### What is the role of a prototype program in problem solving?

it simulates the behavior of portions of the desired software product

### What stages in the software life cycle are influenced by the testing stage?

Refining, production, and maintenance

### What are the main advantages associated with object-oriented programming?

Existing classes can be reused, Program maintenance and verification are easier

### Where do C++ programs begin to execute?

main function

### What is a variable?

An object with a location in memory where value can be stored

### Where are variables declared in a C++ program?

Before they are used.

### What is the main difference between a while and a do...while statement?

the loop body always executes at least once

### What is typically included in a class definition?

Data members and Member functions

### What is the difference between a data member and a local variable inside a member function?

Data members are variables that are declared inside the class definition but outside of the bodies of the class member functions. Local variables can only be used within the function declaration.

### What is the difference between a constructor and a function?

constructor creates the class object into memory where functions perform actions against that object

### When does C++ create a default constructor?

In any class that doesn't explicitly include a constructor.

### How many constructors can be created for a class?

Theoretically unlimited, as long as they are defined by the programmer.

## What is the difference between a function prototype and a function definition?

A function prototype is just a declaration of the function existing, and cant be used as an actual function. A function has to be created with a definition within to tell the compiler what the function does.

## What is the role of a header-file?

To hold reusable content or modules separate from the actual source-code file that can be easily referenced and employed for different programs.

## What does a function signature include?

a return type, and input parameters

## What is the scope of global variables?

File scope.

## How does the compiler handle inline functions?

It replaces all instances of that function call with the inline code itself, resulting in longer but faster programs.

## What is the main advantage associated with function arguments that are passed by reference?

you do not use unessesary memory space to copy variables between functions

## How are overloaded functions differentiated by the compiler?

By the type they are initilized with (int, char, etc.)

## When defining a recursive function, what are possible causes for infinite recursion?

Infinite recursion is an infinite loop if the condition is not met. Either omitting the base case, or writing the recursion step incorrectly so that it does not converge on the base case causes "indefinite" recursion, eventually exhausting memory.

## What are the similarities between iteration and recursion?

As discussed earlier, recursion may be used to process iterative actions. Recursion is used for calculations where the answer can be described in a function that relates to itself.

## What are the similarities between iteration and recursion?

they both are able to do repetiive tasks. however recurisve calls itself with different parameters and defines and exit clause that is guaranteeed to be reached. Iterative includes a loop which iterates a

pre-determined number of times, or checks for an exit clause every time through

## What are the two different ways of specifying the length of an array?

you can assign the size of it inside the brackets when you declare the array [3], or you can have it set by how many items you set the array equal to {1,2,3}

## What is the main difference between strings declared using the type string versus strings declared using an array of characters?

cant modify individual characters of a type string array, character type array can modify individual characters

## How are arrays passed to functions?

function( int [], int length)

## What is the difference between an array declared as static, and one that is not?

Only constants can be used to declare the size of automatic and static arrays Exists for the duration of the program Is initialized when its declaration is first encountered All elements are initialized to zero if not explicitly initialized

## How many dimensions need to be specified when passing a multi-dimensional array as an argument to a function?

not answered

## In one sentence, what is the main idea implemented by insertion sort?

it takes the second element and swaps it with the 1st if it is less and keeps it there if its larger, then it goes to the third element and inserts it in the right places with respect to the first 2 elements and so on...

## In one sentence, what is the main idea implemented by selection sort?

To put the biggest element at the end of the list and place the next highest element behind it, and so on.

## What is the number of operations for insertion sort under a best-case scenario, and what is the best-case scenario?

it could be considered that having only one item would be the easiest to sort, but this could also be a trivial result as nothing is moved having two items allows the algorithm to sort the items into the correct order

## What is the base case for a recursive implementation of merge sort?

the size of the list being sent is <= 1

## What does the address (&) operator return?

The address operator returns the memory address of its operand.

## What does the star (*) operator return?

Returns an alias/nickname for the object to which the pointer operand points.

## How can an array be addressed in pointer/offset notation?

The name of an array is considered to be a pointer in C++, and can be passed as such in functions parameters. Declaring int a[10]; creates a pointer "a" which stores the address of a[0].

## What does the sizeof operator return?

the size of the information in bits.

## What are the different ways to pass a pointer to a function?

Nonconstant pointer to nonconstant data Constant pointer to nonconstant data Nonconstant pointer to constant data Constant point to constant data

## What is a function pointer?

a pointer that points to a function itself, which allows passing a function as a parameter to another function.

