Homework 4

Programming Language Design

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4.1 Pick one of the following languages: Python, Modula, Ada, C#, or Perl. After consulting an authoritative reference, discuss each of the following requirements for that language:

(a) Declaration before use.

In Python, you don't declare variables before use. Variable names have no types, just the values have types.

(b) Overloading of operators for programmer-defined types.

In Python, you can overload operators for programmer-defined types. Types are just objects, and you can overload methods for objects.

(c) Binding time of array size.

Python lists are dynamically sized and mutable, containing references to objects. Since they're dynamic, array size is bound when the list gets an assignment. If something is added to the list it creates a new, larger, list.

(d) What constitutes a scope.

Scope in Python is a matter of where a name is accessible. Names defined outside of a function are global, names defined inside of a function are only accessible inside of that function, etc.

(e) Location of a declaration within a scope.

Like other variables, local variables in Python don't need to be declared, and a name is created for a value once it's assigned.

4.2 After consulting an authoritative reference on the requirements for using global variables in C, answer the following questions.

(a) How can they be accessed in other compilation units?

Using the `extern` keyword.

(b) How can global variables be hidden from other compilation units?

Using the `static` keyword.

(c) Why would you want to hide global variables?

If you wanted to reduce name collisions. For example, you had a common variable name in 2 different files that you wanted to make sure their namespaces didn't overlap.

4.3 C and C++ distinguish between declarations and definitions. What is the distinction? Give an example of each each.

A declaration creates an address in memory for that specific type. Whereas, a definition assigns it a value.

4.5 Most programming languages prohibit redeclaring the same variable name within the same scope.

(a) Explain why types alone cannot be used to distinguish such a duplication.

(**b) What is the difference between this restriction and the absence of such a restriction for overloaded functions?**

4.6 For the language C, give three examples of r-values that cannot be l-values. Give three more examples of l-values? Are there l-values that cannot be r-values? Explain.

Cannot be l-values: Constants, Expressions, An array type

Cannot be r-values: Assignment operators, Address operator (&)

L-values are a locator value and has an address to location in memory. A r-value is everything that doesn't represent an object in memory.