Core Language Features of C++

1. Basic Syntax and Types

- Primitive types: int, char, float, double, bool, etc.
- Type modifiers: signed, unsigned, short, long, etc.
- Type inference: auto
- Constants: const, constexpr

2. Pointers and References

- Pointers: int* ptr
- References: int& ref
- Pointer arithmetic and nullptr

3. Control Structures

- Conditionals: if, else, switch
- Loops: for, while, do-while, range-based for
- Jump statements: break, continue, goto, return

4. Functions

- Declaration and definition
- Overloading
- Default arguments
- Inline functions
- Lambda expressions

5. Object-Oriented Programming

- Classes and objects

- Encapsulation: private, public, protected

- Constructors / Destructors

- Inheritance: Single, multiple, virtual

- Polymorphism: Virtual functions, override, pure virtual

- Access control and friend functions

6. Templates (Generic Programming)

- Function and class templates

- Template specialization and SFINAE

- Type traits and metaprogramming

7. Operator Overloading

- Custom behavior for operators with user-defined types

8. Memory Management

- Stack vs Heap

- Manual memory: new, delete

- Smart pointers: unique_ptr, shared_ptr

- RAII (Resource Acquisition Is Initialization)

9. Standard Template Library (STL)

- Containers: vector, list, map, set, etc.

- Iterators

- Algorithms: sort, find, for_each, etc.

- Function objects and binders

10. Exception Handling

- try, catch, throw

- Custom exception classes

11. Namespaces

- namespace, using directive

12. Input/Output

- Streams: cin, cout, cerr, ifstream, ofstream

13. Concurrency (C++11 and beyond)

- std::thread, mutexes, condition variables, atomics