

Chapter 5

2. The advantage of a typeless language is flexibility; any variable can be used for any type values. The disadvantage is poor reliability due to the ease with which type errors can be made, coupled with the impossibility of type checking detecting them.

5. Implicit heap-dynamic variables acquire types only when assigned values, which must be at runtime. Therefore, these variables are always dynamically bound to types.

6. Suppose that a FORTRAN subroutine is used to implement a data structure as an abstraction. In this situation, it is essential that the structure persist between calls to the managing subroutine.

8.

(a) i. sub1

ii. sub1

iii. main

(b) i. sub1

ii. sub1

iii. sub1

10. Variable Where Declared

In sub1:

a sub1

y sub1

z sub1

x main

In sub2:

a sub2

b sub2

z sub2

y sub1

x main

In sub3:

a	sub3
x	sub3
w	sub3
y	main
z	main

	a	main
(e)	c, d, e	fun2
	f	fun3
	b	fun1
	a	main
(f)	b, c, d	fun1
	e	fun2
	f	fun3
	a	main

14. Variable Where Declared

(a)	a, x, w	sub3
	b, z	sub2
	y	sub1
(b)	a, x, w	sub3
	y, z	sub1
(c)	a, y, z	sub1
	x, w	sub3
	b	sub2
(d)	a, y, z	sub1
	x, w	sub3
(e)	a, b, z	sub2
	x, w	sub3
	y	sub1
(f)	a, y, z	sub1

b	sub2
x, w	sub3

Chapter 6

1. Boolean variables stored as single bits are very space efficient, but on most computers access to them is slower than if they were stored as bytes.

13. Require all references to enumeration constants to be qualified with the type name, as in `colors.blue`.

14. Let the subscript ranges of the three dimensions be named `min(1)`, `min(2)`, `min(3)`, `max(1)`, `max(2)`, and `max(3)`. Let the sizes of the subscript ranges be `size(1)`, `size(2)`, and `size(3)`. Assume the element size is 1.

Row Major Order:

$$\text{location}(a[i, j, k]) = (\text{address of } a[\text{min}(1), \text{min}(2), \text{min}(3)]) \\ + ((i - \text{min}(1)) * \text{size}(3) + (j - \text{min}(2))) * \text{size}(2) + (k - \text{min}(3))$$

Column Major Order:

$$\text{location}(a[i, j, k]) = (\text{address of } a[\text{min}(1), \text{min}(2), \text{min}(3)]) \\ + ((k - \text{min}(3)) * \text{size}(1) + (j - \text{min}(2))) * \text{size}(2) + (i - \text{min}(1))$$