Define Abstract Base Class?

An abstract base class is C++ 's way of defining an interface. It is a class which declares that all child classes derived from it must implement a certain set of methods. It is abstract because an instance of the abstract base class may not be created (only concrete implementations of the interface may be instantiated).

What is Instance?

A class is a definition of a set of data and member functions. When space for the data is actually allocated, we say that a member of the class has been instantiated. The instantiation is called an instance of the class. Each instance has its own set of data (there is also a mechanism in C++ to define data that is only allocated once per class, and shared amongst all instances of the class).

Define Concrete Class?

A concrete class is a class that is not abstract. An instance of the class may be created, which contains copies of all the data members of the class, and member functions which may be invoked.

Name the Properties of a Binary Tree?

Since binary tree nodes can only have a maximum of two children, this fact introduces several properties that do not make sense on general trees. There are three important properties that a binary tree can have: fullness, balance, and leftness.

Define Binary Search Trees (BST) with example?

The most popular variation of the Binary Tree is the Binary Search Tree (BST). BSTs are used to quickly and efficiently search for an item in a collection. Say, for example, that you had a linked list of 1000 items, and you wanted to find if a single item exists within the list. You would be required to linearly look at every node starting from the beginning until you found it. If you're lucky, you might find it at the beginning of the list. However, it might also be at the end of the list, which means that you must search every item before it. This might not seem like such a big problem, especially nowadays with our super fast computers, but imagine if the list was much larger, and the search was repeated many times. Such searches frequently happen on web

servers and huge databases, which makes the need for a much faster searching technique much more apparent. Binary Search Trees aim to Divide and Conquer the data, reducing the search time of the collection and making it several times faster than any linear sequential search.

Define Heap?

1. A portion of memory reserved for a program to use for the temporary storage of data structures whose existence or size cannot be determined until the program is running. To build and use such elements, programming languages such as C and Pascal include functions and procedures for requesting free memory from the heap, accessing it, and freeing it when it is no longer needed. In contrast to stack memory, heap memory blocks are not freed in reverse of the order in which they were allocated, so free blocks may be interspersed with blocks that are in use. As the program continues running, the blocks may have to be moved around so that small free blocks can be merged together into larger ones to meet the program's needs.
2. A complete binary tree in which the value of any node is not exceeded by the value of either of its children.

Define Binary Trees?

As the name implies, a binary tree is simply a recursively-defined tree that can have a maximum of two children. The two children are commonly given the names left child and right child, and binary trees have an additional traversal called the in-depth traversal. Binary trees are used for many things, ranging from efficient searching techniques, data compression, and even arithmetic expression parsers (simple compilers). Note that some people refer to binary trees as ‘B-Trees’, which is incorrect! B-Trees are a special kind of multi-data per node tree used for advanced balancing algorithms, and Apple Macintoshes even use B-trees for their file systems. Be careful to not call a ‘Binary Tree’ a ‘B-Tree’!

How can we differentiate among database, data communication and data structure?

Database: A collection of data arranged for ease and speed of search and retrieval.

Data Communication: Communications involves data transfer from one computer to another through a communications medium, such as a telephone, microwave relay, satellite link, or physical cable. Two primary methods of computer communications exist: temporary connection of two computers through a switched network, such as the public telephone system, and permanent or semipermanent linking of multiple workstations or computers in a network. The line between the two is indistinct,

however, because microcomputers equipped with modems are often used to access both privately-owned and public-access network computers.

Data Structure: An organizational scheme, such as a record or array, that can be applied to data to facilitate interpreting the data or performing operations on it.

Describe 32bit programming and 16 bit programming and difference between them? Is there 64 bit programming available?

16 bits programming was done using 16-bits registers which is now obsolete. Now 32-bit programming is done using 32-bits registers which is now a days used for constructing windows application. These are the cases of IBM compatible PCs which consists of 32 bits register until now. There are other architecture which are consists of 64 bits registers e.g. Sun Sparc Machines are 64 bits Machines. So it depends upon the architecture of the Machine and softwares are written accordingly.

What is difference between Pseudo code and Algorithm?

Pseudo code:Any informal, transparent notation in which a program or algorithm description is written. Many programmers write their programs first in a pseudocode that looks much like a mixture of English and their favorite programming language, such as C or Pascal, and then translate it line by line into the actual language being used.

Algorithm:A step-by-step problem-solving procedure, especially an established, recursive computational procedure for solving a problem in a finite number of steps.

What is external node?

A terminal or "bottom" item of a tree,i.e.an item with no child known as external node.

How Data Compression Works?

The goal of data compression is to represent an information source (e.g. a data file, a speech signal, an image, or a video signal) as accurately as possible using the fewest number of bits.

Differentiate between Greedy Algorithm and Huffman Algorithm?

Greedy Algorithm:An algorithm that always takes the best immediate, or local, solution while finding an answer. Greedy algorithms find the overall, or globally, optimal solution for some optimization problems, but may find less-than-optimal solutions for some instances of other problems.

