
What is the difference between appending a node and inserting a node?
Answer
?

Question
When is it necessary to destroy a linked list and why?
Answer
?

Question
What are the two steps required to delete a node from a linked list?
Answer
?

Question
What is the advantage of using a template to implement a linked list?
Answer
?

Question
State the difference between the structure of a node of a singly linked list and a doubly linked list.
Answer
?

Question
What type of linked list is the STL list container?
Answer
?

Question
What type of linked list is the STL forward_list container?
Answer
?

Question
Consider the following code.

```
struct ListNode
{
int value;
struct ListNode *next;
};
ListNode *head; // List head pointer
```

Assume a linked list has been created and head points to the first node.
a. Write code that traverses the list displaying the contents of each node's value member.
b. Write code that destroys the linked list.
c. Write code that defines an STL list container for holding float values.
d. Write code that stores the values 12.7, 9.65, 8.72, and 4.69 in the STL list container you defined for Question above.
e. Write code that reverses the order of the items you stored in the STL list container in Question above.
Answer
?
/////
a.
b.
c.
d.
e.
/////

Question
Find the Errors

Each of the following member functions has errors in the way it performs a linked list operation. Find as many mistakes as you can.

a.

```
// Insert a node at the beginning of a linked list
void NumberList::addInFront(double num)
{
ListNode* newNode;
// Allocate a new node & store num
newNode = new listNode;
newNode->value = num;
// If there are no nodes in the list make newNode the first node.
if ( !head )
head = newNode;
// Otherwise, insert newNode before head.
else
{
newNode->next = head->next;
// Assign newNode as the list head
head = newNode;
}
}
```

b.

```
void NumberList::deleteNode(double num)
{
ListNode* nodePtr;
ListNode* previousNode;
// If the list is empty, do nothing.
if ( !head ) {
   return;
}
// Determine if the first node is the one.
if (head–>value == num) {
   delete head;
}
else
{
// Initialize nodePtr to head of list.
nodePtr = head;
// Skip all nodes whose value member is not equal to num.
while (nodePtr–>value != num)
{
previousNode = nodePtr;
nodePtr = nodePtr–>next;
}
// Link the previous node to the node after nodePtr, then delete nodePtr.
previousNode–>next = nodePtr–>next;
delete nodePtr;
}
}
```

c.

```
NumberList::~NumberList()
{
```

```
    ListNode* nodePtr;
    ListNode* nextNode;
    nodePtr = head;
    while ( nodePtr != nullptr )
    {
       nextNode = nodePtr–>next;
       nodePtr–>next = nullptr;
       nodePtr = nextNode;
    }
}
```

Answer
?
/////
a.
b.
c.
/////

Question
?
Answer
?

Lecture Stacks Last In First Out LIFO, Queues First In First Out FIFO

Question
What does LIFO mean?
Answer
?

Question
What element is always retrieved from a stack?
Answer
?

Question
What is the difference between a static stack and a dynamic stack?
Answer
?

Question
Describe two operations that all stacks perform.
Answer
?

Question
Describe two operations that static stacks must perform.
Answer
?

Question
The STL stack is considered a container adapter. What does that mean?
Answer
?

Question
What types may the STL stack be based on?
By default, what type is an STL stack based on?
Answer
?

Question
What does FIFO mean?
Answer
?

Question
When an element is added to a queue, where is it added?

Answer
?

Question
When an element is removed from a queue, where is it removed from?
Answer
?

Question
Describe two operations that all queues perform.
Answer
?

Question
What two queue like containers does the STL offer?
Answer
?

Question
?
Answer
?

Lecture Recursion

Question
What is the base case of the recursive functions?
Answer
?

Question
What type of recursive function do you think would be more difficult to debug, one that uses direct recursion, or one that uses indirect recursion? Why?
Answer
?

Question
Which repetition approach is less efficient, a loop or a recursive function? Why?
Answer
?

Question
When should you choose a recursive algorithm over an iterative algorithm?
Answer
?

Question
Explain what is likely to happen when a recursive function that has no way of stopping executes.
Answer
?

Question
?
Answer
?

Lecture Binary Tree, Binary Search Tree, Balanced Binary Search Tree

Question
Suppose the following values are inserted into a binary tree, in the order given:
12, 7, 9, 10, 22, 24, 30, 18, 3, 14, 20
a. Draw a diagram of the resulting binary tree.
b. How would the values in the tree you sketched for Question above be displayed in an inorder traversal?
c. How would the values in the tree you sketched for Question above be displayed in a preorder traversal?
d. How would the values in the tree you sketched for Question above be displayed in a postorder traversal?
Answer
?
/////
a.
b.
c.
d.
/////

Question
?
Answer
?