## What is a linked list?

A linked list is a collection of Objects each containing at least one data member, and a pointer to the next object in the list (and the previous object in the case of a doubly linked list)

## What is the main advantage of linked lists over arrays?

Linked lists do not have a set size and can grow or shrink as needed.

## What is the main advantage of arrays over linked lists?

Array size is fixed. But Linked is not fixed, data is also accessed quicker in array list, also memory requirement is less and no pointers required. Arrays have random access and less overheads compared to Linked list have sequential access only with too much overheads and no cache memory support. On the other hand, arrays allow random access, while linked lists allow only sequential access to elements. Singly-linked lists, in fact, can only be traversed in one direction.

## What is the difference between a circular linked list and a basic linked list?

A circular linked list is a linked list that links items in a continuous circle. This allows the full list to be traversed by starting at any item in the list; a fixed head or tail is not required.

## What is the main advantage of a doubly-linked list over a basic linked list?

you can traverse the list from front to back and back to front

## What is the main disadvantage of a doubly-linked list over a basic linked list?

Double-linked lists require more space per node, and their elementary operations are more expensive

## What is a stack?

a data structure that moves elements in last in first out

## What are the two main functions defined by a stack?

pop and push

## How can you implement a stack with an array?

Create an array based on a pre-defined size N There can't be more elements than N. Bottom stack element stored at element 0 last index in the array is the top Increment top when one element is pushed, decrement after pop

## How can you implement a stack with a list?

You can implement a stack using arrays or and linked list. By the use of pointers, that point element(node) to the next element in the stack. By the use of pointers, the stack becomes a linked list.

## How are infix expressions evaluated by computers?

infix expressions are pointers evaluated by reference to the memory location

## What operations would you need to perform to find a given element on a stack?

pop operation

## What is a queue?

A data structure that removes nodes from the head and adds nodes at the tail.

## What are the two main functions defined by a queue?

enqueue dequeue

## How can you implement a queue with a list?

A list can have unlimited elements in it. You can push a node onto the end of the list and pop the one in the front.

## What is the stack operation corresponding to the enqueue operation in queues?

The stack operation corresponding to enqueue in queues is the push operation.

## What is a tree?

A data structure that contains a root, internal nodes and external nodes. Each node references another node by means of pointers (pass-by-reference). The root is the "base" of the tree, it has no parents. A "leaf" is a node at the end of the tree which points to NULL.

## What is the height of a tree?

the number of nodes from root to leaf

## What is a leaf?

A node with no children.

## What is a binary tree?

a tree where every parent has only two children

## What is the inorder traversal of a binary tree?

For every node in the binary tree we first visit its left sub-tree (if its there) and then visit the parent node itself, and then the right sub-tree (if its there).

## How many comparisons does it take to find an element in a binary search tree?

O(log n)

## What are the elements typically included in a class definition?

The elements that are included in a class definition is the access-modifier, data types, variables, and function signatures.

## What are the access-specifiers that can be used in a C++ class definition?

Private, public, protected

## How are objects initialized when they are created?

When the class is called by the Constructor

## What is a function signature?

its return type and its input parameters

## What is a recursive function?

A function that calls itself. Each time it does, it must get smaller, and eventually MUST converge to a base case, otherwise you can start an infinite loop.

## What is the alternative way to solve a problem that could be solved through recursive functions?

iteration

## What is the difference between an array that is declared as static and one that is not?

An array declared static remains the same throughout the execution of the program.

## What is the main difference between a string of characters that is read into a variable of type string versus a variable of type char[]?

String of characters are followed by a null statement. type string is for example string s;

## Briefly describe the divide-and-conquer paradigm.

The divide and conquer paradigm divides a problem into smaller and smaller portions that are easier to solve.

## Briefly describe in one sentence how does merge sort work?

A merge sort works by removing all items to sepperate memory locations and merging them back together in order.

## What is a pointer?

A variable in memory that hold the address of another memory location to which it points too

## What is the experimental approach for measuring the running time of an algorithm?

not answered

## Briefly, how does selection sort work?

Compare the largest element to the front element and swap data according to value if needed.

## What is the advantage of linked lists over arrays?

Linked Lists can be of variable size, where arrays have fixed size.

## What is a queue?

A data structure that implements first in, first out. The element that has been there the longest is the first to get served.

## What are the main operations associated with a stack?

push - puts an element on the stack pop- takes an element off the stack

## What is the Euler tour traversal of a tree?

To start from the root , traveling left and visiting ever child along the way till you return to the root from the right.

## How do you delete a node from a binary search tree?

Link the to-be-deleted's left child to the to-be-deleted's parent's left child pointer.

## How many steps does it take to search a node in a binary search tree?

The number of steps to search a node is the function n-1.