Huffman Algorithm:A method of compressing a given set of data, based on the relative frequency of the individual elements. The more often a given element, such as a letter, occurs, the shorter, in bits, is its corresponding code. It was one of the earliest data compression codes and, with modifications, remains one of the most widely used codes for a large variety of message types.

What is the formula for finding the minimum number of nodes in AVL tree i.e logon for BST?

AVL Trees

- similar to binary search trees
- difference: for every node left and right subtrees can have height difference of at most 1
- height of an AVL tree = at most 1.44 log n (approx.)

$N(h)$: # of nodes in minimum size AVL tree of height h
$N(h) = N(h\text{-}1) + N(h\text{-}2) + 1$
$N(0) = 1, N(1) = 2$

all operations, except insertion, performed in $O(log\ N)$ time.

What is difference between Paging and Virtual Memory?

Paging: The transfer of pages of data between a computer's main memory and an auxiliary memory.

Virtual Memory: Computer memory, separate from the main memory of a specific machine that can be used as an extension of the machine's main memory.

What is transient object?

A transient object is an instance of an object type. Its lifetime cannot exceed that of the application. The application can also delete a transient object at any time.

How Stack useful in hardware?

Stack data structure has a large number of uses:

1) Activation records for function calls are stored on a stack.

2) Eliminating recursion to make an algorithm faster can be achieved by using a stack.

3) Stacks can be used in expression evaluation

4) Stacks are used by compilers during parsing.

5) Search algorithms often exploit stack structures.

6) It helps you in memory management.

What is generic data type?

A generic data type is a type whose complete specification is defered until it is actually used in one or the other way. The missing pieces must be specified when used. This is what C++ knows as "templates".

Difference between binary, unary and operand?

Binary Operator: Any Mathematical operation which involves two operands for one operator e.g. A+B

Where A and B are operands and + is a binary operator.

Unary Operator: Characteristic of a mathematical operation with a single operand (object)

Operand: A quantity on which an operation is performed.

Why we can't use parenthesis at start in postfix?

Parenthesis are needed in infix expression only because that is the only way to override the default precedence of operators. In C++, if you write

```
x = 4 + 3 * 2;
```

x will get 10. If you really meant to say add 3 to 4 and then multiply by 2, you will need to write

```
x = ( 4+3) * 2;
```

The parenthesis are not necessary in postfix form because a binary operator appears after its two operands

Posfix,Infix,Prefix with some Examples?

Postfix: In postfix notation, the operator is written after the operand/s it operates on.

Infix: In infix notation, the operator is written in between the operands it operates on as in the case of binary operators.

Prefix: In prefix notation, the operator is written before the operand/s it operates on.

Exmples of Infix to Postfix:

Infix	Postfix
A + B	A B +
12 + 60 – 23	12 60 + 23 –
(A + B)*(C – D)	A B + C D – *
A^B * C –D + E/F	AB^ C* D– E F/+

Difference between .h file and .cpp file?

Header File: The subdirectory called INCULDE contains header files. These files (also called "include" files) are text files, like the ones you generate with a word processor or the Dev C++ Editor. Header files can be combined with your program before it is compiled, in the same way that a typist can insert a standard heading in a business letter. Each header file has **.h** file extension.

Header files serve several purposes. You can place statements in your program listing that are not program code but are instead messages to the compiler. These messages, called *compiler directives*, can tell the compiler such things as the definitions of words or phrases used in your program. Some useful compiler directives have been grouped together in header files, which can be included in the source code of your program before it goes to the compiler.

CPP File: Class methods are defined (implement) in the CPP files. Also main function is defined in the CPP file.

What is Standard Template Library(STL)?

At its July 1994 meeting, the ANSI/ISO C++ Standards Committee voted to adopt STL as part of the standard C++ library. The STL proposal to the committee by Alex Stepanov and Meng Lee of Hewlett-Packard Labs was based on research on generic programming and generic software libraries that Stepanov, Lee, and David Musser have been working on for several years, in Scheme, Ada, and C++.
The Standard Template Library a library of reusable containers and is now part of the C++ Standard Library. The STL provides C++ programmers with a library of common data structures --linked lists, vectors, deques, sets, and maps -- and a set of fundamental algorithms that operate on them.

What is a default constructor?

A constructor that doesn't take any parameters. The following class only has one

constructor, it doesn't take parameters, and therefore is a default constructor. class date { public: date() { cout << "This is a DEFAULT constructor" << endl; } }; The term default is used because when an object is created without passing any parameters to the constructor, the default is used.

What is difference between int* i and int *i?

There is no difference between int* i or int *i as far as the compiler is concerned. Both declare "i' to a pointer to an integer.The actual difference is how this declaration is perceived. The declaration syntax in general is "type variable", e.g., "int x", "double z", "char c" etc. If we follow this pattern, suppose we want the type of a variable "time" to be "pointer to int". To do so, we would write "int* time"; "int*" is the type and "time" is variable. However, the notation "*time" can be thought of as a variable name with the "*" included. [Variables names cannot being with a "*" normally]. To get to the actual integer stored in memory, the syntax is "*time", e.g., "*time = 10", "y = *time". In this approach, the type is "int" and the variable name is "*time" and the declaration thus "int *time".

