The scope of a name is the collection of statements which can access that name binding

✦ Static scoping (lexical scoping)

- A name is bound to a collection of statements in terms of its position in the source program (C, Java, Python)
- Good readability and better compile-time checking

✦ Dynamic scoping

- A name is bound to its most recent declaration in terms of the program’s execution history (Perl)
- Generally not used, since it makes type checking difficult and is prone to errors
Nested and Disjoint Scopes

✧ Disjoint scopes
  • The same name can be bound to different entities without any interference (e.g. C function)

✧ Nested scopes
  • Syntactic nesting: obvious in the layout of a program
  • Semantic nesting: not obvious from the layout of a program (e.g. inheritance of Java, C++)
Reference

**Defining Scope**: the scope in which a name is defined or declared

**Nonlocal reference**: a reference to a name occurs in a nested scope of the defining scope

**Local reference**: a reference which is not a nonlocal reference
Symbol Table

A symbol table is a data structure kept by a compiler or interpreter to keep track of each declared name and its bindings.

- Dictionary, which links an identifier with its attributes (e.g. value, type, etc.), is used for current scope, holding all identifiers declared in that scope.

- To handle nested scoping, symbol tables are placed in a stack, and the tables are searched from inner to outer.
Algorithm for Nested Scoping Implementation

✦ When entering a new scope, push a new, empty dictionary on the symbol table stack

✦ When exiting a scope, pop the top dictionary off the symbol table stack

✦ When a name is bound to a value, push the entry onto the current dictionary

✦ Given a name reference, look in the current dictionary
  
  • If the name reference has a binding, return the appropriate value
  
  • If the name reference is not found, repeat the process with the next dictionary in the stack
  
  • If there are no more dictionaries, return failure and report a lookup error