```
/*-----FIRST COMPUTE THE BASIC BILL.-----***/
     IF USAGE > 500 THEN BILL = 14.50 + .025*(USAGE-500);
                    ELSE IF USAGE > 50 THEN BILL = 2.00 + .035*(USAGE-50);
                                       ELSE BILL = 2.00;

/***-----NOW APPLY THE DISCOUNT.-----***/

      IF HEAT
         THEN IF USAGE < 10000
              THEN IF USAGE > 1000 THEN BILL = BILL * .95;
                                   ELSE;
              ELSE BILL = BILL * .90;
```

To begin with, the case that deals with usage between 100 and 500 has been inadvertently left out. This is not a big problem, since the error works to the advantage of the electric company. There are also a couple of minor boundary errors, since the specification gives a 5% discount for the inclusive range 1000 to 10000, while the code gives it for the exclusive range. ("Take care to branch the right way on equality.")

The null ELSE (second to last line) handles the case where the usage is less than 1000; it is required because the decisions are made in the wrong order, as we discussed in Chapter 3.

Most interesting, however, is the second version of the program. The textbook says that "Since a customer with usage less than 500 will never receive a discount, the program will be more efficient if the test for the discount is made only when we already know the usage exceeds 500," and presents a more efficient version, as follows:

```
IF USAGE > 500 THEN DO;
                    IF HEAT
                       THEN IF USAGE < 10000 THEN BILL = BILL * .95;
                                             ELSE;
                       ELSE BILL = BILL * .90;
                 END;

               ELSE IF USAGE > 100THEN BILL = 3.50 + .0275*(USAGE-100);
                                   ELSE IF USAGE > 50 THEN
                                           BILL = 2.00+.035*(USAGE-50);
                                                  ELSE BILL=2.00;
```

As is often the case, the attempt at "efficiency" doesn't work out too well. Passing over the typo 100THEN, notice first that if USAGE exceeds 500, BILL is never initialized, so it is either a dreg from the previous customer or garbage. This oversight will probably be caught quickly once the program is actually run.

Less glaring, and therefore more likely to escape notice for a while, is the incorrect correspondence of IF's and ELSE's: the test

```
IF HEAT
```

is paired with

```
ELSE BILL = BILL * .90;
```

because the null ELSE wasn't removed during the modifications. Thus anyone whose usage is more than 500 but who *doesn't* heat with electricity gets a free 10% discount. One hopes that the increased efficiency of the program will help to compensate for giving everyone a 10% discount.