What is head?

Head: The first item of a list is called head.

What is argc and argv?

C and C++ have a special argument list for main( ), which looks like this:

int main(int argc, char* argv[]) { // …

The first argument is the number of elements in the array, which is the second argument. The second argument is always an array of char*, because the arguments are passed from the command line as character arrays (and remember, an array can be passed only as a pointer). Each whitespace-delimited cluster of characters on the command line is turned into a separate array argument. The following program prints out all its command-line arguments by stepping through the array:

Example:

#include

int main(int argc, char* argv[]) {

cout << "argc = " << argc << endl;

for(int i = 0; i < argc; i++)

cout << "argv[" << i << "] = "

<< argv[i] << endl;

}

You'll notice that argv[0] is the path and name of the program itself. This allows the program to discover information about itself. It also adds one more to the array of program arguments, so a common error when fetching command-line arguments is to grab argv[0] when you want argv[1].

You are not forced to use argc and argv as identifiers in main( ); those identifiers are only conventions (but it will confuse people if you don't use them). Also, there is an alternate way to declare argv:

int main(int argc, char** argv) { // ...

Both forms are equivalent

What is inline function in C++?

In programming, referring to a function call replaced with an instance of the function's body. Actual arguments are substituted for formal parameters. An inline function is usually done as a compile-time transformation to increase the efficiency of the program. Using inline functions can reduce execution time but increase program size.

What is an Array?

An array is a data structure that allows storage of a sequence of values. The values are stored in a contiguous block of memory. Arrays allow fast random access to particular elements. If the number of elements is indefinite or if insertions are required then we can't use an array. Example:
int idnumbers[100];
This declares an array of 100 integers named idnumbers.

What is an Array Element?

A data value in an array.

What is a Pointer?

In programming and information processing, a variable that contains the memory location (address) of some data rather than the data itself.

What is Real Storage?

The amount of RAM memory in a system, as distinguished from virtual memory.Also called physical memory, physical storage.

What is Priority Queue?

A priority queue is a specialized queue in which the items ares stored in order. A priority queue allows access to the smallest(or sometimes the largest)item.

What is Stack?

A collection of items in which only the most recently added item may be removed. The latest added item is at the top. Basic operations are push and pop. Also known as "last-in, first-out" or LIFO.

Difference between Stack and Queue?

Stack is "Last in first out" LIFO. Queue is "First in first out"FIFO

What is Method?

A Method, or Member Function is a routine which is associated with a data structure to make a class. A Method can be invoked, and when it executes it has access to the data in the class, as well as data passed by way of arguments.

What is an Algorithm?

An Algorithm is a generic term for any procedure. We usually mean a procedure that can be implemented as a routine, and which performs some well defined task. In general there are several possible Algorithms to perform the same task. NAO's Algorithm class is an organizational class that does note define any interface, but merely groups classes. Algorithms that perform the same task (or type of task) will share an interface defined in an abstract base class derived from the Algorithm class.

What is an Interface?

The interface of a class is the set of routines which are provided to manipulate instances of the class.

What is a Queue?

A multielement data structure from which (by strict definition) elements can be removed only in the same order in which they were inserted; that is, it follows a first-in-first-out (FIFO) constraint. The important queue operation are inserting an item at the rear of the queue and removing the item from the front of the queue.

What is Abstract Data Type(ADT)?

In programming, a data set defined by the programmer in terms of the information it can contain and the operations that can be performed with it. An abstract data type is more generalized than a data type constrained by the properties of the objects it contains—for example, the data type "pet" is more generalized than the data types "pet dog," "pet bird," and "pet fish." The standard example used in illustrating an abstract data type is the stack, a small portion of memory used to store information, generally on a temporary basis. As an abstract data type, the stack is simply a structure onto which values can be pushed (added) and from which they can be popped (removed). The type of value, such as integer, is irrelevant to the definition. The way in which the program performs operations on abstract data types is encapsulated, or hidden, from the rest of the program. Encapsulation enables the programmer to change the definition of the data type or its operations without introducing errors to the existing code that uses the abstract data type. Abstract data types represent an intermediate step between traditional programming and object-oriented programming.

What is Data Structure?

A data structure is a way of grouping fundemental types (like integers, floating point numbers, and arrays) into a bundle that represents some identifiable thing. For example, a matrix may be thought of as the bundle of the number of rows and columns, and the array of values of the elements of the matrix. This information must be known in order to manipulate the matrix. C introduced the struct for declaring and manipulating data structures. C++ extended the struct to a class.

What is Member Function?

A Member Function, or Method is a routine which is associated with a data structure to make a class. A Member Function can be invoked, and when it executes it has access to the data in the class, as well as data passed by way of arguments.

What is Reference?

To access a variable, such as an element in an array or a field in a record.