11.4 Pointers as Arguments

So far, we've managed to avoid a rather important question: What are pointers good for? There's no single answer to that question, since pointers have several distinct uses in C. In this section, we'll see how a pointer to a variable can be useful as a function argument. We'll discover other uses for pointers in Section 11.5 and in Chapters 12 and 17.

We saw in Section 9.3 that a variable supplied as an argument in a function call is protected against change, because C passes arguments by value. This property of C can be a nuisance if we want the function to be able to modify the variable. In Section 9.3, we tried—and failed—to write a `decompose` function that could modify two of its arguments.

Pointers offer a solution to this problem: instead of passing a variable `x` as the argument to a function, we'll supply `&x`, a pointer to `x`. We'll declare the corresponding parameter `p` to be a pointer. When the function is called, `p` will have the value `&x`, hence `*p` (the object that `p` points to) will be an alias for `x`. Each appearance of `*p` in the body of the function will be an indirect reference to `x`, allowing the function both to read `x` and to modify it.

To see this technique in action, let's modify the `decompose` function by declaring the parameters `int_part` and `frac_part` to be pointers. The definition of `decompose` will now look like this:

```
void decompose(double x, long *int_part, double *frac_part)
{
  *int_part = (long) x;
  *frac_part = x - *int_part;
}
```

The prototype for `decompose` could be either

```
void decompose(double x, long *int_part, double *frac_part);
```

or

```
void decompose(double, long *, double *);
```

We'll call `decompose` in the following way:

```
decompose(3.14159, &i, &d);
```

Because of the `&` operator in front of `i` and `d`, the arguments to `decompose` are *pointers* to `i` and `d`, not the *values* of `i` and `d`. When `decompose` is called, the value 3.14159 is copied into `x`, a pointer to `i` is stored in `int_part`, and a pointer to `d` is stored in `frac_part`: