RUST: A system programming language with a focus on safety, especially thread and memory safety. It supports both functional and imperative paradigms. Systematically follows C#. designed by Gradon Hoare at mozilla in 2010. Ownership: One of rusts most distinct and compelling feature for memory safety. There are exactly one binding to any given resource 🡪 memory allocation in heap. \*\*\*Small diagram: memory = [stack|Heap] – this is horizontal) … - The stack stores values in the order it gets them and removes the values in the opposite order (last in first out). – it is fast because of the way it accesses data. – the heap is used to store data with a size unknown at compile time. It is less organized and slower. Borrowing: It means that we do not take over the ownership, just borrow the ownership via pass by reference. Any borrow must last for a scope no greater than that of the owner. Lifetime you may only have one or more references (&T) to a reference. You can have only one mutable reference (&Mut T). Lifetime: the length of time that (things or variables) that is usable. //for code: the &’a = return value of fn skip\_prefix() has the same lifetime as the line parameter, which makes the v reference safe to use even after the p goes out of scope in the original example. Mutable Reference: mutability[ a borrow(&mut), a binding(let mut). you are referencing the place in memory where the variable x is stored. Across function boundaries, you can change the value stored in memory there. when the method returns and println! Hits. The value of x is updated. Data Race: two or more pointers are used to write to data. These are no mechanisms being used to synchronize access to data. GO: Go was released in 2012 and was designed by Google engineers Robert Griesemer, Rob Pike, Ken Thompson. Main features: 1) Static typing and efficiency(like C++ and Java), 2) Productivity (like python), 3) High performance networking and multiprocessing. C# Property: it provides the opportunity to protect a data member in a class by reading a writing to it through the property. CODE: Access\_Modifier Type PropertyName {get {//read actions} set{//write action}}. Indexer: it allows your class to be used just like an array. Indexers are usually known as smart array. CODE: <modifier> <return type> this [argument list]{ get{//get block code} set{//set block code}. Polymorphism: it allows you to access derived class methods through a base class pointer during run-time. Delegate: Using a delegate allows the programmer to encapsulate a reference to a method inside a delegate object. The delegate object can then be passed to code which can call the referenced method, without having to know at compile time which method will be invoked. Pointer: is nothing but a variable that holds the memory address of another type. But in **C# pointer** can only be declared to hold the memory address of value types and arrays. Unlike reference types, **pointer** types are not tracked by the default garbage collection mechanism. Any code involving pointers should be inside an unsafe context. C# allows restrictive use of pointers, while java does not. Pass-by-ref: the caller and the callee use the same variable for the parameter, if the callee modifies the parameter variable, the effect is visible to the caller’s variable. Pass by value: the caller and callee have two independent variables with the same value. if the callee modifies the parameter variable, the effect is not visible to the caller.

JAVA: Interface: the description of a class with the bodies of the methods omitted. Multiple inheritance: public class game extends applet, thread. Can we have multiple inheritance in java? While a class can only extend to a single class, it can implement any number of classes. Dynamic binding and polymorphism: in c++, a method must be defined to be virtual to allow dynamic binding. In java, all method calls are dynamically bound unless the called method has been defined to be final. Inheritance: public class new\_class extends {same as:} baseclass{…}. Exception handling: throws-it specifies the exceptions that are not handled in the current routine. Those exception will be progated to the method caller. If no handler is found (all the way to main) the program will terminate. In java methods are virtual by default unless you use “final” to terminate polymorphism. Dynamic Binding: compiler doesn’t decide the method to be called. Overriding is a perfect example of dynamic binding. In overriding both parent and child classes have same method. Perl: Practical extraction and report language. Good general scripting language. Hash: an unordered collection of pairs of scalars (key and value) also called associative arrays. \*\*\* draw a box, name it hash, inside the box have 3 entities. One box titled red with ‘255.0.0’, one with green ‘0.255.0’ other with blue etc. $name {$index} #scalar value of an array element, $name {key}: scalar value of a hash entry at the key ‘key. A class = a package. Constructor: you can use “new: as a function name. it returns objects by blessing function which blesses a reference to the package class. Pattern matching: if($string =~ m/foo/){#do something}#(=~) matching, (m/foo/) 🡪 pattern. Patterns matching are normally enclosed in slash characters: /def/. Python: a high level programming language that supports object orientation, imperative and functional paradigms. It is often used as scripting. List comprehension: it provides a condensed way to create likes without restoring to use map(), filter() and/or lambda. Each list comprehension consists if an expression followed by a for clause, then zero or more for or if clauses. The result will be a list resulting from evaluating the expression in the context of the for and if causes which follow it. Tuple: it is much like a list except it is immutable once created. It is generally used for data that should not be changed. Tuples are enclosed in parenthesis, like lists in Lisp or scheme. Module: ­­­modules are a simple way to structure a program. There are modules in the standard library, other python files, or dictionaries containing python files. A module is a file containing phyon definition and statements. The file name is the module name with a suffix. It contains excutable statements as well as function definition list is associate array, mutable. Indentation: it uses whitespace indentation, rather than curly braces to delimit statement blocks. An increase in indentation comes after certain statement and a decrease in indentation signifies the beginning and end of the current block respectively. Pattern matching: A regular expression is a special sequence of characters that helps you **match** or find other strings or sets of strings, using a specialized syntax held in a **pattern**. Parallel Computing: it is a form of computing in which many calculations are conducted simultaneously or in parallel. Levels of parallelism: bit, instration, data, and task level. Cloud computing: internet-based, lots of small allocation requests, amazon EC2 window azure. Grid Computing: distributed computer system that is loosely compiled (each node is autonomous) heterogeneous, and geographically dispersed (LAN or WAN). Cluster computing: linked via fast local network, bewolf cluster a # of identical commercially available comparte connected by TCP.IP LAN and operated on linux or unix. MPI: a library of functions that can be called form c, c#, and fortran. Each process can be run on a different memory pair. Two processes can communicate by calling functions. One process calls a send function and slave processes. Other calls a receive function🡨 master process. OpenMP: easier to program and debug, can still run the program as a serial code. Cons: can only be run in shared memory computers, mostly used for loop penalization. #progma omp parallel num\_threads(thread\_count), “#” only execute one time. Progma is directive. Parallel: a directive: it specifies that is following statement will be executed in the parallel. The **pragma omp** parallel is used to fork additional threads to carry out the work enclosed in the construct in parallel. The original thread will be denoted as master thread with thread ID 0. Num\_thread(thread\_count) is a clause that modifies the directive. an API for shared memory parallel programming. MP refers to multiprocessing. Openmp is designed for systems in which each thread or process can potentially have access to all available memory. OpenCL: open computing language, the first royalty-free industry standard that makes much faster computations possible. Compute devices(CPU/GPU) are attached to a host processor (a CPU). CUDA: Compute United Device Architecture. Which is a parallel computing platform. CUDA platform consists of CUSA accelerated libraries, extended C/C#/fortran languages. CUDA works on NVIDIA graphics cards. Kernel Function: is a GPU function that is meant to be called from the CPU Code. It gives it two fundamental characteristics. Kernels cannot explicitly return a value. all result data must be written to an array passed to the function (if computing a scalar, you will probably pass a one-element array). \_\_global\_\_ specifier is also called kernels,, this function can be called from the host side using kernel call semantics (<<<…>>>), this function can be executed in the device, the devices and executed only on the GPU/device. Threads are organized in blocks and the blocks are executed by a multiprocessing unit. kernel<<<nBlock,nThreads>>>(args). C++: Polymorphism: a third component of OOP. It means that a call to a member function will cause a different function to be executed depending on the type of object that invokes the function. Extern: a keyword tells the compiler that a variable is declared in another module (outside of the current scope) extern int i = declares that there is a variable named i of type of int, defined somewhere in the program. The linker then finds this actual declaration and sets up the extern variable to point to the correct location. Variable described by extern statements have any space allocated for them, as they should be properly defined everywhere. Inline function: enhanced feature to increase execution time of a program. Functions can be instructed to compiler to make them inline so that compiler can replace those function definitions wherever they are called. nested class: is a member and as such has the same access rights as any other member. The members of an enclosing class have no special access to members of a nested class; the usual access rules shall be obeyed. Polymorphism: C# and Java both have dynamic binding. So, whatever is in the class of that array element is what is printed by the talk function. C++ does not have dynamic binding. So, whatever is in the base class ends up being what is printed by the talk() function. Block vs Thread: for most graphics cards, 512 is the limit per block. If your problem is bigger than 512, we have to use the combination pf blocks and threads. The maximum number of resident blocks per multiprocssor is 8 for all cards. Blocks hold all threads. Event: Is a GPU time stamp that is recorded at a user-specified point in time.

Q: What are keypoints in c++ for implement polymorphism? A: 1)virtual function, 2) pointer to a base call. Q: static vs dynamic – by default a class is dynamic. A: If static 🡪 there is only one such object in an application it is created automatically by java when your program is executed. You cannot use new to create an instance. Eg. Math class – just contains constants and methods. Q: if you don’t provide this what happens? A: No object of this subclass can be created. Public classs rectangle extends shape{public float getArea(){return height\*width}}. Q: why use parallel computing? A: Bottleneck of cpu technonogy nanotechnology. Limits how many transition can be put on a chip. Solves large problems. The universe is parallel, galaxy formation weather, rush hour traffic.





